EFFECTS OF INFECTIOUS DISEASES AND MALNUTRITION ON THE NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN IN SELECTED AREAS IN AKWA IBOM STATE OF NIGERIA

A THESIS SUBMITTED TO THE DEPARTMENT OF NUTRITION AND FOOD SCIENCE UNIVERSITY OF GHANA - LEGON IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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DECLARATION

I, Afiong J. Ekong (Mrs.),do hereby declare that this study, with the exception of quotations and ideas acknowledged, was written by me and contains an authentic analysis of the survey conducted in Akwa Ibom State, Nigeria, from 1990 to 1991. That this thesis has in no way been published nor presented elsewhere for the award of a degree.

AFIONG J. EKONG (MRS.)

SUPERVISOR

CO- SUPERVISOR

DEDICATION

In memory of my parents whose inspiration instilled a love for learning;

To my husband Don, for his financial support, love and encouragement;

To Mrs. Afiong D Okeke, Dr Donald U. Ekong, Dr. Udeme Ekong and Dr. Anie Ekong who allowed me to grow ....

for the joy of "growing together ....

and for whom all began;

and

To Perseverance and Determination.

ABSTRACT

A research was conducted in some urban and rural areas of Akwa Ibom State of Nigeria from August 1990 to July 1991. The objectives were to study the interactions of infectious diseases and malnutrition and their effects on the nutritional status of pre-school children (Study I). The occurrence and distribution of diarrhoeal disease and its relationship to infant feeding practices (Study II) and the influence of socio-economic and environmental factors on the prevalence and severity of infectious diseases (study III).

Four hundred and sixty-six (466) pre-school children aged 6 months to 48 months were the subjects. Infant feeding practices were recorded. Follow-up visits involved fortnightly records of morbidity, and 3 monthly anthropometric measurements. The effects of infectious diseases and malnutrition on the growth pattern of the pre-school children were examined.

For study I, a 2 x 2 factorial design was used in grouping the Sick/ Malnourished children and the Not Sick/Not Malnourished children into four groups as follows : (1) the "Not Sick Not Malnourished"(NSNM) (control group), (ii)The "Sick but Not Malnourished" (SNM), (iii) the "Not Sick but Malnourished" (NSM), (iv)The "Sick and Malnourished" (SM).Nutritional status of the children in each group was assessed and compared to that of their age control group.

The results showed that the "Sick and Malnourished" (SM) group had low body weight, poor growth, low skinfold thickness, low head circumference, low upper arm circumference, low chest circumference, low muscle circumference, low

body fat, low buttocks circumference, low upper thigh circumference, low lower thigh circumference, low calf circumference and low haemoglobin levels compared to other groups.

Mean weights of the "Not Sick Not Malnourished" (NSNM) group were significantly ($p<0.05$) higher throughout all ages when compared to those of the other three groups (NSM, SNM and SM). Mean weight of the "Sick but Not Malnourished" (SNM) group was significantly ($p<0.05$) higher than those of the malnourished groups (NSM, SM). Subsequently, Mean weight of the "Not Sick but Malnourished" (NSM) group was significantly ($p<0.05$) higher than that of the "Sick and Malnourished" (SM) group.

Increase in weight and length/height of children were measured as 3 monthly changes in body weights and lengths/heights. Mean values were based on NCHS/WHO standard. Mean increase in weights and lengths/ heights of the "Not Sick Not Malnourished" (NSNM) group exceeded that of the NCHS/WHO standard.. Mean increase in weights and lengths/heights of the "Sick but Not Malnourished" (SNM) group compared favourably with that of the NCHS/WHO standard. Mean increase in weights and lengths/heights of the "Not Sick but Malnourished" (NSM) and "Sick and Malnourished " (SM) groups were below the NCHS/ WHO standard.This study demonstrates synergism between malnutrition and infectious disease, in which the combined effect was greater than the sum of the impact of each condition.

It was found in Study II that the incidence of diarrhoea occurred among the children at the ages of 12 months and 24 months of life. There was a gradual increase in diarrhoeal prevalence in infancy. The observed first peak at 12 months coincides with the age of introduction of supplementary foods. The observed second peak at 24 months coincides with age at which children are left crawling on the floor. There is, in general, greater exposure to contamination in areas with poor hygiene and improper sanitation.

Place of residence emerged as a strong predictor of diarrhoeal disease in children. The percentage of children who had diarrhoea was higher among the children from the rural areas compared to those from the urban area. During the season of high diarrhoeal incidence which is usually from September to January, the percentage of children who had diarrhoea was higher among children from the rural areas.

In Study III factor analysis was used to group the children into social strata. The influence of socio-economic and environmental factors on the prevalence and severity of infectious diseases among the children were assessed. The results reveal high incidence of infectious diseases among the low socio-economic class followed by the middle socio-economic class with least occurrence among children from high socio-economic class. Severity of infectious diseases as it affects pre-school children according to social strata was also assessed. It was found that severity was highest among children from low socio-economic class.

A model was developed using variables used in factor analysis to predict outcome of nutrition and infections. The model reveals that the relative risk of being sick and malnourished were high among children from low socio- economic class and children from families with poor sanitary conditions.

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CHAPTER 1

INTRODUCTION

Each year about 13 million infants and children die in the developing countries (Mason et al., 1989). The majority of these deaths are due to infectious and parasitic diseases, and many of these children die malnourished. In most developing countries, children from birth or soon after, are caught in a cycle of malnutrition and infection, of which many do not survive (Fauveau, V. et al., 1990, Rivera and Martoare (1988), WHO(1994).

In Africa for instance, more than 20% of the children- on average - do not reach their fifth birthday (Mason et al., 1989). Malnutrition and infections interact to produce most of the diseases and deaths among the poor infants and young children in developing countries. Among children the two conditions combine not only to increase morbidity and mortality but also to produce life-long deficit in physical and mental development. Interactions are cyclic, in that infections produce malnutrition,and malnutrition increases the occurrence and severity of infections.

The synergism between bacterial, viral, and parasitic infections and malnutrition has been recognized for many years (Jelliffe et al., 1989). Knowledge of this subject has become well-established. The mechanism of many of these interactions has been elucidated. There have been enormous advances in methods for preventing and managing infections. Immunization coverage for major childhood diseases has now reached over 65% of children. Improvements in environmental sanitation, Education and Literacy which help to improve child rearing and health practices, and a whole range of new and increasing affordable antibiotics and anthelminthic have been effected presently (Mason et al 1989).

The understanding of protein-energy and micronutrient deficiencies is now well advanced but preventing these deficiencies appears to be problematic. Protein-energy malnutrition is related to poverty and long term progress is linked with development. "Globally, the proportion of people undernourished fell during the 70's, probably less so during the 80's - and actually increased in Africa - the total number of people undernourished continue to rise with population growth (Mason et al., 1989). Along with this, the total numbers of children underweight - due to malnutrition and infection are still increasing (Mason et al., 1989).

Brown et al. (1985) conducted dietary intake studies once a month for 12 months on 70 children between 5 and 18 months of age from 2 villages in the Matlab field research area, Bangladesh. Foods consumed by the child were weighed by a field worker in the home and breast milk intake estimated from 12 hours test weighings. Morbidity data was collected once a week. Variations in intake were related to inter-individual differences and season. The intake of most nutrients was significantly depressed by approximately 10% during febrile illnesses.

This investigation goes to confirm the negative effect of infections and malnutrition on the nutritional status of the infants. The fact that nutrition influences infection and the causes and outcomes of episodes of disease is well documented. For instance, protein energy malnutrition is known to have a depressing effect on the immune system and effect of this can be distinguished (Kauffman et al., 1986). Growth failure is associated with lowered immunity. It seems that even mild degree of malnutrition begins to adversely affect immuno-competence, resulting in morbidity and mortality.

Moreover, the mechanisms whereby infections lead to growth failure and clinical malnutrition are now better understood. They operate through anorexia, changes in metabolism, malabsorption, as well as behavioural changes affecting feeding practices. The interactions of nutrition and infection with regards to individual infections and some nutrients and vitamins are now known. For example, Protein-energy malnutrition increases the duration of episodes of diarrhoea.

Vitamin A deficiency affects epithelial membranes, and relates to respiratory tract infections and diarrhoea. Deficiencies of other micronutrients exert an influence through such routes as immunocompetence and intergrity of epithelial tissues (Tomkins and Watson, 1989).

Fauveau and co-workers (1990), Sommerfelt (1991) and Brown et al (1989) came out with a number of significant factors which predisposed a child to malnutrition. One of the most significant factors was found to be the pattern of child feeding practices. Breast-feeding, its duration, methods of cessation of breast feeding, types and quantities of supplementary food and foods given to the child after complete weaning, were all found to be very important.

Elo and Grummer-Strawn (1991) reported on child feeding practices in Peru in relation to malnutrition. They observed that breast feeding continues till latter part of the 2nd year. However, supplementary food consists of gruel of boiled and fermented millet together with snacks from the adult diet. They further reported that from age of 18 months onwards, the child is given the softer portion of the family diet composed mainly of starchy foods. These are eaten with rather spicy stew and this obviously leads to irritation type of diarrhoea. The cumulative effect of this poor diet and frequent diarrhoea set the stage for the occurrence of kwashiorkor, they concluded.

Among Brazilian children, Barros and Victora, (1990) elucidated the basic cause of severe PEM as inadequate breastfeeding and early weaning onto a bottle-fed diet of low nutritional value and of high bacterial contamination. They observed further, that the habit of giving sweetened tea or water and thereby providing on the average 40gm of sugar a day, contributed to the occurrence of kwashiorkor. In Sudan, the pattern of protein-energy malnutrition was found to be determined to a large extent by the duration of breast feeding and the method of weaning. About 59% of the children suffering from marasmus and kwashiorkor were weaned abruptly, while only 12% of them had been gradually weaned onto a mixed diet at an average age of 15.6 months (Kashyap and Young, 1989).

Nigeria, just like other developing countries, is saddled with many childhood diseases with PEM featuring prominently. Consequently, a sizable number of surveys and researches have been carried out on malnutrition among pre-school children as it relates to feeding pattern, urbanization and other ecological factors (NISH, 1985).

In a nutrition survey carried out by Bankole and Olaleye in Kenya (1991), many nutritional problems were identified,(including kwashiorkor) which were caused by lower than optimum caloric intake mainly from carbohydrate sources such as gari and yam. In the same year Feyisetan (1991) gave a detailed account of infant feeding among the Yorubas of Ile-Ife in Nigeria. He reported that breastfeeding continued for nearly 2 years for most children who were fed on demand rather than by schedule. However, the supplementary foods were introduced rather earlier than usually considered to be the case in West Africa.

These consisted almost exclusively of cabohydrate with a low content of protein, vitamins and minerals. He emphsized that meat and fish were rarely given to these children.

The Nigerian Demographic and Health Surveys (NDHS 1990) reported that it is the custom to start giving solid foods during the first year. This is mainly pap (akamu) made from maize, which due to the traditional method of preparation, loses a high proportion of its protein content. Another solid food is steamed bean cake (moimoi) which is introduced 4-5 months later than maize pap, however, the pepper content is so high that the amount the child actually takes is virtually insignificant.

Protein-energy malnutrition among pre-school children is still one if not the most important public health problem in Nigeria (Nnanyelugo, 1980). Surveys carried out in different parts of the country most recently indicated a high level of malnutrition among pre-school children (Health and Nutrition Survey, 1985). In a well-nourished population, only about 2 percent of the population is expected to fall below the median weight-for-height However, this survey found that this proportion was ten times greater than the standard in both urban and rural areas of Nigeria (Health and Nutrition Survey, 1985). The survey also showed that 21 percent of the urban children and 20 percent of the rural children fell below the NCHS/WHO median. These findings imply that about one-fifth of children aged below 60 months were moderately or severely malnourished (HNS, 1985).

1.2 STUDY LOCATION

Akwa Ibom State

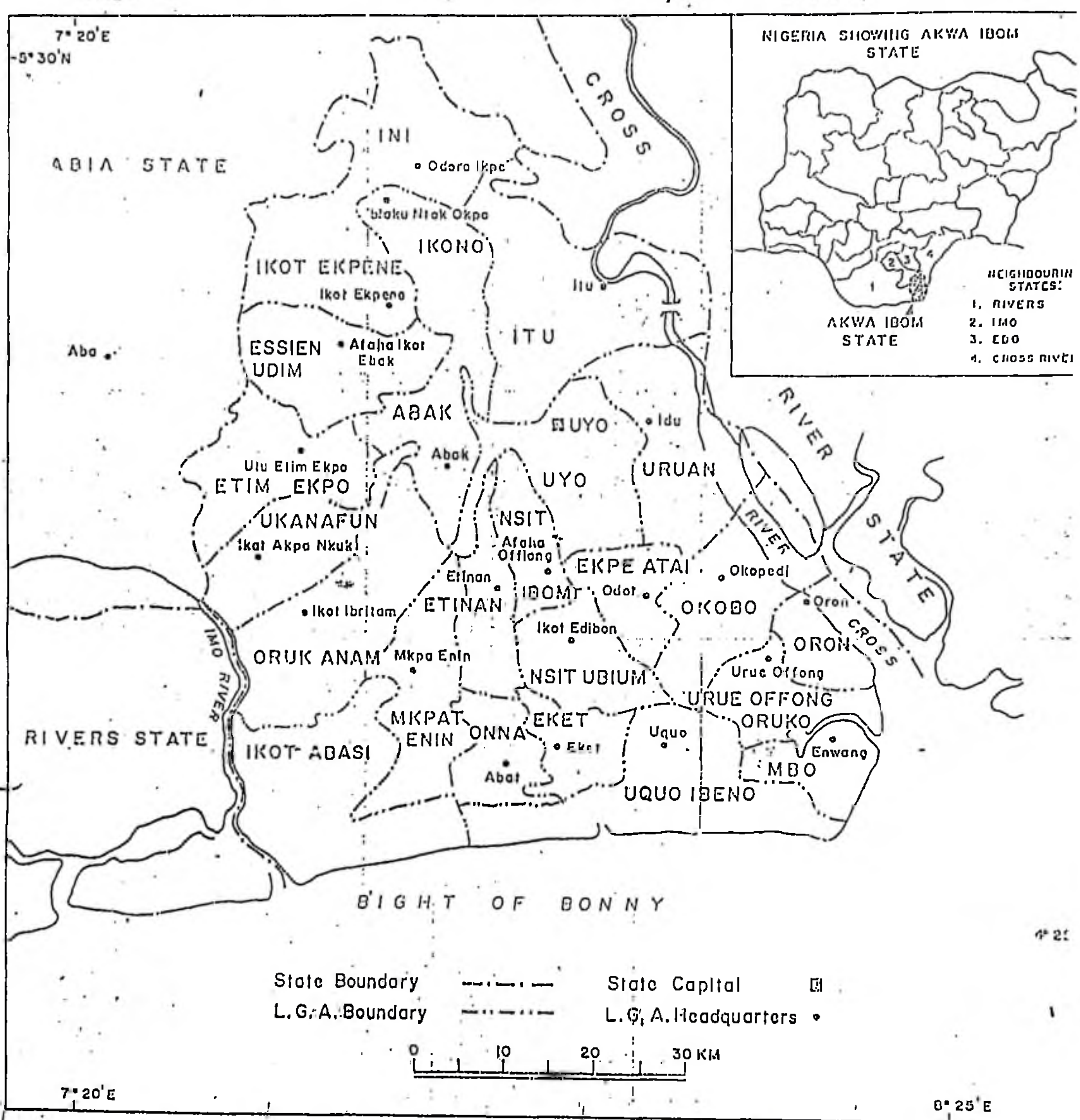
Akwa Ibom State was created from the former Cross River State of Nigeria in September 1987 by President Ibrahim Babangida's Military administration. Before its creation, the State was that part of the former Cross River State generally referred to as the "Mainland". Akwa Ibom State is made up of 30 local Government areas with Uyo as the State capital. It occupies a territory covering approximately 8412 square kilometres with a population of about 2.4 million (Nigeria Census, 1992). Over 1 million people live in the State capital, Uyo (Nigeria's Akwa Ibom State Report, 1988). The State is made up of a homogenous group of people who originated from a single ancestral stock. The people have a common linguistic heritage, the main language being Ibibio which is spoken and understood by every group in the State including the Efiks of the Cross River State.

Akwa Ibom State falls within the tropical zone. There are two main seasons - the rainy season, from May to October; and the dry season, from November to April. Along the coastal areas, rain falls all year round. The coastal areas have an annual rainfall of about 350mm (Nigeria's Akwa Ibom State Report, 1988).

The ecological zone in which the State is placed offers very high potential for agricultural development. Due to its wide range of fertile soil and well distributed rainfall, the State has the natural advantage of being able to produce food for its teeming population. The people cultivate a wide variety of food and cash crops, such as rice, cassava, yam, cocoyam, plantain, banana, maize and a wide variety of fruits and vegetables as well as oil palm, rubber, raffia, cocoa, coffee, coconut and citrus.

The abundance of rivers and tributaries in the State encourages fishing all year round. Livestock farming which is undertaken in the State includes rearing of cows, pigs, chicken, goats and snails. Numerous small poultries are developed in most villages in the State.

Fig. 1 AKWA IBOM STATE, NIGERIA.



1.3 Relevance of Project

Nnanyelugo (1980) conducted a nutritional survey in urban and rural areas of Uyo when Uyo was a part of Cross River State of Nigeria on 540 pre-school children. The study revealed that the urban children had greater growth rates than the rural children and the increases were found to be statistically significant at all ages. The study also revealed that the infectious disease prevalence was higher among the children from low income group.

Nigeria has been involved with development of the major cities in the country resulting in an influx of the rural settlers to the urban areas. Moreover, Uyo, which formed a part of the former Cross River State of Nigeria has now become a State Capital. Uyo has been undergoing a rapid industrialization in the last few years. However, social and economic factors are not static, due to the dynamic nature of the people. Therefore, the interplay of these factors and their effects on nutritional status of the pre-school children needs to be investigated.

1.4 Objectives

The main objective of this study is to investigate the interactions of infectious diseases and malnutrition on the nutritional status of pre-school children in selected areas of Akwa Ibom State of Nigeria.

The specific objectives are:

1. To study the interaction of infectious diseases and malnutrition on growth pattern of pre-school children in selected areas in Akwa Ibom State of Nigeria.
2. To investigate the occurrence and distribution of diarrhoeal diseases among pre-school children and their relationship to infant feeding practices.

3. To study the influence of socio-economic and environmental factors on the prevalence and severity of infectious diseases among the pre-school children.

4. To make some recommendations aimed at improving pre-school child health and nutrition in Nigeria.

CHAPTER 2

LITERATURE REVIEW

2.1.1 Historical Background of Malnutrition

Although the clinical condition now referred to as "kwashiorkor" was first described in Germany (Czerny and Ketler1906) as a primary nutritional disorder. its close association with dietary deficiency was not established until the classic description of a "nutritional disease of childhood associated with a maize diet" in the Gold Coast (now Ghana) by Cicely Williams (1933). Williams (1935) named this condition "kwashiorkor". a word derived from the Ga language, which, means "the disease which the child gets when the second one is expected", or "the disease which occurs in a younger child deposed by subsequent pregnancy".

The condition has long been known to constitute a major health problem in many developing countries, the term kwashiorkor has been universally retained. "Infantile atrophy" a nutritional disorder, has long been recognised in a number of developed countries, but it was originally referred to by German and Austrian workers as marasmus. The similarity between "infantile atrophy" and the condition now termed "nutritional marasmus" in the developing countries has now been appreciated.

A significant contribution to our understanding of the problems of clinical nutritional disorder has been the concept that they constitute a spectrum of disease. The term "protein- caloric malnutrition" (PCM) specifying childhood nutritional disorders which primarily involve protein and calorie requirements in infant feeding, was proposed by Jellife (1959) to describe this spectrum of disease. According to this concept, kwashiorkor and nutritional marasmas respectively are the best defined of this spectrum with an intermediate syndrome called marasmic - kwashiorkor.

Prior to 1959, childhood malnutrition was described by different terms such as "infant pellagra" (Altman, 1948),"fatty liver disease" (Waterlow, 1948). Recently, the term "protein-energy malnutrition" (PEM) was derived from protein-caloric malnutrition" (PCM) which was introduced in the 1960s by Professor Platt (Waterlow, 1973). This term is now universally accepted in the field of human nutrition studies.

2.1.2 **Prevalence and Incidence of Protein-energy Malnutrition (P.E.M.)**

Protein-energy malnutrition is the most widespread form of malnutrition in the world. Its prevalence is high in developing countries. In Africa, for instance; more than 20 percent of pre-school children on average do not reach their fifth birth day (ACC/SCN 1989). The occurrence of severe cases of PEM, even in small numbers, is an indication of a much more extensive problem, that is, the existence of a large number of mild to moderate, frequently unrecognized, form of PEM.

Although the exact prevalence of PEM in Nigeria is unknown, there can be no doubt that in Akwa Ibom State and indeed throughout the country, its prevalence is high. The survey carried out in different parts of the country most recently showed that children in southern Nigeria exhibited severe growth retardation for age (Health and Nutrition Survey, 1985). Evidence had also shown that infant mortality rate in developing countries may be 20 to 50 times the rate in developed countries (ACC/SCN 1989).

Internationally, statistical data on prevalence of PEM shows that PEM is a public health problem of great importance. For instance, it is estimated that 50%

of all the children admitted into the paediatric wards in developing countries suffer from some degree of malnutrition (Sommerfelt, 1991). It should be noted that in these data emphasis is placed only on moderate and severe degrees of PEM which are much readily recognisable.

2.1.3 Morbiditv Due to Protein-EneravMalnutrition (P.E.M.)

Despite the high mortality rate in PEM, the subsequent growth, development and wellbeing of the survivors are adversely affected. For instance, it has been observed that at adolescence, children from areas where malnutrition is prevalent, are shorter in stature than those from the same age and ethnic group who have grown up in more developed areas in which acute or chronic malnutrition is less prevalent (Graitcer et al. 1981; Mathur et al. 1985).

The study of Ebomoyi (1987) on the body weight and other anthropometric characteristics of rehabilitated children revealed that with recovery, their heights were still low. Their skeletal development was retarded when compared with children of the same age and ethnic group. Similarly, Fletcher et al., (1988) observed that Jamaican children who had been undernourished 5-8 years before, were found to be significantly shorter than their siblings and these in turn were shorter than the control children from the same school. Balcazar and Cobas (1991) however, stressed that malnutrition occurring very early in life left severe deficits in height and head circumference which seemed likely to be permanent.

While the severe forms of PEM may be on the decline, the more moderate ones are now the most important from the public health point of view. Less severe forms have wide spread and insidious effects that tend to be over looked but are nevertheless, responsible for a great deal of morbidity. For instance, Tomkins et al.

(1983) found high morbidity and caloric intake and low morbidity and protein intake to be inversely correlated.

The morbidity variables used by these authors were the rates of infectious diseases or group of illnesses such as diarrhoea, respiratory and communicable diseases which were computed for every child for each of the first 3 years of life as well as for the total 3 years period. The rates were calculated by dividing the total number of days of disease by the total number of days of observation. They found the rate of diarrhoeal illness for a particular child in the second year of life to be 0.2 which is equivalent to the child having diarrhoea for 2.4 months during that year.

2.1.4 Mortality Due to Protein-Energy Malnutrition (P.E.M.)

In developed countries, childhood mortality declines remarkably after birth as soon as peri -natal causes cease to be significant determinants of death. Clearly, after the first year, the chances of death are small for the pre-school child in these countries. In contrast, survivors of the peri -natal period in developing countries continue to be at a high risk of dying during the first year of life and remain only at slightly lessened risk for the next five years.

In Nigeria a high mortality from PEM has been reported by various authors (NDHS 1990; OSDHS 1986);. It is however difficult to obtain reliable estimates of vital statistics because there are only rudimentary and incomplete registrations of vital events and even only occur in few localities. Furthermore, many children are reported to die from infectious diseases when infact malnutrition is the underlying or associated cause. Thus age specific death rates for children under 5 years of age vary widely and these depend largely upon the types of study carried out.

2.1.5 **Malnutrition and Growth**

Growth is the progressive development of a living being or part of an organism from its earliest stage to maturity, including the attendant increases in size. Growth is influenced by genes, nutrition, hormones and time (Martorel and Habicht 1986). Good nutrition for instance, promotes the production and activities of such hormones that influence the metabolism of protein, carbohydrate, fat and minerals as well as promotion of nitrogen retention. Lack of adequate nutrition will hinder such a natural growth pattern and stunted physical growth may be accompanied by physiological abnormalities or even retarded mental development.

Growth retardation is first manifested as inability to gain weight and leads to skeletal immaturity as well as physical, mental and emotional inactivity. Retardation due to malnutrition may begin in utero if the mother's diet during the latter part of pregnancy is not adequate in energy, high quality protein and other nutrients.

Commenting on the relationship of the maternal diet and the growth of the baby in terms of its birth length, Nanyelugo and Ngwu (1985) proposed that the length of a baby at birth was influenced more by the amount of energy and protein in the maternal diet than by the mother's height. A diet rich in energy and protein tends to produce a long baby, while a low protein, low energy diet would in all probability result in a relatively short baby, irrespective of the mother's height.

Growth retardation among children of post-weaning age may be caused by dietary deficiencies of specific nutrient. These may be vitamins or minerals or by a general lack of body-building proteins and/or energy for maintaining basal metabolism as well as allowing for further weight gain. Brown et al. (1981) had suggested that dietary management of malnourished children should aim at providing at least 165 cals (0.66 MJ) and 3.86 of protein per kilogram body weight per day during the first few months of rehabilitation.

In most developing countries it is the inadequate availability of both energy and high quality proteins that precipitates malnutrition. During infancy when the mother's milk provides a balanced ratio of amino acids as well as other nutrients, most children in the developing countries show growth rates comparable to those of advanced nations. Such a pattern is, however, not continued in the post-weaning period because most children, particularly those belonging to lower socio economic groups, get an unbalanced and insufficient diet both with respect to protein and energy.

Apart from economic constraints, the parents of under-privelleged children do not have a full appreciation of the growth needs of these pre-school children. They do not understand that when quality and adequate protein and energy are lacking in the diet, the growth of the child is likely to be affected adversely. A sufficient amount of energy in the diet is as essential as good quality proteins particularly as proteins that are needed for tissue-building will be used as source of energy if the intake of energy is not adequate.

Falusi (1985) reported on the physical growth of children from 2 different socio-economic groups in Ibadan, Nigeria. He observed significant differences between these children using various anthropometric measurements. The physical measurements of the children from the upper socio-economic group compared well with those of children from developed countries, whereas children of lower socio-economic group demonstrated a marked retardation of growth. These differences in growth were the result of a combination of a diet deficient in both energy and protein and chronic or recurrent acute infections. Similar findings have been reported from other developing countries where dietary inadequacies exist.

Tomkin et al (1986) in Gambia, reported gross disparity in the weights and heights of neonates and children aged one to eleven years belonging to the upper, middle and lower socio-economic groups. The authors calculated from the available data that in terms of weight and height, a one year old child of the upper socio-economic group was equivalent to a one-and-half year old in the middle socio-economic class and a two-year-old in the lower socio-economic group. Similarly, the weight and height of a six to seven year old upper socio-economic class were similar to those of a nine year old lower socio-economic class child.

2.1.6 **Malnutrition and Mental Performance**

The association between malnutrition in pre-school children and low levels of mental performances has been documented in several regions of the world where malnutrition is highly prevalent. Pollitt (1990) in Guatemala; Stephenson (1987) in Kenya; Galler et al. (1983) in Barbados, and Jamison, (1986) reported that severe malnutrition affects intellectual development, especially if it occurs during the first six months of life or possibly in the first two years,

They stated that even though developmental quotients increase during rehabilitation, thus diminishing the differences between mental and chronological age, these children never score the expected values for their respective ages. Galler et al. (1986) studied two groups of children recovering from malnutrition, using Griffith's Intelligent test scale. Both groups had the same dietary and medical treatment, the basic difference being the amount of stimulation offered to them.

At the end of the observation period of 4 months, the stimulated group had a higher performance quotient. However, both groups never reached the expected values for their respective ages. A greater deficit was found to occur in the area of language and communication.

In another follow-up study of 36 children who had been hospitalized at the ages of 4-24 months, Moock and Leslie (1986), found that at the ages of 7-14 years, their intelligent quotient level was 88. This figure was significantly lower than the value of 93 found in a group of normal children of unskilled workers. It is interesting to note that 1/3 of the fathers of the rehabilitated children were either professional or army officers and the rest skilled and unskilled workers.

Galler et al. (1983) and Mckay and Mckay (1983) showed in Colombia and Boston respectively the same relationship. In Mexico, the intelligence lag among pre-school children who had suffered severe malnutrition before their 30th month of life was assessed. The results showed that while 9 of the 37 siblings had intelligence quotient below 70, 18 survivors of the malnourished children scored above 90 (Soewondo et al . 1989). Pollitt (1990) contended that the antecedents of this mental lag are the sub-optimal development of auditory-visual competence and visual-kinesthetic intersensory integration, and ability related to learning to write.

Seshadri and Gopaldas (1989) in a follow up in India, found that children who had kwashiorkor had lower levels of certain type of intellectual skills - especially, the higher cognitive skills, at school age, than their siblings, classmates and control except their rural counterparts. They also reported that severe kwashiorkor appeared to have a selective long term effect on short term memory, logical reasoning, perceptual organization and the ability to synthesize and analyse. Thus the available information provides strongly suggestive evidence of the effect of nutrition per se on intellectual competence both directly and indirectly.

In the line of direct relationship, it has been found that severely malnourished children have brains smaller than average size, 15-20% fewer brain cells than the well-nourished children (Galler et al. 1983). It is also known now that the brain achieves 70% of its adult weight by the end of first year of life with corresponding 80% of the growth occurring by the first 2 years. During this period the body on the other hand achieves 20% of the adult weight (Galler et al 1986). Thus the first three to four years of development of the young child are very vital for normal growth of the brain and coincide with the critical period of sequential maturation and myelinization of the brain as it intergrates into functional units in the development of mental ability. It therefore, stands to reason that protein energy deficiency serious enough to affect gain in weight and height would also affect brain growth during the first three years when the brain is undergoing most of its increase in size.

Indirectly, there is the factor of loss of learning time and as such some months of experience when the child was ill and was not reacting to his environment. There is also the problem of interference with critical periods of development which may result in disturbance of functions that are both profound and of long term significance. Lack of active interaction between the child and the mother during the illness is also significance.

One of the first effects of malnutrition is a reduction in the child's responsiveness to stimulation and the emergence of various degrees of apathy.

This in turn generates apathy on the mother's side which can have consequences for stimulation, learning, maturation and interpersonal relations. The subsequent result is backwardness in performing more complex learning tasks. This clearly implies a higher risk of failure to profit from school exposure (Pollitt 1990). This definitely has serious repercussions for the individual families as well as the national development especially in a pre-industrial society.

Sending a child to school imposes a real sacrifice on the parents and other members of the household. Consequently, the demand for the child leaving school to contribute to the financial strength of the family, and look after his younger siblings could not be over emphasized. But, operating at a lower quotient means additional years in school with repeated failures.

Leslie and Jamison. (1990) stated that in Central Sri Lanka, and Zimbabwe, 26-30% of children repeated their first school year at least once and 17% repeated the 2nd school year. 60% of first graders in Sri Lanka (1989) and 67% for Zimbabwe (1988), dropped out before the end of the first year. Unfortunately, such figures are not available for most African countries to demonstrate the magnitude of the problem.

In any case, despite repeated failures, some of these children managed to go through with grades which qualify them to work at a particular level which put a ceiling on the income remuneration. Coupled with this is the tendency for them to marry women of their own level thus, producing children who are bound to suffer the fate of their parents.

Winnick et al(1970) summed up by saying:

> "The malnourished infant growing up in poverty is unable to acquire the skills to deal with the complexities of modern society. The result is that he remains poor for the rest of his life and his children are born into the same social and economic conditions. The family does not have the resource to adequately nourish the new infant. He in turn becomes seriously malnourished and if able to survive is handicapped in such a way as to prevent him from extricating himself from the plight of his parents. Thus a condition of poverty is perpetuated and will pass from one generation to the next".

It appears that severe PEM does not only cause exceptionally high mortality and morbidity in young children, but also is responsible for sub-optimal growth and mental handicap among the survivors.

2.2 Effect of Infections on Nutritional Status

Infections have a deleterious effect on the nutritional status of the host through physiologic and anatomic changes. Infectious disease is associated with loss of body constituents, rapid utilization of body stores of nutrient (Martorell et al. 1980). Most infections cause anorexia and decrease in food intake. With infection, caloric expenditure increases significantly even during rest periods, general malaise, changed sensory perception, diminished appetite, increased mucus secretion and other general disturbances lead to reduced food intake. In diseases such as measles and herpes, soreness of the mouth in young infants usually leads to inability to suck and failure of feeding from the breast or the bottle. Vomiting and diarrhoea which are frequent symptoms of infection aggravate nutritional losses and malabsorption.

Tomkins et al. (1984) studied Nigerian children with acute malaria. They observed that the mean absolute loss of albumin measured by faecal clearance of Fe59 labelled dextran was 1.7g/day, the equivalent of about 20% of the child's normal protein intake. Serum albumin falls during an attack of measles and may precipitate oedema.

The severity of nutritional changes varies with different types of infections or inflammatory processes, and are proportionate to the severity and duration of illness. Beisel (1975) classified nutritional wastage during infection as either:

(i) Absolute losses e.g. increased urinary nitrogen, loss of electrolytes, minerals, and protein in vomiting and diarrhoea, proteinuria, negative metabolic balance of cations, minerals and trace elements; OR

(ii) Functional Wastages - which include

(a) Overutilization such as increased usage of metabolic substrates, depletion of glycogen stores, diversion of amino acids for gluconeogenesis, mobilization of fat from depots, increased synthesis of cholesterol and triglyceride.

(b) Diversion such as hepatic uptake of plasma nutrients e.g. amino acids, increased hepatocytic synthesis of enzymes.

(c) Sequestration such as uptake of minerals (Fe, Zn) into parenchymal liver cells and phagocytes, uptake of trace elements into liver and other organs. Catabolic and anabolic processes take place simultaneously, both contributing to depletion of nutrients.

To a well nourished infant, nutritional losses are of little consequence but in infants with marginal or moderately severe nutritional deficiencies, infection may tip the balance toward overt malnutrition, such as kwashiorkor.

2.2.1 Influence of Infections on Protein Metabolism

Various studies have been conducted to define the ways in which infections produce protein deficiency. Protein metabolism and transportation may be affected at different points such as: intestinal absorption, albumin levels in plasma, circulating amino acids and nitrogen retention.

Hall (1985) drew attention to his findings that typhoid fever causes a striking increase in urinary output of nitrogen. He described a patient who experienced a loss of 100g of nitrogen, equivalent to 3.2kg of muscle tissue in only 12 days. Infection is associated with an early decrease in plasma concentration of amino acids (Taren et al. 1987), a consequence of a rapid uptake by hepatocytes engaged in synthesis of various acute-phase reactant glycoproteins. This synthetic activity is associated with sequential changes in nucleic acid metabolism and consequent production of proteins in rough endoplasmic reticulum.

The hepatic flux of amino acids contributes also to the gluconeogenesis. Deamination makes the carbon skeleton available for synthesis of glucose whereas the nitrogen groups give rise to increased production and urinary output of urea. Amino acids are used up not only from the free plasma pool but also from accelerated degradation of proteins in various tissues, especially in skeletal muscle (Chandra and Newberne 1979).

It is believed that some of the released amino acids are reutilized within the muscle cells but only the nonutilizable excess overflows into the blood vascular compartment. The amino acid involved in these metabolic changes include alanine, glutamine, valine, leucine, and isoleucine. 3-Methylhistidine, an analogue of the amino acid histidine, is produced from the breakdown of the contractile proteins actin and myosin, and is an excellent marker to monitor the rate of muscle catabolism (Crompton 1986). 3-Methylhistidine is unique in being neither utilized nor degraded to carbon dioxide (Crompton 1986).

Tyrosine and plasma phenylalanine concentration is increased during infection associated with fever. The ratio of plasma phenylalamine to plasma tyrosine is increased. Phenylalanine is poured out of catabolized skeletal muscle. This exceeds the slight increase in hepatic uptake of phenylalanine (Keusch and Farthing 1986). Hall (1985) observed that in most infections, particularly in typhoid fever, there is a rapid utilization of tryptophan by the liver. Purine metabolism is accelerated as a direct result of rapid turnover of body cells. This is reflected in increased renal excretion of uric acid (Keusch and Farthing 1986).

A decrease in serum albumin is characteristic of acute infections. Tomkins et al. (1984) described a child recovering from Kwashiorkor whose serum albumin rose within seven weeks of therapy from 1.05 to 3.58g per 100ml, only to fall to 1.59g per 100ml five days after the onset of typhoid fever. Acute bacterial infection such as pneumonia produced marked changes in all blood serum components, especially a decrease in albumin and an increase in alpha and beta globulins (Tomkins et al. 1984).

Free amino acids have been utilized as an index of protein status. Infection is associated with an early decrease in plasma concentration of amino acids (Wannemacher, 1977). An early increase in whole blood amino acids was observed in young men with experimentally induced typhoid fever who subsequently developed symptoms, but not in those who had no clinical illness. A significant decrease in blood amino acid concentration followed the development of the disease in subjects who became ill.

El Samani et al., (1988) observed that kwashiorkor was precipitated by an attack of acute diarrhoeal disease. They noted that infectious diarrhoea reached its peak at the beginning of the dry season, when flies were prevalent, and was, in turn, followed by outbreak of kwashiorkor three to four weeks later. A survey carried out by Mathur et al. 1985, on severely dehydrated children with gastroenteritis showed that over 50% had severe hypoalbuminemia.

Delgado et al. (1983) observed a regular overlapping of the seasonal prevalence of gastroenteritis and kwashiorkor, which he believed was due to metabolic effects of the infection along with a marked disturbance of the intestinal flora. In studying the absorption of amino acids, Behrens et al.,(1987) found that spontaneous infection in the loop retarded total absorption of an 18-amino-acid mixture by 14%. Administration of neomycin markedly altered the intestinal flora and decrease absorption by 30%. In general, the rapidly absorbed amino acids in the mixture were less inhibited than those more slowly absorbed.

The nutritional effects induced by tuberculosis were widely studied because tuberculosis is an important cause of death mostly in less developed countries. Brown et al. (1981) showed that urinary nitrogen excretion was markedly increased in patients with tuberculosis. They emphasized the low levels of serum albumin with tuberculosis, compared with other illnesses. Sputum also contributes to nitrogen loss and when large amounts are produced this may add to the strongly negative nitrogen balance of active tuberculosis. The well recognized loss of appetite further complicated clinical management directed to maintaining an adequate nutritional balance.

They suggested that tuberculosis can precipitate kwashiorkor in children already suffering from chronic malnutrition. This is possible in view of the strongly negative effect on nitrogen balance. The increase excretion of nitrogen and the decrease intake of food associated with active tuberculosis is of public health importance in areas where protein malnutrition is common.

Other infections also affect nitrogen balance, for instance Tomkins et al. (1983), studies on nitrogen balance at a Nigerian hospital originally designed to determine the quality of dietary protein, were complicated by variety of intercurrent infections including asthmatic bronchitis, bronchopneumonia, tonsilitis, sinusitis and staphylococcal abscess. These infections were regularly followed by a drop in nitrogen retention.

Field observations suggest that measles of all the common communicable diseases of childhood, imposes an usually severe nutritional stress. Duggan and Milner (1986) and Sarker et al (1986) observed that measles precipitates kwashiorkor in malnourished children more frequently than any other infectious disease. They emphasize the importance of measles as a contributory cause of kwashiorkor. Aaby et al. (1984) and Barclay et al. (1987) observed a fall in serum albumin in measles. Diarrhoea is a frequent accompaniment of measles in malnourished children with impairment of intestinal absorption. Behrens et al. (1987) cited examples of kwashiorkor precipitated by measles, German measles, chickenpox and whooping cough.

Helminthic infection is said to interfere directly with protein utilization. Crompton, (1986); Hall et al. (1992) observed that heavy infection of children with the hookworm markedly reduced net protein utilization, by decreasing the amount of absorbed dietary nitrogen. They observed that human adults with heavy hookworm infection had an average nitrogen absorption of 62.5%, compared with 73.3% in worm-free subject on the same diet. According to Bundy and Golden (1987) children with severe hookworm disease had decreased intestinal absorption of nutrients.

In severe infections more albumin was lost into the gut than would be expected from the lost of red cells alone, because hookworms seemed to ingest tissue fluid as well as capillary blood (Stephenson 1987). Many investigators mention the frequent association of intestinal helminths and PEM (Orraca-Tetteh 1964; Bundy and Golden 1987; Warren 1991). In a child with prior growth failure, there was a gain in bodyweight, with no change in diet following treatment of a heavy ascaris infection (Stephenson et al., 1980; Stephenson et al. 1983, WHO, 1990).

In summary, most bacterial and viral infections have detectable adverse influences on nitrogen balance. Some of them are known to be among the main precipitating causes of kwashiorkor. Evidence on protozoal and helminthic diseases indicates that adverse effects on nitrogen balance are roughly proportional to the parasite load. Presumably, any intestinal parasite present in large numbers would interfere with intake, absorption and retention of protein.

2.2.2 Influence of Infections on Carbohydrate and Fat Metabolisms

Some alterations in carbohydrate metabolism have been reported during infective illness. (Lifshitz et al. 1980). Insulin requirements rise and glucose tolerance is impaired even in nondiabetic person. Serum glucagon concentration is high. Increased output of adrenocortical and growth hormones leads to glycogen breakdown hyperglycaemia, (Chandra and Newberne, 1979).

This is a metabolic response to increased energy demands. Viral hepatitis damage may inhibit gluconeogenesis, resulting in hypoglycaemia. If glycogen reserves are severely depleted and the peripheral muscle mass is reduced, as in marasmus, symptomatic hypoglycaemia may complicate sepsis (Chandra and Newberne, 1979).

In tropical countries, an excess incidence of microbial and parasitic disease is frequently coexistent with high carbohydrate diets. Chandler et al.; (1981) studied hymenolepsis diminuta infection in rats. Sucrose, corn starch or glucose was used as the source of carbohydrate; it was observed that the parasites were smallest in animals receiving sucrose and largest in those consuming corn starch. There is correlation with the observation in rats that sucrose alone results in less growth and poor health than does a mixture of carbohydrates.

Jonas et al. (1979) studied fat absorption in infants recovering from an episode of acute infectious gastroenteritis who failed to gain weight despite adequate energy intake, in hospital in Israel. Stool cultures showed E. Coli as well as Salmonella typhimurium. These patients were restudied after clinical improvement. Fat balance studies during the ingestion of a formula containing long chain fatty acid demonstrated significant degrees of steatorrhoea in these patients. The administration of a test meal demonstrated a marked deficiency of duodenal bile acid concentration and of fat incorporation into the micellar phase. Faecal bile acid excretion was significantly increased in gastroenteritis patients compared to control.

In view of the significant effects observed in the above mentioned studies using high-fat diets and excess carbohydrate, there seem to be reason for concern for children exposed to infectious disease when high levels of fats and excess carbohydrate are included in their diets.

2.2.3 Influence of Infections on Vitamins and Minerals

There is an increased loss of principal vitamins during infections and infestations. For instance, intestinal helminths and protozoa cause blood loss as well as malabsorption. Nutritional anaemias caused by deficiency of iron, folates, and vitamin B12 are more often seen in patients with hookworm and Ascaris disease.

Infections may precipitate overt manifestations of vitamin deficiency e.g. xerophthalmia, pellagrous dermatitis, beriberi, angular stomatitis. The ophthalmic complications of vitamin A deficiency are said to be aggravated by associated local infections. Experimentally corneal damage from hypovitaminosis A can be prevented by maintaining a clean environment in the eye. Most of the intracellular minerals such as potassium, magnesium, zinc, sulphur and phosphorus are lost during an infective illness. The lost is usually in proportion to the lost of body nitrogen (Keusch and Farthing 1986).

Sodium and chloride, which are the extracelluar ions, may also be lost through excessive sweating, vomiting or diarrhoea. Fever stimulates the secretion of salt-retaining mineralocorticoids. Urinary sodium and chloride are reduced. In septicemia, toxic damage to cell membranes may permit sodium to accumulate in the intracellular compartment.

2.2.4 Influence of Infection on Growth and Development

Apart from altering absorption, poor metabolism and excretion of some nutrients, infection specially reduced food intake by influencing appetite. Frequent withdrawal of solid food or change of diet during an illness leads to reducing nutrient intake. Strong purgatives and other medicines often interfere with absorption and utilization of nutrients.

Severe and prolonged illness have an adverse effect on growth and maturation, more especially in an already under nourished child.

Rowland et al. (1988) studied a cohort of 126 newborns in a Gambian Township. Height for weight was monitored monthly. Disease occurrences were recorded. Mean weight for age exceeded the NCHS standards in the first half of infancy but there was a mean deficit of 1.2kg by age 1 year. Only two diseases contributed significantly to weight faltering: diarrhoea diseases were estimated to cause one half of the deficit and lower respiratory tract infections (LRTI) one quarter. LRTI reduced weight gain in young children by 14.7g/day of infection and diarrhoeal diseases in weaning infants by 14.4g/day. Diarrhoea had no significant impact on the growth of exclusively breastfed infants.

Reddy et al. (1986) in India observed flattening of growth curves for children under 5 years during the acute stage of measles. These children showed a significantly lower weight gain in the first 3 months of follow up than control. Out of 281 cases followed, 4.3 percent developed clinical signs of severe malnutrition (less than 60 percent weight for age) compared to 1.3 percent of control.

Duggan and Milner (1986); Hoyle et al. (1980) Black et al. (1984) have reported significant loss of weight in children after the attack of whooping cough, mumps, respiratory, skin infections as well as measles. Growth is always affected during illness and convalescence.

Studies have shown that factors interfering with early growth also influence motor development, the number of neurons in the brain as well as behaviour (SCN News, 1990; Jamison 1986). There is some evidence that malnourished children with arrested somatic growth and biochemical maturation have a retardation of mental development.

In summary infections contribute to protein and other nutrients deficiencies by decreasing appetite and diminishing tolerance to food. In areas where diets are already quantita- tively and/or qualitatively inadequate in protein, the diet given to persons with an infectious disease is usually even more deficient in protein. Treatment of infection often includes administration of purgatives and other medicines with adverse effect on nitrogen absorption or nitrogen retention. An acute diarrhoea which is characteristics of most intestinal and some systemic infections have the capacity of decreasing nitrogen absorption. Severe helminthic disease also reduces nitrogen absorption, even in the absence of diarrhoea.

It is an accepted fact that kwashiorkor is precipitated by acute diarrhoeal disease, measles or some other infection superimposed on a diet already diminished in usable protein. There is evidence that keratomalacia, scurvy and beriberi are close associates of an infectious process in persons depending on diets deficient in Vitamins A and C as well as thiamine. Studies confirm the adverse effect of infection on the metabolism of these vitamins (Roland et al 1988).

Infections interfere with metabolism of calcium and phosphorus. The electrolyte imbalance occurring as a result of diarrhoea is of major clinical and public health importance in most developing countries. Chronic infections interferes with iron metabolism and erythrocyte production resulting in "anaemia of infection". Microcytic anaemia occurs as a result of intestinal bleeding caused by severe hookworm infestation, and occasionally from urinary blood loss as with Schistosoma haematobium. Infection with the fish tapeworm Diphyllobothrium latum often leads to macrocytic anaemia through avidity of the parasite for Vitamin B12. Many infections lower blood glucose and limit deposition of glycogen in the liver.

To some extent, infectious disease, in conjunction with reduced food intake and an altered metabolism of protein and other specific nutrients, is associated with retardation of growth and maturation of young children.

Prospective studies on growth and morbidity in children have identified certain infections as particularly important as causes of poor growth. Among these, diarrhoea, respiratory infections and malaria are the most prevalent; Black et al. 1984; Rowland et al. 1988). The impact of infection on growth may vary according to the previous nutritional status of the child, the availability of food and the time available for feeding, cultural beliefs and access to health facilities (Tomkins and Watson, 1989).

2.3 Effect of Malnutrition on Resistance to Infections

Through the years it has been frequently observed that famines seemed to be associated with epidemics following major catastrophies such as wars and draught. An observation having apparent practical relevance has been the common finding that the prevalence, severity and mortality of infectious diseases almost always increased under conditions when food intake was quantitatively and qualitatively insufficient.

A number of authors have called attention to the high mortality from measles in the developing countries. This is attributable in large part to the poor nutritional state of the people. The growth faltering was frequently protracted in Bangladeshi children (Koster et al. 1981) especially those who developed post-measles dysentery. Measles appear to be a major crisis in the life of a growing child (Tomkins and Watson 1989) with its immune suppression tendency which may persist for three to four months after infection, providing an opportunity for a range of other infections to become established, and cause their own nutritional problems.

Poor food intake as a result of anorexia, dehydration, fever and buccal lesions. The measles virus may damage the intestinal mucosa sufficiently to cause malabsorption and protein loss. There were severe metabolic disturbances among Nigerian children with severe measles attacks as observed by Tomkins et al. (1983). The rates of whole body protein synthesis and breakdown were increased.

During an outbreak of infectious hepatitis in Nigeria, the disease was more common among well-fed persons but deaths were negligible. Undernourished tribes had a greater severity and a high case fatality. Severe PEM seems to be associated with a high prevalence of measles, presumably as a result of severely decreased host resistance. In moderate or mild PEM, however, there is little evidence of an important role of nutrition in the first stage of the illness, environmental, climatic and behavioural factors seem more important. There-after as complications of measles develop, the role of nutrition becomes more important, especially affecting recovery and duration of disease.

2.3.1 Influence of Protein Deficiency on Infections

The metabolism of amino acids of the host is altered greatly during the course of infectious disease. Metabolic and endocrine disturbances which occur during infection are intimately related to the protein metabolism and are highly important during the critical periods of stress (Chandra 1983). Of crucial importance is the ability of the pathogen to colonise.

This depends on the characteristics of the pathogen such as adhesion factors and strain virulence but malnutrition may influence the structure and function of host surfaces considerably. Gastric acidity is decreased in children in certain deficiency states such as marasmus and kwashiorkor (Tomkins and Watson, 1989). A range of nutritional deficiencies may affect mucosal surfaces. Vitamin A deficiency, for instance, affects glycoprotein synthesis and influences the production of mucus, an important protective layer of some mucosal surfaces (Roganapo et al., 1980).

In the severely malnourished there is selective suppression of immune mechanisms. Cell-mediated immunity (CMI) appears to be the most affected and atrophy of thymus and thymus-dependent lymphoid tissues together with impaired functional activity of lymphocytes are well described among children with kwashiorkor and marasmus (Tomkins 1986).

Chandra (1983) has reviewed immunological changes in PEM. Of the humoral immune system, the 1gA system is the most important to be affected by PEM. The secretary 1gA levels are often low and consequently the mucosal response to pathogens such as rotavirus and escherichia coli in the intestine and measles virus in the nasopharynx are impaired. Antibody affinity is decreased in experimental protein deficiency but there is no information on affinity in humans (Tomkins 1986).

In severe PEM there is pronounced reduction of T4 helper cells and a less severe reduction of T8 cytotoxic suppressive cells. The cell surface glycoproteins may alter sufficiently to change certain immunoregulatory mechanisms. These changes in CM1 probably explain why there is such high prevalence of tuberculosis and fungal infection among children with severe PEM (Tomkins 1986).

Chandra and Newberne (1979) showed a gradation of responses to BCG vaccination in malnourished infants and those who were small for gestational age. The latter infants also have impaired function of other components of CM1 and their neutrophils have reduced bactericidal capacity. These anomalies appear to persist for several months or years among those who do not achieve catch-up growth.

A study of Indian infants classified according to weight for age showed that the specific antibody response to tetanus immunization and serum 1gG and 1gM levels were unaffected by nutritional status. However, tests of CM1 showed that there was some gradient in the response between 65-79% (Tomkins, 1986). Colombian children with moderate malnutrition had impaired response to BCG vaccination and decreased lymphocyte transformation tested in vitro in comparison with results obtained in mildly malnourished children (McMurray et al., 1981).

There are frequent questions as to the impact of PEM on immunization programme. In general it seems that immunizations producing antibodies will nearly always occur satisfactorily, albeit sometimes, delayed, whatever the nutritional status, whereas immunization responses requiring cellular systems are likely to be affected even in moderate malnutrition.

The field studies suggest that mild and moderate malnutrition has little to do with disease incidence (Tomkins 1986). It seems more likely that the high attack rates for disease, such as pneumonia, diarrhoea and measles are more related to the environmental, social and behavioural problems that under-privileged populations face, than to nutrition.

Many malnourished children with infection appear to suffer particularly severe forms of illness with a high prevalence of complications. A mild respiratory infection develops into pneumonia; measles appears to develop in a very dangerous form with many complications; diarrhoea is associated with particularly severe fluid, electrolyte, nitrogen and mineral losses (Tomkins, 1986).

The impact of nutrition on severity of infection has received little attention in clinical studies and the whole subject has been overwhelmed by a vast amount of conflicting experimental findings, some of which suggest that nutritional deficiencies actually inhibit the replication of pathogens, decrease parasitaemia or bacteraemia and may even enhance survival
(Ederisinghe et al., 1982). The relevance to human nutrition is not clear but children with severe PEM very rarely die of cerebral malaria (Tomkins, 1986).

Differences in nutritional status would also explain the high case fatality rates (CFR) in measles in underpriviledge communities. Children in Europe or North America have CFR of about 0.1 deaths/100 cases, whereas in rural Nigeria and Gambia rates of 7 and 14% respectively have been recorded (Foster, 1984).

The frequent co-existence of high fatality rates and poor nutrition has been noted many times and is undoubtedly important in severe PEM. Recent study in Guinea-Bissau by (Aaby et al., (1984) has emphasized that very-high CFR for measles can occur in relatively well-nourished children in urban population.

Analysis of the patterns of infection rate and mortality with respect to housing conditions show that the greatest problem occurred among children coming from the most crowded households. These children had similar weight for age to children from less crowded houses. The measles mortality was particularly high in those who came from households where there was more than one child with measles irrespective of nutritional status.

One explanation could be that crowding increases the size of the infective dose as there is some evidence that the severity of viral infection relates to the size of the inoculum. It has been recognized by physicians that a spreading confluent rash is a bad prognostic sign and it has been postulated that the severity of measles is due to the inhalation of a particularly high dose of measles in association with a hot, dry environment to facilitate nasopharyngeal colonization (Tomkins, 1986).

The analysis of nutrition versus environment in the cause of high CFR for measles in developing countries becomes more complicated when age is taken into account. Most studies emphasize that mortality is higher in the youngest children, CFR may be four times as high in the infant than the child aged more than 4 years.

Most comparative studies have shown that measles tends to attack children in urban areas at a much younger age than their rural counterparts, perhaps as a result of the crowding and exposure that is more common in urban slums than scattered rural compounds. A further variable is the presence of other factors affecting immune response such as malaria.

2.3.2 Influence of Vitamin Deficiency on Infection

There is documented evidence that Vitamin A deficiency is associated with impaired production of mucus, predominantly secreted by most cells, and decrease in glycoprotein synthesis (Rojanapo et al., 1980). The appearance of nyctalopia (night blindness), decreased vision in partial darkness resulting from inadequate levels of vitamin A deficiency is a more serious consequences unless corrected. Xerophthalmia, respiratory diseases of chicken and other animals, urogenital disorders, result primarily from alterations in epithelial structures which provide a portal of entry for infectious agents.

Vitamin A was first described as the anti-infective vitamin and it is now recognized as having a wide range of physiological effects which influence the risk of developing diarrhoea (Tomkins and Hussey, 1989). Immune functions are significantly depressed in deficiency, as is the synthesis of glycoproteins, deoxyribonucleic acid (DNA) and protein.

These changes decrease host resistance to colonization and tissue invasion by pathogens. Once established, the infections seem to be longer lasting in vitamin A deficient individual. Studies in Indonesia show an increased prevalence of diarrhoea among children with vitamin A deficiency (Sommer et al, 1984). It was observed that mortality among Indonesian children was reduced by 34% among those who took a capsule of 200,000 IU of vitamin A every 6 months (Sommer et al, 1986). The fortification of monosodium glutamate, also resulted in a significant reduction in mortality rates among children aged 12-60 months (Muhilal et al., 1988).

A study of Tanzanian children showed reduced case fatality rates from measles among those who were given Vitamin A (Barclay et al., 1987). In another study by Milton et al., (1987) in India, an increased prevalence of respiratory disease was noted among vitamin A deficient Indian children.

There is some evidence that riboflavin deficiency increases the severity of malaria among infants in Papua New Guinea (Thurnham et al., 1983). It has been suggested that folate deficiency may contribute to the decrease of immunity that is sometimes found in pregnancy (Brabin, 1982). This may well influence susceptibility to malaria among mothers and their infants. Although pyridoxine deficiency is not widely recognised, supplements can alter cellular immunity among otherwise healthy elderly persons (Talbot et al., 1987). It has been suggested that vitamin C may have important anti-oxidant properties. These properties of scavenging free radicals in the disease may be important in man (Tomkins and Watson, 1989).

2.3.3 **Influence of Mineral Deficiency on Infection**

Nutritional deficiency is usually considered to be deleterious and in particular to affect adversely the defense mechanisms against infectious diseases (Keusch and Farthing, 1986). This view has been challenged recently, especially with respect to micronutrient deficiency, notably due to iron (Keusch and Farthing, 1986).

Two extremes of opinions have now been established: (a) iron deficiency increases host susceptibility to infection, a situation that can be remedied by appropriate iron replacement therapy; and (b) since microbial pathogens require iron for survival, iron deficiency can actually reduce the likelihood of infection and correcting this deficiency may harm the host by promoting replication of the invading pathogens (Humbert and Moore, 1983).

These views present an apparently irreconcilable controversy between the possible benefit and detriment of iron for the infected human host. However, some of the data on which such views are based have not always been well controlled, and in some instances the apparent association of iron status with infection rates remains only an association without firm evidence of causality (Keusch and Farthing 1986).

It is clear that free iron is required by microorganisms and in vitro studies have shown that indeed the iron is necessary for microbial growth (Weinberg, 1984). In addition, iron deficiency has been shown to protect both birds and mammals from some experimental bacterial infections, while infection can be enhanced by iron administration (Humbert and Moore, 1983).

2.3.4 Evidence that Iron Deficiency Promotes Infection

A study of children with malnutrition in Colombia showed a reduction in infections, notably gastroenteritis, after iron deficiency was corrected with iron supplement (Keusch and Farthing, 1986). Similarly, in an urban population in Chile, the diarrhoeal disease rate diminished after introduction of an iron fortified milk formula, although in this instance comparisons were made with disease morbidity during the two-months period immediately prior to introduction of the new formula (Oski and Pearson, 1981).

Additionally, a placebo-controlled trial of prophylactic parenteral iron in early infancy significantly reduced the death rate from infectious disease in Eskimo infants (Oski and Pearson, 1981). A retrospective analysis of anaemic, iron-deficient, hospitalized infants in Papua New Guinea showed that meningitis and pneumonia were more common in the presence of iron deficiency (Oppenheimer, 1980).

Although many of these studies suggest that iron deficiency in infants and children predisposes to infection particularly of the respiratory and gastrointestinal tracts and that administration of iron in some circumstances can reduce infection rates, the majority of these studies have serious shortcomings. Many are uncontrolled or at best poorly controlled.

Retrospective controls are now unacceptable because epidemics and other seasonal factors in illness can distort data analysis and produce false conclusions. Similarly, one can never be certain that an intervention such as the introduction of iron-fortified formula is the only change that occurred during that period. Many of these children studied have had multiple health problems, making data analysis even more complex.

None of these studies permit reliable conclusions about whether iron deficiency alone predisposes to infection and if iron supplementation and correction of iron deficiency as the sole intervention can reduce prevalence and morbidity from infection.

2.3.5 **Evidence that Iron Deficiency Protects against Infection**

There is evidence to suggest that relative or absolute iron deficiency may reduce susceptibility to certain infections and that treatment with iron exacerbates these processes. It has been known for many years that serum iron falls during infection, largely because circulating iron is removed by the liver and to a lesser extent because iron absorption by the intestine is reduced. It has been proposed that this "iron shift" reduces the availability of free iron to infectious agents and therefore induces a degree of "nutritional immunity" (Weinberg, 1984).

Iron deficiency in infancy has been recognized in many populations, particularly in infants from low socioeconomic groups. Iron deficiency in these infants has historically been regarded as damaging to health, which persuaded some clinicians to advise routine prophylaxis with parenteral iron during the first weeks of life (Keusch and Farthing, 1986). Several studies have shown however, this may have detrimental effects.

The proposed detrimental effect of iron is also inferred from reports relating iron overload and other causes of increased serum iron concentration to the prevalence of infection. For instance, haemochromatosis, an inherited disorder of iron metabolism resulting in elevated serum iron concentration and massive accumulation of iron in many organs of the body, has been associated with an increased risk of infection from Yersinia enterocolitica and entamoeba histolytica (Melby et al., 1982).

Iron overload is also seen in South African native men as a result of excessive ingestion of iron in home-made beer brewed in iron vessels.

Severe hepatic amoebiasis is more common in this men compared with native women whose exposure to the same parasite would appear to be identical. In contrast the nomadic Masai who inhabit the Rift Valley are free of amoebiasis, which has been attributed to their custom of drinking milk, resulting in mild iron-deficiency anaemia and low transferrin saturation. Iron supplementation of the Masai during one-year period not only increased haemoglobin and transferrin saturation, but also resulted in a marked increase in prevalence of amoebae in stool and smear-positive malaria (Murray et al., 1980).

The dangers of the hyperferremic state are often considered to be exemplified by the enhanced risk of bacterial infection in conditions associated with decreased red cell survival, notably sickle cell anaemia (Weinberg, 1984), Serum iron concentration is elevated during acute malaria attacks as a result of red cell destruction, and the increase in bacterial infection, particularly salmonellosis has been attributed to this change in circulating iron level.

Although these data are used to support the hypothesis that high levels of free circulating iron are detrimental to the host and increase susceptibility to infection (Weinberg, 1984), none of the cited-studies clearly show causality.

Zinc is an essential requirement for many biochemical pathways in metabolism. Recent studies suggest that zinc deficiency may be an important contributing factor to the high prevalence of infection in children with marasmus or kwashiorkor, many of whom have zinc deficiency. Diarrhoea is common during experimental zinc deficiency; it is associated with atrophy of the intestinal mucosa as measured morphologically and by measurements of mucosal mass and concentration of DNA and protein per length of intestine (Golden et al., 1978).

Mucosal atrophy is associated with a reduction in the absorption of water and sodium from intestinal perfusion fluids during jejunal perfusion. When cholera toxin is added to the perfusion fluid a net secretion is produced. This net secretion is increased, both for water and for sodium, in zinc deficiency. Repletion of the zinc deficient state for 48 hours is followed by a return of rates of water and sodium absorption towards normal level (Golden et al, 1978).

Zinc deficiency is common among children with severe protein-energy malnutrition (Golden and Ramdath 1987; Asibey-Berko 1990). Many such children have low levels of plasma zinc and impaired growth, and respond to zinc supplementation. Malnourished children with acute diarrhoea in Bangladesh had greater intestinal fluid losses than better nourished children. When these malnourished children were given zinc acetate for 2 weeks, there was a reduction in the intestinal fluid loss accompanied by a shortening of the duration of illness. Those children who had received zinc had significantly fewer episodes of diarrhoea during the follow-up period. Among a group of children with persistent diarrhoea syndrome, there was a considerable reduction in mortality among those who had received a 2-week course of zinc acetate (Golden and Ramdath 1987).

It appears, therefore, that zinc has considerable effects on the intestinal mucosa, deficiency states resulting in increased physiological responses to diarrhoea pathogens. However, there are additional effects, probably mediated by an improvement in the immune system, and an adequate zinc status appears to protect against subsequent intestinal infection, as well as enabling "catch-up" of linear growth (Behren et al., 1987).

2.4 Synergistic Action of Nutritional Deficiencies

Studies have shown that malnutrition and infectious disease can be mutually co-existing; together, they can produce more serious consequences than would be expected from a summation of the independent effect of the two conditions. Such synergistic relationship exists between malnutrition and infection - that infections are likely to be more severe in hosts with clinical or subclinical malnutrition, and infectious diseases can turn borderline deficiencies into severe malnutrition. When infection aggravates malnutrition or malnutrition lowers resistance to infection, the relationship between the two can be classified as synergistic (Chandra, 1983; Tomkins 1986).

In some special circumstances, the interaction of nutrition and infection is antagonistic. That is, malnutrition may actually decrease the severity of the infectious disease of the host. Synergism is characteristic of most diseases caused by extra cellular microorganisms, while those of antagonism are associated more with the intracellular agents, usually viruses. The following observations have been made about nutrition and response of the host to infection:

(1) Protein deficiencies generally result in synergistic effects with rare instances of antagonism with selected amino acid deficiencies;

(2) Vitamin A deficiency is regularly synergistic;

(3) Vitamin D deficiency often fails to show interaction but synergism has been observed;

(4) Vitamin B complex seems to behave in a variable fashion depending upon the agent and the host; this is associated in most instances of antagonism;

(5) Vitamin C deficiency usually is synergistic but antagonism has been observed;

(6) Specific mineral deficiencies may result in either synergism or antagonism depending to a large degree on the infective agents. (Chandra and Newberne, 1979).

CHAPTER THREE

3.1 METHODOLOGY OF THE STUDY

3.1.1 Materials and Methods

Five hundred and five (505) preschool children aged 6 months to 4 years from urban and the rural areas of Akwa Ibom State of Nigeria were studied. The study was semi-longitudinal and covered the period from August 1990 to July 1991. All children who participated in the study were ramdomly selected from Maternal and Child Health Clinic, Christ the King Nursery School and Adiahaobong Nursery School, Uyo, for the urban and Ikot Ayan Health Clinic, International Nursery School and Saint Virginia Blair Nursery School, Ikono, for the rural area. The subjects were altogether 505 but a total of 39 were excluded from the final analysis because of dropout, death, unavailability of complete anthropometric and biochemical data. The remaining 466 subjects form the basis of the present study.

Ages of the subjects were obtained from the birth certificates. Where such certificates were unavailable, ages were estimated by parents recollections of an important event which took place at the time of that child's birth. The parents of these children who participated in the study were interviewed using a structured and pre-tested questionnaire (Appendix 1). The questionnaires covered 5 sections designed to obtain:

1. Information on date of birth, age, birth rank among living children and numbers of siblings and other children in the family.

2. Socio-economic information on education, occupation, living accommodation and property owned by the parents.

3. Anthropometric measurements - weight for age, height for age, weight for height, skinfold thickness. body girth measurements, and haemoglobin level of the preschool children.

4. Infant feeding practices, knowledge of breast-feeding. types of liquids given to the baby before initiation of breast-feeding. number of times breastfed in a day. age at weaning.

5. The prevalence and severity of infectious diseases among the pre-school children during the period of survey.

Plate 1 Interview with the mothers at the maternal and child clinic, Uyo

Plate 2 A cross section of the study population at Christ the King Nursery School, Uyo

Plate 3 A cross section of the study population at International Nursery School, Ikono

Plate 4 A cross section of the study population at Ikot Ayan Health Centre

STUDY I

Interactions of Infectious Diseases and Malnutrition on the Nutritional Status of Pre-school Children

Study one was undertaken to investigate the occurrence and interaction of infectious diseases and malnutrition and their effects on the growth patterns of the pre-school children in selected areas in Akwa Ibom State of Nigeria.

Questionnares of appendices 2 and 4 provided Data for the study. 466 pre-school children aged 6 months to 48 months, formed the target population for the study.Those children who were 6 months of age at the initial contact were 18 months at the end of the study. Subsequently,those children who 12 months, 24months, 36 months and 48 months old at the initial contact became 24 months, 36 months 48 months and 60 months old respectively at the end of the study. They were assigned into four groups according to their nutritional status using a 2 x 2 factorial design.

Group 1 were the children who had no infectious diseases and were not malnourished (NSNM). They formed the control group and they were (42.9 percent) (n = 200). Group 2 were the pre-school children who had no infectious diseases but were malnourished (NSM). They were 18.4 percent (n= 86). Group 3 were the pre-school children who had infectious diseases but were not malnourished (SNM). They were 18.7 percent (n=87).

Group 4 were the pre-school children who had infectious diseases and were malnourished (SM). They constituted 20.0 percent (n=93). Weight -for- age, height- for -age, weight-for-height, total skinfolds thickness, arm muscle circumference, percentage body fat, head circumference, chest circumference, upper arm circumference, buttocks circumference, upper thigh circumference, lower thigh circumference, calf circumference and haemoglobin level were assessed at 3 monthly intervals for 12 months. Longitudinal data on weights and heights of pre-school children be presented. Mean increases were calculated.

For other parameters, the values obtained at the end of the study were presented. For children aged 6 months at the initial contact, the values at 12 months were presented (that is when this group of children became 12 months old). This is because it is at the age of 12 months that majority of mothers stopped breast-feeding (Table 41) and children were fed from adult's pot Generally, children were also left crawling about on the floor at that age. There was a greater exposure to infections at this age. Moreover, the percentage of children who had diarrhoea (Table 34) clearly showed a peak prevalence at the age of 12 months. Therefore, it was advisable to present anthropometric data obtained at the age of 12 months.

. 3.2.1 ANTHROPOMETRY

All anthropometric measurements, all measurements of height, weight, upper arm circumference, mid-upper arm circumference, head circumference, upper thigh circumference, lower thigh circumference, calf circumference, triceps skinfold, biceps skinfold were taken following the techniques described by Jelliffe et al (1989). For assessment of body mass, weight of the child was measured. For linear dimensions, height, head circumference, upper thigh circumference, lower thigh circumference and calf circumference were measured. For body composition and reserves of energy (skinfold thickness), triceps skinfold, biceps skinfold, suprailiac skinfold, subscapular skinfold were measured. The total skinfold and percentage body fat were calculated.

Weight:

Ideally, a salter spring scale with a least count of 0.1kg should be used in obtaining the body weights of the infants and young children. Bathroom scale is not recommended but in a situation where nothing else is available, it may have to be used (Jelliffe et al) 1989).

This was the case with the present study. We could neither borrow the salter spring scale from the department nor from the hospitals/ health centres because they were being used. In view of this, we did not have any alternative but to use the bathroom scale with great precision.

Weights of the children were obtained by the use of bath-room scale Children were weighed without clothing and shoes, and privacy was provided by the use of screens. Children were instructed to stand upright on the platform of the weighing scale and be looking straight ahead The weight of the individual child recorded was that which the pointer indicated on the dial of the scale. Fractions were discarded for accuracy. The accuracy of the weighing scale was checked to ensure that it read zero att the beginning, after 10 measurements and at the end of each working session by standard known weights.

Apprehensive/and very young children were weighed with their mothers on the platform of the scale. Mothers were then weighed alone. Both values were recorded. The weight of the children was obtained by subtracting the weight of the mother alone from the weight of the mother and child.

Height or Length:

Heights/supine lengths were measured as described by (Jelliffe et al 1989). For infants and pre-school children aged 6 months to 24 months, recumbent length (crown-heel length) was employed. This was carried out with a wooden length-board which was calibrated in centimeters to the nearest 0.1cm.

An infant was laid on the board which was on a flat surface.The head was positioned firmly against the fixed headboard, with the eyes looking vertically. The knees were extended by firm pressure applied by the mother/father, and the feet were flexed at right angles to the lower legs. The upright sliding foot-piece was moved to obtain firm contact with the heels and the length read to the nearest 0.1cm. Children were measured without shoes or head gear.

Head Circumference:

The head circumference was measured by placing a flexible steel tape firmly round the frontal bones, just superior to the supra-orbital ridges, passing it round the head at the same level on each side, and laying it over the maximum occipital prominence at the back. Measurements were made to the nearest 0.1cm.

Chest Circumference:

Chest circumference was measured by passing the tape beneath the two scapulae posteriorly and at the nipple line anteriorly. Jelliffe etal (1989) recommended that the measurement should be made at the nipple line, preferably in mid-inspiration.

Mid-arm Circumference:

Mid-arm circumference of each subject was determined by measuring the left mid-upper arm hanging freely. A flexible steel tape calibrated in centimetres was used. Upper arm muscle circumference was obtained from the value of the upper arm circumference and that of the subject's triceps skinfold. The mid-upper arm muscle circumference was calculated from the formula given by Jelliffe et al. (1989).

Buttocks Circumference:

Buttocks circumference was taken by instructing the children to stand with feet together and the measurement was taken at the area of maximum circumference of the buttocks.

Upper thigh circumference:

The subjects were instructed to stand with feet slightly apart and the body weight evenly distributed on both feet. The steel tape was placed around the left thigh horizontally, with its top edge just under the gluteal fold.

Lower thigh circumference:

The subjects were instructed to stand as it were for the measurement of the upper thigh circumference. The tape was placed around the left lower thigh just above the knee cap, and the reading was taken.

Calf circumference:

The subjects were instructed to stand on the right foot with the left foot bent slightly at the knee. Measurements were taken at the point of maximum calf circumference.

Skinfold Measurements:

Skinfold measurements were made on the left side of the body at selected sites - triceps, biceps, suprailliac and subscapular. A Harpenden skinfold callipers calibrated in millimetres was used.

Triceps Skinfold:

The skinfold was picked up between the thumb and the forefinger of the left hand, halfway down the arm, between the tip of the acromion process of the scapula and the olecranon process of the ulna. The measurement was made with the arm hanging relaxed at the side.

Biceps Skinfold:

This measurement was at a similar position as for the triceps, but infront of the left upper arm, on the biceps muscle section.

Suprailiac Skinfold:

Suprailiac is the crest (top) of the hip bone just above the waist. The skinfold was picked between the thumb and the fore finger and was pulled slightly from the underlying muscle, the calliper was applied slightly below the finger.

Subscapula Skinfold:

Subscapula skinfold was measured just below and laterally to the angle of the left scapula. This fold was at 45^0 to the spine, in the natural line of skin cleavage.

Total Skinfold:

The total skinfold was derived by addition of the values of biceps, triceps, suprailiac and subscapular skinfolds.

Haemoglobin determination:

The haemoglobin level was determined by the use of the Spencer haemoglobinometer. The finger tips of the subjects were cleaned with cotton wool dipped into 70% alcohol (Methylated Spirit). Blood samples were obtained by finger-tip puncture with the sterile lancet. A drop of blood was placed on the chamber of the Spencer haemoglobinometer and was haemolysed immediately by the use of haemolysing applicator for about half a minute. Haemoglobin readings were taken on the calibrated side of the haemoglobinometer in g/100ml of blood.

3.2.2 **Home Visits**

Regular home visits to all families of selected children were made once every two weeks. Homes of mothers absent on the day of the visit were revisited on the following day until information was obtained. For each illness records of occurrence, duration and severity were made. In addition to manifest illnesses, records were made of any event in the life of the child of likely health significance eg. accidental injuries, environmental conditions.

3.2.3 Disease Occurrence

Information was obtained from the mothers of the pre-school children on the prevalence of infectious diseases. Acute respiratory infection. ("ikon ewek"), malaria ("uto enyin"), diarrhoea ("utoro") and measles ("ata ayaya"). Acute respiratory infection, malaria, diarrhoea and measles are disorders well known by the people of Akwa Ibom state, Nigeria.

Acute Respiratory Disease.

Acute respiratory disease is one of the foremost causes of infant morbidity in Nigeria. Its prevalence was estimated by asking the mothers if their children had experienced coughing, running nose, accompanied by difficulty in breathing in the two weeks preceding the survey. An illness was accepted as a mild form of acute respiratory tract infection if a child experienced general malaise (feeling of unwell), coryza, dry non-productive cough with slight rise in temperature ($<39^{o}C$) lasting less than 3 days.

Illness of more than 3 days duration accompanied by breathlessness, fast breathing, productive cough, fever, anorexia and requires attention from health centre was judged moderate.

An acute respiratory tract disease meeting the stated minimal requirements accompanied by high fever (temperature $>40^{o}C$), productive cough,severe dyspnoea with nasal flaring, severe vomiting and dehydration and requires admission in the hospital was termed severe (Etuk 1990); Borrero et al 1990; Campbell et al 1988).

Malaria

Another major causes of morbidity among children in Nigeria is malaria. Since the major manifestation of malaria is high fever, (high fever without coughing or respiratory distress). Mothers were asked whether their children had fever in the two weeks preceding the survey. An illness was accepted as a mild form of malaria if a child had a slight rise in temperature (<39^{o}C), nausea, general malaise, refusal to eat and responds to antimalarial tablets, lasting for less than 2 days.

An illness of more than 2 days duration accompanied by rise in temperature (>39^{o}C) refusal to eat, vomiting and is admitted into the hospital for treatment was termed moderate. Any rise in body temperature above 40^{o}C, meeting the stated minimal requirements but characterized by coma (may or may not be convulsion) was classed as severe form of malaria (Etuk, 1990; Peters and Grey 1992).

Diarrhoea

Dehydration brought on by severe diarrhoea is a major cause of morbidity among Nigerian children. Mothers were also asked if their children had a liquid or semi-liquid stools within a 24 hour period in the two weeks preceeding the survey.

An illness was accepted as a case of diarrhoea if a child under 1 year of age had five or more liquid or semi-liquid stools within a 24 hour period, or if children beyond that age had three or more such stools. Mild cases were those lasting three days or less. Illness of more than three days duration was judged to be moderate. Any acute intestinal disorder meeting the stated minimum requirements but characterized by blood and mucus in the stool was classed as severe.

Measles

Measles continues to be associated with much higher morbidity in most developing countries including Nigeria. The diagnosis of measles was based largely on recognition of the typical rash. The "atypical" desquamating violaceous rash was not uncommon and was recognized as measles by both mothers and the researcher. An illness was accepted as a mild form of measles if a child has fever (temperature < 39^{o}C) redness and eye discharge, cough, coryza, and appearance of rashes.

An acute illness with temperature above 39^{o}C, with generalised maculo - popular rashes, there may be vomiting but no diarrhoea, redness and discharge from

Plate 5 Unhealthy environment - cracked walls in the rural areas

the eyes, requiring treatment from health centre or out patient department was termed moderate form of measles.

A case of measles illness meeting the stated minimal requirement, characterised by temperature above 40°C, chest complications, cough and breathlessness, diarrhoea and vomiting, severe generalised rashes and required hospital admission was classed severe form of measles (Archibong 1990).

The data on acute respiratory infection, malaria, diarrhoea and measles were used for measuring the period and prevalence of each illness, that is the percentage of children underfive whose mothers reported that they suffered from illnesses under investigation during the study period.

3.2.4 Infectious Disease and Malnutrition Interactions on the Nutritional Status of the Children

Data which is presented here covered the four groups in Study I.

NSNM = Not sick not malnourished (control group)

NSM = Not sick but malnourished

SNM = Sick not malnourished

SM = Sick and malnourished.

1. Not Sick: Absence of any of the following:
    - (i) Acute Respiratory Tract Infection
    - (ii) Diarrhoea
    - (iii) Measles
    - (iv) Malaria.
2. Sick: Presence of any of the conditions listed in 1.
3. Not malnourished: Child satisfies each of the conditions below:
    - (i) Wt-for-Age = >90% (100 - 90%) NCHS/WHO median

(ii) WT-for-Height = >90% NCHS/WHO Median

(iii) Height-for-Age = >95% NCHS/WHO Median

4. Malnourished: Child fails to satisfy one or all of the conditions in 3 above.

The nutritional status of the pre-school children was assessed by comparing their weights with the NCHS/WHO weight-for-age centile. Cut-off point for malnutrition was less than 90% of NCHS/WHO median. The children were assigned into four groups according to the disease prevalence and nutritional status.

According to the classification system adopted, 42.9 percent ofthe children did not have infectious disease and were not malnourished (NSNM). These formed the control group. About 18.4 percent of the children were not sick but they were malnourished (NSM). Also 18.7 percent of the children were sick with infectious diseases but were not malnourished (SNM); while 20.0 percent of the children were sick with infectious diseases and were malnourished (SM).

3.3 STUDY II Occurrence and distribution of diarrhoeal diseases among preschool children and its relationship to infant feeding practices

3.3.1 Diarrhoea Surveilance

Study II was undertaken to obtain information on the occurrence and distribution of acute diarrhoeal disease among the preschool children in urban and rural areas of Akwa Ibom State of Nigeria.

Fortnightly home visits were made to the homes of the selected children. Nursery schools attended by these children were also visited. The cases of diarrhoea which had occurred during the preceding fortnight, their clinical nature, date of onset, duration and character of the stools were recorded.

An illness was accepted as a case of diarrhoea if a child under 1 year of age had five or more liquid or semi-liquid stools within a 24-hour period, or if children beyond that age had three or more such stools. The clinical classification recognized three grades of severity. These are mild, moderate and severe.

Mild cases were those lasting three days or less. Illness of more than three days duration was judged to be moderate. Any acute intestinal disorder meeting the stated minimal requirements but characterized by blood and mucus in the stool was classed as severe.

3.3.2 Collection of Infant Feeding Practices Information

Structured and pre-tested questionnaires were administered to the mothers of the selected children. Information on the present and past feeding practices for the infants and children were collected. Such information are the time breast-feeding was started after delivery; frequency of breast-feeding in a day, the age that breast-feeding was stopped.

3.4 STUDY III Influence of socio-economic and environmental factors on the occurrence and severity of infectious diseases among preschool children

Study III was carried out to study the influence of socio-economic and environmental factors on the occurrence, frequency, and severity of infectious diseases among the pre-school children in selected areas in Akwa Ibom State of Nigeria.

Structured (close-ended) and pre-tested questionnaires were administered by personal interviews to the parents of the selected children. Information on socio-economic status of the parents of the pre-school children were obtained. The analysis includes twelve variables constructed to characterize the socio-economic and environmental settings of the households. Four of the variables included are related more specifically to the socio-economic characteristics of the households, and the other eight describe their residential and economic features._

On the basis of the educational background, the level of education attained by the mothers and fathers of the pre-school children was constructed. From the questions on the respondent's level of education attained, one describes the percentage of mothers who never attended school, one describes the percentage of mothers with primary education, with secondary school education, with post secondary school education, with university education and with graduate education. Similar questions were asked and computed on the level of education attained by the respondent's current partner.

The question on occupation was also used as a socio-economic indicator. One question describes the occupation of the father, another gives the status of the father within the employment network.Similar questions were asked on the occupation of the current partner.

The level of formal education and occupation of the parents were joined. The averages of the grade points of the parents educational and occupational levels were calculated.This was so in the belief that the level of formal education/occupation attained by the head of the family influences the lifestyle of the members of his household.

Other questions are related to material aspects of the environment. The types of residence and furniture; proportion of children living in their own house, in rented house or in family house. Proportion of children in a household with arm chairs only, with arm chairs with cushions, with mattresses and cupboard, with bed, mattresses and wardrobes. Information on standard of living: the proportion of children in a household with refrigerator/deep freezer, with video, with television (coloured or black and white) and with radio. Information on means of transport: proportion of children in a household with a car, with bus/lorry, with a bicycle, and with a motor cycle.

Information on bathroom and toilet facilities:the proportion of children in a household with a shower, with a bathing tub and shower, and with a bucket. The proportion of children in a household with a pit latrine, with a pan latrine, with a water closet, with a public latrine, and with no latrine. Information on the cooking facilities: the proportion of children in a household with a gas/electric cooker, with a kerosine stove, with a coal pot, and with firewood stove. Finally, information on the source of water supply: the proportion of children in household with water system, with a well in the premises and/or with a nearby ponds.

3.5 Computer Data Entry and Software Usage

All raw data and information collected from the 466 accepted pre-tested questionnaires were coded. The data were on anthropometric measurements for nutritional assessment, prevalence and severity of infectious diseases among the pre- school children, as well as breast-feeding pattern and weaning practices.

These items of information were fed into a Wang compatible desk top-computer at the Regional Institute of Population Studies (RIPS). A Statistical Conversional Package of Social Sciences (SC3S) software programme was used. The stored information and data were computed to generate frequency distribution tables. Cross tabulations of variables were done.

3.6 Statistical Analysis

Analysis of variance was used to analyse the results. Mean values were further compared by multiple comparison test (Duncan's multiple range test). Factor analysis was used to group the children into social classes. It is an exploratory multivariate technique used primarily to assess the degree to which variables measuring status or social class are grouped (Barbieri, 1991).

The main characteristic of factor analysis lies in its data-reduction capacity. Factor analysis looks at a few linear combinations which can be used to summarize the data without loss of information (Kim and Mueller 1978). The new variables, less numerous than the initial variables, are called "components" or "factors".

The original variables have now been reduced to 2 factors. Factor1 explains the concept of socio-economic index in the household. Factor 2 explains the concept of environmental index in the household.

Scores were calculated and children were classified into 3 categories. For Factor 1, children were classified according to their socioeconomic classes : Low, middle and high socio economic classes. For factor 2 children were classified according to the prevailing environmental sanitation in the household- Poor, Good and Very Good.

Infectious disease occurrence and severity as they affect the preschool children were assessed. It was observed that those children who were from high socio economic class were also those from household with very good environmental sanitation and vice versa. In describing the disease occurrence and severity, it was advisable to use socio-economic class only to avoid repetition but bearing in mind that those children who were from low socio-economic class were also those from households with poor environmental sanitation and vice versa.

Multiple regression analysis was used to find out the contribution of those variables (in factor analysis) on nutritional status of the children (as defined by weight, height and upper arm circumference) to develop a model which can be used to predict outcomes of nutrition and infections.

CHAPTER 4

4.1 STUDY 1 RESULTS

The data presented in this section are based on the questionnaires of appendices 2 and 4.

4.1.1 Anthropometry.

4.1.2 MEAN WEIGHT-FOR-AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Among the NSNM and SNM groups (Table 1 and Fig 2.) mean weights for-age were significantly ($p<0.05$) higher than those of the NSM and SM groups at the initial contact. Mean weight- for-age of the NSNM group was slightly higher than that of the SNM group. This pattern of growth continued to the 3rd month. By the 3rd month, mean value of the NSNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean weight-for-age of SNM group was significantly ($p<0.05$) higher than those of NSM and SM groups. Mean weight-for-age of the NSNM group was non-significantly ($p>0.05$) higher than that of the SNM group

By the 6th month, when these groups of children were 12 months of age, mean weight-for-age of the NSNM group measured 9.4kg compared with those of the NSM, SNM and SM groups with mean values of 7.6kg, 8.9kg and 7.2kg respectively. Body weight changes followed the age increase closely, the body weights of the NSM and SM groups increased at a slow pace that by the 9th month of contact, mean body weight of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups. Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the

NSM and SM groups. Mean value of NSM group was significantly ($p<0.05$) higher than that of the SM group.

Similarly, by the 12th month, mean value of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean value of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean value of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

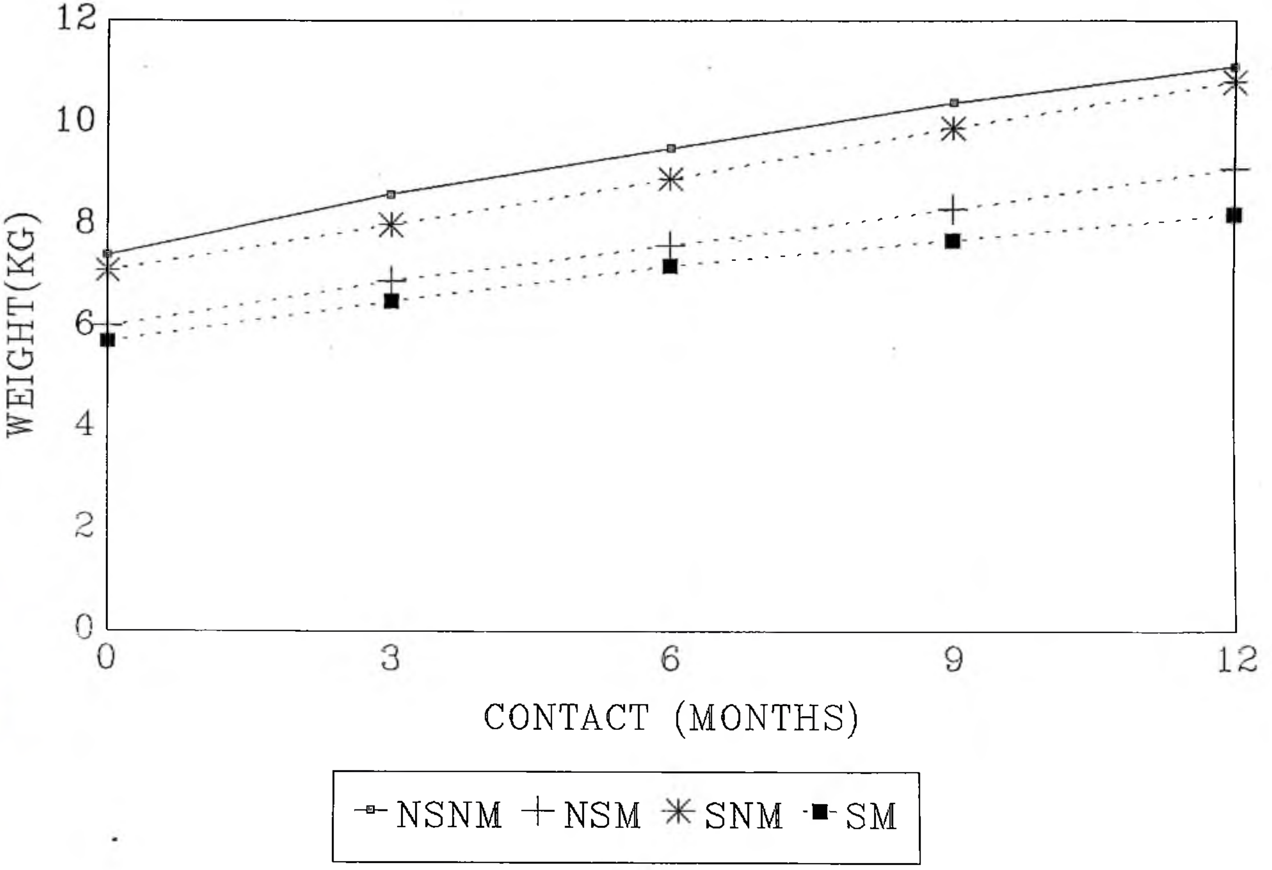
MEAN WEIGHT- FOR AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/ INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 1

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months .Mean ±S.D	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	34	38.6	6 Months	$7.4^{a} \pm 0.5$ (7.0 - 8.0) n = 34	$8.6^{a} \pm 0.7$ (8.0-10.0) n = 34	$9.5^{a} \pm 0.5$ (9.0=10.0) n = 34	$10.4^{a} \pm 0.5$ (10.0 - 11.0) n = 34	$11.1^{a} \pm 0.3$ (11.0-12.0) n = 34
NSM 2	14	15.9		$6.0^{b} \pm 0.4$ (5.0-7.0) n = 14	$6.9^{b} \pm 0.3$ (6.0-7.0) n = 14	$7.6^{b} \pm 0.5$ (7.0-8.0) n = 14	$8.3^{b} \pm 0.5$ (8.0-9.0) n = 14	$9.1^{b} \pm 0.3$ (9.0-10.0) n = 14
SNM 3	10	11.4		$7.1^{a} \pm 0.6$ (6.0-8.0) n = 10	$8.0^{c} \pm 0.7$ (7.0-9.0) n = 10	$8.9^{c} \pm 0.6$ (8.0-10.0) n = 10	$9.9^{c} \pm 0.6$ (9.0-11.0) n = 10	$10.8^{c} \pm 0.6$ (10.0 - 12.0) n = 10
SM 4	30	34.1		$5.7^{b} \pm 0.5$ (4.0-6.0) n = 30	$6.5^{d} \pm 0.7$ (5.0 - 7.0) n =30	$7.2^{b} \pm 0.9$ (6.0-8.0) n = 30	$7.7^{d} \pm 0.8$ (7.0 - 9.0) n = 30	$8.2^{d} \pm 0.5$ (8.0 - 10.0) n = 30
TOTAL	88	100.0	Means in the same column with different superscripts are significantly different (p<0.05 Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 2. MEAN WEIGHT-FOR-AGE (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT INITIAL CONTACT (SEXES COMBINED)



4.1.3 MEAN WEIGHT-FOR-AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).

Among the children who were 12 months of age at the initial contact (Table 2, Fig 3), low body weights were noticeable among the NSM and SM groups. Mean body weights of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. By the 3rd month, mean body weight of the NSNM group measured 9.9kg compared with mean values of the NSM, SNM and SM groups, which measured 8.2kg, 9.0kg and 7.3kg respectively.

Changes in body weights of the children were observed. By the 6th month, mean body weight of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean body weight of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

This pattern of growth continued throughout the period of the study. By the 9th and 12th months, mean body weights of the NSNM group were significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean body weights of the SNM group were significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean body weights of the NSM were significantly ($p<0.05$) higher than that of the SM group. Mean body weight of the NSNM group was superior to other groups throughout the period of study.

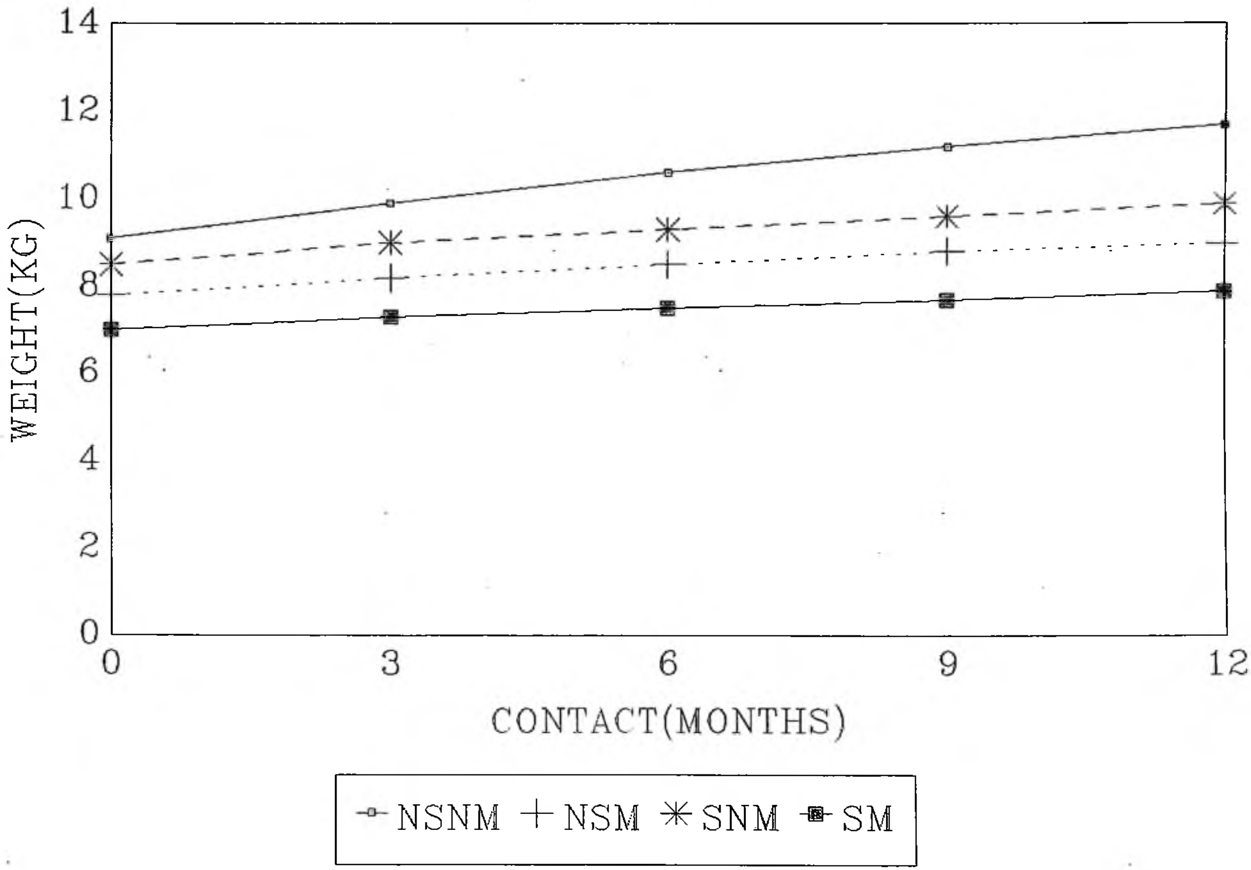
MEAN WEIGHT- FOR- AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION /INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 2

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean $\pm$S.D	3 Months Mean $\pm$S.D	6 Months Mean $\pm$SD	9 Months Mean $\pm$SD	12 Months Mean $\pm$SD
NSNM I	30	37.0	12 Months	$9.1^a \pm 0.3$ (9.0 - 10.0) n = 30	$9.9^a \pm 0.3$ (9.0-10.0) n = 30	$10.6^a \pm 0.5$ (10.0=11.0) n = 30	$11.2^a \pm 0.4$ (11.0 - 12.0) n = 30	$11.7^a \pm 0.8$ (10.0-13.0) n=30
NSM 2	19	23.5		$7.8^b \pm 0.4$ (7.0-8.0) n = 19	$8.2^b \pm 0.6$ (7.0-9.0) n = 19	$8.5^b \pm 0.5$ (8.0-9.0) n = 19	$8.8^b \pm 0.5$ (8.0-10.0) n = 19	$9.0^b \pm 0.2$ (8.0-9.0) n - 19
SNM 3	15	18.5		$8.5^c \pm 0.5$ (8.0-9.0) n = 15	$9.0^c \pm 0.4$ (8.0-10.0) n = 15	$9.3^c \pm 0.6$ (9.0-11.0) n = 15	$9.6^c \pm 0.6$ (9.0-11.0) n = 15	$9.9^c \pm 0.3$ (9.0 - 10.0) n = 15
SM 4	17	21.0		$7.0^d \pm 0.8$ (6.0-8.0) n = 17	$7.3^d \pm 0.5$ (7.0 - 8.0) n =17	$7.5^d \pm 0.6$ (7.0-9.0) n = 17	$7.7^d \pm 0.8$ (7.0 - 10.0) n = 17	$7.9^d \pm 1.0$ (6.0 - 10.0) n = 17
TOTAL	81	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 3. MEAN WEIGHT FOR-AGE (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT(SEXES COMBINED).



4.1.4 **MEAN WEIGHT- FOR-AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)**

Differences in the body weights of the children aged 24 months were observed at the initial contact (Table 3. Fig 4). Mean body weight of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean value of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean value of the NSM group was significanty ($p<0.05$) higher than that of the SM group.

The NSNM group continued to grow steadily. By the 3rd month of contact, mean body weight of NSNM group measured 11.9kg. Mean body weights of the NSM, SNM and SM groups measured 9.9kg, 10.8kg and 9.1kg respectively

This pattern of growth continued throughout the period of the study. By the 6th month, mean body weight of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean value of the NSM group was significantly ($p<0.05$) higher than that of the SM.

Differences in body weights of pre-school children continued to be noticeable throughout the periodof the study. By the 9th month, mean body weight of the NSNM group measured 13.3kg compared with those of the NSM, SNM and SM groups which measured 10.5kg, 11.5kg and 9.7kg respectively.

By the 12th month, mean body weight of the NSNM group was significantly ($p<0.05$) higher than those of the other groups (NSM, SNM and SM). Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and

SM groups. Mean weight-for-age of the NSM group was significantly ($p<0.05$) higher than that of the SM group. Mean body weight of the NSNM group was superior to those of the NSM, SNM and SM groups throughout the period of study.

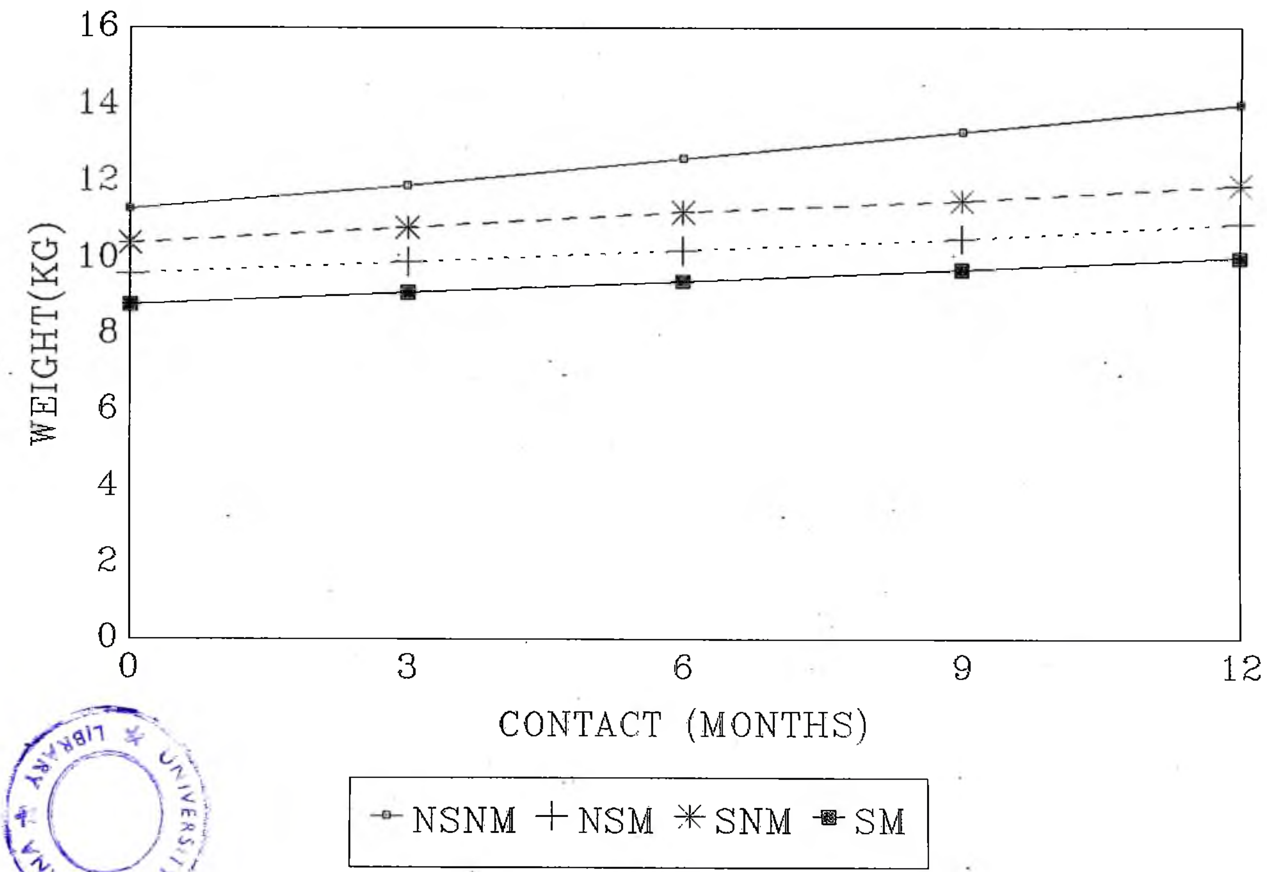
MEAN WEIGHT- FOR- AGE (kg) OF PRESCHOOL CHILDREN WITH MALNUTRITION/ INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 3

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months Mean ±S.D	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	38	44.2	24 Months	$11.3^{a} \pm 1.1$ (10.0 - 14.0) n = 38	$11.9^{a} \pm 1.3$ (10.0-15.0) n = 38	$12.5^{a} \pm 1.4$ (11.0=16.0) n n= 38	$13.3^{a} \pm 1.4$ (12.0 - 16.0) n = 38	$14.1^{a} \pm 1.3$ (12.0-17.0) n = 38
NSM 2	14	16.3		$9.6^{b} \pm 0.5$ (9.0-10.0) n = 14	$9.9^{b} \pm 0.5$ (9.0-11.0) n =14	$10.2^{b} \pm 0.6$ (10.0-12.0) n = 14	$10.5^{b} \pm 0.7$ (10.0-12.0) n = 14	$10.9^{b} \pm 0.3$ (10.0-11.0) n = 14
SNM 3	19	22.1		$10.4^{c} + 0.8$ (9.0-12.0) n = 19	10.8c + 0.7 (10.0-12.0) n = 19	$11.2^{c} + 0.8$ (10.0-12.0) n = 19	$11.5^{c} + 0.5$ (11.0-12.0) n = 19	$11.9^{c} + 0.3$ (11.0 - 12.0) n = 19
SM 4	15	17.4		$8.8^{d} \pm 0.4$ (8.0-9.0) n = 15	$9.1^{d} \pm 0.7$ (8.0 - 10.0) n =15	$9.4^{b} \pm 0.7$ (8.0-11.0) n = 15	$9.7^{d} \pm 0.8$ (9.0 - 12.0) n = 15	$10.0^{d} \pm 1.0$ (8.0 - 12.0) n = 15
TOTAL	86	100.0	Means in the same column with different superscripts are significantly different (p<0.05) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 4 MEAN WEIGHT FOR-AGE (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT INITIAL CONTACT (SEXES COMBINED).



4.1.5 MEAN WEIGHT- FOR-AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Table 4, Fig 5 show the differences in mean body weights of pre-school children aged 36 months at the initial contact. At the initial contact, mean weight-for-age of the NSNM group measured 14.1kg compared with the NSM, SNM and SM groups with mean body weights of 11.6kg, 12.3kg and 9.0kg respectively.

These changes in body weights continued to the 3rd and 6th months. By the 6th month, mean weight-for-age of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean body weight of the NSM group was significantly higher than that of the SM group. This pattern continued to the 9th month. By the 9th month, mean body weight of the NSNM group measured 15.3kg compared with those of the NSM, SNM and SM groups with mean body weights of 12.5kg , 13.6kg and 9.8kg respectively.

Differences in mean body weights of the children continued throughout the period of study. By the 12th month of contact, mean weight-for -age of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean body weight of the NSM group was significantly ($p<0.05$) higher than that of the SM group. Mean body weight of the SM group was inferior to the other groups throughout the period of study.

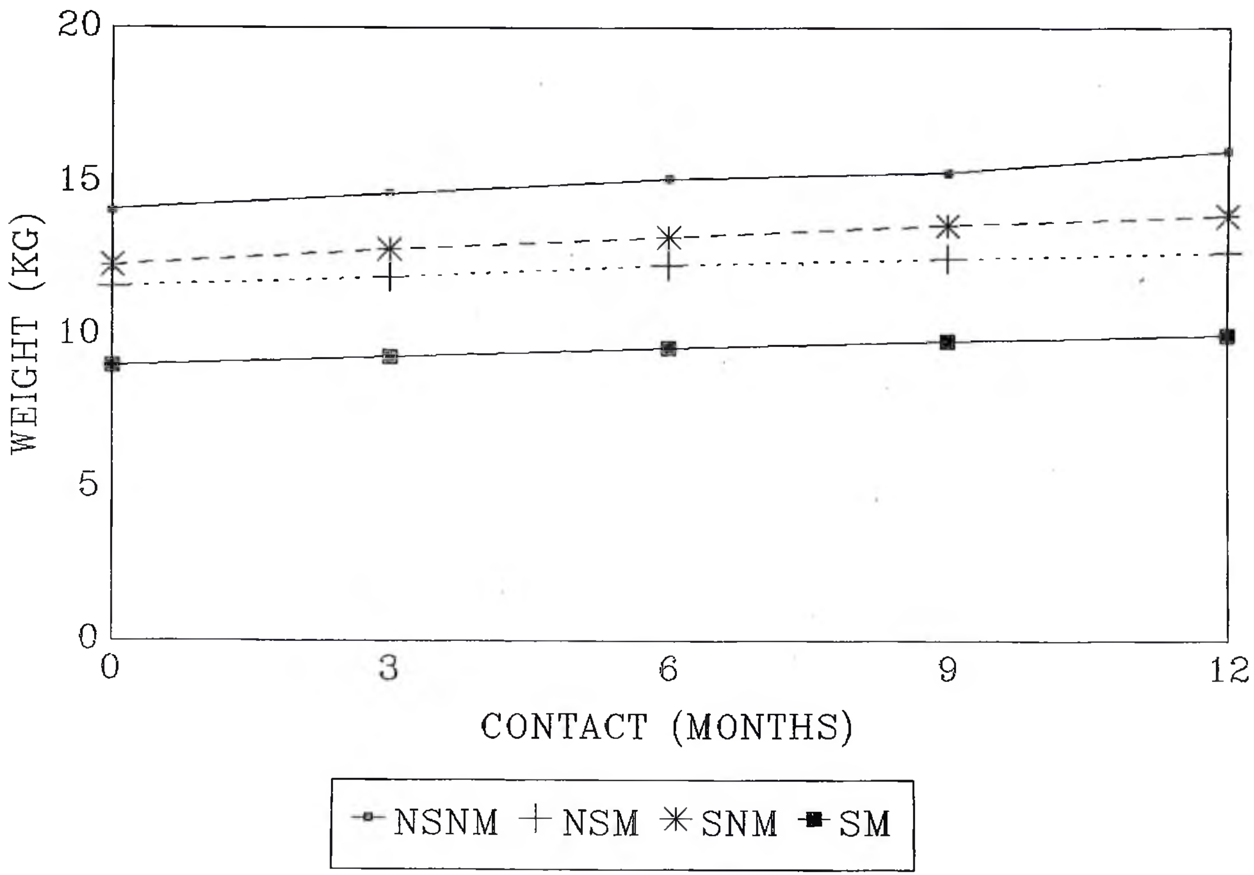
MEAN WEIGHT (kg) FOR AGE OF PRESCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 4

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean $\pm$S.D	3 Months Mean $\pm$S.D.	6 Months Mean $\pm$SD	9 Months Mean $\pm$SD	12 Months Mean $\pm$SD
NSNM I	49	45.8	36 Months	$14.1^{a} \pm 1.1$ (12.0 - 16.0) n = 49	$14.6^{a} \pm 1.0$ (13.0-17.0) n = 49	$15.1^{a} \pm 1.1$ (13.0=18.0) n = 49	$15.3^{a} \pm 1.2$ (14.0 - 18.0) n = 49	$16.0^{a} \pm 1.2$ (14.0-19.0) n = 49
NSM 2	24	22.4		$11.6^{b} \pm 1.1$ (9.0-13.0) n = 24	$11.9^{b} \pm 1.0$ (10.0-14.0) n = 24	$12.3^{b} \pm 0.8$ (11.0-13.0) n = 24	$12.5^{b} \pm 0.9$ (11.0-14.0) n = 24	$12.7^{b} \pm 0.8$ (12.0-14.0) n - 24
SNM 3	20	18.7		$12.3^{c} \pm 0.7$ (11.0-13.0) n = 20	$12.8^{c} \pm 0.8$ (12.0-14.0) n = 20	$13.2^{c} \pm 1.0$ (12.0-15.0) n = 20	$13.6^{c} \pm 0.7$ (13.0-15.0) n = 20	$13.9^{c} \pm 0.3$ (13.0 - 14.0) n = 20
SM 4	14	13.1		$9.0^{d} \pm 1.3$ (6.0-10.0) n = 14	$9.3^{d} \pm 1.5$ (6.0 - 11.0) n =14	$9.6^{d} \pm 1.5$ (6.0-12.0) n = 14	$9.8^{d} \pm 1.3$ (7.0 - 11.0) n = 14	$10.0^{d} \pm 1.4$ (7.0 - 12.0) n = 14
TOTAL	107	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 5 MEAN WEIGHT FOR-AGE (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).



4.1.6 MEANWEIGHT FOR-AGE(kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Table 5, Fig 6 demonstrate the differences in mean body weights of pre-school children aged 48 months at the initial contact. At the initial contact, weight- for-age of the NSNM group was significantly (p<0.05) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly (p<0.05) higher than those of the NSM and SM groups. Mean body weight of the NSM group was significantly (p<0.05) higher than that of the SM group.

By the 3rd month, mean body weight of the NSNM group measured 16.5kg compared with the other groups (NSM, SNM and SM) with mean body weights of 13.7 kg. 15.4kg 11.7kg respectively. This pattern of growth continued to the 6th month. By the 6th month, mean body weight of the NSNM group was significantly (p< 0.05) higher than those of the NSM, SNM and SM groups. Mean body weight of the SNM group was significantly (p<0.05) higher than those of the NSM and SM groups. Similarly, mean body weight of the NSM group was significantly (p< 0.05) higher than that of the SM group.

Similar growth patterns continued throughout the 9th and 12th months. By the 12th month, mean weight-for-age of the NSNM group was 17.7 kg compared with those of the NSM, SNM and SM groups with mean body weights of 14.5 kg, 16.5 kg and 12.4 kg respectively.

Differences in mean body weights of the NSNM group and those of the

NSM, SNM and SM groups were significant ($p<0.05$) at all ages. Mean body weight of the SNM group was significant ($p < 0.05$) to those of the NSM and SM groups. Mean body weight of the NSM group was significant ($p<0.05$) to that of the SM group. mean body weight of the NSNM group was superior to the other groups throughout the period of study. Generally, it was observed from the age of 36 months through 60 months that weight-for-age of a few pre-school children among the NSNM group exceeded the NCHS/WHO median weight-for-age for their age groups.

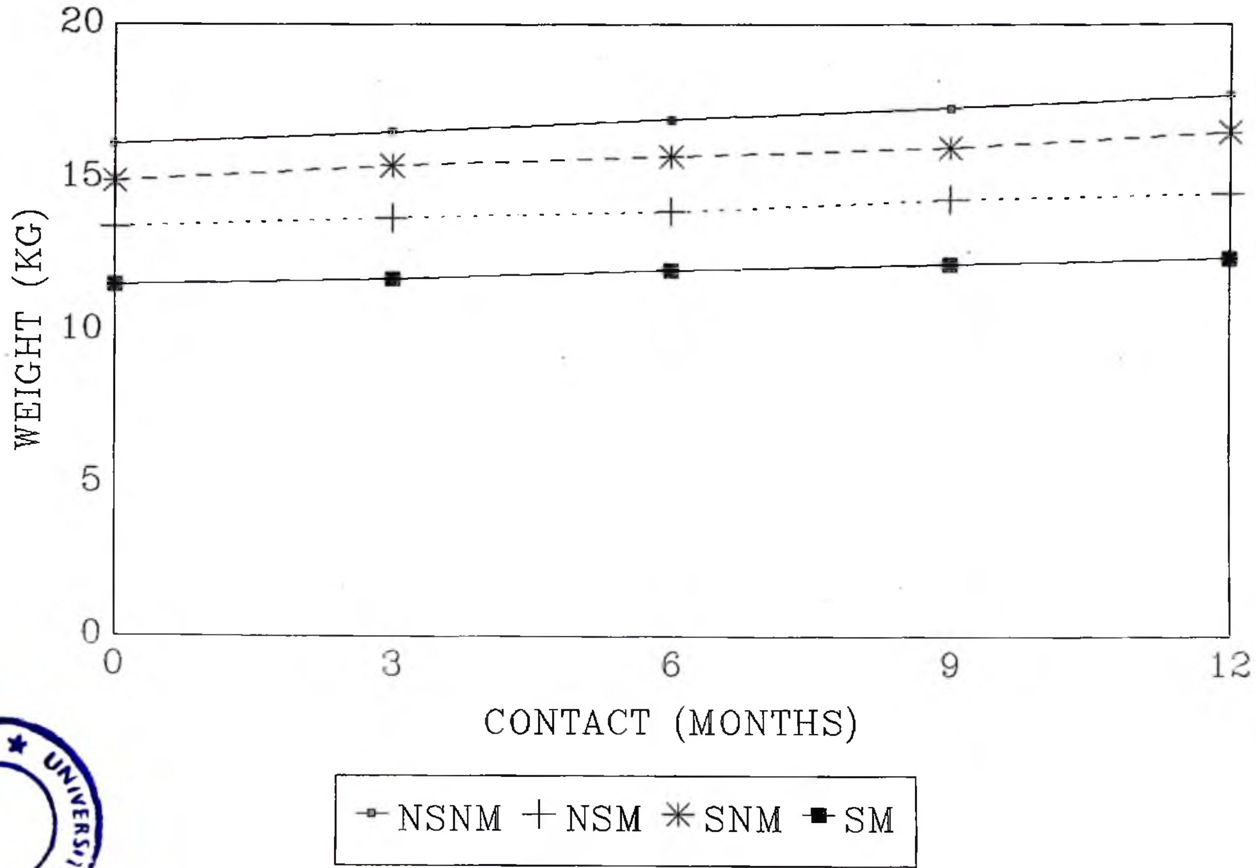
MEAN WEIGHT- FOR- AGE (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 5

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months Mean ±S.D.	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	47.1	48 Moths	$16.1^{a} \pm 1.0$ (15.0 - 18.0) n = 49	$16.5^{a} \pm 1.1$ (15.0-18.0) n = 49	$16.9^{a} \pm 0.8$ (16.0=18.0) n = 49	$17.3^{a} \pm 0.8$ (16.0 - 19.0) n = 49	$17.7^{a} \pm 0.8$ (15.0-20.0) n = 49
NSM 2	15	14.4		$13.4^{b} \pm 0.7$ (12.0-14.0) n = 15	$13.7^{b} \pm 0.7$ (13.0-15.0) n = 15	$13.9^{b} \pm 0.6$ (13.0-15.0) n = 15	$14.3^{b} \pm 0.5$ (14.0-15.0) n = 15	$14.5^{b} \pm 0.5$ (14.0-15.0) n = 15
SNM 3	23	22.1		$14.9^{c} \pm 1.4$ (13.0-17.0) n = 23	$15.4^{c} \pm 1.4$ (13.0-18.0) n = 23	$15.7^{c} \pm 1.4$ (14.0-18.0) n = 23	$16.0^{c} \pm 1.3$ (14.0-19.0) n = 23	$16.5^{c} \pm 1.3$ (15.0 - 19.0) n = 23
SM 4	17	16.4		$11.5^{d} \pm 1.2$ (9.0-13.0) n = 17	$11.7^{d} \pm 1.5$ (10.0 - 14.0) n =17	$12.0^{d} \pm 1.8$ (10.0-15.0) n = 17	$12.2^{d} \pm 1.8$ (10.0 - 15.0) n = 17	$12.4^{d} \pm 2.0$ (9.0 - 16.0) n = 17
TOTAL	104	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 6 MEAN WEIGHT FOR-AGE (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).



4.1.7 MEAN LENGTH-FOR-AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Among the NSNM and SNM groups, mean lengths-for-age were higher than those of the NSM and SM groups at the initial contact (Table 6, Fig 7). Differences were significant (p<0.05). BY the 3rd month, mean length-for-age of the NSNM group measured 71.1cm compared with those of the NSM, SNM and SM groups with mean values of 67.9cm, 70.2cm and 69.2cm respectively.

By the 6th month of contact, when these groups of children were 12 months of age, mean values of the NSNM and SNM groups were significantly (p<0.05) higher than those of the NSM and SM groups. similarly, mean value of SM group was significantly (p<0.05) higher than the NSM group. A similar observation was made on the 9th month. Mean length - for - age of the NSNM group measured 78.0cm compared with those of the other three groups, (NSM, SNM and SM) with mean values of 72.6cm, 76.3cm and 74.0cm respectively. Differences in mean values of the four groups were significant (p<0.05).

This pattern of growth continued through out the period of study. By the 12th month, mean value of the NSNM group was significantly (p<0.05) higher than those of the NSM, SNM and SM groups. Mean value of the SNM was significantly (p< 0.05) higher than those of the NSM and SM groups. Mean length-for-age of the SM group was non-significantly (p>0.05) higher than that of the NSM group.

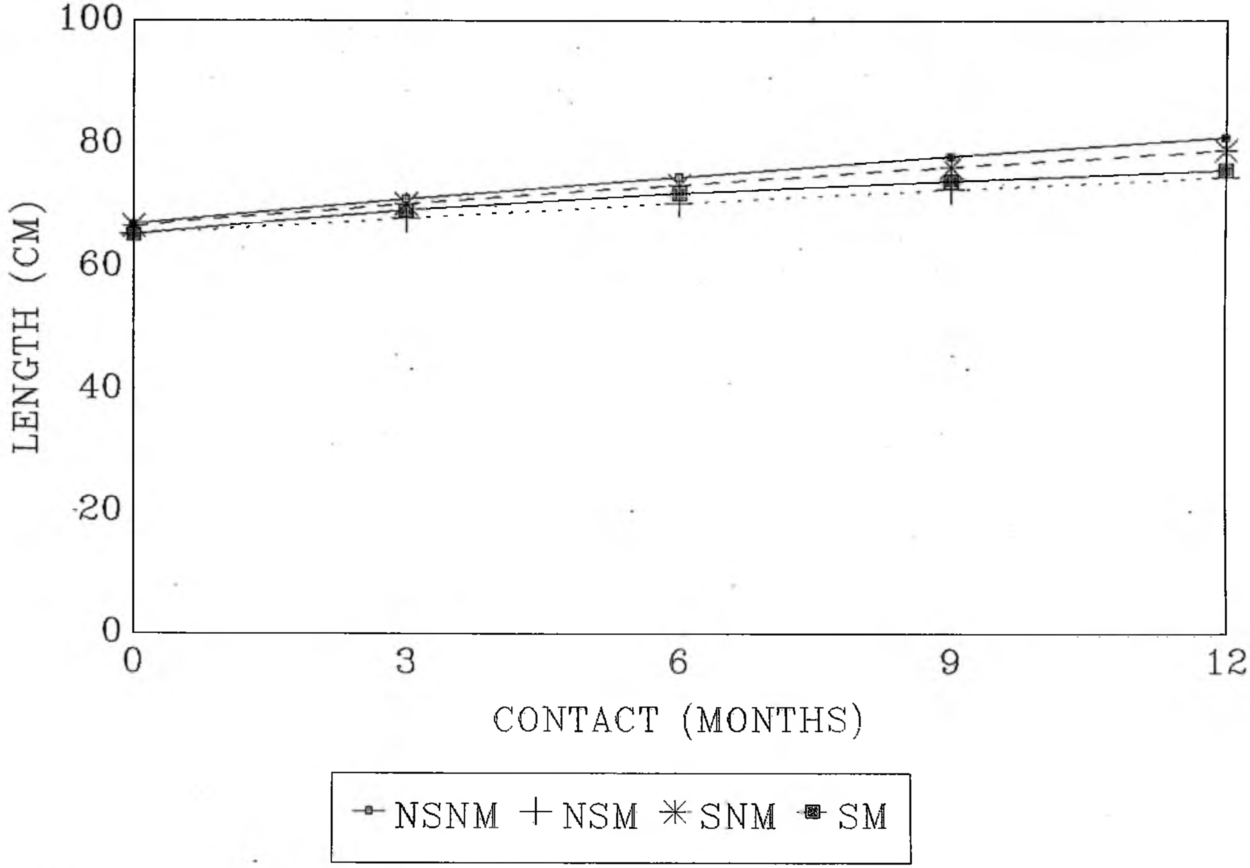
MEAN LENGTH- FOR- AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 6

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months Mean ±S.D.	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	34	38.6	6 Months	67.0[a] ± 0.9 (66.0 - 68.8) n = 34	71.1[a]±1.2 (68.0=73.0) n = 34	74.7[a] ± 1.6 (70.0-78.0) n = 34	78.0[a] ± 1.3 (74.0 - 80.0) n = 34	81.1[a] ± 1.1 (78.0-82.2) n = 34
NSM 2	14	15.9		65.3[b] ± 1.0 (63.0-66.4) n = 14	67.9[b] ± 1.4 (66.0-70.0) n = 14	70.4[b] ± 1.6 (68.0-73.0) n = 14	72.6[b] ± 1.7 (70.0-76.0) n = 14	74.6[b] ± 1.7 (72.0-78.0) n = 14
SNM 3	10	11.4		66.7[a] ± 1.1 (65.0-68.5) n = 10	70.2[a] ± 1.7 (67.0-72.5) n = 10	73.4[a] ± 2.6 (69.0-77.0) n = 10	76.3[c] ± 2.5 (72.0-79.2) n = 10	79.0[c] ± 2.1 (75.0 -81.2) n = 10
SM 4	30	34.1		65.3[b] ±1.9 (60.0 - 67.5) n =30	69.2[c] ± 2.3 (63.0-72.0) n = 30	72.0[c] ± 2.7 (66.0-76.0) n = 30	74.0[d] ± 2.5 (68.0 - 78.0) n = 10	75.8[b] ± 2.5 (70.0 -80.3) n = 10
TOTAL	88	100.0	Means in the same column with different superscripts are significantly different (p<0.05) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 7 MEAN LENGTH FOR-AGE (CM) OF THE PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT INITIAL CONTACT (SEXES COMBINED).



4.1.8 **MEAN LENGTH- FOR-AGE(cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)**

Among the infants who were 12 months of age at the initial contact (Table 7, Fig 8), mean length - for - age of the NSNM group measured 76.1cm. Mean body lengths of the NSM, SNM and SM groups measured 73. 8cm, 75.2cm and 70.9cm respectively. By the 3rd month, mean body length of the NSNM group was significantly (p< 0.05) higher than those of the other three groups (NSM, SNM and SM). Mean body length of the SNM group was significantly (p<0.05) higher than those of the NSM and SM groups. Mean value of the NSM group was significantly (p<0.05) higher than that of the SM group.

This pattern continued to the 6th month. By the 6th month, mean length - for - age of the NSNM group was significantly (p<0.05) higher than those of the NSM, SNM and SM groups. Mean values of the SNM and NSM groups were significantly (p<0.05) higher than that of the SM group.

By the 9th month, mean body length of the NSNM group measured 85. 6cm compared with those of the NSM, SNM and SM groups with mean body lengths of 81.0cm, 82.6cm and 77. 6cm respectively. Differences in mean body lengths among the groups were significant (p<0.05).

By the 12th month, mean body length of the NSNM group was significantly (p<0.05) higher than those of the other groups. Mean body lengths of the SNM and NSM groups were significantly (p<0.05) higher than that of the SM group. Differences between mean lengths-for-age of the SNM and NSM groups were non-significant (p>0.05). Mean length - for - age of the NSNM group was superior to the other groups throughout the period of study..

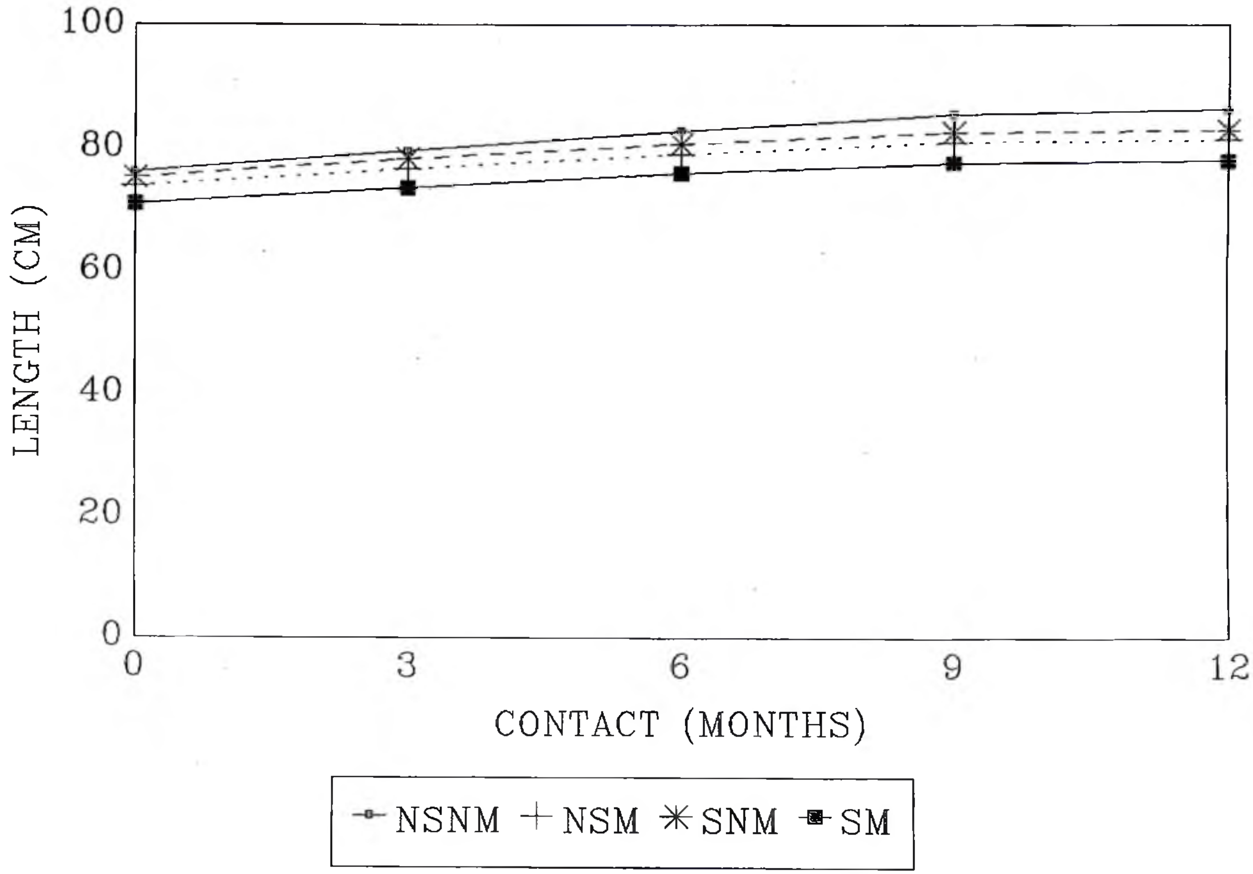
MEAN LENGTH- FOR- AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 7

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean $\pm$S.D	3 Months Mean $\pm$S.D.	6 Months Mean $\pm$SD	9 Months Mean $\pm$SD	12 Months Mean $\pm$SD
NSNM I	30	37.0	12 Months	$76.1^{a} \pm 1.9$ (75.0 - 84.5) n = 30	$79.5^{a} \pm 2.4$ (76.0=89.0) n = 30	$82.8^{a} \pm 2.9$ (77.0-93.0) n = 30	$85.6^{a} \pm 3.5$ (78.6 - 97.0) n = 30	$86.3^{a} \pm 3.7$ (79.0-98.4) n = 30
NSM 2	19	23.5		$73.8^{b} \pm 1.7$ (68.0-75.6) n = 19	$76.6^{b} \pm 2.2$ (70.0-78.9) n = 19	$79.0^{b} \pm 2.5$ (72.0-82.0) n = 19	$81.0^{b} \pm 2.9$ (73.2-84.5) n = 19	$81.4^{b} \pm 2.9$ (73.5-85.0) n = 19
SNM 3	15	18.5		$75.2^{a} \pm 0.8$ (73.3-77.0) n = 15	$78.2^{c} \pm 1.0$ (76.3-80.4) n = 15	$80.7^{b} \pm 1.2$ (78.5-83.5) n = 15	$82.6^{b} \pm 1.7$ (79.7-85.5) n = 15	$83.0^{b} \pm 1.7$ (80.0 - 86.0) n = 15
SM 4	17	21.0		$70.9^{c} \pm 1.8$ (67.6 - 74.0) n =17	$73.5^{d} \pm 2.0$ (69.6-77.4) n = 17	$75.9^{c} \pm 2.3$ (71.6-80.5) n = 17	$77.6^{c} \pm 2.8$ (72.6 - 82.7) n = 17	$78.0^{c} \pm 2.8$ (73.0 - 83.0) n = 17
TOTAL	81	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 8 MEAN LENGTH FOR-AGE (CM) OF THE PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).



4.1.9 **MEAN LENGTH- FOR-AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)**

Mean length-for-age of pre-school children aged 24 months was observed at the initial contact (Table 8, Fig 9). Mean length for-age of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean length-for-age of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean length-for-age of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

This pattern of growth among pre-school children continued to the 3rd month. By the 3rd month, mean value of the NSNM group measured 88.1cm compared with those of the NSM, SNM and SM groups with mean values of 84.6cm 86.5cm and 82.2cm respectively. By the 6th month, all differences were significant ($p<0.05$).

By the 9th month, mean length-for-age of the NSNM group measured 93. 5cm compared with those of the NSM, SNM and SM groups with mean values of 88.5cm, 90.6cm and 84.4 respectively. By the 12th month of contact, mean length- for-age of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean lengths-for-age of the NSM and SNM groups were significantly ($p<0.05$) higher than that of the SM group.There was a non-significant ($p>0.05$) difference between the body lengths of the SNM and NSM groups. Mean length-for-age of the SM group was inferior to the other groups.

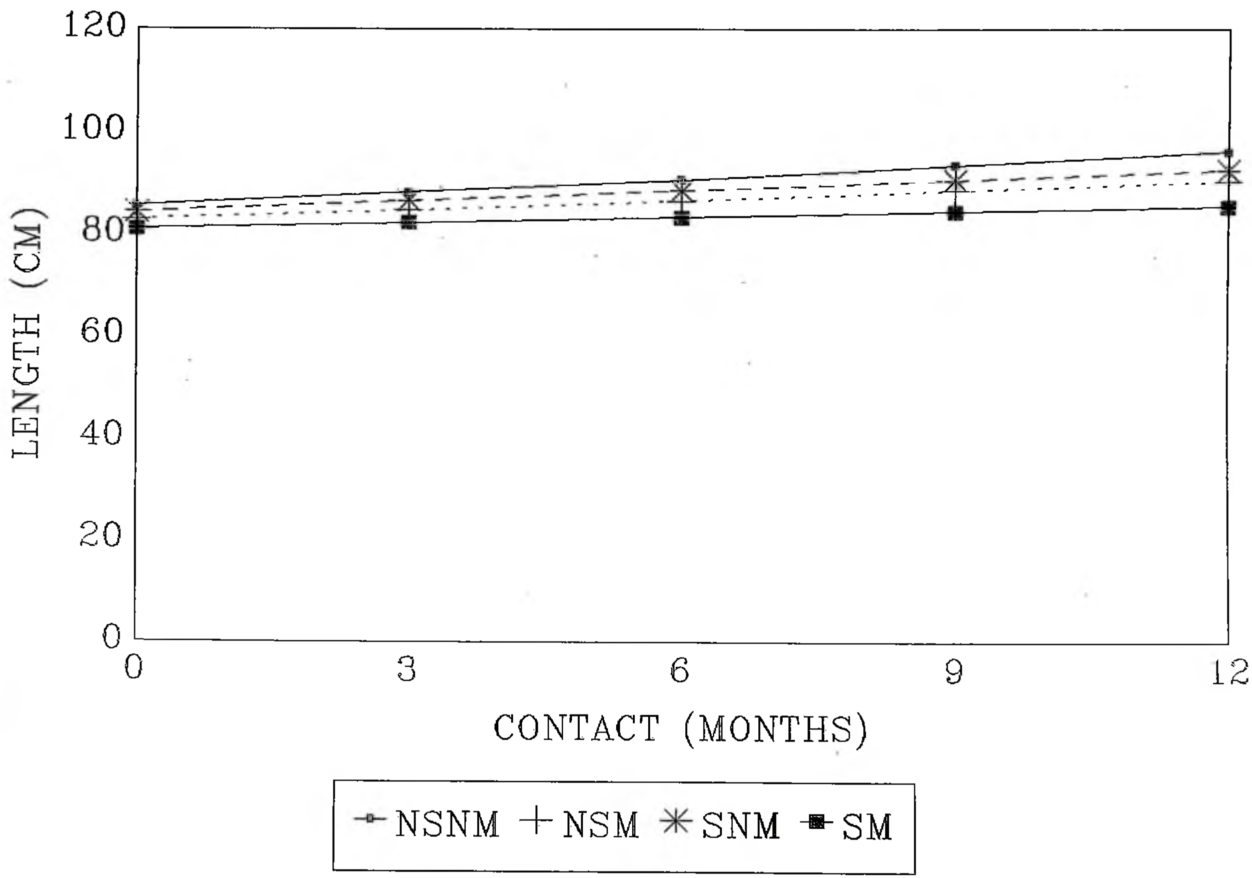
MEAN LENGTH- FOR- AGE(cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 8

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean $\pm$S.D	3 Months Mean $\pm$S.D.	6 Months Mean $\pm$SD	9 Months Mean $\pm$SD	12 Months Mean $\pm$SD
NSNM I	38	44.2	24 Months	$85.4^{a} \pm 0.9$ (83.0 - 87.4) n = 38	$88.1^{a} \pm 1.7$ (84.0=92.2) n = 38	$90.6^{a} \pm 2.3$ (85.0-96.2) n = 38	$93.5^{a} \pm 2.7$ (86.0 - 101.0) n = 38	$96.1^{a} \pm 3.4$ (87.0-105.0) n = 38
NSM 2	14	16.3		$82.8^{b} \pm 2.0$ (79.0-85.6) n = 14	$84.6^{b} \pm 2.1$ (81.0-88.2) n = 14	$86.5^{b} \pm 2.4$ (83.0-90.4) n = 14	$88.5^{b} \pm 2.5$ (85.0-92.8) n = 14	$90.4^{b} \pm 2.8$ (86.0-95.0) n = 14
SNM 3	19	22.1		$84.2^{c} \pm 1.3$ (82.0-86.6) n = 19	$86.5^{c} \pm 1.7$ (83.0-89.5) n = 19	$88.5^{c} \pm 2.0$ (84.0-92.5) n = 19	$90.6^{c} \pm 2.5$ (85.0-96.0) n = 19	$92.5^{b} \pm 2.9$ (86.0 - 99.0) n = 19
SM 4	15	17.4		$80.9^{d} \pm 2.8$ (74.0 - 84.5) n =15	$82.2^{d} \pm 3.0$ (75.0-86.0) n = 15	$83.2^{d} \pm 3.1$ (76.0-88.0) n = 15	$84.4^{d} \pm 3.3$ (77.0 - 90.0) n = 15	$85.4^{c} \pm 3.5$ (78.0 - 92.0) n = 15
TOTAL	86	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 9 MEAN LENGTH FOR-AGE (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT INITIAL CONTACT (SEXES COMBINED).



4.1.10 **MEAN HEIGHT- FOR-AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED**

Among the NSNM and SNM groups, mean heights-for-age were significantly ($p<0.05$) higher than those of the NSM and SM groups at the initial contact (Table 9, Fig 10). By the 3rd month, mean values of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean value of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

This pattern continued to the 6th month. By the 6th month, mean height for-age of the NSNM group measured 99.7cm compared with those of the NSM, SNM and SM groups with mean values of 94.9 cm 97.7cm and 88.0cm respectively. Similarly, by the 9th month, mean height -for -age of the NSNM group measured 102. 1cm. Mean heights-for-age of the NSM, SNM and SM groups measured 96.5cm, 99.3cm and 89.0cm respectively. Differences were significant ($p<0.05$).

By the 12th month, mean height-for -age of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean height-for-age of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Similarly, mean height-for-age of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

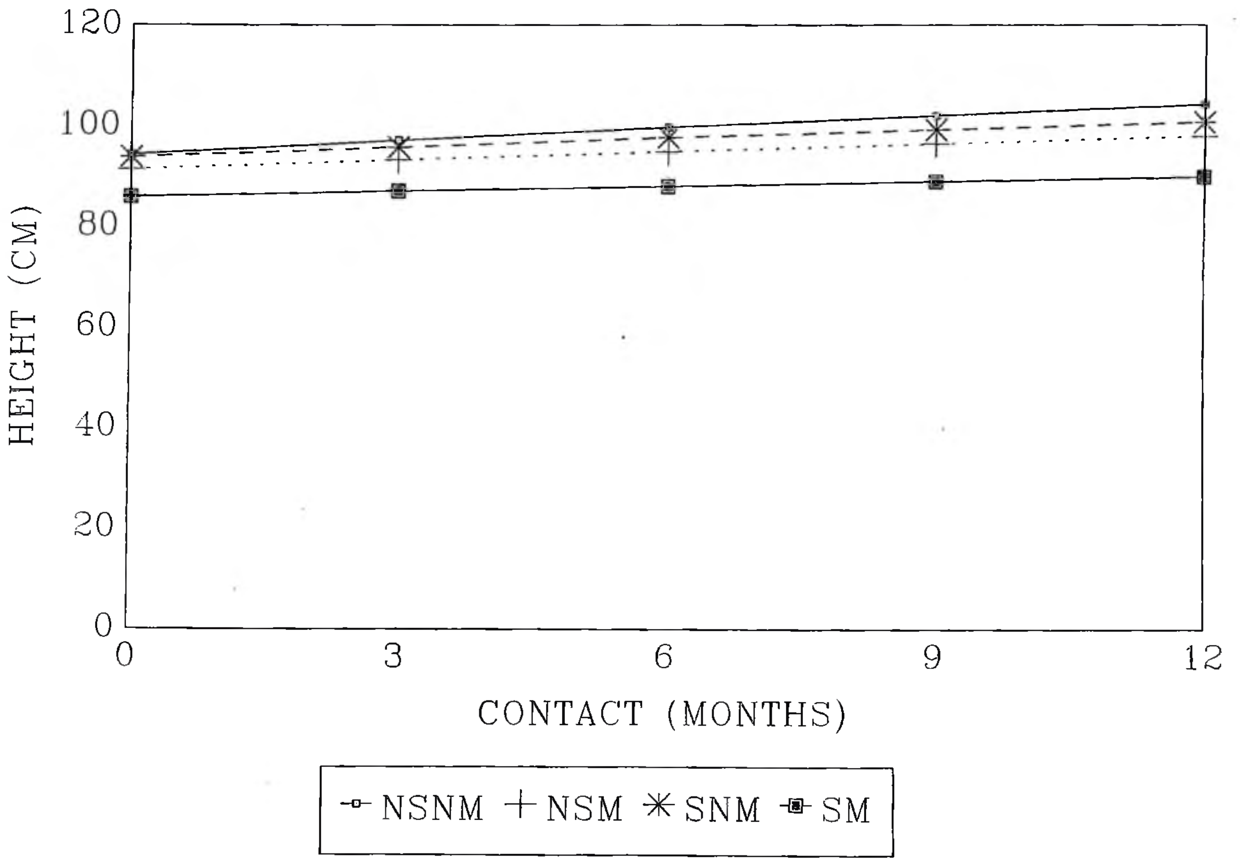
MEAN HEIGHT- FOR- AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION /INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 9

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months Mean ±S.D	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	45.8	36 Months	94.3[a] ± 1.5 (90.0 - 97.0) n = 49	97.1[a]±2.2 (91.0=101.0) n = 49	99.7[a] ± 2.8 (92.0-104.0) n = 49	102.1[a] ± 3.4 (93.0 - 108.0) n = 49	104.3[a] ± 4.0 (94.5-112.0) n = 49
NSM 2	24	22.4		91.4[b] ± 3.0 (82.0-94.0) n = 24	93.2[b] ± 3.4 (83.0-97.5) n = 24	94.9[b] ± 3.9 (84.0-101.0) n = 24	96.5[b] ± 4.3 (85.0-104.0) n = 24	98.0[b] ± 4.8 (86.0-107.0) n = 24
SNM 3	20	18.7		93.8[a] ± 0.8 (92.0-96.0) n = 20	95.7[a] ± 1.3 (93.0-99.0) n = 20	97.7[c] ± 1.7 (94.0-102.0) n = 20	99.3[c] ± 2.1 (95.0-105.0) n = 20	100.8[c] ± 2.6 (96.0 - 108.0) n = 20
SM 4	14	13.1		85.9[c] ±5.8 (72.0 - 93.0) n =14	87.0[c]± 5.9 (73.0-95.0) n = 14	88.0[d] ± 6.1 (74.0-97.4) n = 14	89.0[d] ± 6.2 (75.0 - 99.2) n = 14	89.9[d] ± 6.3 (76.0 - 101.0) n = 14
TOTAL	107	100.0	Means in the same column with different superscripts are significantly different (p<0.05) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 10 MEAN HEIGHT FOR-AGE (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT INITIAL CONTACT (SEXES COMBINED).



4.1.11 **MEAN HEIGHT-FOR-AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).**

Differences in mean height-for-age of pre-school children were recorded at the initial contact (Table 10, Fig 11). Mean height-for-age of the NSNM group measured 102.3cm compared with those of the NSM, SNM and SM groups with mean values of 99.0cm, 101.8cm and 95. 8cm respectively. By the 3rd month, mean heights-for-age of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean value of the NSM group was significantly ($p<0.05$) higher than that of the SM group.

This pattern of growth continued to the 6th month. By the 6th month, mean height-for-age of the NSNM group measured 106.7cm compared with those of the NSM, SNM and SM groups with mean values of 101.6cm, 105.0cm and 97.9cm respectively. Differences among the group means were significant ($p<0.05$). Similarly, by the 9th and 12th months, mean heights-for-age of the NSNM group were significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean values of the SNM group were significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean values of the NSM group were significantly ($p<0.05$) higher than those of the SM group.

Mean values of the NSNM group were superior to those of the other groups through out the period of study. It was observed that from the age of 36 months through 60 months, among the NSNM group, height-for-age of a few pre-school children exceeded the NCNS/WHO median height-for-age for their age groups.

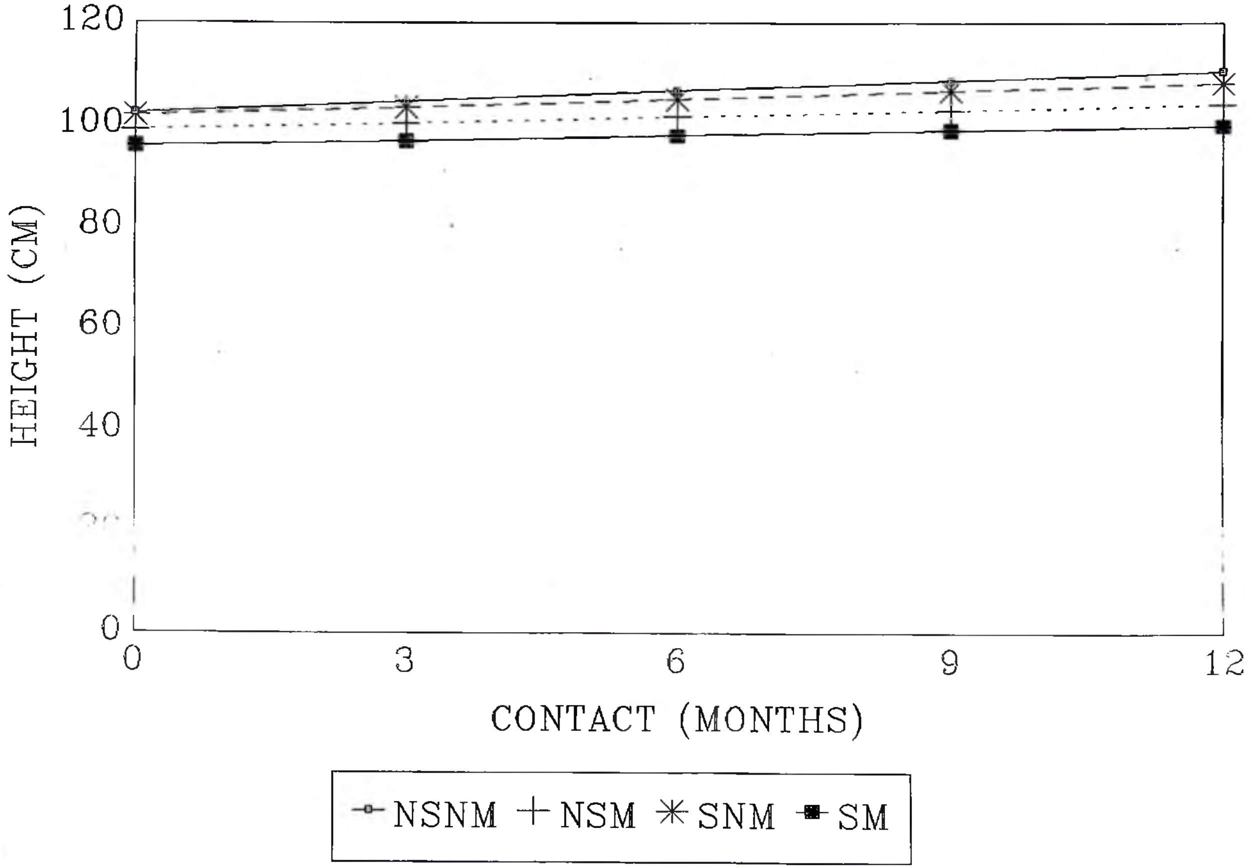
MEAN HEIGHT- FOR-AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 10

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	O Month Mean ±S.D	3 Months Mean ±S.D	6 Months Mean ±SD	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	47.1	48 Months	$102.3^a \pm 0.8$ (100.0 - 104.0) n = 49	$104.5^a \pm 1.5$ (101.0=107.0) n = 49	$106.7^a \pm 2.5$ (102.0-115.0) n = 49	$108.7^a \pm 2.8$ (103.0 - 114.0) n = 49	$110.5^a \pm 3.4$ (104.0-117.0) n = 49
NSM 2	15	14.4		$99.0^b \pm 2.0$ (94.0-101.0) n = 15	$100.3^b \pm 2.2$ (95.0-102.0) n = 15	$101.6^b \pm 2.6$ (96.0-104.0) n = 15	$102.8^b \pm 3.0$ (97.0-106.0) n = 15	$104.0^b \pm 3.2$ (98.0-108.0) n = 15
SNM 3	23	22.1		$101.8^a \pm 1.0$ (99.0-103.5) n = 23	$103.4^a \pm 1.6$ (100.0-107.0) n = 23	$105.0^c \pm 2.2$ (101.0-110.0) n = 23	$106.7^c \pm 2.7$ (102.0-112.0) n = 23	$108.1^c \pm 3.2$ (103.0 - 117.0) n = 23
SM 4	17	16.4		$95.8^c \pm 4.2$ (87.0 - 100.2) n =17	$96.8^c \pm 4.2$ (88.0-102.0) n = 17	$97.9^d \pm 4.3$ (89.0-103.4) n = 17	$98.9^d \pm 4.2$ (91.0 - 105.0) n = 17	$99.8^d \pm 4.3$ (92.0 - 106.5) n = 17
TOTAL	104	100.0	Means in the same column with different superscripts are significantly different ($p<0.05$) Duncan's Multiple Range Test.)					

NSNM = Not Sick Not Malnourished
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 11 MEAN HEIGHT FOR-AGE (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT INITIAL CONTACT(SEXES COMBINED).



4.1.12 WEIGHT-FOR-HEIGHT (In kg and cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

About 91.0 percent of the pre-school children (Table 11) who were NSNM were within the NCHS/WHO median weight - for - height, 7.5 percent of the children were within +1SD and 1.5 percent were within +2SD

Among the NSM group, 44.2 percent of the children were within -1SD, 47.7 percent were within -2SD and 8.1 percent were within -3SD.

About 9.9 percent of the children who were SNM had median weight-for-height. Only 1.2 percent of the SNM group came under +1SD.

Among the SM group, 15.1 percent were under -1SD weight-for-height, 48 percent were within -2SD and 36.6 percent were within -3SD.

WEIGHT-FOR-HEIGHT (in kg and cm)OF PRESCHOOL CHILDREN WITH INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Table 11

Malnutrition/ Infectious Disease Complex	TOTAL		- 3SD		- 2SD		- 1SD		0		+ 1SD		+2SD		+3SD	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
NSNM 1 (Control)	200	42.9	-	-	-	-	-	-	182	91.0	15	7.5	3	1.5	-	-
NSM 2	86	18.4	7	8.1	41	47.7	38	44.2	-	-	-	-	-	-	-	-
SNM	87	18.7	-	-	-	-	-	-	86	9.9	1	1.2	-	-	-	-
SM 4	93	20.0	34	36.6	45	48.4	14	15.1	-	-	-	-	-	-	-	-

NSNM = Not sick not malnourished

NSM = Not sick but malnourished

SNM = Sick not malnourished

SM = Sick and malnourished

4.1.13 MEAN TOTAL SKINFOLD THICKNESS (mm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low skinfold thickness (Table 12 Fig 12) was observed among the SM group. At the age of 12 months, mean skinfold thickness of the SM group measured 208.3mm compared with the other three groups (NSM, SNM and NSNM) with mean skinfold thicknesses of 253.4mm, 270.7mm and 265.4mm respectively.

At the age of 24 months, mean skinfold thickness of the NSNM group measured 302.0mm compared with the NSM, SNM and SM groups with skinfold thicknesses of 265.0mm, 268.1mm and 252.6mm respectively. The skinfold thickness of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups.

The NSNM group show steady increased skinfold thickness that at the age of 36 months, mean skinfold thickness of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (NSM, SNM and SM). A similar pattern of increase in skinfold thickness was observed at the age of 48 months. At the age of 48 months, mean skinfold thickness of the NSNM group measured 311.2mm compared with the NSM, SNM and SM groups with mean skinfold thicknesses of 250.9mm, 263.9mm and 253.0mm respectively. At the age of 60 months, mean skinfold thickness of the NSNM group was significantly ($p<0.05$) higher than those of the NSM, SNM and SM groups. Mean skinfold thickness of the SNM group was non-significantly ($p>0.05$) higher than the NSM and SM groups.

MEAN TOTAL SKINFOLD THICKNESS- FOR- AGE (mm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

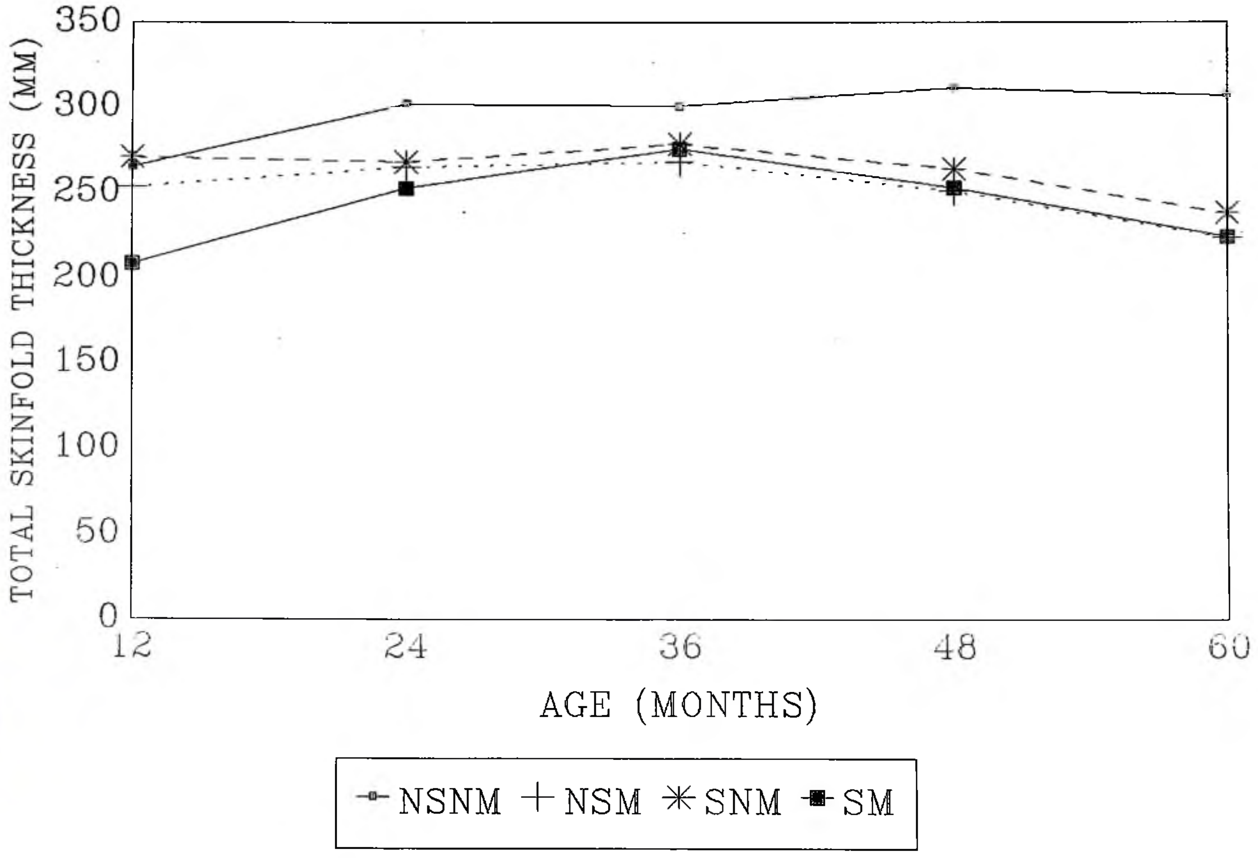
TABLE 12

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	265.4[a] ± 55.2 (184.0-416.0) n = 34	302.0[a] ± 47.0 (204.0-394.0) n = 30	300.6[a] ± 53.4 (206.0-408.0) n = 38	311.2[a] ± 53.9 (190.5-422.0) n = 49	306.7[a] ± 33.1 (242.0-402.0) n = 49
NSM 2	86	18.4	253.4[a] ± 45.3 (188.0-334.0) n = 14	265.0[b] ± 50.7 (176.0-360.0) n = 19	268.0[a] ± 43.3 (194.0-352.0) n = 14	250.9[b] ± 66.4 (150.0-392.0) n = 24	223.5[b] ± 32.1 (174.0-286.0) n = 15
SNM 3	87	18.7	270.7[a] ± 35.9 (198.0-334.0) n = 10	268.1[b] ± 41.2 (212.0-374.0) n = 15	278.3[a] ± 48.8 (186.0-364.0) n = 19	263.9[b] ± 46.0 (150.0-332.0) n = 20	238.0[b] ± 55.3 (116.0 -330.0) n = 23
SM 4	93	20.0	208.3[b] ± 33.9 (162.0-292.0) n = 30	252.6[b] ± 51.9 (178.0-340.0) n = 17	275.5[a] ± 46.5 (176.0-376.0) n = 15	253.0[b] ± 38.0 (204.0-338.0) n = 14	224[b] ± 44.1 (168.0-326.0) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of children

Fig 12. MEAN TOTAL SKINFOLD THICKNESS(MM)FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.14 MEAN HEAD CIRCUMFERENCE(cm)OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Head circumference increase was observed among the NSNM group at the age of 12 months (Table 13 and Fig 13). At the age of 12 months, mean head circumferences of the NSNM and SNM groups measured 45.6cm and 45.3cm respectively. Mean head circumferences of the NSM and SM groups measured 44.9cm and 44.2cm respectively.

At the age of 24 months, mean head circumference of the NSNM group measured 48.0cm. Mean head circumferences of the NSM, SNM, and SM groups measured 46.2cm, 46.9cm and 45.8cm respectively. Mean head circumference of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (SNM,NSM and SM).

A similar pattern continued to the age of 36 months. At the age of 36 months, mean head circumference of the NSNM group measured 49.5cm compared with the NSM, SNM and SM groups with mean head circumferences of 48.5cm, 48.8cm and 47.1cm respectively.

Mean head circumference of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (SNM ,NSM, and SM). Mean head circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

The NSNM group continued to demonstrate higher mean head circumference. At the age of 60 months, mean head circumferences of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. There was a non-significant ($p>0.05$) difference between mean head circumferences of the NSM and SM groups.

MEAN HEAD CIRCUMFERENCE- FOR- AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

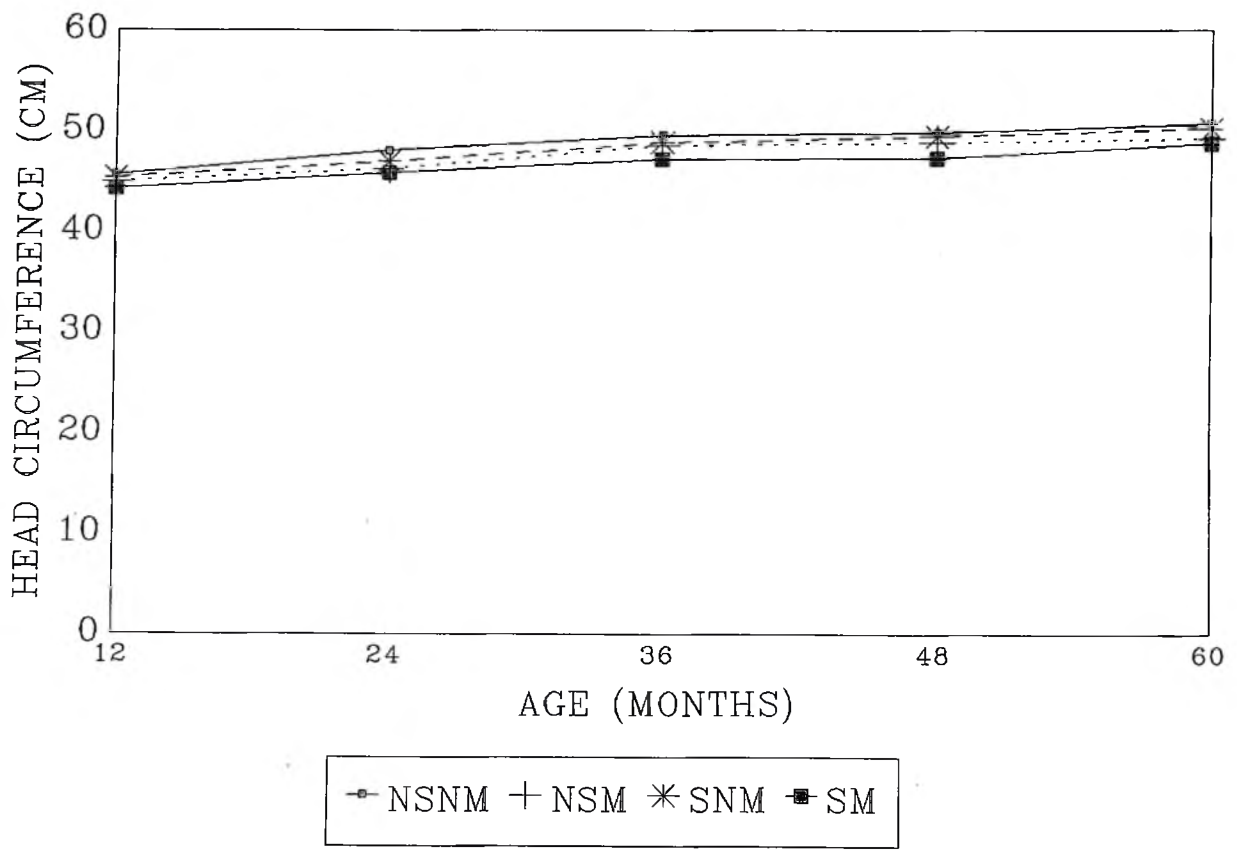
TABLE 13

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$45.6^{a} \pm 1.2$ (42.0-48.5) n = 34	$48.0^{a} \pm 0.8$ (46.5-49.6) n = 30	$49.5^{a} \pm 1.0$ (47.3.51.6) n = 38	$49.8^{a} \pm 1.1$ (47.0-52.0) n = 49	$50.7^{a} \pm 0.6$ (49.5-51.7) n = 49
NSM 2	86	18.4	$44.9^{a} \pm 1.0$ (42.8-46.8) n = 14	$46.2^{b} \pm 1.2$ (43.5-48.4) n = 19	$48.5^{b} \pm 1.3$ (46.5-50.6) n = 14	$48.8^{b} \pm 1.2$ (46.5-50.4) n = 24	$49.2^{b} \pm 0.8$ (47.9-51.0) n = 15
SNM 3	87	18.7	$45.3^{a} \pm 1.1$ (43.8-47.5) n = 10	$46.9^{b} \pm 1.3$ (45.0-49.0) n = 15	$48.8^{c} \pm 1.1$ (46.4-50.6) n = 19	$49.4^{a} \pm 1.1$ (47.2-51.6) n = 20	$50.2^{a} \pm 1.9$ (47.2-57.5) n = 23
SM 4	93	20.0	$44.2^{d} \pm 1.2$ (42.0-46.5) n = 30	$45.8^{d} \pm 1.7$ (43.2-49.3) n = 17	$47.1^{d} \pm 1.5$ (45.5-50.5) n = 15	$47.2^{c} \pm 2.2$ (41.5-50.2) n = 14	$48.7^{b} \pm 1.0$ (46.3-50.4) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of children

Fig 13. MEAN HEAD CIRCUMFERENCE (CM) FOR PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.15 MEAN CHEST CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low chest circumference was noticed among the SM group (Table 14 and Fig 14). At the age of 12 months, mean chest circumference of the SM group measured 42.8cm compared with the NSNM, SNM and NSM groups with mean chest circumferences of 45.9cm,45.0cm and 44.0cm respectively. Mean chest circumference of the NSNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean chest circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

At the ages of 24 and 36 months, mean chest circumferences of the NSNM group were significantly ($p<0.05$) higher than those of the other three groups. Mean chest circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

The NSNM and SNM groups continued to demonstrate higher mean chest circumferences through the ages of 48 months and 60 months. At the age of 60 months, mean chest circumferences of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. There was a non-significant ($p>0.05$) difference between mean chest circumferences of the NSNM and SNM groups. Mean chest circumference of the NSM group was significantly higher than that of the SM group.

MEAN CHEST CIRCUMFERENCE- FOR- AGE (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

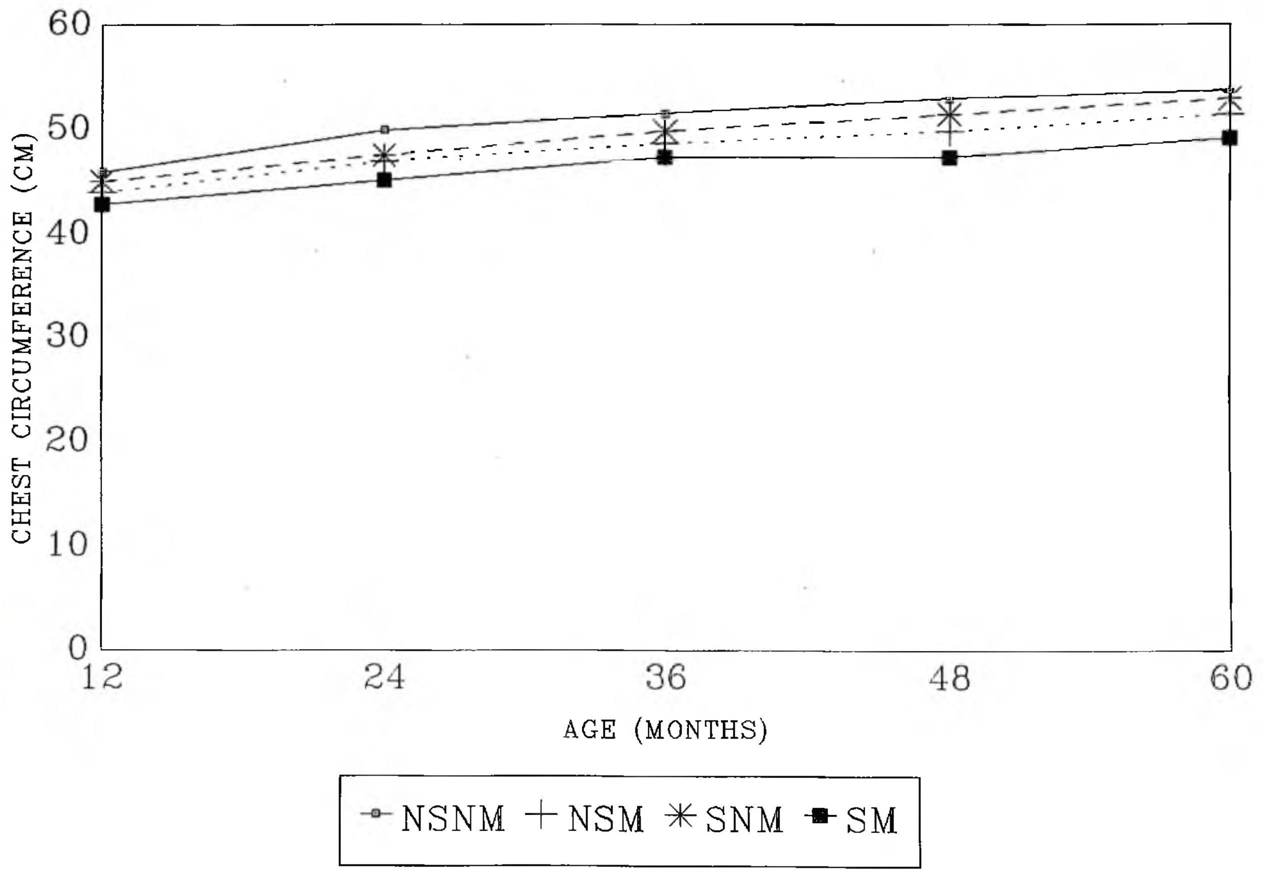
TABLE 14

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 mmnths Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$45.9^{a} \pm 2.1$ (41.8-50.5) n = 34	$49.9^{a} \pm 1.4$ (48.2-55.3) n = 30	$51.5^{a} \pm 1.9$ (47.5-57.4) n = 38	$52.9^{a} \pm 1.6$ (50.0-57.0) n = 49	$53.7^{a} \pm 1.7$ (50.6-58.0) n = 49
NSM 2	86	18.4	$44.0^{b} \pm 1.9$ (41.0-48.8) n = 14	$46.9^{b} \pm 2.0$ (45.0-54.2) n = 19	$48.6^{b} \pm 1.6$ (46.5-52.2) n = 14	$49.8^{b} \pm 1.5$ (46.5-52.1) n = 24	$51.4^{b} \pm 1.8$ (48.5-54.5) n = 15
SNM 3	87	18.7	$45.0^{a} \pm 1.9$ (41.5-48.5) n = 10	$47.5^{b} \pm 1.9$ (44.0-51.0) n = 15	$49.8^{b} \pm 1.4$ (47.2-53.5) n = 19	$51.4^{c} \pm 1.3$ (49.4-54.0) n = 20	$52.9^{a} \pm 2.0$ (50.0-57.8) n = 23
SM 4	93	20.0	$42.8^{c} \pm 1.4$ (39.6-47.3) n = 30	$45.1^{d} \pm 1.4$ (42.0-48.0) n = 17	$47.3^{c} \pm 2.7$ (44.8-53.5) n = 15	$47.3^{d} \pm 3.4$ (40.8-55.2) n = 14	$49.1^{c} \pm 2.5$ (45.4-53.0) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 14. MEAN CHEST CIRCUMFERENCE (CM) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.16 MEAN CHEST/HEAD RATIO OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Mean chest -to -head circumference ratio (Table 15 and Fig 15) among the NSNM, SNM and NSM groups begun at 1.01 and 0.99 and 0.98 respectively and increased beyond 1 at 24 months. Among the SM group, the ratio remained under 1 from 6 months to 48 months.

At the age of 36 months, chest/head ratios of the NSNM and SNM groups were 1.04 and 1.02 respectively compared with the chest/head ratios of the NSM and SM groups (1.00 and 1.00 respectively).

Chest/head ratios of the NSNM, SNM and NSM groups continued to increase to the age of 48 months. At the age of 48 months, chest/head ratios of the NSNM and SNM groups were 1.06 and 1.04 respectively compared with those of the NSM and SM groups with chest/head ratios of 1.02 and 1.00 respectively.

A similar pattern continued to the age of 60 months. At the age of 60 months, chest/head ratios of the NSNM, SNM and NSM groups, were 1.06, 1.05 and 1.04 respectively. Chest/head ratio of the SM group was 1.01.

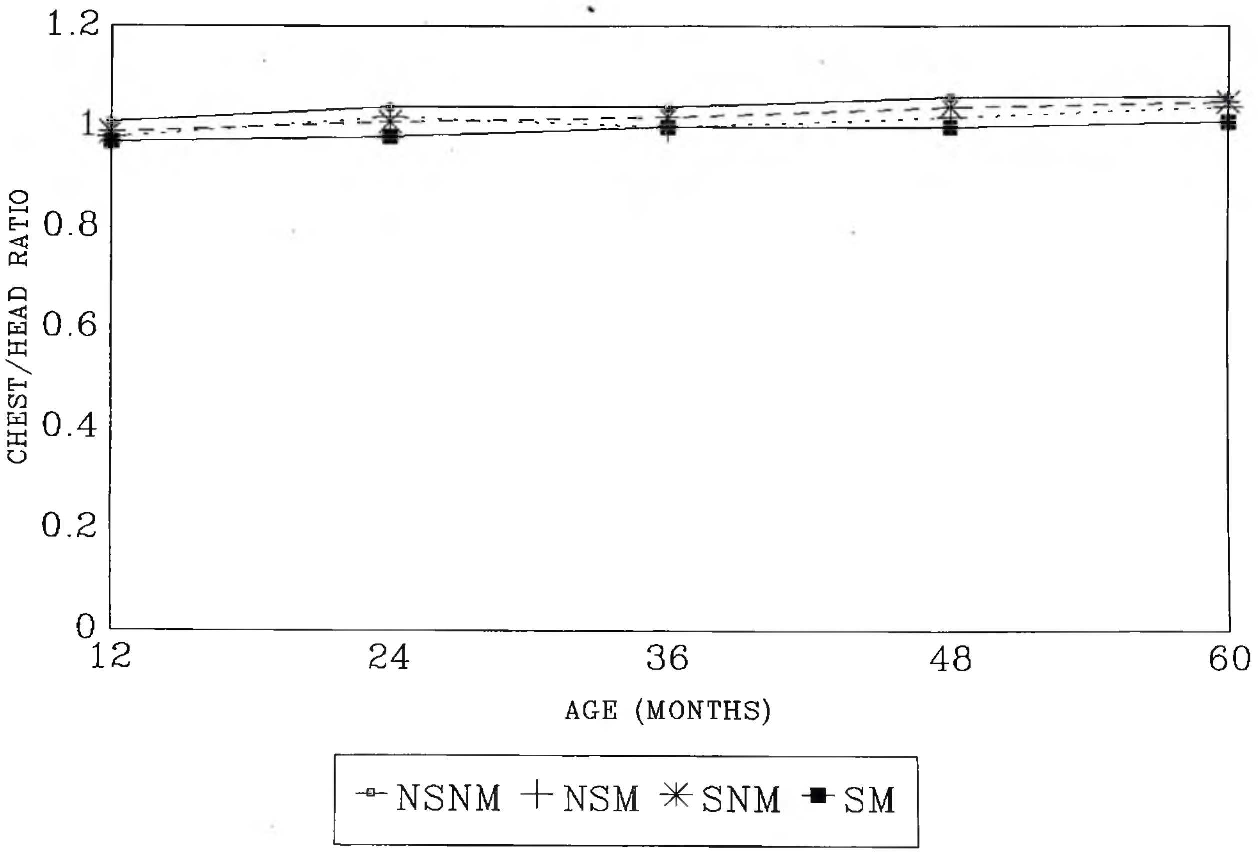
MEAN CHEST/HEAD RATIO OF THE PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

TABLE 15

Malnutrition/ Infectious Complex	Total		12 Months	24 months	36 months	48 months	60 months
	N	%					
NSNM 1 (Control)	200	42.9	1.01	1.04	1.04	1.06	1.06
NSM 2	86	18.4	0.98	1.02	1.00	1.02	1.04
SNM 3	87	18.7	0.99	1.01	1.02	1.04	1.05
SM 4	93	20.0	0.97	0.98	1.00	1.00	1.01

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished

Fig 15. MEAN CHEST/HEAD RATIO OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.17 MEAN MID-UPPER ARM CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low mid-upper arm circumference was observed among the SM group (Table 16, Fig 16). At the age of 12th month, mean mid-upper-arm circumference of the SM group measured 12.5cm compared with those of the NSNM, SNM and the NSM groups with mean mid-upper-arm circumferences of 13.9cm, 13.9cm and 13.4cm respectively. .

The NSNM group continued to grow steadily increasing in mid- upper arm circumference. At the age of 24 months, mean mid-upper-arm circumference of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (NSM, SNM and SM). Mean mid-upper-arm circumferences of the NSM and SNM groups were significantly ($p<0.05$) higher than that of the SM group.

This pattern continued to the age of 36 months. At the age of 36 months, the NSNM group demonstrated significantly ($p<0.05$) higher mean mid- upper-arm circumference than the other groups. The SNM and NSM groups showed significantly ($p<0.05$) higher mid- upper- arm circumferences than the SM group. At the age of 48 months, mean mid-upper-arm circumference of the NSNM group measured 15.8cm. Mean mid-upper-arm of the NSM,SNM and SM groups measured 14.5cm, 14.9cm and 13.5cm respectively. At the age of 60 months, the NSNM group significantly ($p<0.05$) demonstrated higher mid-upper- arm circumference compared with the NSM,SNM and SM groups. Mean Mid-upper-arm circumferences of NSM and SNM groups were significantly ($p<0.05$) higher than that of the SM group.

MEAN MID- UPPER- ARM CIRCUMFERENCE- FOR -AGE (cm) OF PRE-SCHOOL CHILDREN WITH MULNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

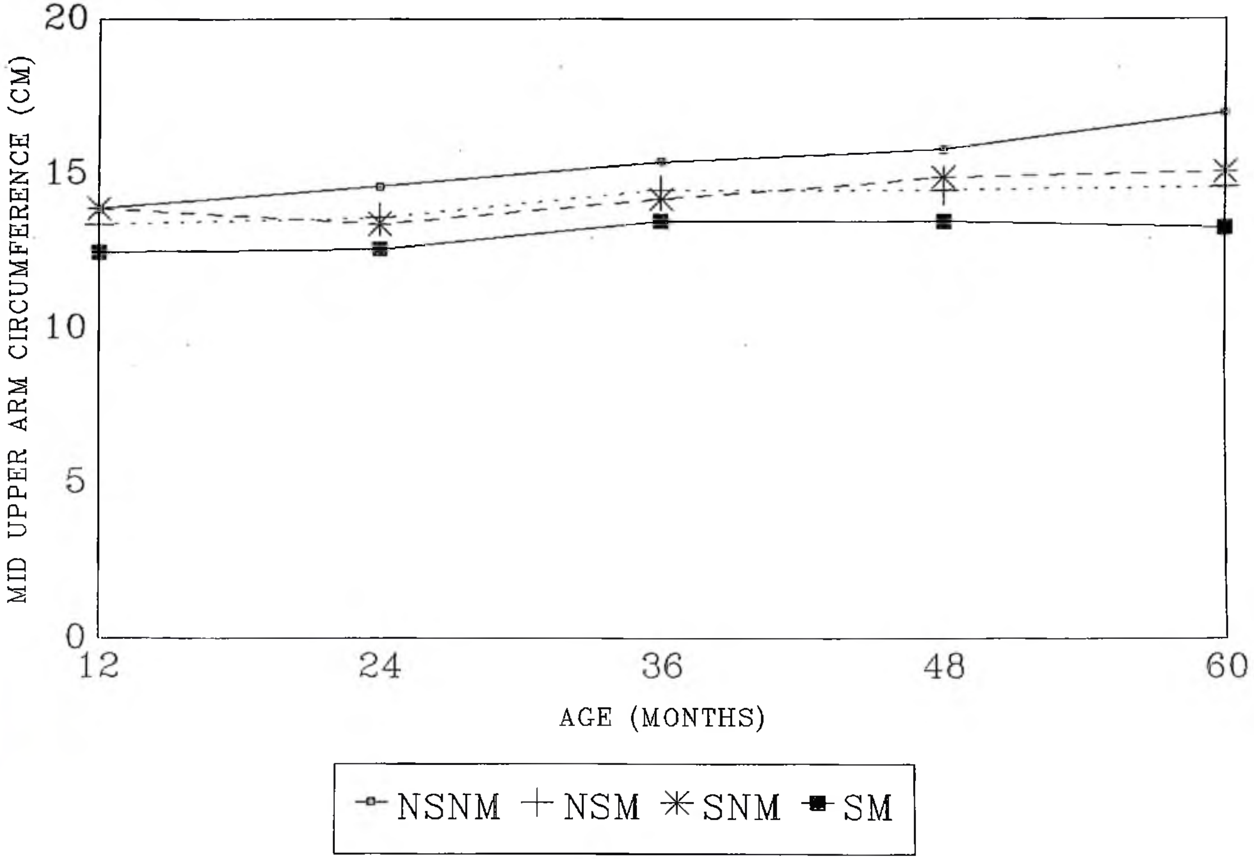
TABLE 16

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$13.9^{a} \pm 0.8$ (12.0-15.5) n = 34	$14.6^{a} \pm 0.9$ (12.5-15.8) n = 30	$15.4^{a} \pm 1.1$ (13.5-19.2) n = 38	$15.8^{a} \pm 1.0$ (13.6-18.4) n = 49	$17.0^{a} \pm 1.0$ (14.6-18.8) n = 49
NSM 2	86	18.4	$13.4^{a} \pm 0.9$ (12.0-15.5) n = 14	$13.6^{b} \pm 0.6$ (13.0-14.8) n = 19	$14.3^{b} \pm 0.7$ (13.3-15.8) n = 14	$14.5^{b} \pm 1.2$ (13.5-18.6) n = 24	$14.6^{b} \pm 0.7$ (13.3-16.0) n = 15
SNM 3	87	18.7	$13.9^{a} \pm 0.9$ (11.8-14.8) n = 10	$13.4^{b} \pm 0.9$ (11.5-14.8) n = 15	$14.2^{b} \pm 0.8$ (13.0-16.0) n = 19	$14.9^{b} \pm 0.7$ (13.7-16.5) n = 20	$15.1^{b} \pm 1.0$ (13.5-16.8) n = 23
SM 4	93	20.0	$12.5^{b} \pm 1.1$ (10.0-15.0) n = 30	$12.6^{d} \pm 0.9$ (11.0-14.0) n = 17	$13.5^{c} \pm 0.7$ (12.2-15.0) n = 15	$13.5^{c} \pm 1.2$ (10.7-15.2) n = 14	$13.3^{c} \pm 1.2$ (11.0-15.2) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 16. MEAN MID UPPER ARM CIRCUMFERENCE(CM) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.18 MEAN MID-ARM- MUSCLE CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXESCOMBINED)

Mid-arm muscle circumference decrease was apparent among the SM group at the age of 12 months (Table 17 and Fig 17). At the age of 12 months, mean mid- arm muscle circumference of the SM group measured 12.3cm. Mean mid-arm muscle circumferences of the NSNM, NSM and SNM groups measured 13.7cm, 13.0cm and 13.3cm respectively.

Mid-arm muscle circumference changes followed age increase closely. At the age of 24 months, mean mid- arm muscle circumference of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (NSM,SNM and SM). Mean mid-arm muscle circumferences of the NSM and SNM groups were significantly ($p<0.05$) higher than that of the SM group. There was a non-significant ($p>0.05$) difference between the mean mid-arm muscle circumferences of the NSM and SNM groups.

The NSNM group continued to grow steadily increasing in mid arm muscle circumference. At the age of 36 months, mean mid -arm muscle circumference of the NSNM group was significantly ($p<0.05$) higher than the other three groups. The pattern continued to the ages of 48 and 60 months. At the age of 60 months, the NSNM group demonstrated significantly ($p<0.05$) higher mean mid- arm muscle circumference than the other three groups.

Mean mid- arm muscle circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group. There was a non- significant ($p>0.05$) difference between mean mid- arm muscle circumferences of the NSM and SNM groups.

MEAN MID-ARM- MUSCLE CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDRENWITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

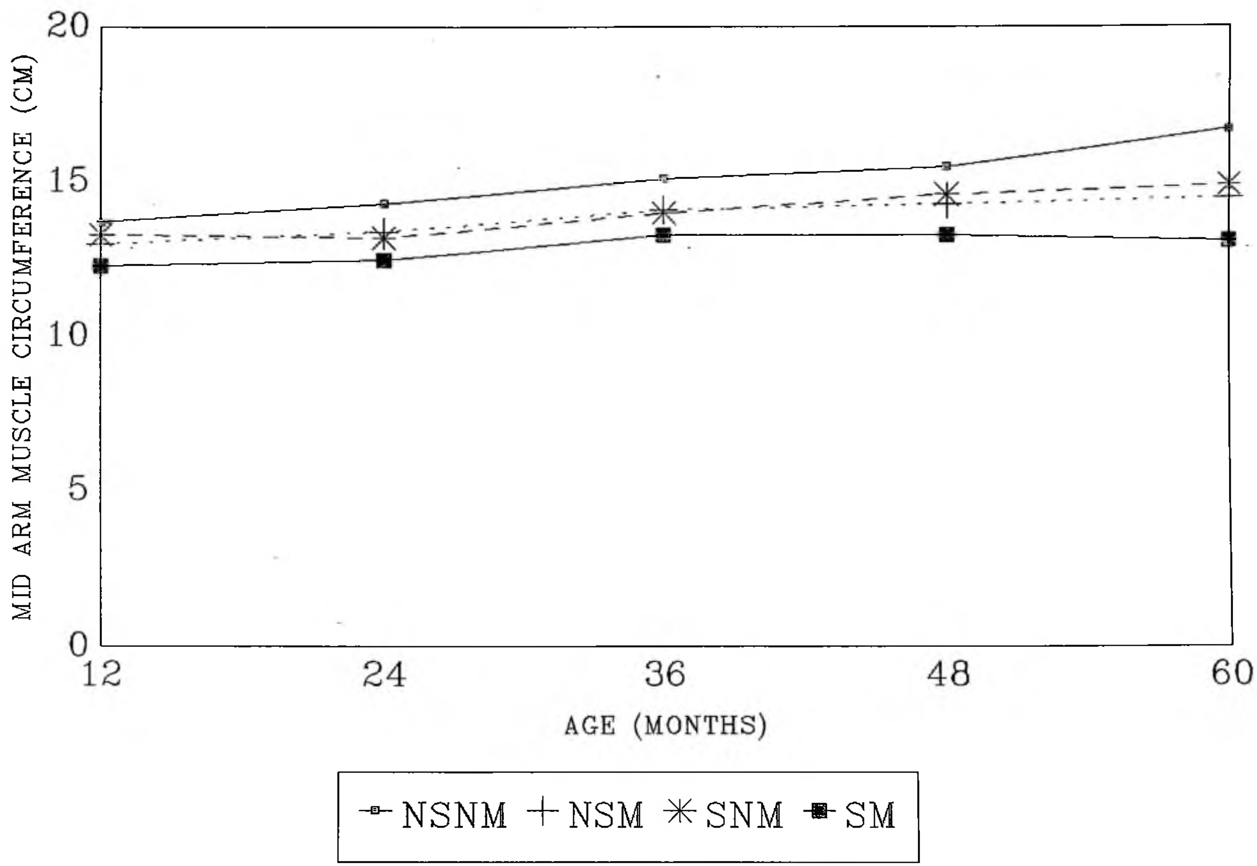
TABLE 17

Malnutrition/infectious Disease Complex	N	%	12 months	24 months	36 months	48 months	60 months
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
NSNM 1 (control)	200	42.9	$13.7^a \pm 0.8$ (11.8-15.3) n = 34	$14.3^a \pm 0.9$ (12.3-15.6) n = 30	$15.1^a \pm 1.1$ (13.3-19.0) n = 38	$15.5^a \pm 0.9$ (13.3-18.1) n = 49	$16.7^a \pm 0.9$ (14.3-18.6) n = 49
NSM 2	86	18.4	$13.0^a \pm 1.0$ (11.8-15.2) n = 14	$13.4^b \pm 0.6$ (12.8-14.6) n = 19	$14.1^b \pm 0.7$ (13.1-15.5) n = 14	$14.3^b \pm 1.1$ (13.3-18.4) n = 24	$14.5^b \pm 0.7$ (13.1-15.8) n = 15
SNM 3	87	18.7	$13.3^a \pm 1.2$ (11.2-14.6) n = 10	$13.2^b \pm 0.9$ (11.3-14.6) n = 15	$14.0^b \pm 0.7$ (12.8-15.7) n = 19	$14.6^b \pm 0.7$ (13.6-16.2) n = 20	$14.9^b \pm 1.0$ (13.3-16.6) n = 23
SM 4	93	20.0	$12.3^b \pm 1.1$ (9.8-14.8) n = 30	$12.5^c \pm 0.9$ (10.9-13.8) n = 17	$13.3^b \pm 0.7$ (12.0-14.7) n = 15	$13.3^c \pm 1.2$ (10.5-15.0) n = 14	$13.1^c \pm 1.2$ (10.9-15.0) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 17. MEAN MID ARM MUSCLE CIRCUMFERENCE(CM) OF THE PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.19 MEAN BODY FAT (%) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low mean body fat became noticeable among the malnourished groups (NSM and SM) at the age of 12 months (Table 18 and Fig 18). At the age of 12 months, mean body fat of the malnourished groups (NSM and SM) measured 12.4 percent and 12.0 percent respectively compared with the well nourished groups (NSNM and SNM) with mean body fat of 16.3 percent and 15.5 percent respectively.

Mean body fat of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean body fat of the NSNM group continued to increase with age. At the age of 24 months, mean body fat of the NSNM group was significantly ($p<0.05$) higher than those of the other two groups (NSM and SM). There was a non-significant ($p>0.05$) difference between mean body fat of the NSNM and SNM groups.

This pattern continued through the ages of 36 to 60 months. At the age of 60 months, the NSNM and SNM groups demonstrated significantly ($p<0.05$) higher mean body fat than the other two groups (NSM and SM). The NSM group showed significantly ($p<0.05$) higher mean body fat than the SM group. Differences among the values were significant ($p<0.05$) at all ages throughout the study.

MEAN PERCENTAGE BODY FAT (%) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

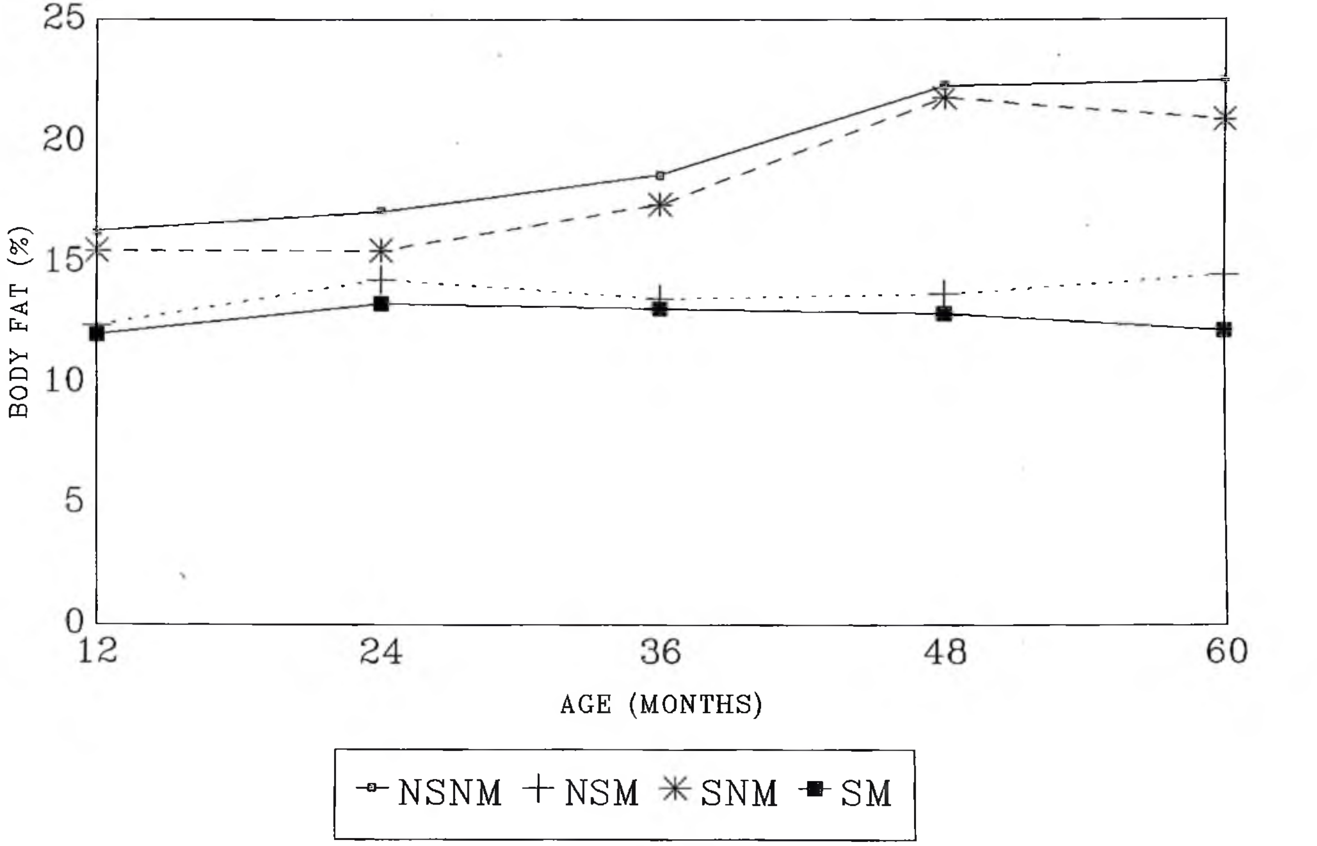
TABLE 18

Malnutrition/infectious Disease Complex	N	%	12 months	24 months	36 months	48 months	60 months
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
NSNM 1 (control)	200	42.9	$16.3^a \pm 3.5$ (10.7-25.3) n = 34	$17.1^a \pm 4.8$ (5.3-24.6) n = 30	$18.6^a \pm 3.1$ (13.2-24.0) n = 38	$22.3^a \pm 1.9$ (16.1-25.2) n = 49	$22.5^a \pm 1.9$ (19.5-24.9) n = 49
NSM 2	86	18.4	$12.4^b \pm 1.8$ (10.3-15.5) n = 14	$14.3^b \pm 3.2$ (10.0-19.1) n = 19	$13.5^b \pm 2.1$ (10.8-17.7) n = 14	$13.7^b \pm 3.7$ (6.6-23.5) n = 24	$14.5^b \pm 2.6$ (9.0-16.5) n = 15
SNM 3	87	18.7	$15.5^a \pm 3.5$ (10.5-20.3) n = 10	$15.5^a \pm 3.2$ (10.2-19.9) n = 15	$17.4^a \pm 3.3$ (11.3-23.4) n = 19	$21.8^a \pm 1.8$ (18.6-25.5) n = 20	$20.9^c \pm 2.7$ (17.3-26.9) n = 23
SM 4	93	20.0	$12.0^b \pm 3.1$ (6.6-17.1) n = 30	$13.3^b \pm 3.3$ (7.8-20.3) n = 17	$13.1^b \pm 1.5$ (10.4-16.7) n = 15	$12.9^b \pm 2.3$ (10.0-17.7) n = 14	$12.2^d \pm 4.9$ (7.0-22.6) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 18 . MEAN BODY FAT (%) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.20 MEAN BUTTOCKS CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low buttocks circumference became noticeable among the SM group at the age of 12 months (Table 19, Fig 19). At the age of 12 months, mean buttocks circumference of the SM group measured 38.3cm compared with the other three groups (NSNM, NSM and SNM) with mean buttocks circumferences of 41.8cm, 40.4cm and 42.1cm respectively. Mean buttocks circumferences of the NSNM, SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

The NSNM group continued to grow steadily increasing in buttocks circumference through the age of 24 months. At the age of 24 months, the NSNM group demonstrated significantly ($p<0.05$) higher mean buttocks circumference than the NSM,SNM and SM groups. Mean buttocks circumference of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups.

Low buttocks circumference continued among the SM group to the age of 36 months. At the age of 36 months, the NSNM group significantly ($p<0.05$) demonstrated higher mean buttocks circumference than the other three groups.Mean buttocks circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

The pattern continued to the ages of 48 and 60 months. At the age of 60 months, mean buttocks circumference of the NSNM group was significantly ($p<0.05$) higher than the other three groups. Mean buttocks circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than the SM group.

MEAN BUTTOCKS CIRCUMFERENCE- FOR- AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

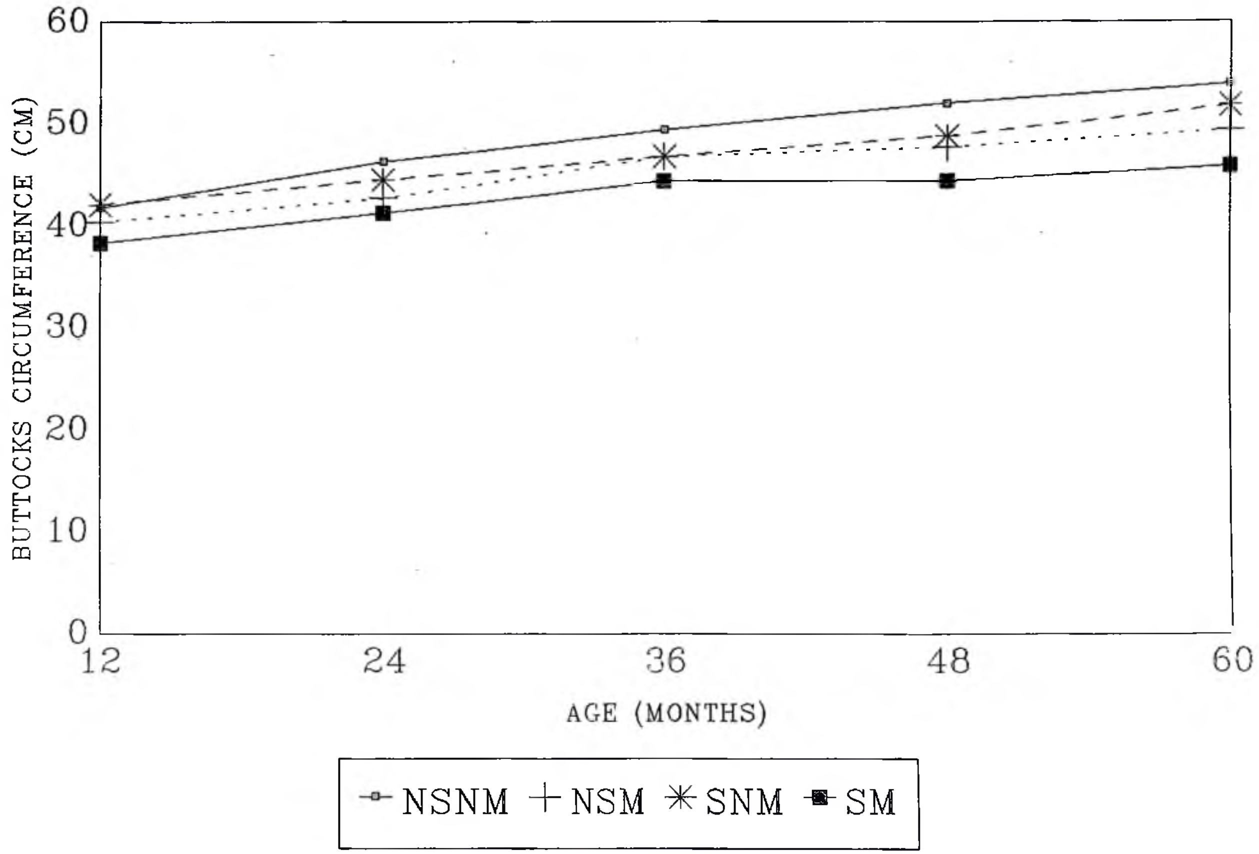
TABLE 19

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$41.8^{a} \pm 4.1$ (23.4-48.4) n = 34	$46.3^{a} \pm 2.4$ (40.0-52.0) n = 30	$49.4^{a} \pm 2.2$ (45.0-54.2) n = 38	$52.0^{a} \pm 1.7$ (48.2-55.8) n = 49	$53.9^{a} \pm 2.4$ (50.0-62.5) n = 49
NSM 2	86	18.4	$40.4^{a} \pm 2.8$ (35.5-46.7) n = 14	$42.7^{b} \pm 1.9$ (40.2-48.0) n = 19	$46.8^{b} \pm 1.5$ (44.2-49.0) n = 14	$47.7^{b} \pm 1.6$ (44.0-50.5) n = 24	$49.4^{b} \pm 1.7$ (47.5-52.0) n = 15
SNM 3	87	18.7	$42.1^{a} \pm 3.0$ (39.0-48.6) n = 10	$44.5^{c} \pm 3.2$ (40.2-54.6) n = 15	$46.8^{b} \pm 1.8$ (41.0-49.2) n = 19	$48.8^{b} \pm 1.4$ (46.4-50.7) n = 20	$51.8^{c} \pm 2.5$ (47.0-57.0) n = 23
SM 4	93	20.0	$38.3^{b} \pm 2.2$ (33.0-43.5) n = 30	$41.3^{b} \pm 2.6$ (36.0-45.6) n = 17	$44.4^{c} \pm 2.5$ (40.0-48.2) n = 15	$44.4^{c} \pm 3.6$ (34.8-48.5) n = 14	$45.9^{d} \pm 3.0$ (40.5-51.0) n = 17

Means in the same column with different superscripts are significantly different ($p < 0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 19. MEAN BUTTOCKS CIRCUMFERENCE (CM) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.21 MEAN UPPER THIGH CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low upper thigh circumference was observed among the SM group at the age of 12 months (Table 20 and Fig 20). At the age of 12 months, mean upper thigh circumference of the SM group measured 21.4cm. Mean upper thigh circumferences of the NSNM, SNM and NSM groups measured 24.4cm, 23.7cm and 23.4cm respectively.

At the age of 24 months, mean upper thigh circumference of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups. Mean upper thigh circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than the SM group. There was a non-significant ($p>0.05$) difference between mean upper thigh circumferences of the NSM and SNM groups.

The NSNM group continued to demonstrate higher mean upper thigh circumference. At the age of 36 months, mean upper thigh circumference of the NSNM group measured 29.1cm compared with the NSM, SNM and SM groups with mean upper thigh circumferences of 25.8cm, 26.6cm and 24.9cm respectively.

At the age of 60 months, The NSNM group demonstrated significantly ($p<0.05$) higher mean upper thigh circumference than the NSM, SNM and SM groups. Mean upper thigh circumferences of the NSM and SNM groups were significantly ($p<0.05$) higher than that of the SM group. There was a non- significant ($p>0.05$) difference between mean upper thigh circumferences of the SNM and NSM groups.

MEAN UPPER THIGH CIRCUMFERENCE- FOR -AGE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

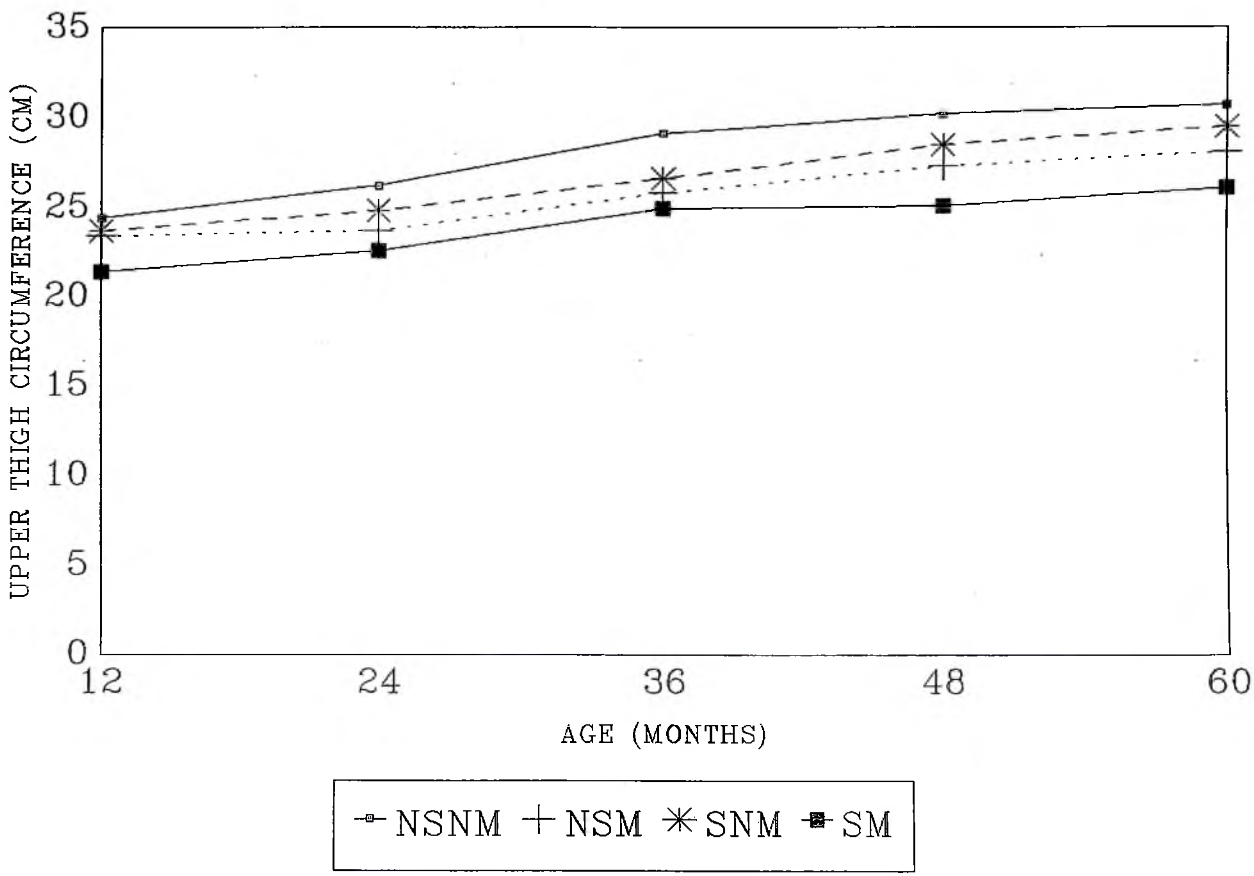
TABLE 20

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$24.4^{a} \pm 2.5$ (18.2-30.0) n = 34	$26.2^{a} \pm 1.8$ (22.0-30.2) n = 30	$29.1^{a} \pm 2.5$ (25.6-39.6) n = 38	$30.2^{a} \pm 1.3$ (27.5-33.0) n = 49	$30.7^{a} \pm 2.2$ (24.0-36.0) n = 49
NSM 2	86	18.4	$23.4^{a} \pm 1.6$ (20.6-25.5) n = 14	$23.7^{b} \pm 1.3$ (21.6-26.2) n = 19	$25.8^{b} \pm 0.9$ (24.4-27.2) n = 14	$27.3^{b} \pm 1.1$ (25.0-30.2) n = 24	$28.1^{b} \pm 1.4$ (25.5-30.0) n = 15
SNM 3	87	18.7	$23.7^{a} \pm 1.7$ (21.4-27.0) n = 10	$24.8^{b} \pm 2.1$ (21.0-30.0) n = 15	$26.6^{b} \pm 1.1$ (24.0-28.6) n = 19	$28.5^{c} \pm 0.7$ (27.0-29.8) n = 20	$29.5^{b} \pm 2.0$ (25.0-33.5) n = 23
SM 4	93	20.0	$21.4^{b} \pm 2.1$ (16.6-25.0) n = 30	$22.6^{c} \pm 1.9$ (19.0-27.0) n = 17	$24.9^{c} \pm 1.9$ (20.4-27.8) n = 15	$25.1^{d} \pm 2.9$ (19.0-28.0) n = 14	$26.1^{c} \pm 3.0$ (21.0-31.0) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 20 . MEAN UPPER THIGH CIRCUMFERENCE (CM) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.22 MEAN LOWER THIGH CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

The SM group showed low mean lower thigh circumference at the age of 12 months (Table 21 and Fig 21). At the age of 12 months, mean lower thigh circumference of the SM group measured 19.0cm compared with those of the NSNM,SNM and NSM groups with mean lower thigh circumferences of 22.0cm, 20.5cm and 20.1cm respectively. Mean lower thigh circumferences of the NSNM, SNM, and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

This trend continued to the age of 24 months. At the age of 24 months, the NSNM group had significantly ($p<0.05$) higher mean lower thigh circumference than the NSM, SNM and SM groups. Mean lower thigh circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

A similar pattern continued through the ages of 36 to 48 months. At the age of 48 months, mean lower thigh circumference of the NSNM group measured 24.7cm compared with those of the NSM,SNM and SM groups with mean lower thigh circumferences of 22.4cm, 23.0cm and 20.2cm respectively. Mean lower thigh circumferences of the SNM and NSM groups were significantly ($p<0.05$) higher than that of the SM group.

The NSNM and SNM groups continued to show higher mean lower thigh circumferences through the ages of 48 to 60 months. At the age of 60 months, the NSNM and SNM groups demonstrated significantly ($p<0.05$) higher mean lower thigh circumferences than the NSM and SM groups. The NSM group showed significantly ($p<0.05$) higher mean lower thigh circumference than the SM group.

MEAN LOWER THIGH CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

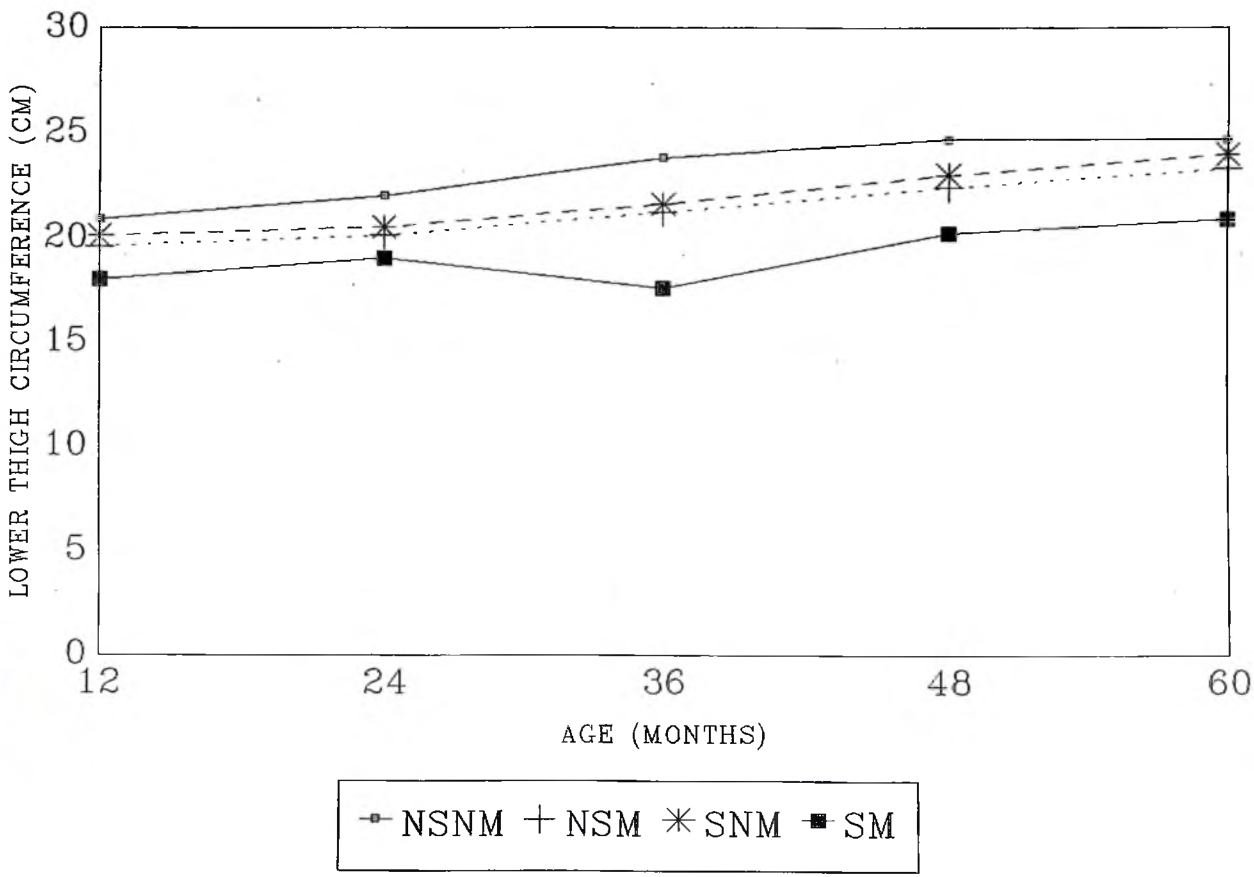
TABLE 21

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$20.9^{a} \pm 2.1$ (16.3-25.6) n = 34	$22.0^{a} \pm 1.2$ (19.0-24.0) n = 30	$23.8^{a} \pm 1.6$ (20.7-27.8) n = 38	$24.7^{a} \pm 1.3$ (22.0-28.5) n = 49	$24.7^{a} \pm 1.6$ (21.5-30.5) n = 49
NSM 2	86	18.4	$19.6^{a} \pm 1.5$ (16.6-22.0) n = 14	$20.1^{b} \pm 1.1$ (18.0-22.6) n = 19	$21.2^{b} \pm 1.1$ (19.1-23.0) n = 14	$22.4^{b} \pm 1.6$ (20.8-28.2) n = 20	$23.3^{b} \pm 0.8$ (21.0-23.6) n = 15
SNM 3	87	18.7	$20.1^{a} \pm 1.3$ (18.8-23.0) n = 10	$20.5^{b} \pm 2.0$ (17.0-24.8) n = 15	$21.6^{b} \pm 1.4$ (18.2-24.4) n = 19	$23.0^{b} \pm 1.2$ (21.0-25.2) n =20	$24.0^{a} \pm 1.6$ (21.5-27.5) n = 23
SM 4	93	20.0	$18.0^{b} \pm 1.5$ (14.8-21.4) n = 30	$19.0^{c} \pm 1.3$ (16.3-22.0) n = 17	$17.6^{c} \pm 1.7$ (15.0-20.0) n = 15	$20.2^{c} \pm 1.7$ (16.5-22.2) n = 14	$20.9^{c} \pm 2.2$ (17.5-24.5) n = 17

Means in the same column with different superscripts are significantly different ($p < 0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 21. MEAN LOWER THIGH CIRCUMFERENCE (CM) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.1.23 MEAN CALF CIRCUMFERENCE (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

Low calf circumference (Table 22 Fig 22) was observed among the SM group at the age of 12 months. At the age of 12 months , mean calf circumference of the SM group measured 14.9cm compared with those of the NSNM,SNM and NSM groups with mean calf circumferences of 16.7cm, 16.7cm and 15.6cm respectively. Mean calf circumferences of NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups.. Mean calf circumference of the NSM group was slightly higher than that of the SM group.

Low calf circumference continued to be noticeable among the SM group. At the age of 24 months, mean calf circumference of the SM group measured 15.8cm compared to other groups (NSNM, NSM and SNM) with mean calf circumferences of 18.9cm, 17.2cm and 17.7cm respectively. Mean calf circumference of the NSNM was significantly ($p<0.05$) higher than the other three groups. Mean calf circumferences of SNM and NSM groups were significatly ($p<0.05$) higher than that of SM group.

The NSNM and SNM groups continued to demonstrated higher mean calf circumferences through the ages of 36 and 48 months. At the age of 48 months; mean calf circumferences of the NSNM and SNM groups measured 21.3 cm and 19.9 cm respectively. Mean calf circumferences of the NSM and SM groups measured 19.2cm and 17.7cm respectively. The pattern continued to the age of 60 months. At the age of 60 months, The NSNM group had significantly ($p<0.05$) higher mean calf circumference than the other groups.

The SNM group showed significantly ($p < 0.05$) higher mean calf circumference than the NSM group. The NSM group also demonstrated significantly ($p < 0.05$) higher mean calf circumference than the SM group.

MEAN CALF CIRCUMFERENCE (cm) FOR AGE OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

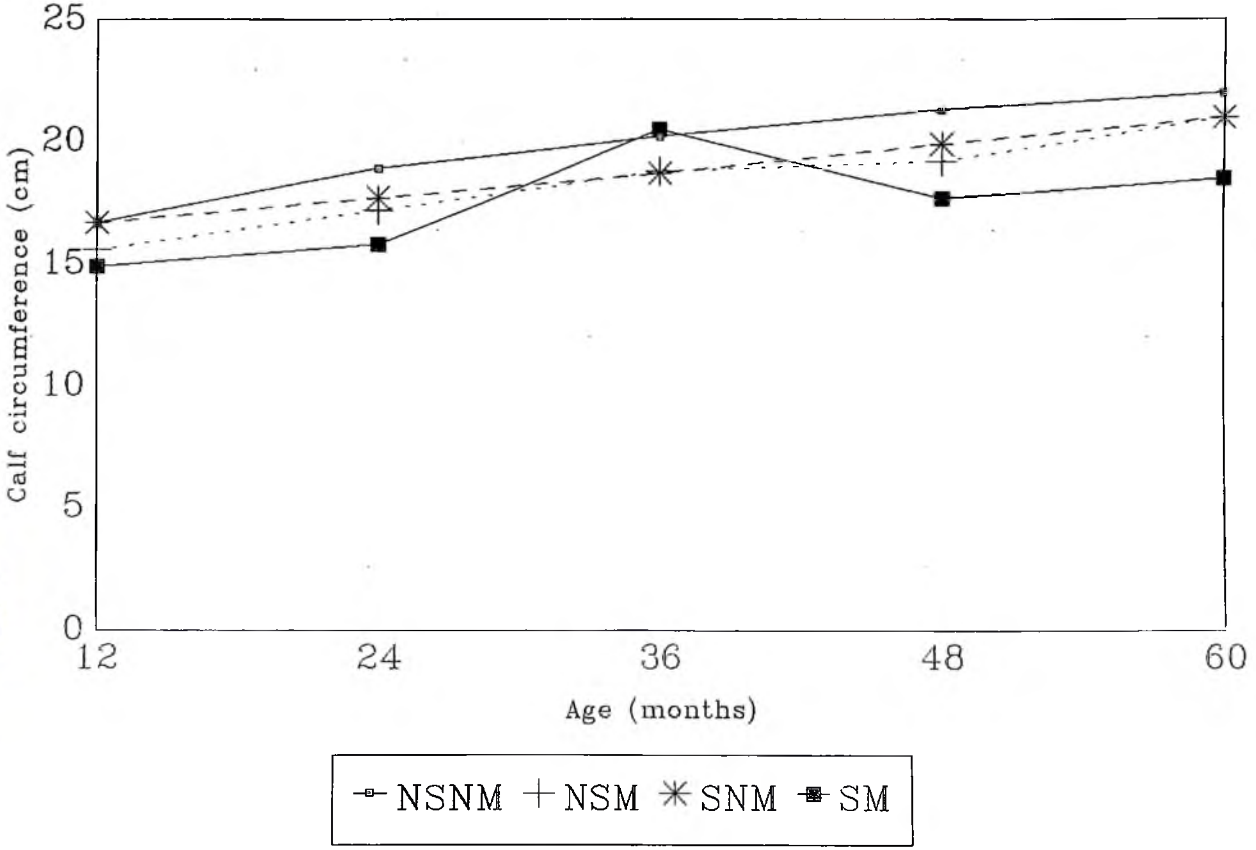
TABLE 22

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$16.7^{a} \pm 1.5$ (13.8-20.0) n = 34	$18.9^{a} \pm 1.2$ (16.6-21.0) n = 30	$20.2^{a} \pm 1.3$ (17.4-24.0) n = 38	$21.3^{a} \pm 1.1$ (19.0-24.0) n = 49	$22.0^{a} \pm 1.2$ (19.4-25.0) n = 49
NSM 2	86	18.4	$15.6^{b} \pm 1.3$ (14.0-18.3) n = 14	$17.2^{b} \pm 0.9$ (15.5-19.2) n = 19	$18.8^{b} \pm 1.3$ (16.8-21.5) n = 14	$19.2^{b} \pm 0.4$ (18.5-20.0) n = 24	$19.7^{b} \pm 0.6$ (19.0-21.2) n = 15
SNM 3	87	18.7	$16.7^{a} \pm .09$ (15.0-18.4) n = 10	$17.7^{b} \pm 1.9$ (14.6-23.0) n = 15	$18.7^{b} \pm 1.1$ (16.5-20.5) n = 19	$19.9^{c} \pm 0.7$ (18.8-20.8) n = 20	$21.0^{c} \pm 0.9$ (19.6 -23.5) n = 23
SM 4	93	20.0	$14.9^{b} \pm 1.2$ (12.5-17.5) n = 30	$15.8^{c} \pm 1.4$ (12.4-18.0) n = 17	$20.5^{c} \pm 1.8$ (17.0-24.0) n = 15	$17.7^{d} \pm 1.9$ (14.0-20.5) n = 14	$18.5^{d} \pm 1.5$ (16.0-21.5) n = 17

Means in the same column with different superscripts are significantly different ($p<0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 22. MEAN CALF CIRCUMFERENCE (cm) FOR AGE OF THE PRESCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMLEX (SEXES COMBINED)



4.1.24 **MEAN INCREASE IN WEIGHT/ 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).**

Infant weight increases were measured as 3 monthly changes in body weights in the infants (Table23,Fig23). Mean values were based on NCHS/WHO standard. By the 3rd month, mean weight increase of the NSNM group compared favourably with the NCHS/WHO standard, and was higher than mean weight increases of the NSM, SNM and SM groups. By the 6th month, mean weight increase of the NSNM group exceeded the NCHS/WHO standard. Mean weight increase of the SNM group compared favourably with that of the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard.

By the 9th month, mean weight increases of the NSNM and SNM groups exceeded of the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard. This pattern continued throughout the period of study. At the end of the study, mean weight increases of the NSNM, NSM, SNM groups exceeded the NCHS/WHO standard. Mean weight increase of the SM group was below the NCHS/WHO standard.

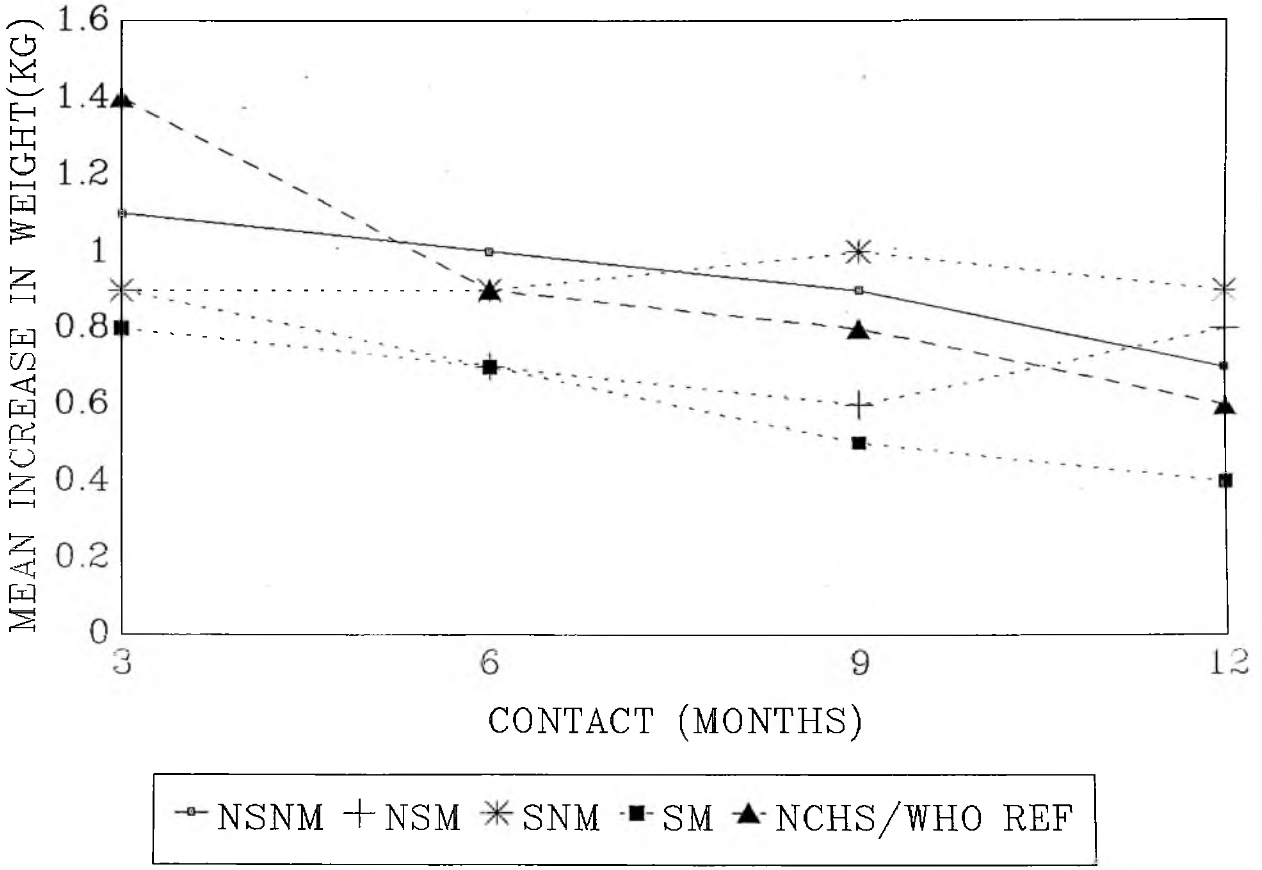
MEAN INCREASE IN WEIGHT / 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 23

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	34	38.6	6 Months	1.1 ± 0.3 (1.0 -2.0) n = 34	1.0 ±0.0 (1.0 - 1.0) n = 34	9.0 ± 0.3 (0.0 -1.0) n = 34	0.7 ± 0.5 (0.0 - 1.0) n = 34
NSM 2	14	15.9		0.9 ± 3.0 (0.0-1.0) n = 14	0.7 ± 0.5 (0.0-1.0) n = 14	0.6 ± 0.5 (0.0- 1.0) n = 14	0.8 ± 0.4 (0.0-1.0) n = 14
SNM 3	10	11.4		0.9 ± 0.3 (0.0-1.0) n = 10	0.9 ± 0.3 (0.0-1.0) n = 10	1.0 ± 0.0 (1.0-1.0) n = 10	0.9 ± 0.3 (0.0-1.0) n = 10
SM 4	30	34.1		0.8 ± 0.5 (-1 .0 - 1.0) n =30	0.7 ± 0.5 (0.0-1.0) n = 30	0.5 ± 0.5 (0.0- 1.0) n = 30	0.4 ± 0.7 (-1.0 - 1.0) n = 30
TOTAL	88	100.0	* Reference NCHS/ WHO (1989)	*1.4	*0.9	*0.8	*0.6

NSNM = Not Sick Not Malnourished
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 23. MEAN INCREASE IN WEIGHT 3 MONTHLY (KG) OF THE PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT INITIAL CONTACT (SEXES COMBINED)



4.1.25 MEAN INCREASE IN WEIGHT/3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Increases in body weight of infants were observed as 3 monthly changes in body weights in the infants (Table 24, Fig 24). By the 3rd month, mean weight increase of the NSNM group compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. By the 6th month, mean weight increase of the NSNM group exceeded the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. This pattern of weight increase continued to the 9th month. By the 9th month, mean increase in weight of the NSNM group exceeded the NCHS/WHO standard and those of the other groups (NSM, SNM and SM). Mean increases in body weight of the NSM, SNM and SM groups were below the NCHS/WHO standard.

A similar pattern was observed on the 12th month. By the 12th month, mean increase in weight of the NSNM group exceeded the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. The NSNM group exhibited superior growth pattern as compared with the other groups throughout the study period.

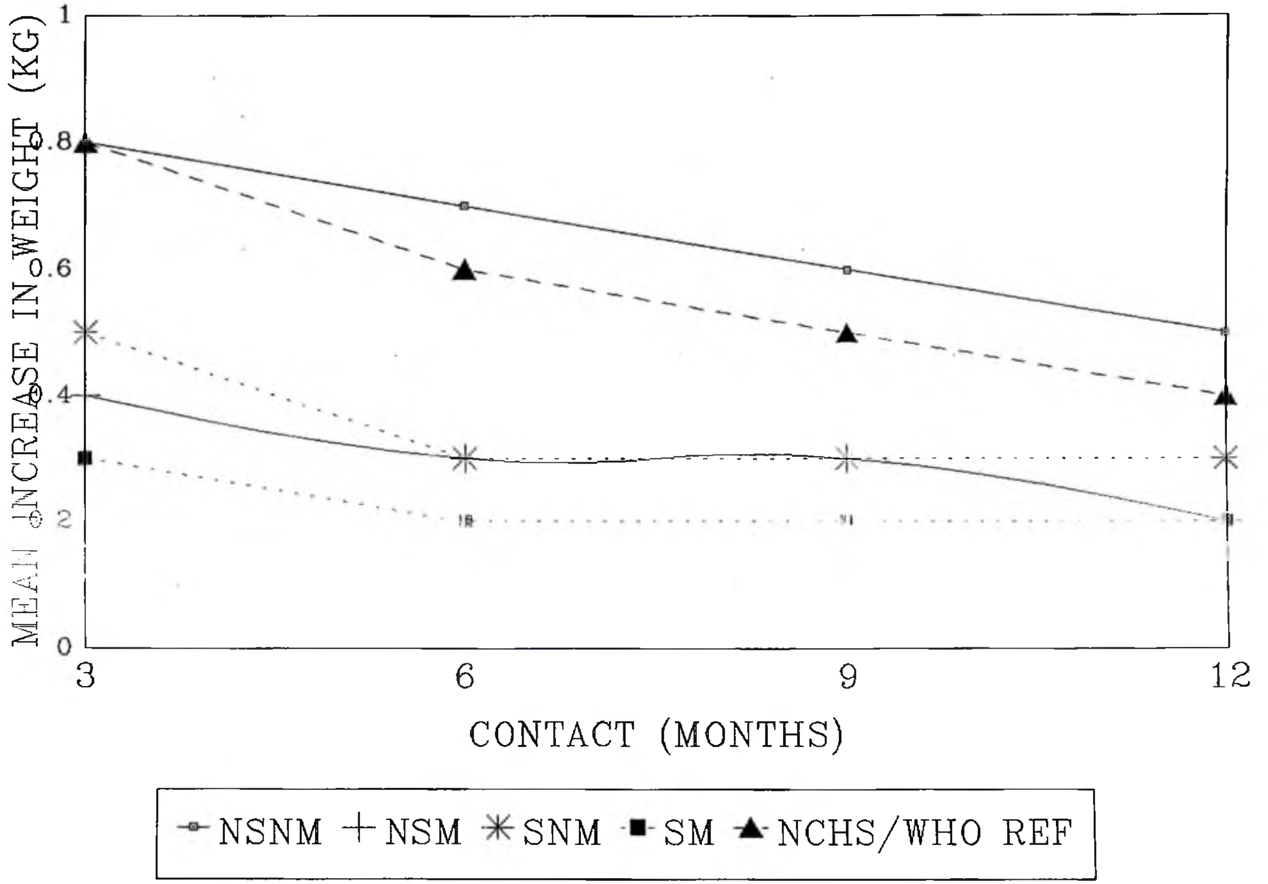
MEAN INCREASE IN WEIGHT/ 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 24

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	30	37.0	12 Months	0.8 ± 0.4 (0.0 -1.0) n = 30	0.7 ±0.5 (0.0 - 1.0) n = 30	0.6 ± 0.5 (0.0 -1.0) n = 30	0.5 ± 0.6 (- 1.0 - 1.0) n = 30
NSM 2	19	23.5		0.4 ± 0.6 (-1.0-1.0) n = 19	0.3 ± 0.7 (- 1.0-1.0) n = 19	0.3 ± 0.8 (- 1.0- 1.0) n = 19	0.2 ± 0.5 .(- 1.0-1.0) n = 19
SNM 3	15	18.5		0.5 ± 0.5 (0.0-1.0) n = 15	0.3 ± 0.5 (0.0-1.0) n = 15	0.3 ± 0.5 (0.0-1.0) n = 15	0.3 ± 0.6 (- 1.0-1.0) n = 15
SM 4	17	21.0		0.3 ± 0.8 (- 1.0 - 1.0) n =17	0.2 ± 0.4 (0.0-1.0) n = 17	0.2 ± 0.8 (- 1.0- 1.0) n = 17	0.2 ± 0.7 (-1.0 - 1.0) n = 17
TOTAL	81	100.0	* Reference NCHS/ WHO (1989)	*0.8	*0.6	*0.5	*0.4

NSNM = Not Sick Not Malnourished
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 24. MEAN INCREASE IN WEIGHT 3 MONTHLY (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4.1.26 **MEAN INCREASE IN WEIGHT/ 3 MONTHLY(kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).**

Infant weight increases were recorded as 3 monthly changes in body weights in the infants (Table 25, Fig 25). By the 3rd month, mean increase in body weight of the NSNM group compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

By the 6th month, mean weight increases of the NSNM group exceeded the NCHS/WHO standard and those of the other groups. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

Similarly, by the 9th month, mean increase in body weight of the NSNM group exceeded the NCHS/WHO standard and those of the NSM, SNM and SM groups. Mean weight increases of the NSM, SNM and SM were below the NCHS/WHO standard. This pattern continued throughout the period of study. By the 12th month, mean weight increase of the NSNM group exceeded the NCHS/WHO standard and those of the other groups (NSM, SNM and SM). Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

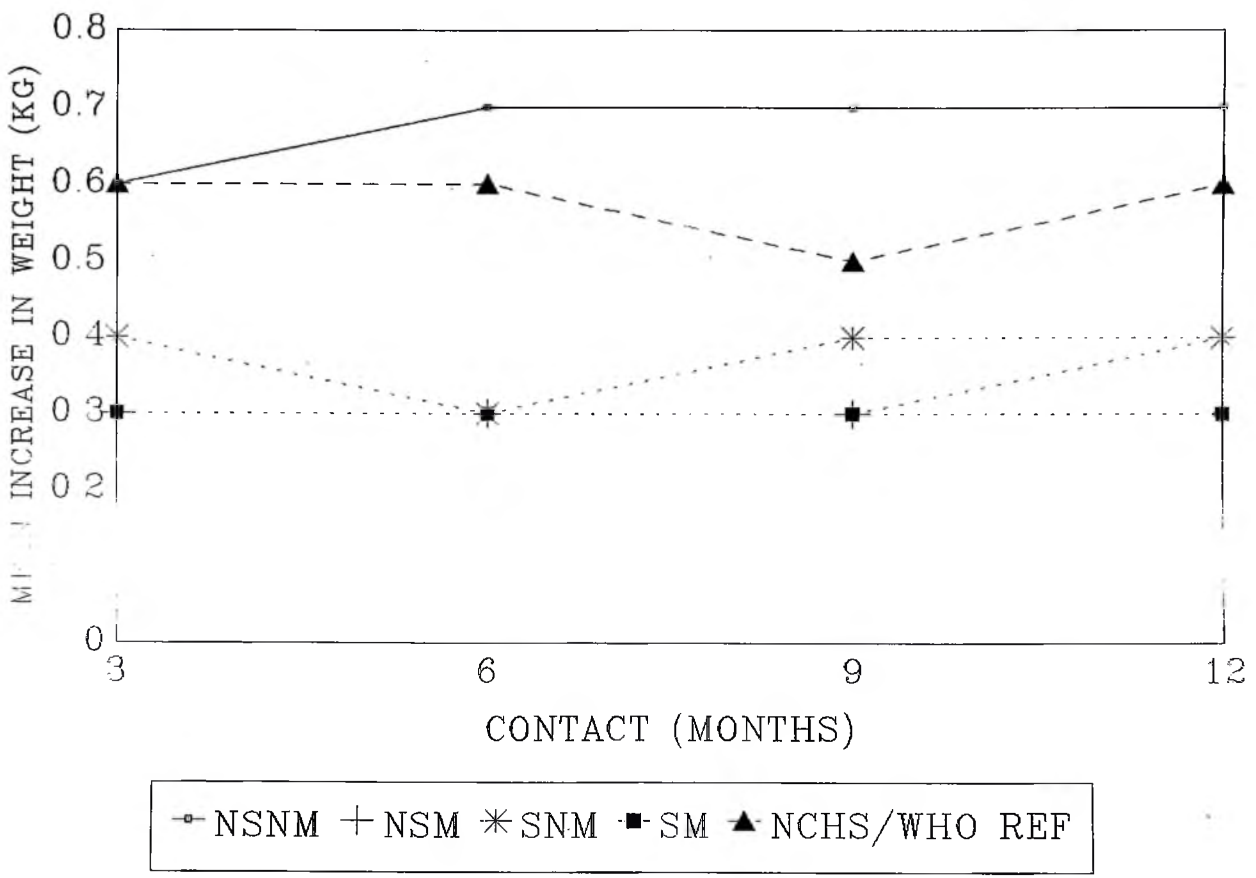
MEAN INCREASE IN WEIGHT/ 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 25

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	38	44.2	24 Months	0.6 ± 0.5 (0.0 -1.0) n = 38	0.7 ±0.5 (0.0 - 1.0) n = 38	0.7 ± 0.5 (0.0 -1.0) n = 38	0.7 ± 0.5 (0.0 - 1.0) n = 38
NSM 2	14	16.3		0.3 ± 0.5 (0.0-1.0) n = 14	0.3 ± 0.5 (0.0-1.0) n = 14	0.3 ± 0.8 (- 2.0- 1.0) n = 14	0.4 ± 0.7 (- 1.0-1.0) n = 14
SNM 3	19	22.1		0.4 ± 0.7 (-1.0-1.0) n = 19	0.3 ± 0.6 (-1.0-1.0) n = 19	0.4 ± 0.5 (0 . 0-1.0) n = 19	0.4 ± 0.5 (0.0-1.0) n = 19
SM 4	15	17.4		0.3 ± 0.8 (- 1.0 - 1.0) n =15	0.3 ± 0.8 (-1.0-1.0) n = 15	0.3 ± 0.6 (- 1.0- 1.0) n = 15	0.3 ± 0.7 (-1.0 - 1.0) n = 15
TOTAL	86	100.0	* Reference NCHS/ WHO (1989)	*0.6	*0.6	*0.5	*0.6

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 25 MEAN INCREASE IN WEIGHT 3 MONTHLY (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4.1.27 MEAN INCREASE IN WEIGHT/ 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

Children's weight increases were observed as 3 monthly changes in body weights in the children (Table 26, Fig 26). By the 3rd month, mean weight increases of the NSNM and SNM groups compared favourably with that of the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard.

By the 6th month, mean increase in body weight of the NSNM group compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

This pattern of weight increase continued to the 9th month. By the 9th month, mean weight increases of the NSNM and SNM groups were slightly below the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard

Similarly,. By 12th month, mean increase in body weight of the NSNM group exceeded the NCHS/WHO standard. Mean weight increases of NSM, SNM and SM groups were below the NCHS/WHO standard.

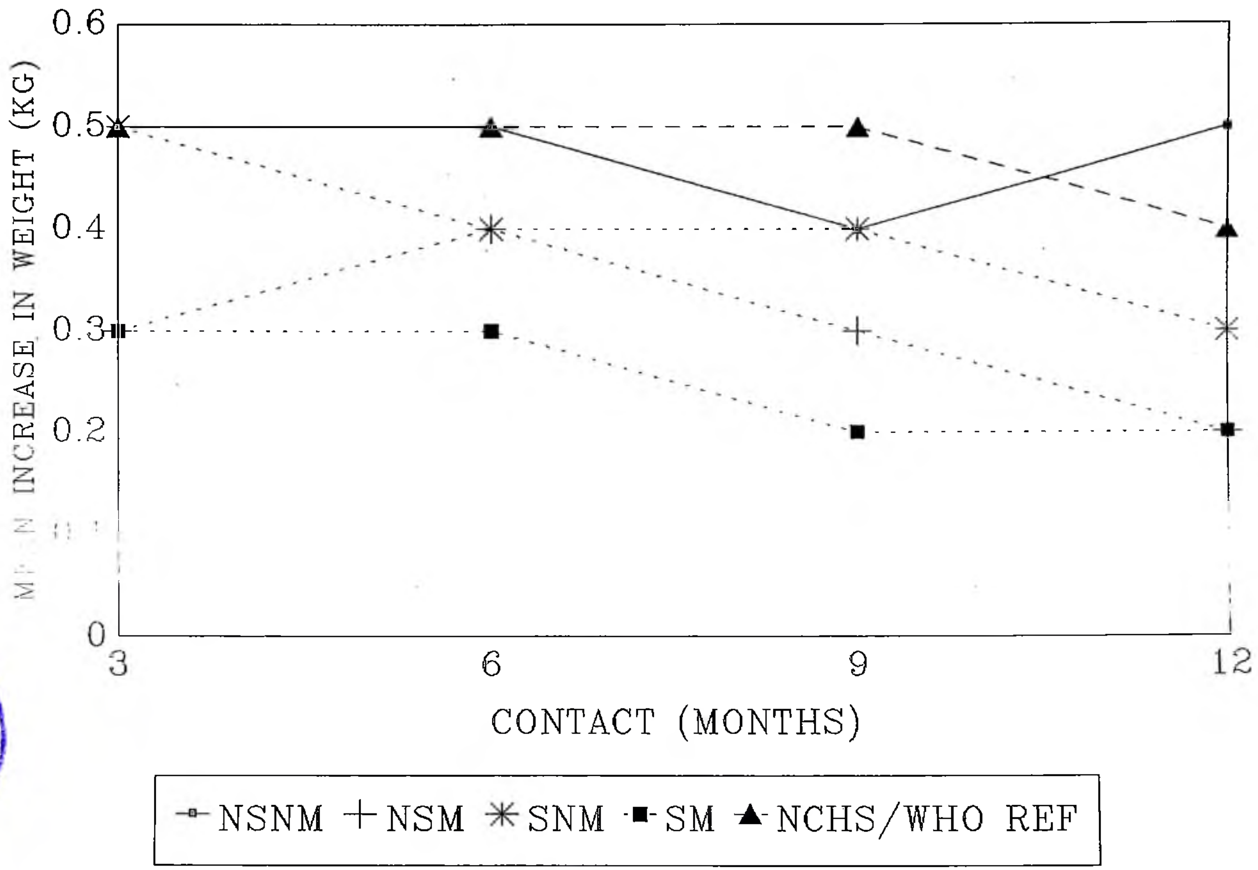
MEAN INCREASE IN WEIGHT/3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 26

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	45.8	36 Months	0.5 ± 0.6 (-1.0 -1.0) n = 49	0.5 ±0.8 (- 0.0 - 1.0) n = 49	0.4 ± 0.7 (-1.0 -1.0) n = 49	0.5 ± 0.7 (-1.0 - 1.0) n = 49
NSM 2	24	22.4		0.3 ± 0.8 (-1.0-1.0) n = 24	0.4 ± 0.8 (- 1.0-1.0) n = 24	0.3 ± 0.7 (- 0.0- 1.0) n = 24	0.2 ± 0.6 (- 1.0-1.0) n = 24
SNM 3	20	18.7		0.5 ± 0.5 (0.0-1.0) n = 20	0.4 ± 0.5 (0.0-1.0) n = 20	0.4 ± 0.6 (-1.0-1.0) n = 20	0.3 ± 0.7 (-1.0-1.0) n = 20
SM 4	14	13.1		0.3 ± 0.6 (- 1.0 - 1.0) n =14	0.3 ± 0.7 (-1.0-1.0) n = 14	0.2 ± 0.6 (- 1.0- 1.0) n = 14	0.2 ± 0.7 (-1.0 - 1.0) n = 14
TOTAL	107	100.0	* Reference NCHS/ WHO (1989)	*0.5	*0.5	*0.5	*0.4

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 26. MEAN INCREASE IN WEIGHT 3 MONTHLY (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4.1.28 MEAN INCREASE IN WEIGHT/ 3 MONTHLY(kg)OF PRE-SCHOOL CHILDREN WITH MANUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMINED)

Weight increases of pre-school children were measured as 3 monthly changes in body weights in the children (Table 27,Fig 27). By the 3rd month, mean weight increases of the NSNM and SNM groups compared favourably with that of the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard.

By the 6th month, mean weight increase of the NSNM group compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. This pattern of growth continued to the 9th month. By the 9th month, mean weight increase of the NSNM group compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

This pattern of weight increase continued throughout the study period. By the 12th month, mean weight increases of the NSNM and SNM groups compared favourably with the NCHS/WHO standard. Mean weight increases of the NSM and SM groups were below the NCHS/WHO standard.

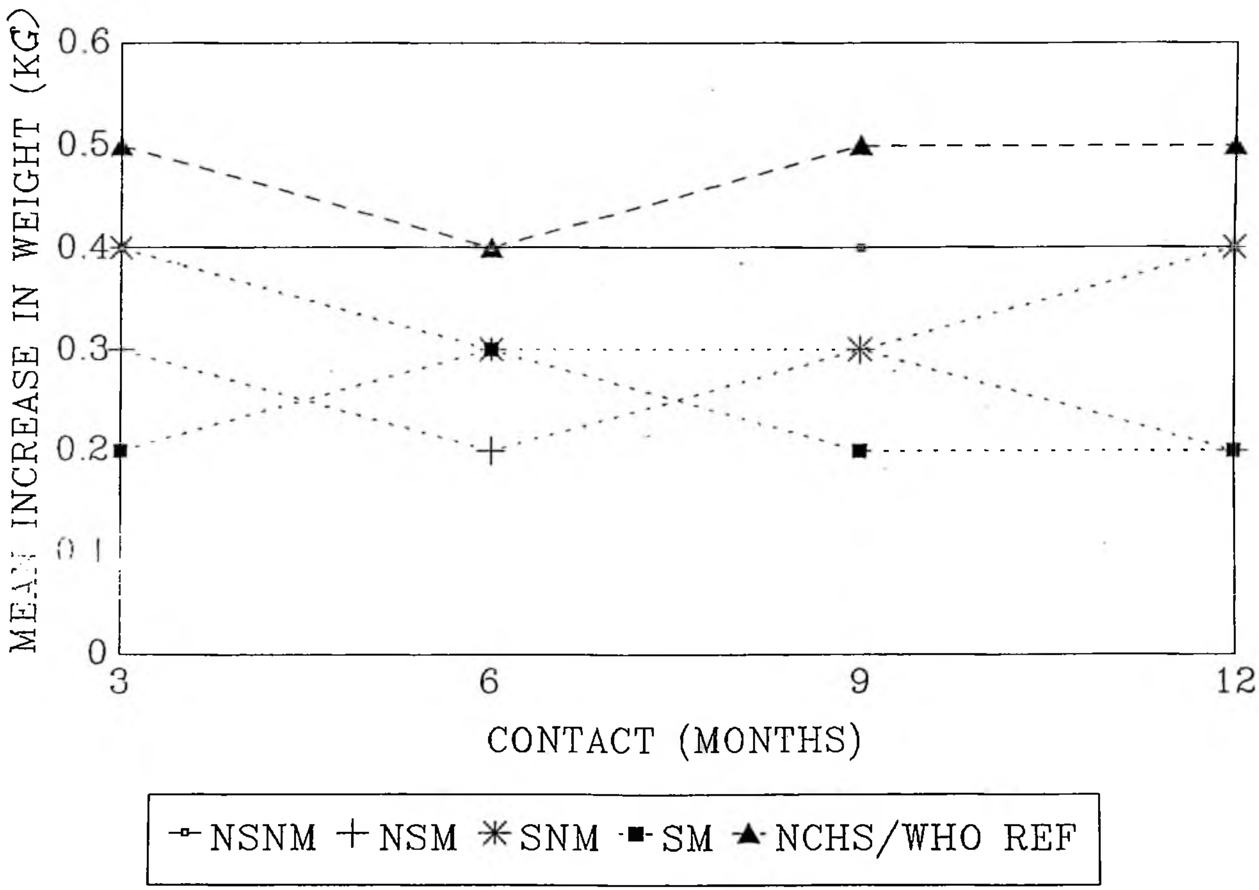
MEAN INCREASE IN WEIGHT/ 3 MONTHLY (kg) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 27

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	47.1	48 Months	0.4 ± 0.5 (0.0 -1.0) n = 49	0.4 ±0.6 (- 1.0 - 1.0) n = 49	0.4 ± 0.6 (-1.0 -1.0) n = 49	0.4 ± 0.5 (-1.0 - 1.0) n = 49
NSM 2	15	14.4		0.3 ± 0.6 (-1.0-1.0) n = 15	0.2 ± 0.7 (- 1.0-1.0) n = 15	0.3 ± 0.6 (- 1.0- 1.0) n = 15	0.2 ± 0.8 (- 1.0-1.0) n =15
SNM 3	23	22.1		0.4 ± 0.6 (-1.0-1.0) n = 23	0.3 ± 0.5 (0.0-1.0) n = 23	0.3 ± 0.8 (-1.0-1.0) n = 23	0.4 ± 0.7 (-1.0-1.0) n = 23
SM 4	17	16.4		0.2 ± 0.8 (- 1.0 - 1.0) n =17	0.3 ± 0.6 (-1.0-1.0) n = 17	0.2 ± 0.4 (0.0- 1.0) n = 17	0.2 ± 0.5 (-1.0 - 1.0) n = 17
TOTAL	104	100.0	* Reference NCHS/ WHO (1989)	*0.5	*0.4	*0.5	*0.5

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 27. MEAN INCREASE IN WEIGHT 3 MONTHLY (KG) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4.1.29 MEAN INCREASE IN LENGTH/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).

Increases in length of infant were measured as 3 monthly changes in body lengths in infants (Table 28, Fig 28). Mean values were based on NCHS/WHO standard. By the 3rd month, mean length increase of the NSNM group compared favourably with the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

By the 6th month, mean increase in length of the NSNM group compared favourably with the NCHS/WHO standard and exceeded those of the NSM, SNM, and SM groups. Mean length increases of the NSM, SNM and SM groups were below the NCHS/ WHO standard.

Increase in body length of infants continued to the 9th month. By the 9th month, mean increase in body length of the NSNM group compared favourably with that of the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

This pattern continued to the 12th month. By the 12th month, mean increase in body length of the NSNM group compared favourably with the NCHS/WHO standard and exceeded those of the NSM, SNM and SM groups. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

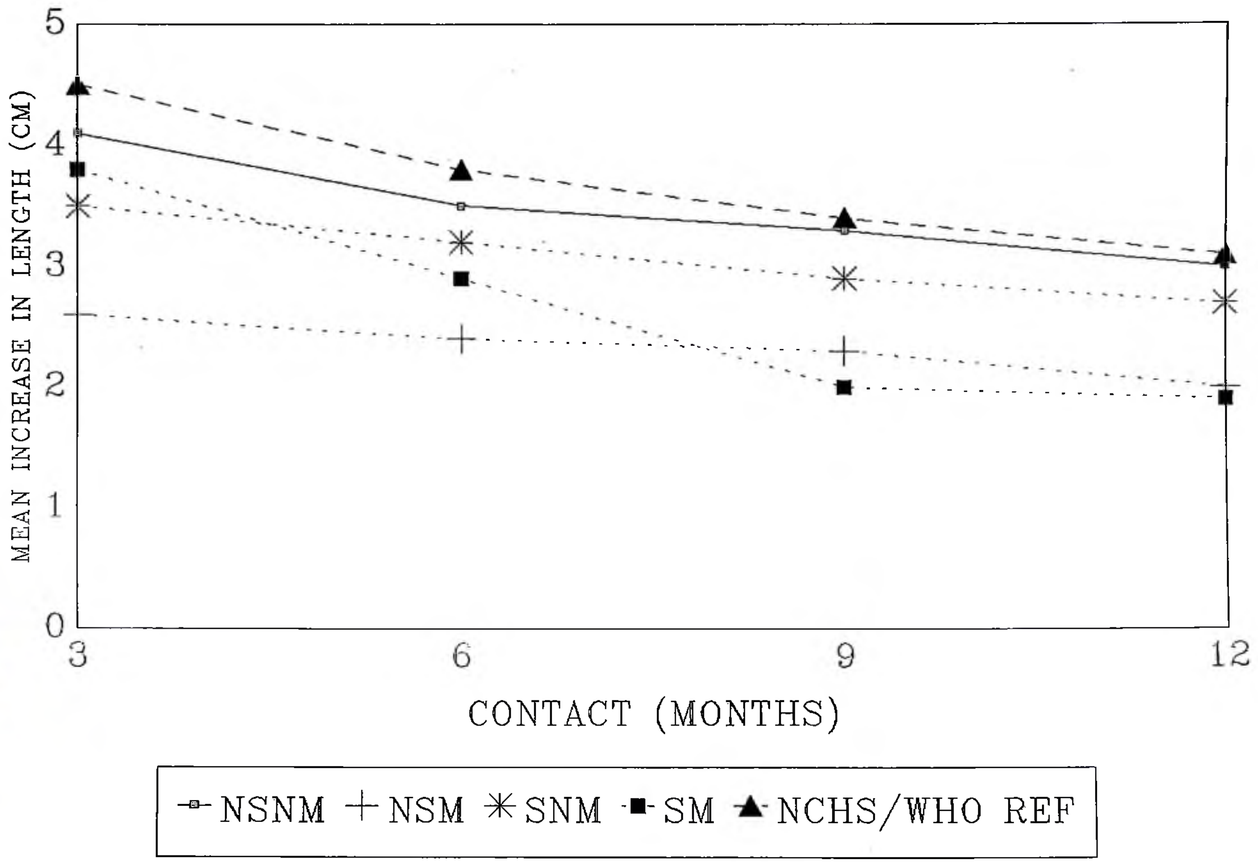
MEAN INCREASE IN LENGTH 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 28

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	34	38.6	6 Months	4.1 ± 0.6 (2.0 -4.8) n = 34	3.5 ±0.6 (2.0 - 5.0) n = 34	3.3 ± 0.5 (2.0 -4.0) n = 34	3.0 ± 0.4 (2 .0 - 4.0) n = 34
NSM 2	14	15.9		2.6 ± 0.7 (2.0-3.7) n = 14	2.4 ± 0.4 (2.0-3.0) n = 14	2.3 ± 0.3 (2 .0- 3.0) n = 14	2.0 ± 0.1 (2.0-2.0) n = 14
SNM 3	10	11.4		3.5 ± 0.7 (2.0-4.2) n = 10	3.2 ± 0.9 (2.0-4.5) n = 10	2 .9 ± 0.4 (2 .2 -3.4) n = 10	2.7 ± 0.5 (2 .0-3.0) n = 10
SM 4	30	34.1		3 .8 ± 0.7 (2.0 - 4.5) n =30	2.9 ± 0.7 (2.0 - 4.5) n = 30	2 .0 ± 0.4 (1.2- 2.6) n = 30	1.9 ± 0.3 (0.9 - 2.2) n = 30
TOTAL	88	100.0	* Reference NCHS/ WHO (1989)	*4.5	*3.8	*3.4	*3.1

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 28. MEAN INCREASE IN LENGTH 3 MONTHLY (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 6 MONTHS AT INITIAL THE CONTACT (SEXES COMBINED)



4. 1. 30 **MEAN INCREASE IN LENGTH/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).**

Infant length increases were recorded as 3 monthly changes in body lengths in the infants (Table 29, Fig 29). Mean values were based on NCHS/WHO standard. By the 3rd month of contact, mean length increase of the NSNM group compared favourably with that of the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/ WHO standard.

Increase in body length of infants continued. By the 6th month, mean increase in length of the NSNM group exceeded the NCHS/WHO standard. Mean increases in body length of the NSM, SNM and SM groups were below the NCHS/WHO standard.

Similarly, by the 9th month, mean increase in length of the NSNM group exceeded the NCHS/WHO standard. Mean increases in length of the NSM, SNM and SM groups were below the NCHS/WHO standard. This pattern continued to the 12th month. By the 12th month, mean increase in body length of the NSNM group exceeded the NCHS/ WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

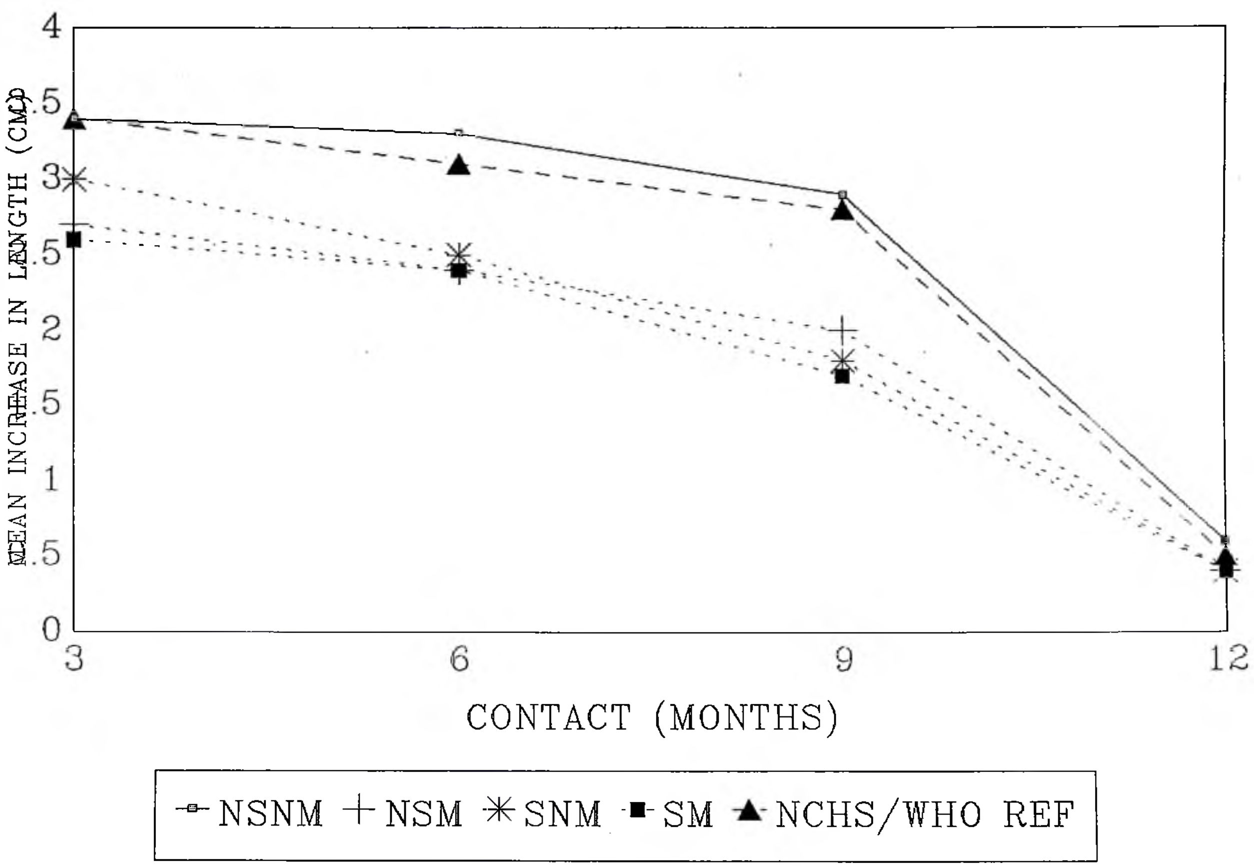
MEAN INCREASE IN LENGTH / 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 29

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±S.D	12 Months Mean ±SD
NSNM I	30	37.0	12 Months	3.4 ± 0.8 (1.0 -4.5) n = 30	3.3 ± 0.8 (1.0 - 4.0) n = 30	2.9 ± 0.7 (1.4 -4.0) n = 30	0.6 ± 0.2 (0 .4 - 1.4) n = 30
NSM 2	19	23.5		2.7 ± 0.6 (2 .0 - 3 .4) n = 19	2.4 ± 0.5 (2.0 -3.1) n = 19	2.0 ± 0.5 (1 .2- 2.8) n = 19	0.4 ± 0.1 (0.3 -0 .5) n = 19
SNM 3	15	18.5		3.0 ± 0.3 (2 .0- 3 .3) n = 15	2.5 ± 0.6 (2 .0- 3 .2) n = 15	1 .8 ± 0.7 (0 .5 - 3.0) n = 15	0 .4 ± 0.1 (0 .3 -0 .6) n = 15
SM 4	17	21.0		2 .6 ± 0.6 (1 .6 - 3 .4) n =17	2 . 4 ± 0.6 (1.0 - 3.1) n = 17	1 .7 ± 0.6 (1.0 - 2 .7) n = 17	0 .4 ± 0.1 (0 .2 - 0 .5) n = 17
TOTAL	81	100.0	* Reference NCHS/ WHO (1989)	*3.4	*3.1	*2.8	*0.5

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 29. MEAN INCREASE IN LENGTH 3 MONTHLY (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 12 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4. 1. 31 **MEAN INCREASE IN LENGTH/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION /INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)**

Length increases in infant were recorded as 3 monthly changes in body lengths in the infants (Table 30, Fig 30). By the 3rd month, mean increase in body length of the NSNM group exceeded the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/ WHO standard.

A similar observation was made on the 6th month. By the 6th month, mean increase in body length of the NSNM group exceeded the NCHS/ WHO standard. Mean increase in body length of the SNM group compared favourably with that of the NCHS/WHO standard. Mean length increases of the NSM and SM groups were below the NCHS/WHO standard.

Increases in body length of infant continued to the 9th month. By the 9th month, mean increase in body length of the NSNM group exceeded the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

Differences in increase in body length continued to the 12th month. By the 12th month, mean increase in body length of the NSNM group exceeded the NCHS/WHO standard. Mean length increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. Mean increase in body length of the SM group was inferior to the other groups throughout the period of study.

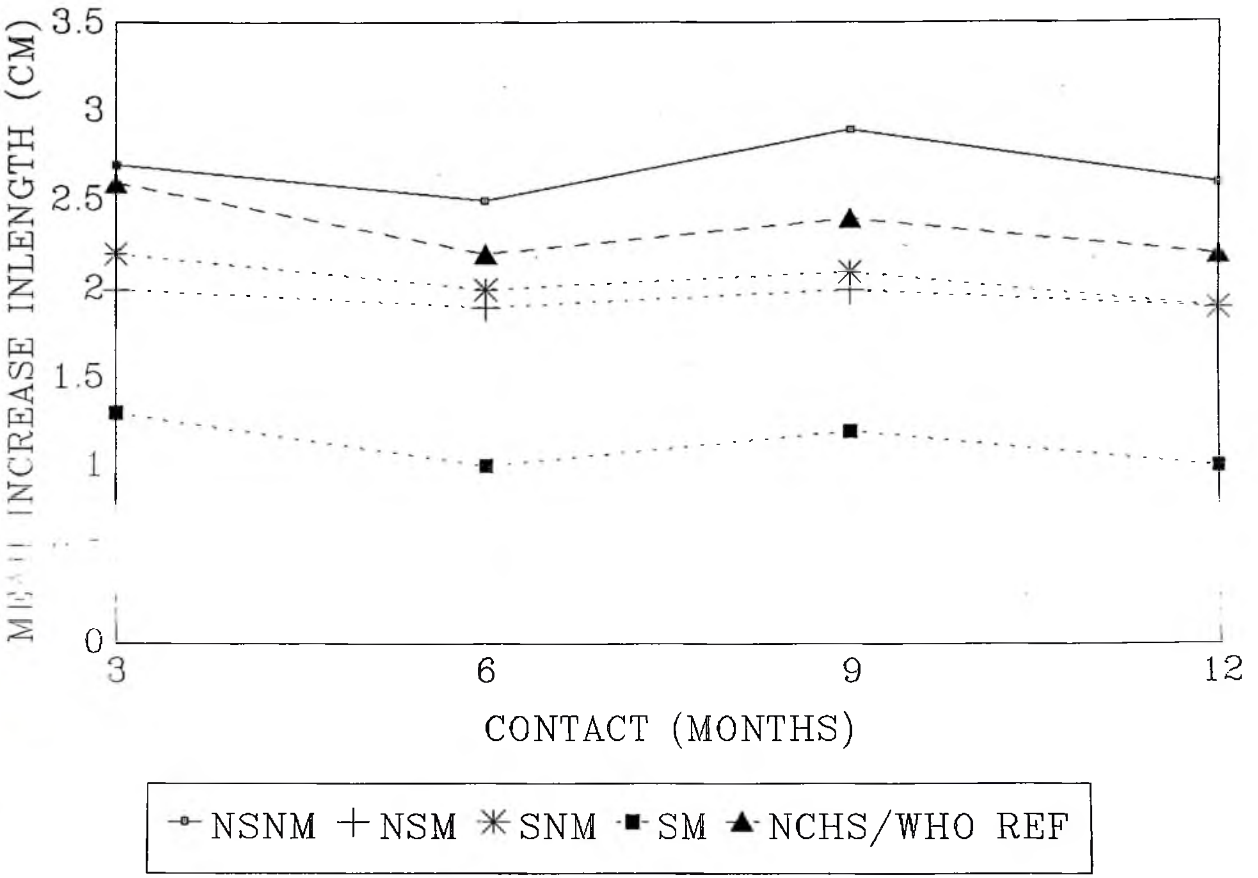
MEAN INCREASE IN LENGTH / 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 30

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	38	44.2	24 Months	2.7 ± 0.9 (1.0 -4.8) n = 38	2.5 ± 0.7 (1.0 - 4.0) n = 38	2.9 ± 0.6 (1.0 -4.8) n = 38	2 .6 ± 0.7 (1 .0 - 4.0) n = 38
NSM 2	14	16.3		2.0 ± 0.3 (1 .5 - 2 .6) n = 14	1.9 ± 0.4 (1.0 -2.2) n = 14	2.0 ± 0.2 (1 .5- 2.4) n = 14	1 .9 ± 0.4 (1.0 -2 .2) n = 14
SNM 3	19	22.1		2.2 ± 0.6 (1 .0- 3 .5) n = 19	2.0 ± 0.5 (1 .0- 3 .0) n = 19	2 .1 ± 0.6 (1 .0 - 3.5) n = 19	1 .9 ± 0.6 (1 .0 -3 .0) n = 19
SM 4	15	17.4		1 .3 ± 0.4 (1 .0 - 2 .0) n =15	1 . 0 ± 0.3 (0.5 - 2 .0) n = 15	1 .2 ± 0.4 (0 . 5 - 2 .0) n = 15	1 .0 ± 0.3 (0 .5 - 2 .0) n = 15
TOTAL	86	100.0	* Reference NCHS/ WHO (1989)	*2.6	*2.2	*2.4	*2.2

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 30. MEAN INCREASE IN LENGTH 3 MONTHLY (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 24 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4. 1. 32 **MEAN INCREASE IN HEIGHT/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WTH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)**

Increases in height of pre-school children were recorded as 3 monthly changes in heights in the children (Table 31, Fig 31). By the 3rd month, mean increase in height of the NSNM group exceeded the NCHS/WHO standard. Mean increase in height of the SNM group compared favourably with the NCHS/WHO standard. Mean height increases of the NSM and SM groups were below the NCHS/WHO standard.

This pattern continued to the 6th month. By the 6th month, mean height increase of the NSNM group exceeded the NCHS/WHO standard. Mean increase in height of the SNM group compared favourably with the NCHS/WHO standard. Mean height increases of the NSM & SM groups were below the NCHS/WHO standard.

Differences in height increase in pre-school children continued to the 9th month. By the 9th month, mean increase in height of the NSNM group exceeded the NCHS/WHO standard. Mean height increases of the NSM, SNM and SM groups were below the NCHS/WHO standard. A similar pattern continued to the 12th month. By the 12th month, mean height increase of the NSNM group exceeded the NCHS/ WHO standard. Mean height increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

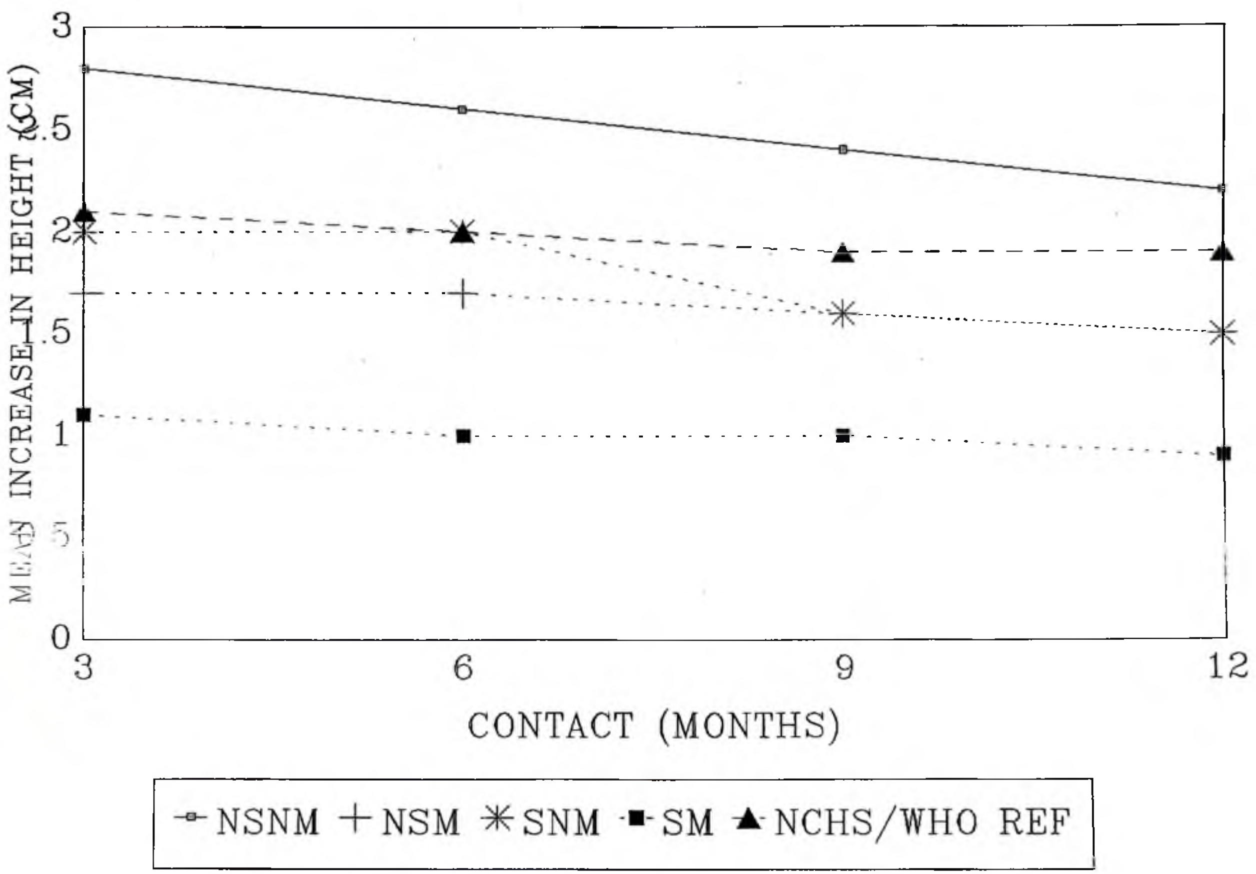
MEAN INCREASE IN HEIGHT/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 31

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	45.8	36 Months	2.8 ± 0.9 (1.0 -4.0) n = 49	2.6 ± 0.7 (1.0 - 4.0) n = 49	2.4 ± 0.7 (1.0 -4.0) n = 49	2 .2 ± 0. (1 .0 - 4.0) n = 49
NSM 2	24	22.4		1.7 ± 0.8 (1 .0 - 3 .5) n = 24	1.7 ± 0.8 (1.0 -3.5) n = 24	1.6 ± 0.6 (1 .0- 3 .0) n = 24	1 .5 ± 0.5 (1.0 -3 .0) n = 24
SNM 3	20	18.7		2.0 ± 0.5 (1 .0- 3 .0) n = 20	2.0 ± 0.5 (1 .0- 3 .0) n = 20	1 .6 ± 0.6 (1 .0 - 3.0) n = 20	1 .5 ± 0.5 (1 .0 -3 .0) n = 20
SM 4	14	13.1		1 .1 ± 0.3 (0 .5 - 2 .0) n =14	1 . 0 ± 0.4 (0.5 - 2 .4) n = 14	1 .0 ± 0.3 (0 . 5 - 1 .8) n = 14	0 .9 ± 0.3 (0 .5 - 1 .8) n = 14
TOTAL	107	100.0	* Reference NCHS/ WHO (1989)	*2.1	*2.0	*1.9	*1.9

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 31. MEAN INCREASE IN HEIGHT 3 MONTHLY (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 36 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4. 1. 33 MEAN INCREASE IN HEIGHT/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED).

Children's height increases were measured as 3 monthly changes in heights in the children (Table 32, Fig 32). Mean values were based on the NCHS/WHO standard. By the 3rd month, mean height increase of the NSNM group exceeded the NCHS/WHO standard. Mean height increases of the NSM, SNM and SM groups were below the NCHS/WHO standard.

This pattern continued to the 6th month. By the 6th month, mean increase in height of the NSNM group exceeded the NCHS / WHO standard. Mean increase in height of SNM group compared favourably with that of the NCHS/WHO standard. Mean height increases of the NSM and SM groups were below the NCHS/WHO standard.

Differences in mean increase in height of pre-school children continued to the 9th month. By the 9th month, mean increase in height of the NSNM group exceeded the NCHS/WHO standard. Mean increase in height of the SNM group compared favourably with that of the NCHS/WHO standard. Mean height increases of the NSM and SM groups were below the NCHS/WHO standard.

Height increases in children continued to the 12th month. By the 12th month, mean increase in height of the NSNM group exceeded the NCHS / WHO standard. Mean height increases of the NSM, SNM and SM groups were below the NCHS / WHO standard. Generally, mean increase in length / height of the NSNM group was superior compared with the other groups throughout the period of study.

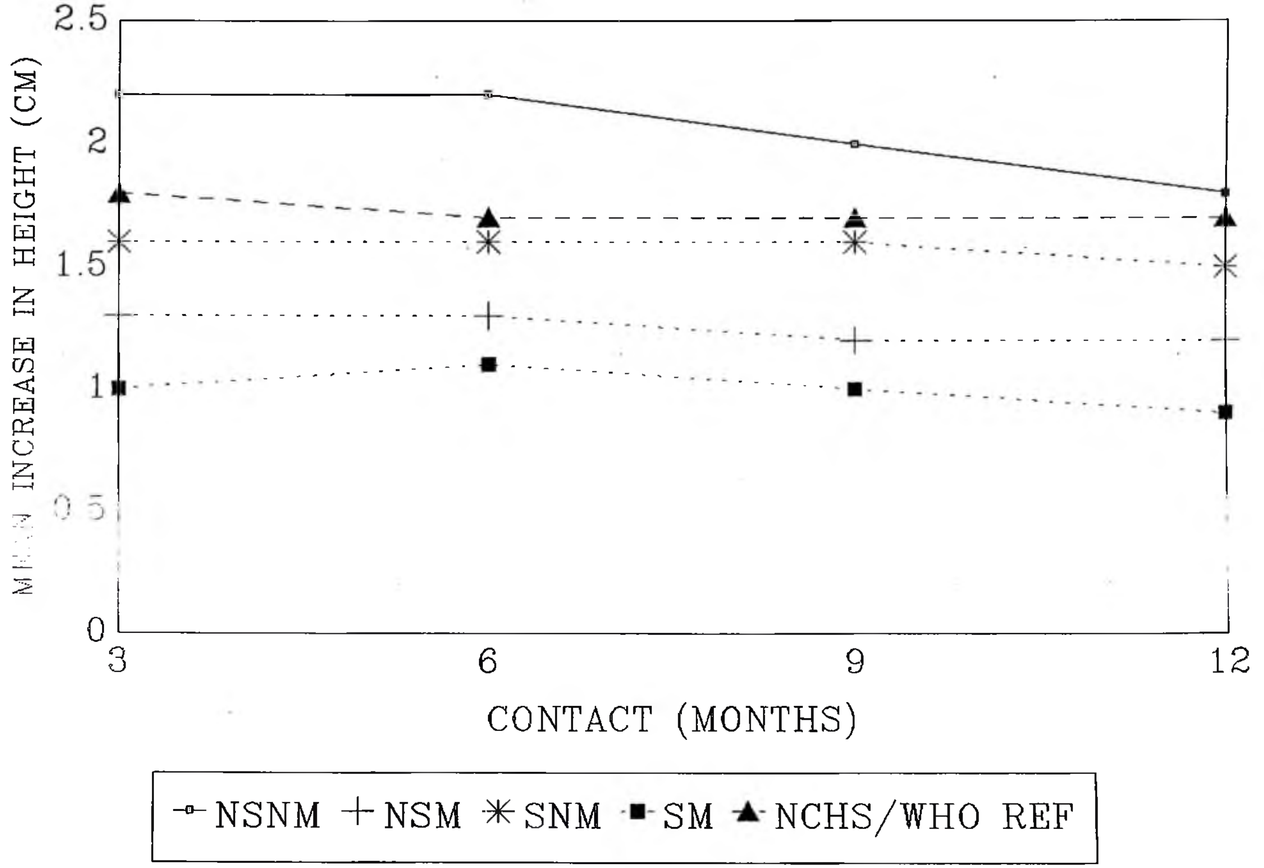
MEAN INCREASE IN HEIGHT/ 3 MONTHLY (cm) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION / INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)

TABLE 32

Malnutrition/Infectious Disease complex	N	%	Age at Initial contact, (in months)	3 Months Mean ±S.D	6 Months Mean ±S.D	9 Months Mean ±SD	12 Months Mean ±SD
NSNM I	49	47.1	48 Months	2.2 ± 0.8 (1.0 -3.5) n = 49	2.2 ± 0.8 (1.0 - 3.5) n = 49	2.0 ± 0.7 (1.0 -3.5) n = 49	1 .8 ± 0.7 (0 .5 - 3.0) n = 49
NSM 2	15	14.4		1.3 ± 0.5 (0 .5 - 2 .0) n = 15	1.3 ± 0.6 (0.5 -2.0) n = 15	1.2 ± 0.5 (0 .5- 2 .0) n = 15	1 .2 ± 0.5 (0.5 -2 .0) n = 15
SNM 3	23	22.1		1.6 ± 0.7 (1 .0- 3 .5) n = 23	1.6 ± 0.7 (1 .0 - 3 .5) n = 23	1 .6 ± 0.7 (1 .0 - 3.5) n = 23	1 .5 ± 0.6 (1 .0 -3 .0) n = 23
SM 4	17	16.4		1 .0 ± 0.2 (0 .5 - 1 .8) n =17	1 . 1 ± 0.2 (1.0 - 1 .5) n = 17	1 .0 ± 0.3 (0 . 5 - 1 .6) n = 17	0 .9 ± 0.4 (0 .4 - 1 .5) n = 17
TOTAL	107	100.0	* Reference NCHS/ WHO (1989)	*1.8	*1.7	*1.7	*1.7

NSNM = Not Sick Not Malnourished.
NSM = Not Sick but Malnourished
SNM = Sick Not Malnourished
SM = Sick and Malnourished
( ) = Range
N = No of Children

Fig 32. MEAN INCREASE IN HEIGHT 3 MONTHLY (CM) OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX AGED 48 MONTHS AT THE INITIAL CONTACT (SEXES COMBINED)



4.1.34 **MEAN HAEMOGLOBIN (GM/100ML) LEVEL OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASECOMPLEX (SEXES COMBINED)**

Low mean haemoglobin level (Table 33 and Fig 33) was a common finding among the NSM and SM groups. At the age of 12 months, mean haemoglobin level of the NSM and SM groups were 9.9gm/100ml and 9.8 gm/100ml respectively. Mean haemoglobin level of the NSNM and SNM groups were 10.9gm/100m and 10.9gm/100ml respectively. Mean haemoglobin level of the NSNM and SNM groups were significantly ($p<0.05$) higher than those of the NSM and SM groups.

Low mean haemoglobin level among the NSM and SM groups persisted to the age of 24 months. At the age of 24 months, mean haemoglobin levels of the NSM and SM groups read 10.0gm/100ml and 9.9gm/100ml respectively compared with the NSNM and SNM groups with mean haemoglobin levels of 11.8gm/100ml and 10.8gm/100ml respectively. Mean haemoglobin level of NSNM group was significantly ($p<0.05$) higher than the other three groups. Mean haemoglobin level of the NSM was slightly higher than that of the SM group.

The NSNM group continued to demonstrate higher mean haemoglobin level to the age of 36 months. At the age of 36 months, mean haemoglobin level of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (NSM, SNM, SM). Mean haemoglobin level of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups.

There was a non-significant ($p>0.05$) but slightly higher mean haemoglobin level for the NSM group compared with that of the SM group. At the age of 48 months, mean haemoglobin level of the NSNM group was significantly ($p < 0.05$) higher than those of the NSM and SM groups. Mean haemoglobin level of the SNM group was significantly ($p < 0.05$) higher than that of the SM group. There was a non-significant ($p > 0.05$) but slightly higher mean haemoglobin level for the NSM group compared with that of the SM group.

This pattern continued to the age of 60 months. At the age of 60 months, mean haemoglobin level of the NSNM group was significantly ($p < 0.05$) higher than those of the SNM,NSM and SM groups. Mean haemoglobin level of the SNM group was significantly ($p < 0.05$) higher than that of the SM group. There was a non-significant but slightly higher mean haemoglobin level for the NSM group compared with the SM group

MEAN HAEMOGLOBIN (gm/100ml) LEVEL OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)

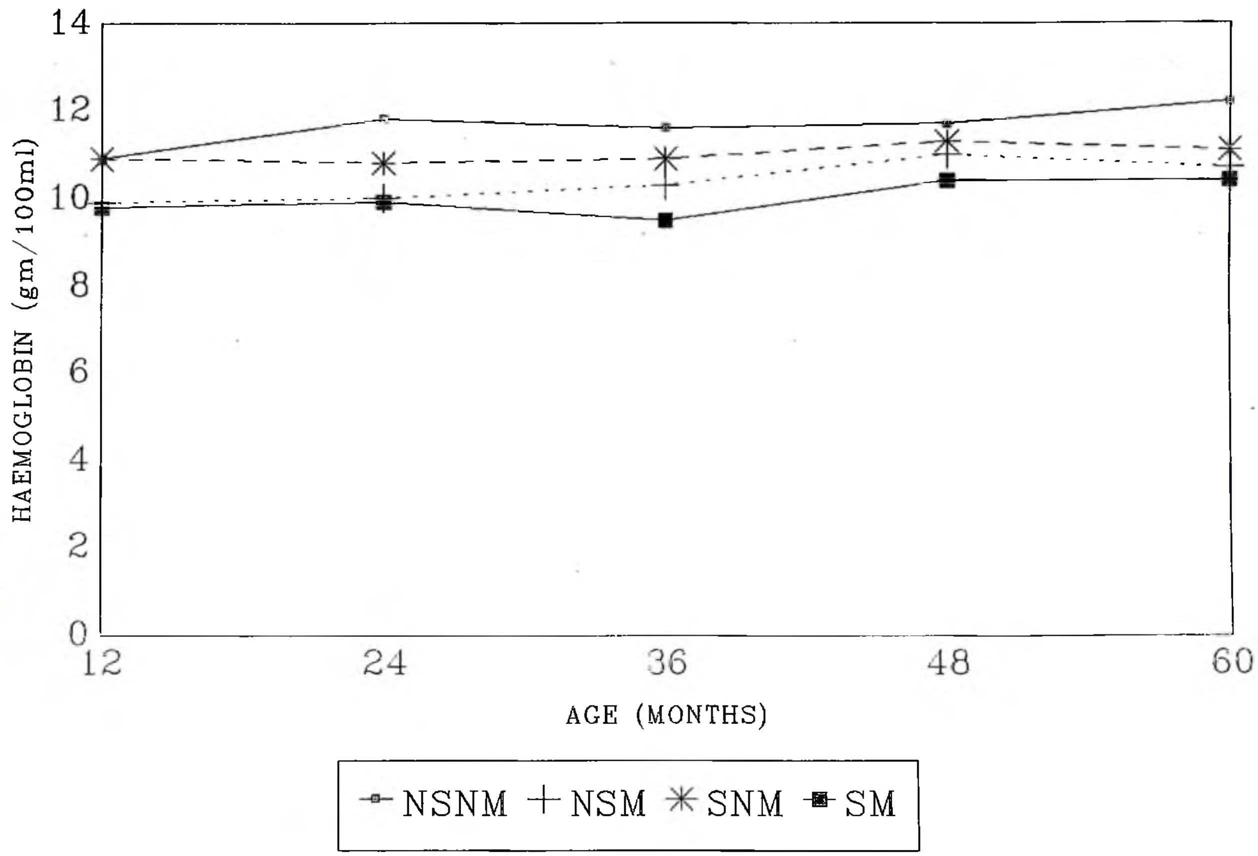
TABLE 33

Malnutrition/infectious Disease Complex	N	%	12 months Mean ± SD	24 months Mean ± SD	36 months Mean ± SD	48 months Mean ± SD	60 months Mean ± SD
NSNM 1 (control)	200	42.9	$10.9^{a} \pm 1.4$ (7.3-13.1) n = 34	$11.8^{a} \pm 1.2$ (8.8-13.5) n = 30	$11.6^{a} \pm 1.0$ (10.0-13.1) n = 38	$11.7^{a} \pm 0.9$ (7.3-13.1) n = 49	$12.2^{a} \pm 0.5$ (11.6-13.0) n = 49
NSM 2	86	18.4	$9.9^{b} \pm 1.6$ (7.3-11.7) n = 14	$10.0^{b} \pm 1.4$ (7.3-12.0) n = 19	$10.3^{b} \pm 1.3$ (7.3-12.0) n = 14	$11.0^{b} \pm 0.9$ (8.7-12.0) n = 24	$10.7^{b} \pm 1.3$ (8.8-12.0) n = 15
SNM 3	87	18.7	$10.9^{a} \pm 1.5$ (8.8-13.1) n = 10	$10.8^{b} \pm 1.1$ (8.7-12.0) n = 15	$10.9^{b} \pm 1.0$ (9.0-12.0) n = 19	$11.3^{a} \pm 0.9$ (10.0-13.1) n = 20	$11.1^{c} \pm 1.1$ (8.0-13.0) n = 23
SM 4	93	20.0	$9.8^{b} \pm 1.6$ (7.3-12.0) n =30	$9.9^{b} \pm 1.7$ (7.3-12.0) n = 17	$9.5^{c} \pm 1.7$ (7.0-11.7) n = 15	$10.4^{b} \pm 1.4$ (7.3-12.0) n = 14	$10.4^{b} \pm 1.1$ (7.3-11.8) n = 17

Means in the same column with different superscripts are significantly different ($p < 0.05$, Duncan's Multiple Range Test).

NSNM = Not sick not malnourished
NSM = Not sick but malnourished
SNM = Sick not malnourished
SM = Sick and malnourished
( ) = Range
n = No. of Children

Fig 33. MEAN HAEMOGLOBIN (gm/100ml) LEVEL OF PRE-SCHOOL CHILDREN WITH MALNUTRITION/INFECTIOUS DISEASE COMPLEX (SEXES COMBINED)



4.2 STUDY II

The materials used in this section are based on the questionnaires of the appendix 4. Mothers were asked if their children had more liquid or semi liquid stools in the two weeks preceding the survey.

4.2.1 PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA DURING THE PERIOD OF SURVEY ACCORDING TO AGE (SEXES COMBINED)

Table 34 and Fig 34 offer summaries of the pre-school children who had diarrhoea during the period of survey month by month according to age (sexes combined).

During the month of September, 10.5 percent of the pre-school children had diarrhoea ranging between 1 to 3 times. Only 0.4 percent of the children had diarrhoea exceeding 4 times in the month.

Among those children who had diarrhoea in September, the percentage was higher among children aged 24 months (17.3 percent),followed by children aged 12 months (17.1 percent) and children aged 36 months 15.1 percent). The percentage was lower among children aged 48 months (3.7 percent) and children aged 60 months (2.9 percent). Only children aged 24 months (1.2 percent) and children aged 12 months (1.1 percent) had diarrhoea more than 4 times in the month.

In the month of October, 7.1 percent of the pre-school children had diarrhoea with a number of occurrences not exceeding 3 times. The percentages were higher among children aged 24 months (17.3 percent) and children aged 12 months (9.1 percent). The percentages were lower among children aged 36 months (4.7 percent) followed by children aged 48 months (3.7 percent) and children aged 60 months (2.9 percent).

In the month of November, 7.9 percent of the pre-school children had diarrhoea 1-3 times. The percentages were higher among children aged 24 months (14.8 percent) and children aged 12 months (13.6 percent). The percentages were lower among children aged 36 months (7.0 percent), children aged 48 months (3.7 percent) and children aged 60 months (2.9 percent).

During the month of December a total of 7.9 percent of the pre-school children had diarrhoea occurring 1-3 times, with a higher percentage occurring among children aged 12 months (17.1 percent) and children aged 24 months (9.9 percent). The percentages were lower among children aged 36 month (8.1 percent), children aged 48 months (3.7 percent) and children aged 60 months (2.9 percent).

In January 5.4 percent of the children had diarrhoea with a number of occurrences not exceeding 3 times.The percentages were higher among children aged 12 months (10.2 percent) and children aged 24 months (9.9 percent). The percentages were lower among children aged 36 months (4.7 perecnt), children aged 48 months (1.9 percent) and children aged 60 months (1.9 percent).

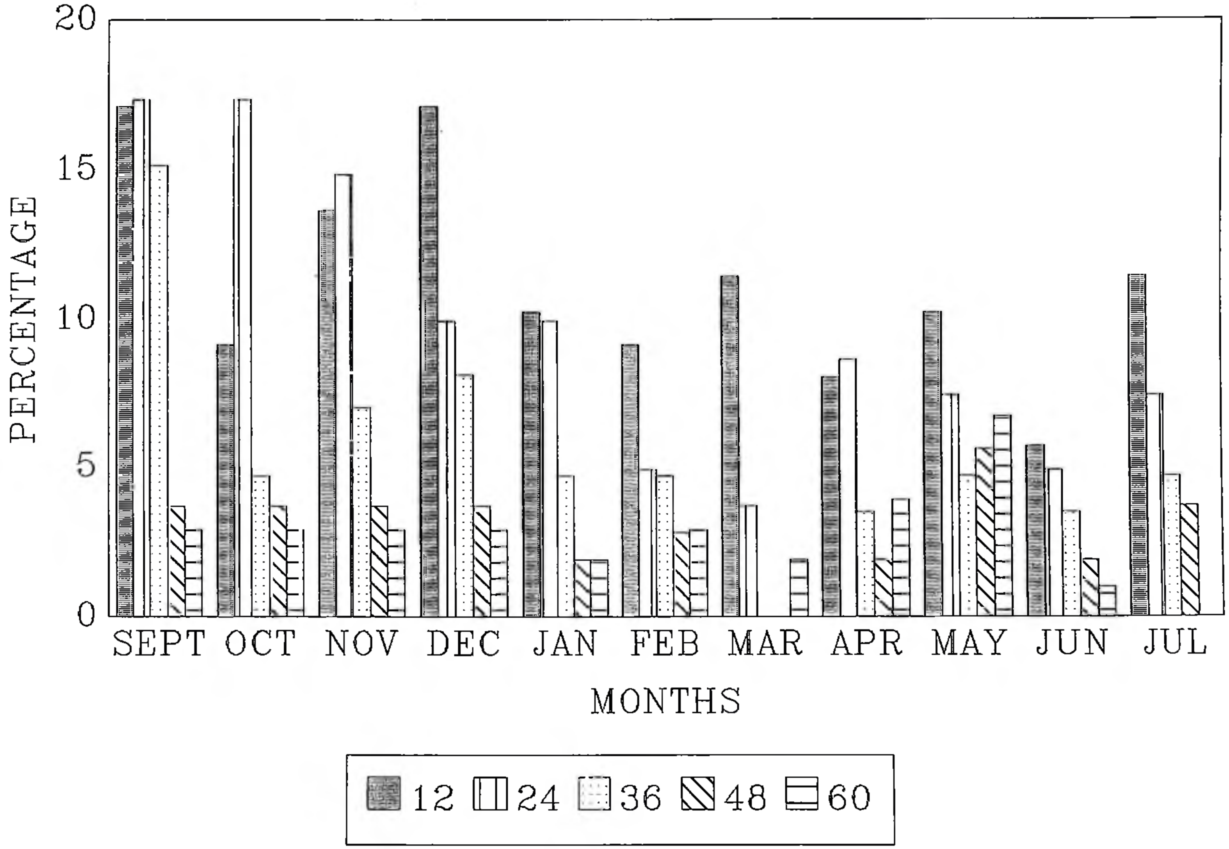
In the months of February, March, April, June and July about 5.0 percent of the children had diarrhoea in each month. These months seem to be the seasons of low diarrhoea incidence. Among the children who had diarrhoea during these periods the percentages were higher among children aged 12 months followed by children aged 24 months with the least occurrence among children aged 36 months through 60 months.

THE PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO AGE INDICATING THE NUMBER OF OCCURRENCE (SEXES COMBINED)

TABLE 34

Age in Months	Total		Sept. No of Occurrence		Oct. 1-3	Nov. 1-3 Times	Dec. 1-3 Times	Jan. 1-3 Times	Feb. 1-3 Times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+										
12	88	18.9	17.1 (15)	1.1 (1)	9.1 (8)	13.6 (12)	17.1 (15)	10.2 (9)	9.1 (8)	11.4 (10)	8.0 (7)	10.2 (9)	5.7 (5)	11.4 (10)
24	81	17.4	17.3 (14)	1.2 (1)	17.3 (14)	14.8 (12)	9.9 (8)	9.9 (8)	4.9 (4)	3.7 (3)	8.6 (7)	7.4 (6)	4.9 (4)	7.4 (6)
36	86	18.5	15.1 (13)	0.0 (0)	4.7 (4)	7.0 (6)	8.1 (7)	4.7 (4)	4.7 (4)	0.0 (0)	3.5 (3)	4.7 (4)	3.5 (3)	4.7 (4)
48	107	22.9	3.7 (4)	0.0 (0)	3.7 (4)	3.7 (4)	3.7 (4)	1.9 (2)	2.8 (3)	0.0 (0)	1.9 (2)	5.6 (6)	1.9 (2)	3.7 (4)
60	104	22.3	2.9 (3)	0.0 (0)	2.9 (3)	2.9 (3)	2.9 (3)	1.9 (2)	2.9 (3)	1.9 (2)	3.9 (4)	6.7 (7)	1.0 (1)	0.0 (0)
Total No	466		(49)	(2)	(33)	(37)	(37)	(25)	(22)	(15)	(23)	(32)	(15)	(24)
Total %		100.0	10.5	0.4	7.1	7.9	7.9	5.4	4.7	3.2	4.9	6.9	3.2	5.2

FIG 34. PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO AGE INDICATING THE NUMBER OF OCCURRENCE (SEXES COMBINED)



4.2.2 PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA DURING THE SURVEY ACCORDING TO SEX (SEXES SEPARATED).

In order to gain information on whether there are sex differentials in occurrence of diarrhoea as a result of sex preference of the parents. The sex of the child was introduced into the model.

As indicated in (Table 35 and Fig 35), in the month of September, 10.5 percent of the pre-school children had diarrhoea occurring 1 to 3 times.Only 0.4 percent of the children had diarrhoea exeeding 4 times in the month. Among the children who had diarrhoea, 11.0 percent were male children and 10.0 percent were female children. Among the children who had diarrhoea occurrence exceeding 4 times in the month, o.4 percent were male children and 0.4 percent were female children.

During the month of October, 7.1 percent of the children had diarrhoea occurring 1 to 3 times. Out of this, 5.8 percent of the children who had diarrhoea were male children and 8.3 percent were female children.

In the month of November, 7.9 percent of the pre-school children had diarrhoea occurring 1 to 3 times. Among the children who had diarrhoea, 7.1 percent were males and 8.7 percent were females.

In the month of December, a total of 7.9 percent of the pre-school children had diarrhoeal disease occurring 1 to 3 times. Among the children who had diarrhoea, 9.3 percent were males while 6.6 percent were females.

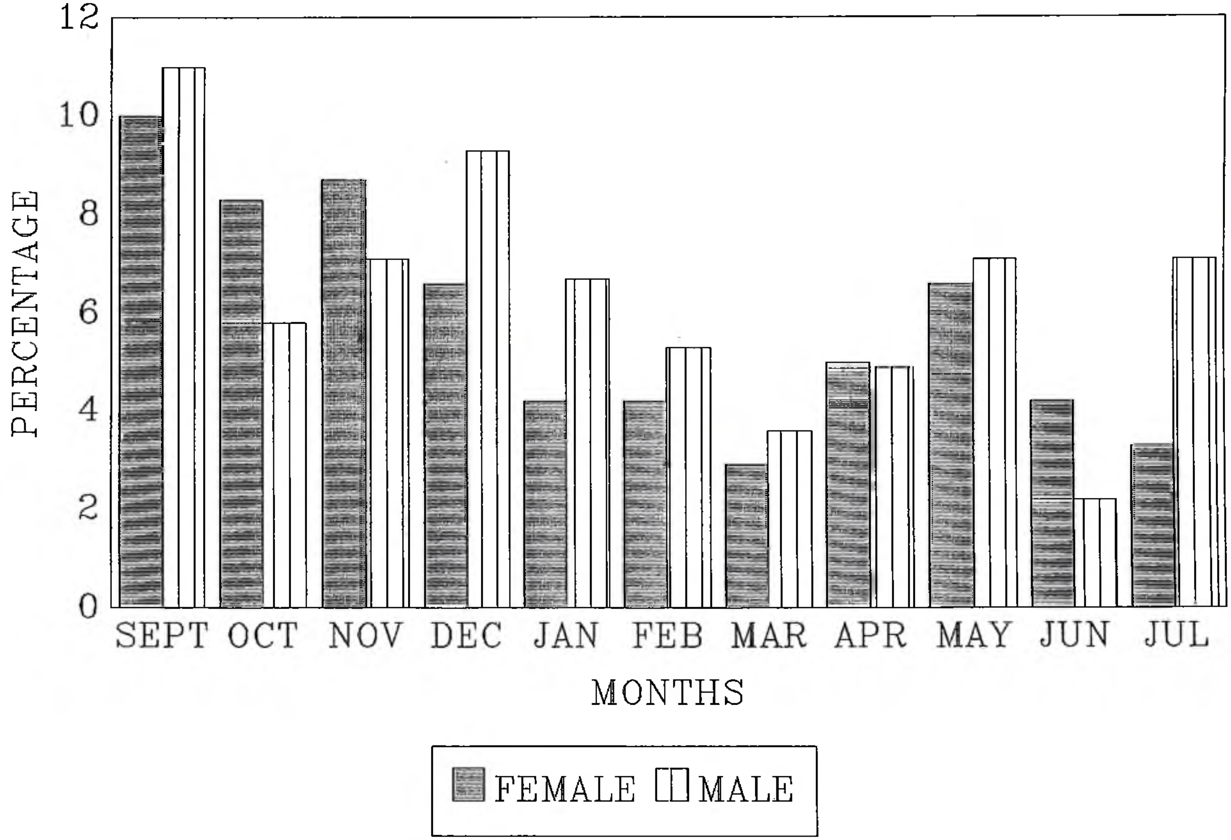
During the month of January, 5.4 percent of the children had diarrhoea. Out of this, 6.7 percent were males and 4.2 percent were females. February, March, April, May, June and July seemed to be the seasons for low diarrhoeal incidence. The percentage of children who had diarrhoea during these months were quite low for both sexes compared with other months.

PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO SEX INDICATING THE NUMBER OF OCCURRENCE (SEXES SEPARATED)

TABLE 35

Sex	Total		Sept. No of Occurrence		Oct. 1-3 Times	Nov. 1-3 Times	Dec. 1-3 Times	Jan. 1-3 Times	Feb. 1-3 Times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+										
Female	241	51.7	10.0 (24)	0.4 (1)	8.3 (20)	8.7 (21)	6.6 (16)	4.2 (10)	4.2 (10)	2.9 (7)	5.0 (12)	6.6 (16)	4.2 (10)	3.3 (8)
Male	225	48.3	11.0 (25)	0.4 (1)	5.8 (13)	7.1 (16)	9.3 (21)	6.7 (15)	5.3 (12)	3.6 (8)	4.9 (11)	7.1 (16)	2.2 (5)	7.1 (16)
Total No	466		(49)	(2)	(33)	(37)	(37)	(25)	(22)	(15)	(23)	(32)	(15)	(24)
Total %		100.0	10.5	0.4	7.1	7.9	7.9	5.4	4.7	3.2	4.9	6.9	3.2	5.2

FIG 35. PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO SEX INDICATING THE NUMBER OF OCCURRENCE (SEXES SEPARATED)



4.2.3 PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA DURING THE SURVEY ACCORDING TO RESIDENCE (SEXES COMBINED).

To obtain information on the occurrence of diarrhoeal disease in children in the urban and rural areas, place of residence of the children was introduced into the model. Table 36 and Fig 36 are the summaries of the occurrence of diarrhoeal disease among the pre-school children in the urban area compared with the rural area.

In the month of September, 10.5 percent of the children had diarrhoea. Among the children who had diarrhoea occurring 1 to 3 times, 6.8 percent were from the urban area and 15.0 percent were from the rural area. Percentage was higher among children from the rural area (15.0 percent) with the occurrence not exceeding 3 times.About 0.5 percent of children from the rural area and 0.4 percent of children from the urban area had diarrhoeal occurrence exceeding 4 times within the month.

In the month of October, 7.1 percent of children had diarrhoea, percentage of pre-school children who had diarrhoeal disease was higher among the rural children (13.6 percent) compared with those from the urban area (1.6 percent).

During the month of November, 7.9 percent of children had diarrhoea. About 13.6 percent of pre-school children who had diarrhoea were from the rural area compared with those from the urban children (3.2 percent) who also had diarrhoea for the occurrence not exceeding 3 times.

In the month of December, 7.9 percent of children had diarrhoea. Among those who had diarrhoea, 13.6 percent were from the rural area and 3.2 percent were from the urban area.

In the month of January, 5.4 percent of children had diarrhoeal disease. Out of the 5.4 percent of the children who had diarrhoeal disease, 7.9 percent were from the rural area compared with 3.2 percent from the urban area.

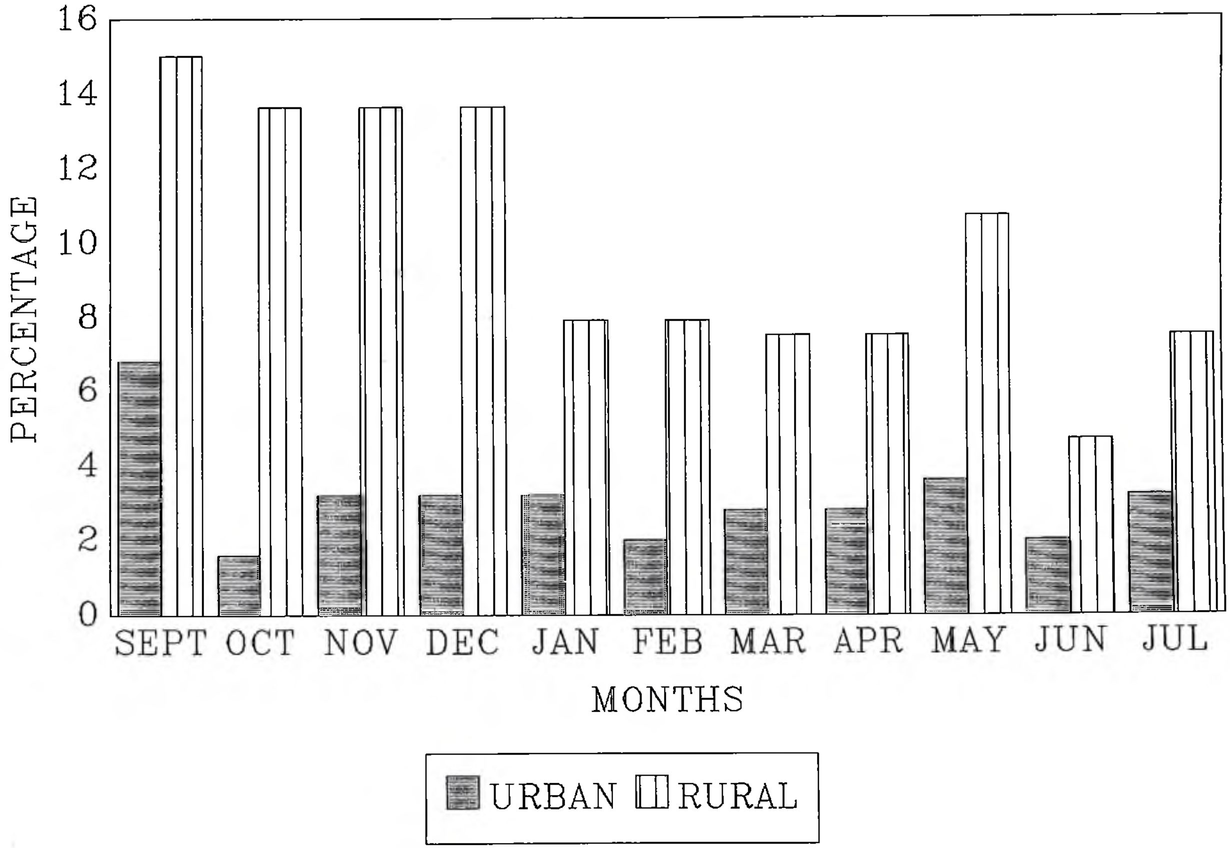
During the month of February, March, April, May, June and July, the percentages of children who had diarrhoea were 4.7 percent, 3.2 percent, 4.9 percent, 6.9 percent, 3.2 percent and 5.2 percent respectively. Among the children who had diarrhoea during these periods, percentages were higher among children from the rural area (7.9 percent, 3.7 percent, 7.5 percent 10.7 percent, 4.7 percent and 7.5 percent respectively) compared with those children from the urban area (2.0 percent, 2.8 percent, 2.8 percent, 3.6 percent, 2.0 percent and 3.2 percent respectively).

PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO RESIDENCE INDICATING THE NUMBER OF OCCURRENCE (SEXES COMBINED)

TABLE 36

Residence	Total		Sept. No of Occurrence		Oct. 1-3 Times	Nov. 1-3 Times	Dec. 1-3 Times	Jan. 1-3 Times	Feb. 1-3 times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+										
Urban	252	54.1	6.8 (17)	0.4 (1)	1.6 (6)	3.2 (8)	3.2 (8)	3.2 (8)	2.0 (5)	2.8 (7)	2.8 (7)	3.6 (9)	2.0 (5)	3.2 (8)
Rural	214	45.9	15.0 (32)	0.5 (1)	13.6 (29)	13.6 (29)	13.6 (29)	7.9 (17)	7.9 (17)	3.7 (8)	7.5 (16)	10.7 (23)	4.7 (10)	7.5 (16)
Total No	466		(49)	(2)	(33)	(37)	(37)	(25)	(22)	(15)	(23)	(32)	(15)	(24)
Total %		100.0	10.5	0.4	7.1	7.9	7.9	5.4	4.7	3.2	4.9	6.9	3.2	5.2

FIG 36. PERCENTAGE OF CHILDREN WHO HAD DIARRHOEA ACCORDING TO RESIDENCE INDICATING THE NUMBER OF OCCURRENCE (SEXES COMBINED)



4.3 INFANT FEEDING PRACTICES AND DIARRHOEA.

Mothers were asked if they had breast-fed their babies. 250 out of 252 mothers from the urban area breast-fed their babies compared with 212 out of 214 mothers in the rural areas who also breast-fed their babies.

Table 37. DISTRIBUTION OF MOTHERS WHO BREAST-FED

Response	Urban		Rural		Total	
	N	%	N	%	N	%
Yes	250	99.2	212	99.1	462	99.1
No	2	.8	2	.9	4	.9
	252	100.0	214	100.0	466	100.0

Table 37 is a summary of distribution of mothers who breast-fed their babies:. About 99.2 percent of the mothers from the urban area breast-fed their babies and 99.1 percent of the mothers in the rural areas also breast-fed their babies.

Table 38 Fig 37 shows the type of food given to the infants soon after birth before breast-feeding begins according to mothers' education: 81.0 percent of the mothers without formal education gave plain water to their babies soon after birth before the commencement of breast-feeding. Same practice was observed among the mothers with primary school education, 63.8 percent of these mothers gave plain water also to their babies before breast-feeding.

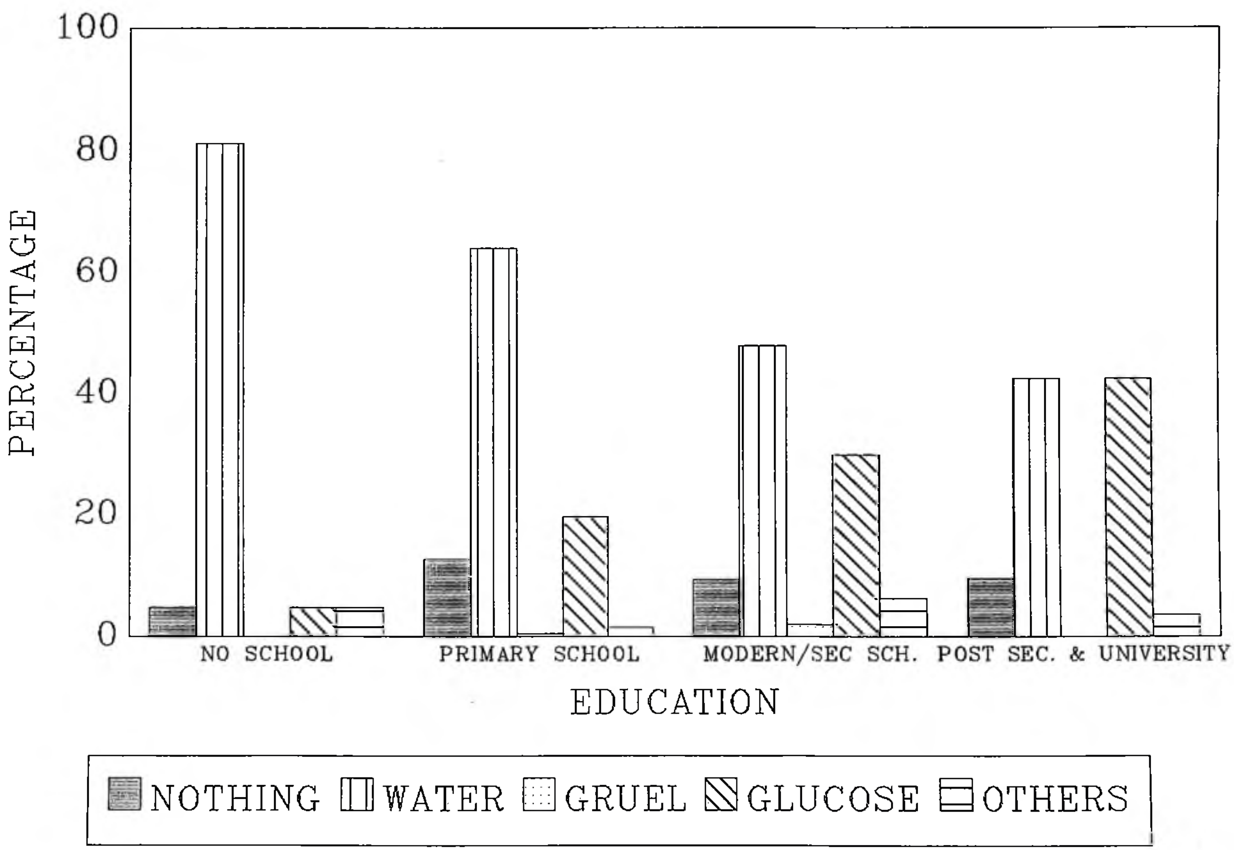
About 47.8 percent of the mothers with Secondary School education gave plain water to their children soon after birth before the initiation of breastfeeding, while 42.4 percent of the mothers with post-secondary and university education also gave plain water to their children before breast-feeding.

FOOD OFFERED TO CHILD BEFORE BREAST-FEEDING AFTER DELIVERYACCORDING TO MOTHERS' EDUCATION (SEXES COMBINED)

TABLE 38

Mother's Education	Total		Nothing		Water		Gruel		Glucose		Others	
	N	%	N	%	N	%	N	%	N	%	N	%
No School	21	4.5	1	4.8	17	81.0	0	0.0	1	4.8	1	4.8
Primary School	199	42.7	25	12.6	127	63.8	1	0.5	39	19.6	3	1.5
Modern/ Secondary School	161	34.5	15	9.3	77	47.8	3	1.9	48	29.8	10	6.2
Post-Secondary & University	85	18.2	8	9.4	36	42.4	0	0.0	36	42.4	3	3.5
	466	100.0	49	10.5	257	55.2	4	0.9	12	26.6	17	3.8

Fig 37. FOOD OFFERED TO CHILD BEFORE BREASTFEEDING AFTER DELIVERY ACCORDING TO MOTHERS' EDUCATION (SEXES COMBINED)



Percentage of children who received glucose drinks before breast-feeding was higher among mothers with post-secondary and university education (42.4 percent), 29.8 percent of mother with secondary school education, 19.6 percent of mothers with primary school education and 4.8 percent of mothers with no formal education also gave their babies glucose drinks before initiation of breast-feeding.

Table 39 and Fig 38 summarise the substances offered to infants soon after delivery before breast-feeding according to residence. On being asked, what food was offered to the baby soon after birth before initiation of breast-feeding? More than half of the infants in the sample (55.2 percent) were given plain water soon after birth, about 26.6 percent of the infants were given glucose drinks. Only 10.5 percent of the infants in the sample were not given anything before the commencement of breast-feeding.

In the urban area, about 44.8 percent of infants were given water soon after birth before the initiation of breast-feeding compared with the rural area (67.3 percent). About 34.5 percent of infants from the urban area were given glucose drinks soon after birth before initiation of breast-feeding compared with the rural area (29.8 percent). Only 9.9 percent of infants in the urban area were not given anything soon after birth before the initiation of breast-feeding compared with the rural area (11.2 percent). About 0.8 percent of infants from the urban area were given corn porridge before initiation of breast-feeding and 0.9 percent were from the rural area.

FOOD OFFERED TO INFANTS SOON AFTER DELIVERY BEFORE BREASTFEEDING ACCORDING TO RESIDENCE (SEXES COMBINED)

TABLE 39

Residence	Total		Nothing		Water		Corn Porridge		Glucose		Others	
	N	%	N	%	N	%	N	%	N	%	N	%
Urban	252	54.1	25	9.9	113	44.8	2	0.8	87	34.5	12	4.3
Rural	214	45.9	24	11.2	144	67.3	2	0.9	37	29.8	5	1.5
	466	100.0	49	10.5	257	55.2	4	0.9	124	26.6	17	3.6

FIG 38. FOOD OFFERED TO INFANT SOON AFTER DELIVERY BEFORE BREASTFEEDING ACCORDDING TO RESIDENCE (SEXES COMBINED)

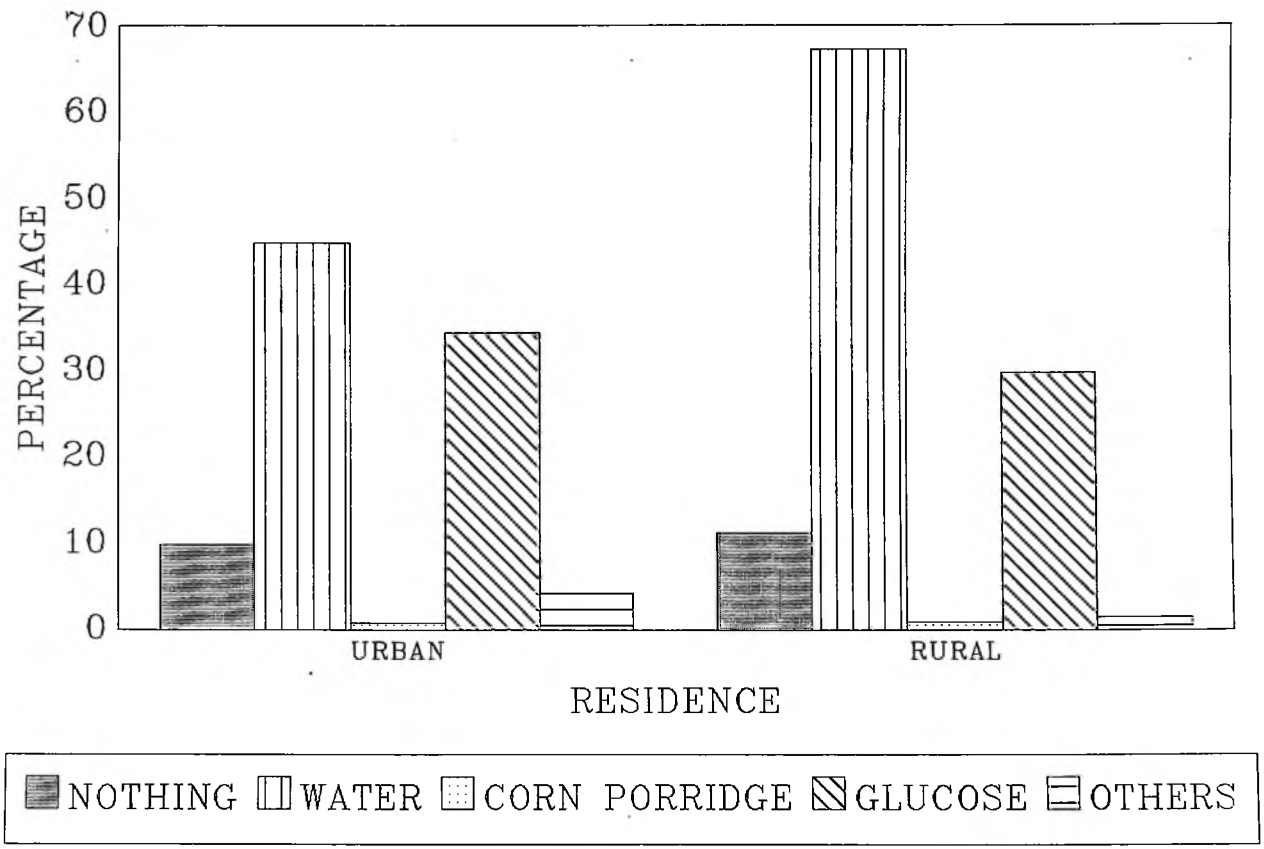


Table 40 and Fig 39 give summaries of the number of times an infant was breast-fed in a day according to residence:

Mothers were asked, how many times a day did you breast-feed your baby? Majority of the babies, about 81.1 percent were breast-fed on demand. About 78.6 percent of the babies from the urban area were breast-fed on demand. A slightly higher percentage (84.1 percent) of the babies from the rural areas received breast-feeding on demand. A few minority of the infants received breast-feeding on schedule both in the urban and rural areas.

Table 41 and Fig 40 give a summary of age at which breast-feeding was stopped according to residence.

In the urban area, about 6.7 percent of infants aged 1-3 months had been taken off the breasts compared with the rural area where no infant was taken off the breast at that age. At 4-6 months, 5.6 percent of the infants in the urban area had been taken off the breasts as against 0.9 percent in the rural areas. At the age of 7-9 months, about 18.3 percent of children from urban area had been taken off the breasts compared with 2.8 percent of children in the rural areas. At the end of 12 months of age, about 46.4 percent of the children from urban area had been taken off the breasts compared with 22.4 percent from the rural area.

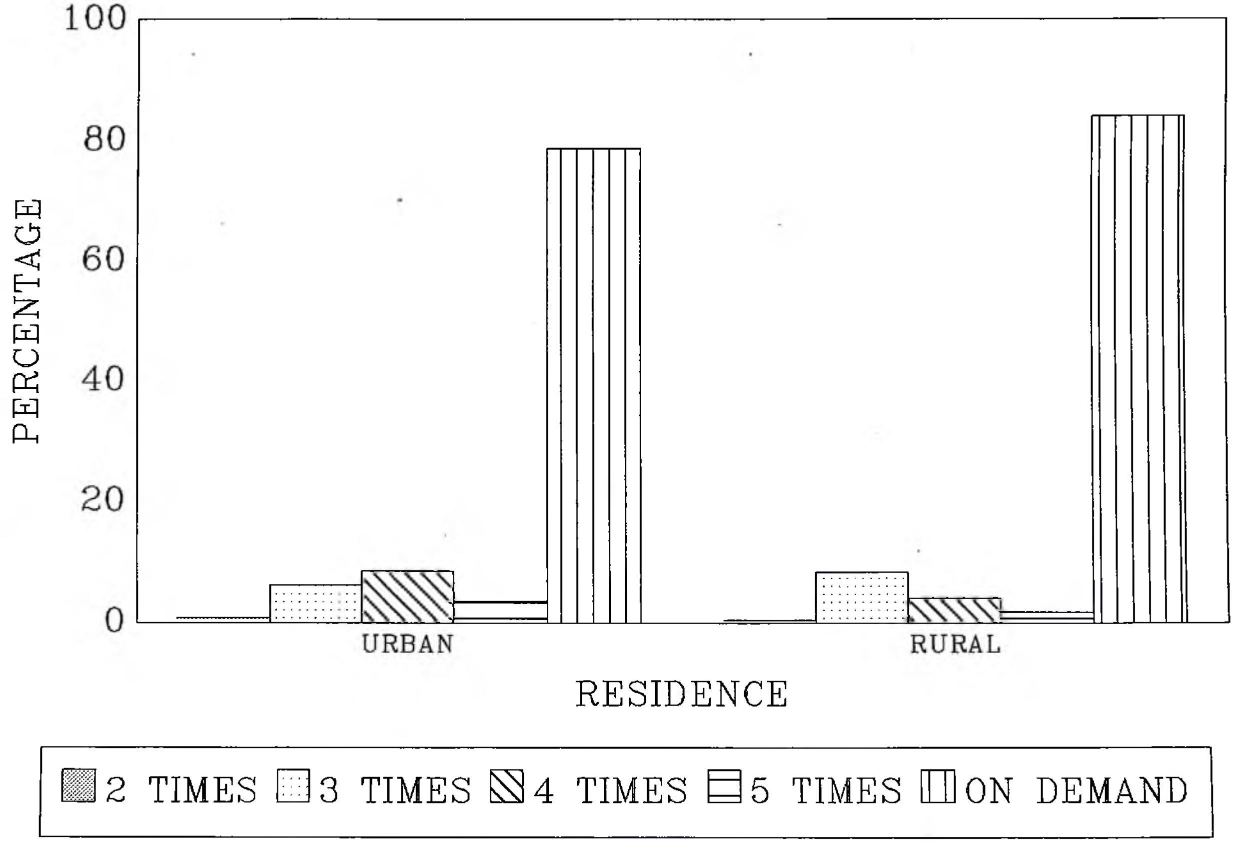
Majority of children from the rural areas were still breast-fed at the age of 18 months (1.8 percent) compared with 3.2 percent from the urban area. At the age of 22 months and above, 1.9 percent of the rural children were still being breast-fed compared with 1.2 percent of the children from the urban area.

NUMBER OF TIMES AN INFANT WAS BREAST-FED IN A DAY BY RESIDENCE (SEXES COMBINED)

TABLE 40

Residence	Total		2 Times		3 Times		4 Times		5 Times		On Demand	
	N	%	N	%	N	%	N	%	N	%	N	%
Urban	252	54.1	2	0.8	16	6.3	22	8.7	9	3.6	198	78.6
Rural	214	45.9	1	0.5	18	8.4	9	4.2	4	1.9	180	84.1
	466	100.0	3	0.6	34	7.3	31	6.7	13	2.8	378	81.1

FIG 39. NUMBER OF TIMES AN INFANT WAS BREAST-FED IN A DAY BY RESIDENCE (SEXES COMBINED)



AGE AT WHICH BREASTFEEDING WAS STOPPED ACCORDING TO RESIDENCE (SEXES COMBINED)

TABLE 41

	Total		1 - 3 Months		4 - 6 Months		7 - 9 Months		10-12 Months		13-15 Months		16-18 Months		19-21 Months		22+ Months		NA	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Urban	252	54.1	17	6.7	14	5.6	46	18.3	117	46.4	41	16.3	8	3.2	3	1.2	3	1.2	3	1.2
Rural	214	45.9	0	0.0	2	0.9	6	2.8	48	22.4	80	37.4	68	31.8	1	0.5	4	1.9	5	2.3
	466	100.0	17	3.6	16	3.4	52	11.2	165	35.4	121	26.0	76	16.3	4	0.9	7	1.5	8.	1.7

FIG 40. AGE AT WHICH BREASTFEEDING WAS STOPPED ACCORDING TO RESIDENCE (SEXES COMBINED)

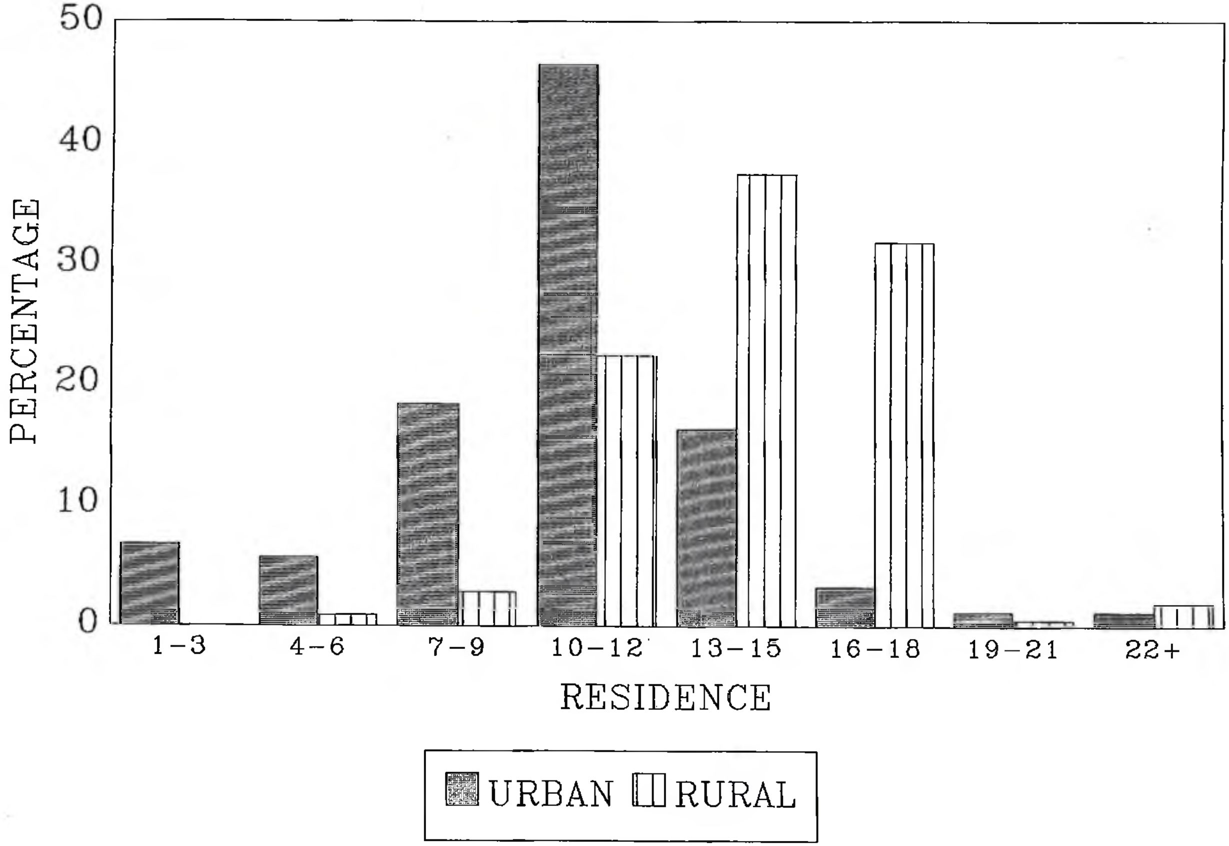


Table. 42 Fig 41 summarise the age at which milk was given to the infants from the bottle.

Majority of infants received milk from the bottles during the first two weeks of life. About 50.0 percent from the urban area and 81.8 percent from the rural areas.At the age of 1-3 months of life, about 34.5 percent of the infants from the urban area received milk from the bottle compared with the rural area (2.8 percent).

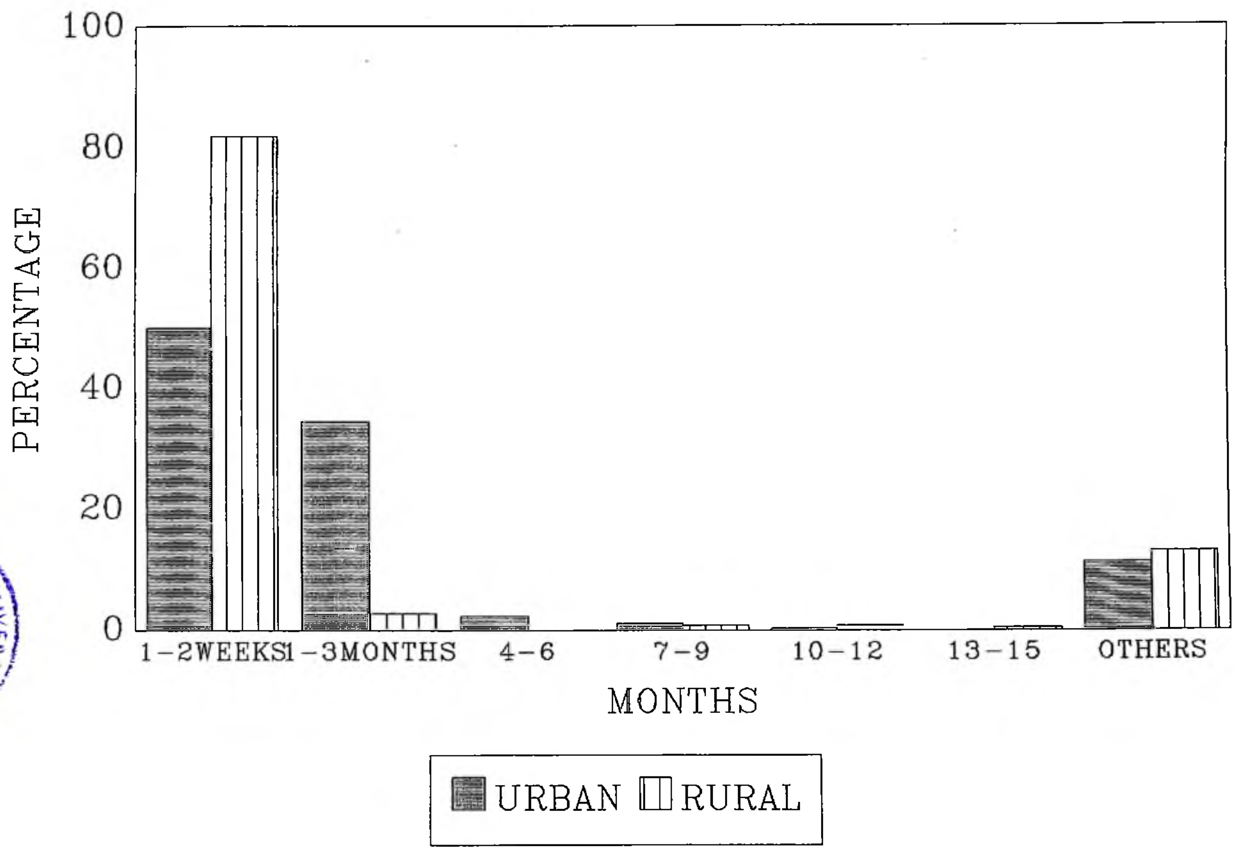
About 2.4 percent of the infants fron the urban area received milk from the bottle at the age of 4-6months compared to none in the rural area. At the ages of 7-9months, 10 - 12 months and 13-15 months. About 1.2 percent, 0.4 percent and 0.0 percent respectively of the infants from the urban area have received milk from the bottle compared with 0.9 percent, 0.9 percent and 0.5 percent of infants from the rural areas at these ages who have also received milk from the bottle.

AGE AT WHICH INFANTS WERE GIVEN MILK FROM THE BOTTLES ACCORDING TO RESIDENCE (SEXES COMBINED)

TABLE 42

	Total		1st day to 2 weeks		1 - 3 Months		4 - 6 Months		7 - 9 Months		10-12 Months		13 - 15 Months		Others	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Urban	252	54.1	126	50.0	87	34.5	6	2.4	3	1.2	1	0.4	0	0.0	29	11.3
Rural	214	45.9	175	81.8	6	2.8	0	0.0	2	0.9	2	0.9	1	0.5	28	13.1
	466	100.0	301	64.6	93	20.0	6	1.3	5	1.1	3	0.6	1	0.2	57	12.2

FIG 41. AGE AT WHICH INFANTS WERE GIVEN MILK FROM THE BOTTLES ACCORDING TO RESIDENCE (SEXES COMBINED)



4.3.1 RELATIONSHIP BETWEEN INFANTS FEEDING PRACTICES AND DIARRHOEA

Tables 39 and Fig 38 present data on feeding practices among children,:

More than 50.0 percent of the pre-school children had early supplementation with water and other foods even though it has been shown that these practices increase the risk of infectious diseases especially diarrhoea.

Furthermore, bottles with nipples were used in the feeding of all supplementory liquids and this increased the likelihood of diarrhoeal diseases. As an exclusive breast-feeding is such a rare event in Nigeria, the protective effect of breast milk becomes somewhat diluted by the utilization of contaminated weaning foods soon after birth resulting in diarrhoeal disease.

4.4 STUDY III

The materials presented here are based on the questionnaires of appendices 1 and 4.

Information was collected from the mothers of the pre-school children on the prevalence and severity of infectious diseases - such as acute respiratory tract infections, malaria, diarrhoea and measles. Factor analysis was used in grouping the children according to their social strata.

Table 43 Variables used in the factor analysis

- Fathers education
- Mothers education
- Fathers occupation
- Mothers occupation
- Types of residence and furniture
- Property owned
- Means of transport
- Bathroom and toilet facilities
- Cooking facility
- Source of water supply

The prevalence and the severity of infectious diseases among the pre-school children was assessed by asking the mothers if their children had suffered from any of the illnesses under investigation during the reference periods.

4.4.1 PERCENTAGE OF CHILDREN WITH ARTI OCCURRENCE ACCORDING TO SOCIO-ECONOMIC CLASS (SEXES COMBINED)

Table 44 and Fig 42 show the percentage of the children who had acute respiratory tract infections (ARTI) during the survey according to socio-economic class.

In the month of September, 15.5 percent of children suffered from acute respiratory tract infections (ARTI) ranging between 1 to 3 times. Among the children who had ARTI, percentage was highest among pre-school children from low socio-economic class (21.4 percent) and children from middle socio-economic class (14.3 percent) compared with children from high socio-economic class (5.3 percent).

During the month of October, 9.2 percent of children had ARTI ranging between 1 to 3 times. Among children who had ARTI, percentage was highest among children from low socio-economic class (10.2 percent) and those from middle socio-economic class (8.6 percent) compared with children from high socio-economic class (8.4 percent).

The pattern continued to the month of November. In the month of Novenber, 11.4 percent of pre-school children were reported as having suffered from ARTI. Among the children who had ARTI, 9.7 percent were children from low socio-economic background, 16.0 percent were from middle socio-economic class and 5.3 percent came from high socio-economic class.

Similarly, the prevalence of ARTI according to socio-economic status was observed throughout the period, in the month of December, 11.8 percent of the pre-school children suffered from ARTI. Out of this number, 16.3 percent were from low socio-economic group, 9.7 percent were from the middle socio-economic class and 6.3 percent came from high socio-economic class.

During the month of January, 3.6 percent of the children had ARTI ranging between 1 to 3 occurrences. Among those who had ARTI, 5.1 percent were from low socio-economic class, 2.3 percent were from the middle socio-economic class and 3.2 percent were from high socio-economic class.

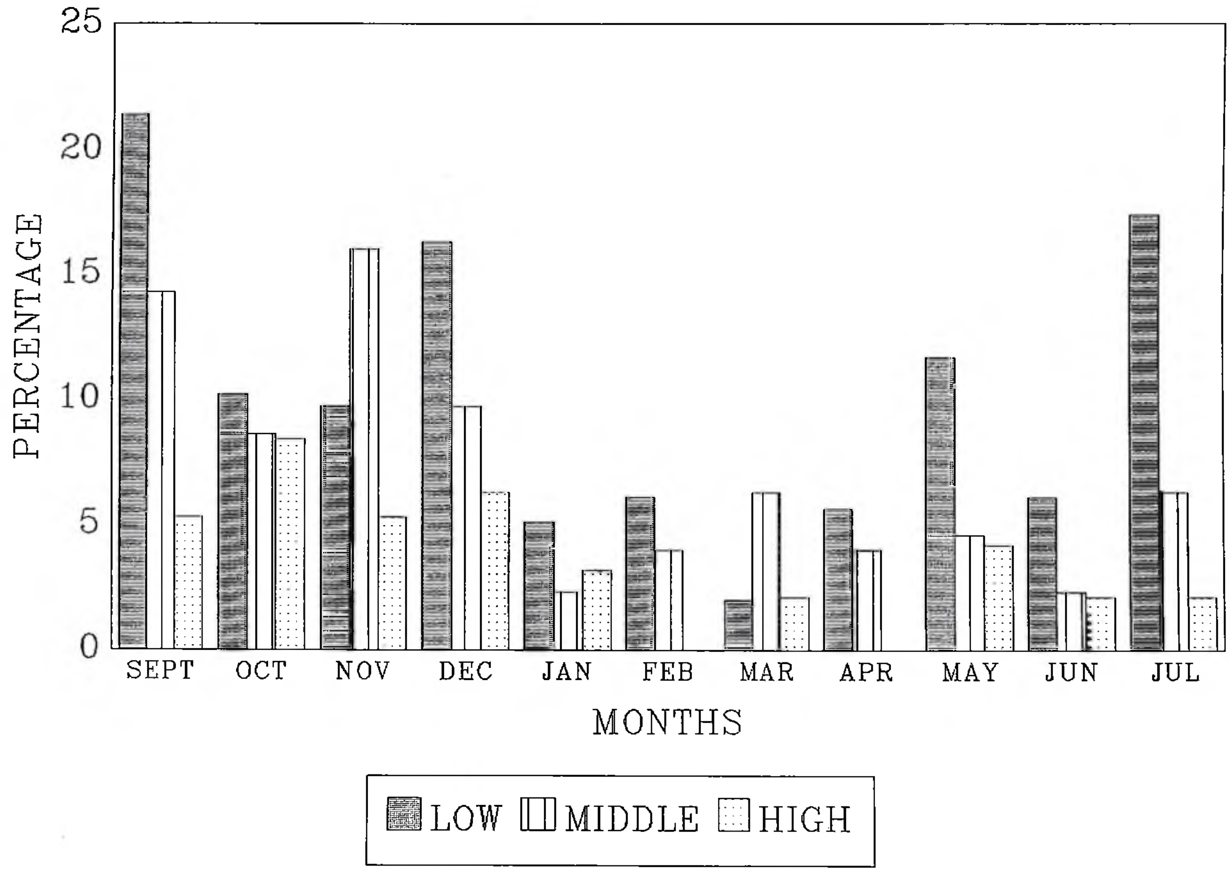
The trend continued throughout the period of survey. Percentage of children who suffered from ARTI was observed to be highest among children from low socio-economic class, followed by children from middle socio-economic class with least occurrence among children from high socio-economic class.

THE PERCENTAGE OF CHILDREN WITH ACUTE RESPIRATORY TRACT INFECTION DURING THE PERIOD OF FIELD SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

TABLE 44

Socio Economic Class	Total		Sept. No of Occurrence		Oct. 1-3 Times	Nov. 1-3 Times	Dec. 1-3 Times	Jan. 1-3 Times	Feb. 1-3 times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+										
Low	196	42.0	21.4 (42)		10.2 (20)	9.7 (19)	16.3 (32)	5.1 (10)	6.1 (12)	2.0 (4)	5.6 (11)	11.7 (23)	6.1 (12)	17.4 (34)
Middle	175	37.6	14.3 (25)		8.6 (15)	16.0 (28)	9.7 (17)	2.3 (4)	4.0 (7)	6.3 (11)	4.0 (7)	4.6 (8)	2.3 (4)	6.3 (11)
High	95	20.4	5.3 (5)		8.4 (8)	5.3 (5)	6.3 (6)	3.2 (3)	0.0 (0)	2.1 (2)	0.0 (0)	4.2 (4)	2.1 (2)	2.1 (2)
Total No.	466		(72)		(43)	(52)	(55)	(17)	(19)	(17)	(18)	(35)	(18)	(47)
Total %		100.0	15.5		9.2	11.4	11.8	3.6	4.1	3.6	3.9	7.5	3.9	10.1

FIG 42. PERCENTAGE OF CHILDREN WITH ACUTE RESPIRATORY TRACT INFECTION DURING THE SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)



4.4. 2 PERCENTAGE OF CHILDREN WITH ACUTE RESPIRATORY TRACT INFECTION (ARTI) INDICATING SEVERITY BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

In the month of September, severity of Acute Respiratory Tract Infections as it affects the children was recorded according to socio-economic class. (Table 45 Fig 43) Among the children who had mild ARTI, percentage was highest among children from low socio-economic group (8.2 percent)

Percentage of children who had moderate ARTI was highest among children from middle socio-economic class (6.9 percent) and children from low socio-economic class (6.1 percent). Percentage of children who had severe ARTI was highest among children from low socio-economic class (7.1 percent) compared with children from middle socio-economic class (5.1 percent) and those from high socio-economic class (2.1 percent).

Similarly, in the month of October, percentage of children who had mild ARTI was highest among children from low socio-economic class (2.6 percent). Among the children who had moderate ARTI, percentage was highest among children from high socio-economic class (4.2 percent). Among those children who had severe ARTI, percentages were highest among children from low socio-economic class (3.1 percent) compared with children from middle socio-economic class (2.9 percent) and those from high socio- economic class (2.1 percent).

During the month of November, percentage of pre-school children who had mild ARTI was highest among children from middle socio-economic class (3.4 percent). Among the children who had moderate ARTI, percentage was highest among children from middle socio-economic class (7.4 percent). Among those children who had severe ARTI, percentage was highest among children from low socio-economic class (5.1 percent) and children from middle socio-economic class (5.1 percent) compared with children from high socio-economic class (3.2 percent).

The same pattern of severity was observed throughout the period of study. In the month of December, percentage of children who had mild ARTI was highest among children from low socio-economic class (3.1 percent). Among the children who had moderate ARTI, percentage was highest among children from low socio-economic class (8.7 percent). Among the children who had severe ARTI , percentage was highest among children from low socio-economic class (4.6 percent) compared with children from middle socio-economic class (3.4 percent) and high socio-economic class (1.1 percent).

In January, percentage of children who had mild ARTI was highest among children from low socio-economic class (1.5 percent), those who had moderate ARTI, percentage was highest among children from low socio-economic class (3.1 percent). Among the children who had severe ARTI, percentage was highest among children from low and middle socio-economic classes (0.5 percent and 0.6 percent respectively). No child from high socio-economic class had severe ART1 (0.0 percent).

A similar trend was observed in the month of February. Among the children who had mild ARTI, percentage was highest among children from low socio-economic class (0.5 percent). Percentage of children who had moderate ARTI was highest among children from low socio-economic class (3.6 percent) and those who had severe ARTI the percentage was highest among children from low socio-economic class (2.0 percent) compared to that of middle socio-economic group (0.6 percent), and high socio-economic group (0.0 percent).

Generally, the trend continued throughout the period of survey. Severity of ARTI was highest among children from low socio-economic class, followed by children from middle socio-economic class with less severity among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH ARTI DURING THE PERIOD OF SURVEY INDICATING THE SEVERITY BY SOCIO ECONOMIC CLASS (SEXES COMBINED)

TABLE 45

Socio Economic Class	Total		SEPT. SEVERITY			OCT. SEVERITY			NOV. SEVERITY			DEC SEVERITY			JAN. SEVERITY		
	No	%	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	196	42.0	8.2 (16)	6.1 (12)	7.1 (14)	2.6 (5)	4.1 (8)	3.1 (6)	0.0 (0)	4.5 (9)	5.1 (10)	3.1 (6)	8.7 (17)	4.6 (9)	1.5 (3)	3.1 (6)	0.5 (1)
Middle	175	37.6	2.3 (4)	6.9 (12)	5.1 (9)	2.3 (4)	4.0 (7)	2.9 (5)	3.4 (6)	7.4 (13)	5.1 (9)	0.6 (1)	5.7 (10)	3.4 (6)	0.6 (1)	1.1 (2)	0.6 (1)
High	95	20.4	0.0 (0)	3.2 (3)	2.1 (2)	2.1 (2)	4.2 (4)	2.1 (2)	0.0 (0)	2.1 (2)	3.2 (3)	1.1 (1)	4.2 (4)	1.1 (1)	1.1 (1)	2.1 (2)	0.0 (0)
Total No.	466		(20)	(27)	(25)	(11)	(19)	(13)	(6)	(24)	(22)	(8)	(31)	(16)	(5)	(10)	(2)
Total %		100.0	4.3	5.8	5.4	2.4	4.1	2.8	1.3	5.2	4.9	1.7	6.7	3.4	1.1	2.1	0.4

Socio Economic Class	FEB. SEVERITY			MAR. SEVERITY			APRIL SEVERITY			MAY SEVERITY			JUN. SEVERITY			JUL. SEVERITY		
	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	0.5 (1)	3.6 (7)	2.0 (4)	0.0 (0)	1.5 (3)	0.5 (1)	3.1 (6)	1.5 (3)	1.0 (2)	5.1 (10)	5.1 (10)	1.5 (3)	2.0 (4)	2.6 (5)	1.5 (3)	4.1 (8)	11.2 (22)	2.0 (4)
Middle	0.0 (0)	3.4 (6)	0.6 (1)	3.4 (6)	2.9 (5)	0.0 (0)	1.1 (2)	2.9 (5)	0.0 (0)	2.3 (4)	2.3 (4)	0.0 (0)	0.0 (0)	1.7 (3)	0.6 (1)	1.1 (2)	4.0 (7)	1.1 (2)
High	0.0 (0)	0.0 (0)	0.0 '(0)	0.0 (0)	2.1 (2)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	2.1 (2)	0.0 (0)	2.1 (2)	0.0 (0)	1.1 (1)	1.1 (1)	0.0 (0)	2.1 (2)	0.0 (0)
Total No.	(1)	(13)	(5)	(6)	(10)	(1)	(8)	(8)	(2)	(16)	(14)	(5)	(4)	(9)	(5)	(10)	(31)	(6)
Total %	0.2	2.8	1.1	1.3	2.1	0.2	1.7	1.7	0.4	3.4	3.0	1.1	0.9	1.9	1.1	2.1	6.7	1.3

ML - Mild
MOD - Moderate
SEV - Severe

() No. of Children

FIG 43(a). PERCENTAGE OF CHILDREN WITH ARTI DURING THE SURVEY INDICATING THE MILD FORM OF ARTI BY SOCIO-ECON CLASS (SEXES COMBINED)

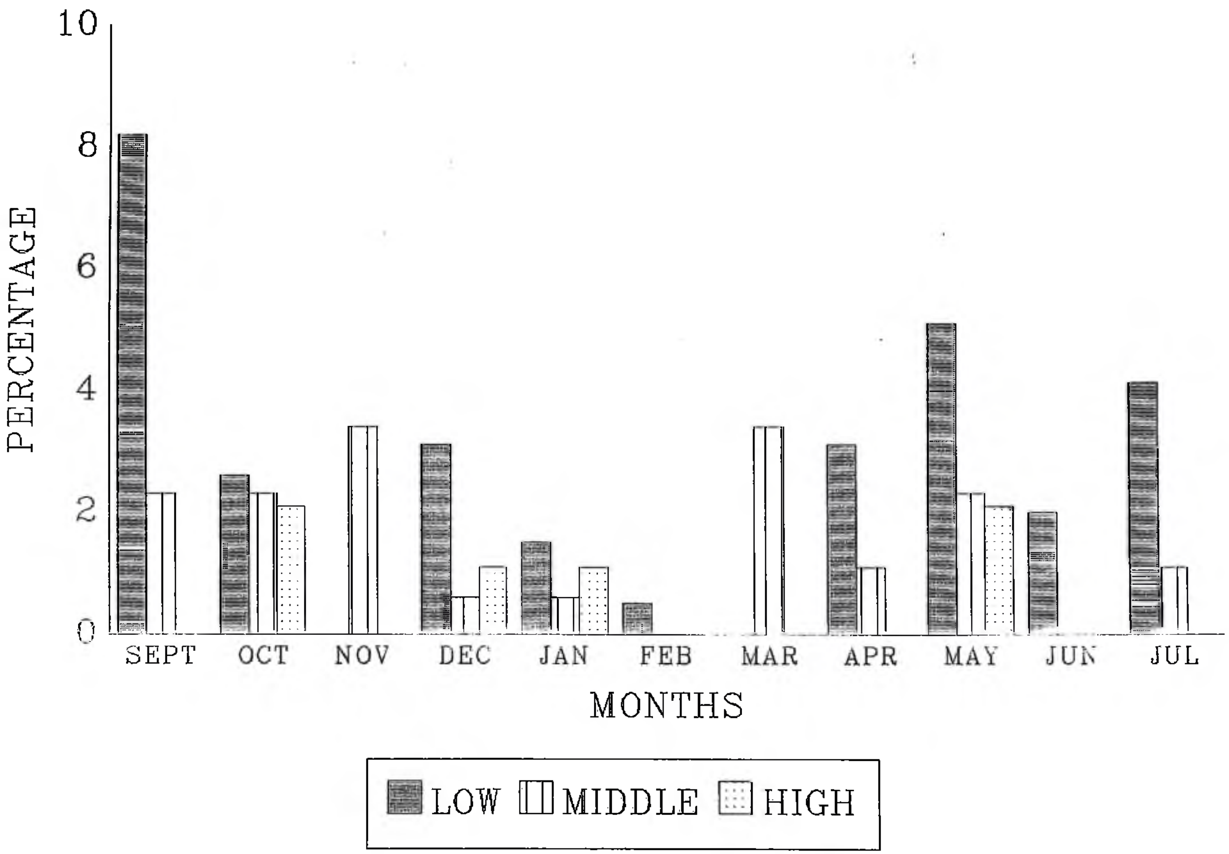


FIG 43(b). PERCENTAGE OF CHILDREN WITH ARTI DURING THE SURVEY INDICATING MODERATE FORM OF ARTI BY SOCIO-ECON CLASS (SEXES COMBINED)

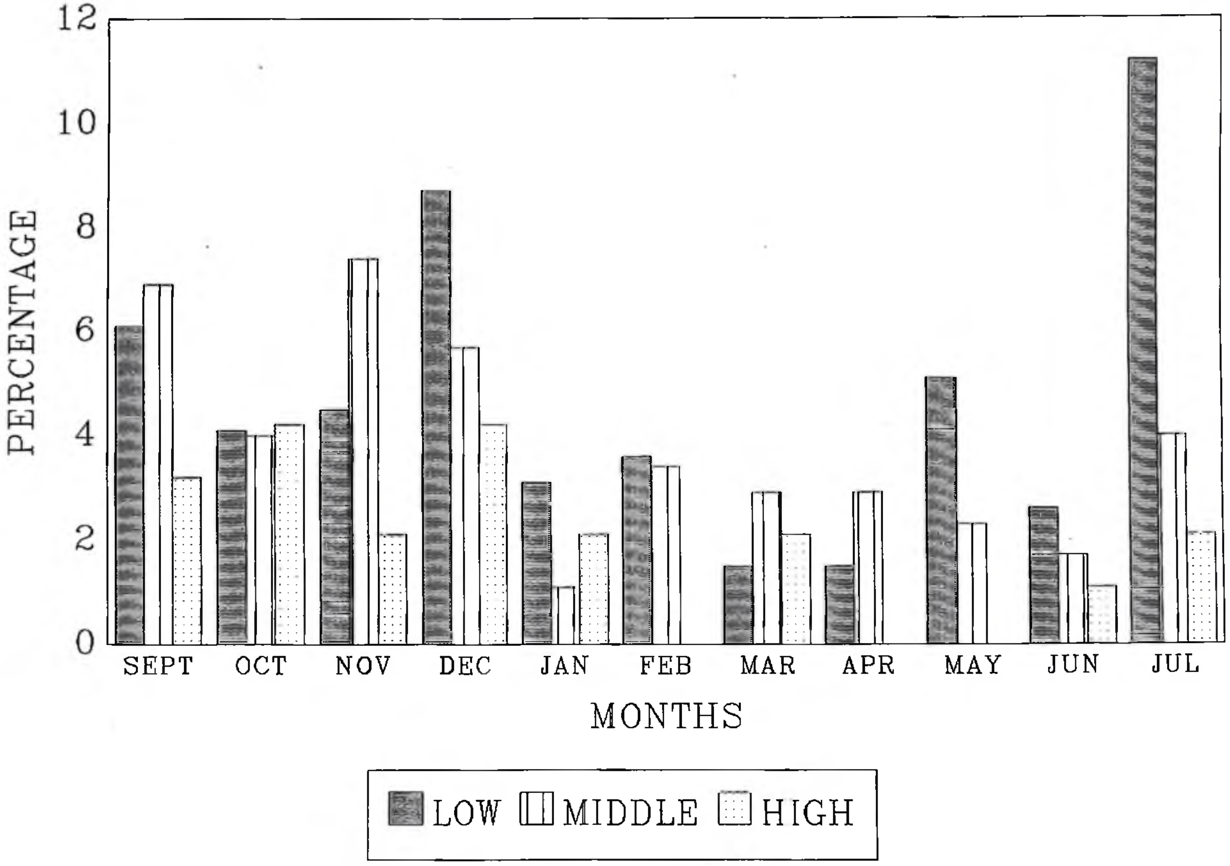
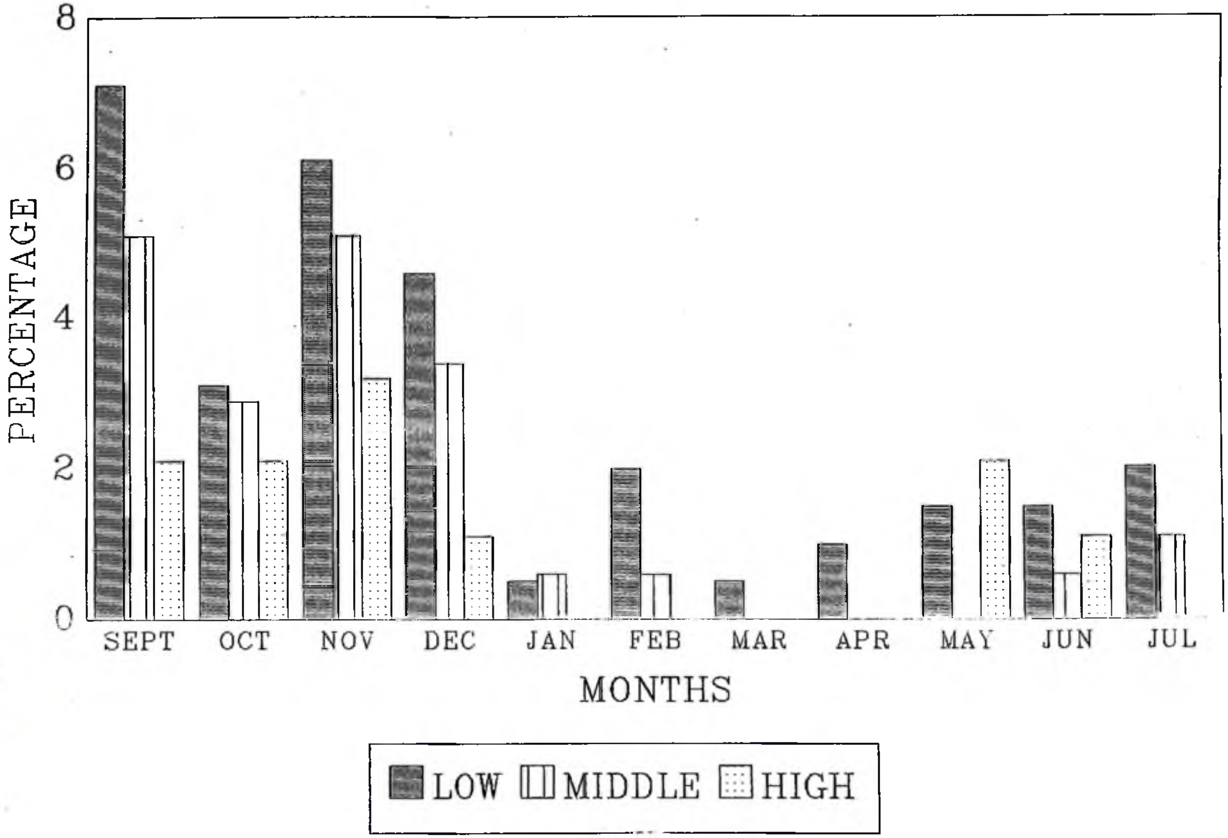


FIG 43(c). PERCENTAGE OF CHILDREN WITH ARTI DURING THE SURVEY INDICATING SEVERE FORM OF ARTI BY SOCIO-ECON CLASS (SEXES COMBINED)



4.4.3 PERCENTAGE OF CHILDREN WITH MALARIA INDICATING OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED).

Table 46 and Fig 44 show summaries of prevalence of malaria by socio-economic class.

On being asked "has your child suffered from malaria?" About half of the mothers of pre-school children (48.5 percent) claimed that their children had malaria 1 to 3 times. About 2.2 percent of children had malaria more than 4 times in the month of September. Out of the children who had malaria 1 to 3 times, 65.3 percent were from low socio-economic class, 44.6 percent were from middle socio-economic class and 21.1 percent came from high socio-economic class. Among those who had malaria more than 4 times in the month of September, 3.4 percent were from low socio-economic class, 1.7 percent were from middle socio-economic class, and no child from high socio-economic class had malaria more than 4 times in the month of september.

In the month of October, 27.3 percent of pre-school children had malaria 1 to 3 times. Out of the 27.3 percent of the children who had malaria, 31.1 percent were from low socio-economic class, 28.6 percent were from the middle socio-economic class and 16.8 percent were from the high socio-economic class.

During the month of November, 35.4 percent of pre-school children were reported as having had malaria 1 to 3 times. Among those who had malaria, percentage was highest among children from low socio-economic class (44.4 percent). 32.0 percent were from the middle socio-economic class and 23.2 percent were from high socio-economic class. About 0.4 percent of the children were reported to have suffered from malaria over 4 times. Those who suffered from malaria over 4 times in the month of November, were children from low socio-economic class (1.0 percent) only.

A similar trend was observed in the month of December. About 22.1 percent of the children suffered from malaria ranging between 1 to 3 times. About 0.4 percent of the children had malaria ranging over 4 times. Among the children who had malaria 1 to 3 times, about 43.4 percent were from the low socio-economic class, 9.7 percent came from middle socio-economic class and 1.1 percent were from the high socio-economic class. Among those who had malaria over 4 times, 0.5 percent were from the low socio-economic class, 0.6 percent were from the middle socio-economic class. No child from high socio-economic class had malaria over 4 times.

Prevalence of malaria was also observed in the month of January. About 23.8 percent of the children suffered from malaria in January. Out of these children, 29.6 percent of the children were from low socio-economic class. 24.6 percent were from the middle socio-economic class and 10.5 percent were from high socio-economic class.

In the month of February, 22.3 percent of the children had malaria ranging between 1 to 3 occurrences. Among those children who had malaria about 32.7 percent were from low socio-economic class, 19.4 percent were from middle socio-economic class and 6.3 percent were from high socio-economic class.

Similarly, during the month of March, about 18.5 percent of the children had malaria ranging between 1 to 3 occurrences. Out of those who had malaria, about 24.0 percent were from low socio-economic group, 17.1 percent were from the middle socio-economic class and 9.5 percent were from high socio-economic class.

The trend continued to April. In the month of April, about 20.8 percent of children suffered from malaria. Among those who had malaria, percentage was highest among children from low socio-economic class (27.6 percent) compared with children from middle socio-economic class (18.3 percent) and those from high socio-economic class (11.6 percent).

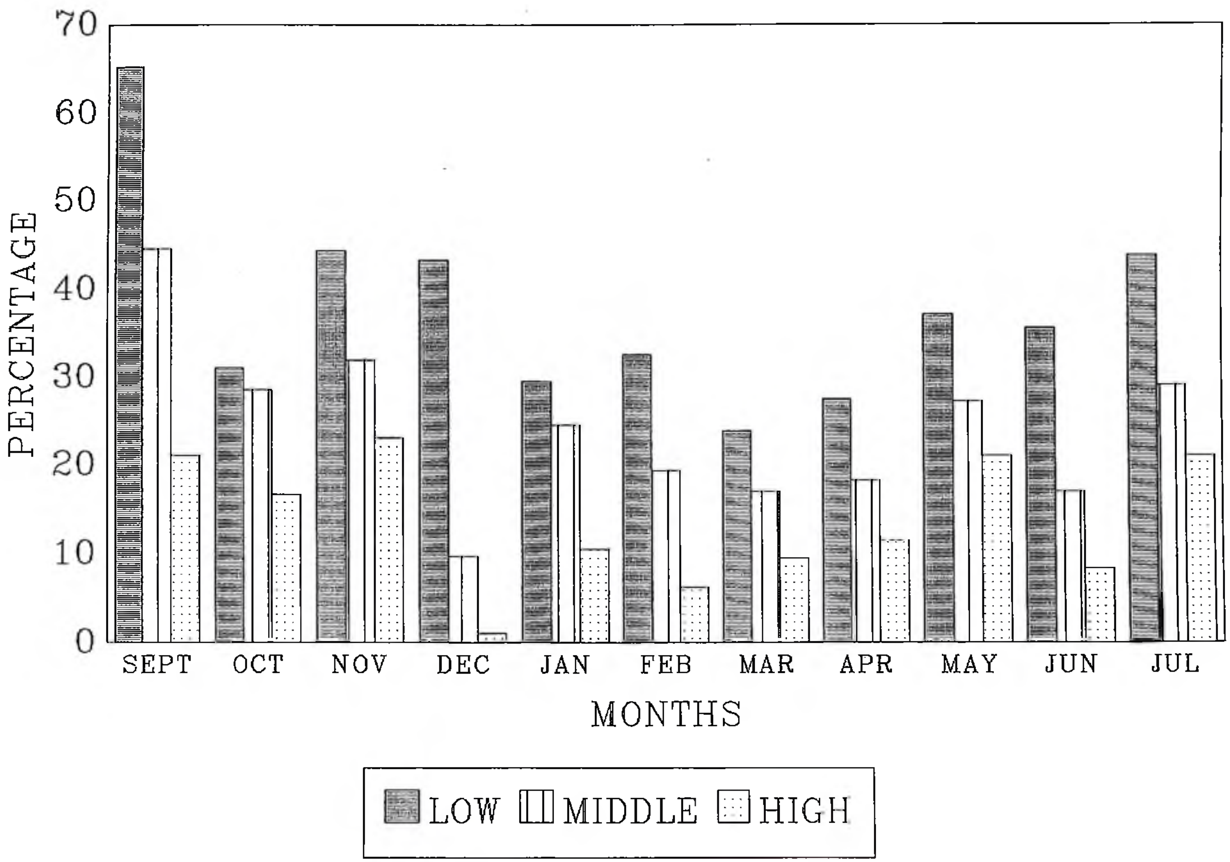
Prevalence of malaria among the pre-school children was observed throughout the period of survey to the month of July. Percentage of occurrence was highest among children from low socio-economic class followed by children from middle socio-economic class, With less occurenece among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH MALARIA DURING THE PERIOD OF FIELD SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

TABLE 46

Socio Economic Class	Total		Sept. No. of Occurrence		Oct. 1-3 Times	Nov. 1-3 Times	Nov. 4 Times	Dec. 1-3 Times	Dec. 4 Times	Jan. 1-3 Times	Feb. 1-3 times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+												
Low	196	42.0	65.3 (128)	3.6 (7)	31.1 (61)	44.4 (87)	1.0 (2)	43.4 (85)	0.5 (1)	29.6 (58)	32.7 (64)	24.0 (47)	27.6 (54)	37.3 (73)	35.7 (70)	43.9 (86)
Middle	175	37.6	44.6 (78)	1.7 (3)	28.6 (50)	32.0 (56)	0.0 (0)	9.7 (17)	0.6 (1)	24.6 (43)	19.4 (34)	17.1 (30)	18.3 (32)	27.4 (48)	17.1 (30)	29.1 (51)
High	95	20.4	21.1 (20)	0.0 (0)	16.8 (16)	23.2 (22)	0.0 (0)	1.1 (1)	0.0 (0)	10.5 (10)	6.3 (6)	9.5 (9)	11.6 (11)	21.1 (20)	8.4 (8)	21.1 (20)
Total No	466		(226)	(10)	(127)	(165)	(2)	(103	(2)	(111)	(104)	(86)	(97)	(141)	(108)	(157)
Total %		100.0	48.5	2.2	27.3	35.4	0.4	22.1	0.4	23.8	22.3	18.5	20.8	30.3	23.2	33.7

FIG 44. PERCENTAGE OF CHILDREN WITH MALARIA DURING THE SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)



4.4. 4 PERCENTAGE OF CHILDREN WITH MALARIA INDICATING SEVERITY BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

Table 47 and Fig 45 display severity of malaria by socio-economic class.

About half of the mothers (50.6 percent) reported on severity of malaria among their children in the month of september. Among children who had mild form of malaria, percentage was highest among children from low socio-economic class (10.2 percent). Those children who had moderate form of malaria, percentage was highest among children from low socio-economic class (26.5 percent). percentage of children who had severe form of malaria was highest among children from low socio-economic class (32.1 percent) compared with children from middle socio-economic class (18.3 percent) and children from high socio- economic class (7.4 percent).

During the month of October, percentage of children who had mild form of malaria was highest among children from low socio-economic class (7.1 percent). Among children who had moderate form of malaria, percentage was highest among children from low socio-economic class (11.7 percent). Those children who had severe form of malaria, percentage was highest among children from low socio-economic class (12.2 percent) compared with children from middle socio-economic class (11.4 percent) and those from high socio-economic class (5.3 percent).

Similarly, in the month of November, severity of malaria was also observed. Among children who had mild form of malaria, percentage was highest among children from low socio-economic class (2.6 percent). Percentage of children who had moderate form of malaria was highest among children from low socio-economic class (19.4 percent).

Those who had severe form of malaria, percentage was highest among children from low socio-economic class (23.5 percent) compared with children from middle and high socio-economic classes (17.7 percent and 10.5 percent respectively). The trend continued to the month of December. In the month of December, percentages of children who had mild and moderate forms of malaria were highest among children from low socio-economic group (3.1 percent and 24.0 percent respectively). Among those children who had severe form of malaria, percentage was highest among those from low socio-economic group (16.8 percent) compared with children from middle and high socio-economic groups (5.1 percent and 0.0 percent respectively).

Severity of malaria was also reported by the mothers of pre-school children in the month of January. Among the children who had mild and moderate forms of malaria, percentage were highest among children from middle and low socio-economic groups (9.1 percent and 16.3 percent respectively). Among those who had severe form of malaria, percentage was highest among children from low socio-economic class (9.7 percent) compared with those from middle socio-economic class (5.1 percent) and those from high socio-economic class (2.3 percent).

In the month of February, percentages of children who had mild and moderate forms of malaria were highest among children from low socio-economic class (8.2 percent and 12.8 percent respectively). Among the children who had severe form of malaria, percentage was highest among children from low socio-economic class (11.7 percent) compared with children from middle socio-economic class (7.4 percent) and children from high socio-economic class (0.0 percent).

A similar trend was observed in the month of March. Among the children who had mild and moderate forms of malaria percentages were highest among children from low socio-economic group (4.6 percent and 11.7 percent respectively). Among the children who had severe form of malaria, percentages were highest among children from low socio-economic class (7.7 percent) and children from middle socio-economic class (8.0 percent) compared with those from high socio-economic class (0.0 percent).

This pattern of severity of malaria continued to the month of April. The percentages of children who had mild and moderate forms of malaria were highest among children from low socio-economic class (9.2 percent and 12.8 percent respectively). Among the children who had severe form of malaria, percentages were highest among children from low socioeconomic class (5.6 percent) and those from middle socio-economic class (5.7 percent) compared with children from high socio-economic class (5.3 percent).

The trend continued throughout the period of survey. Among the children who had severe form of malaria, percentage was highest among children from low socio-economic class. This was followed by children from middle socio-economic class with low percentage among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH MALARIA DURING THE PERIOD OF FIELD SURVEY INDICATING THE SEVERITY BY SOCIO ECONOMIC CLASS (SEXES COMBINED)

TABLE 47

Socio Economic Class	Total		SEPT. SEVERITY			OCT. SEVERITY			NOV. SEVERITY			DEC SEVERITY			JAN. SEVERITY		
	No	%	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	196	42.0	10.2 (20)	26.5 (52)	32.1 (63)	7.1 (14)	11.7 (23)	12.2 (24)	2.6 (5)	19.4 (38)	23.5 (46)	3.1 (6)	24.0 (47)	16.8 (33)	3.6 (7)	16.3 (32)	9.7 (19)
Middle	175	37.6	8.0 (14)	20.0 (35)	18.3 (32)	5.7 (10)	11.4 (20)	11.4 (20)	1.1 (2)	11.7 (23)	17.7 (31)	1.1 (2)	4.0 (7)	5.1 (9)	9.1 (16)	10.3 (18)	5.1 (9)
High	95	20.4	3.2 (3)	10.5 (10)	7.4 (7)	3.2 (3)	8.4 (8)	5.3 (5)	0.0 (0)	12.6 (12)	10.5 (10)	1.1 (1)	0.0 90)	0.0 (0)	3.2 (3)	3.2 (3)	2.3 (4)
Total No.	466		(37)	(97)	(102)	(27)	(51)	(49)	(7)	(73)	(87)	(9)	(54)	(29)	(26)	(53)	(32)
Total %		100.0	7.9	20.8	20.6	5.8	10.9	10.5	1.5	15.7	18.7	1.9	15.0	14.8	5.6	12.4	5.8

Socio Economic Class	FEB. SEVERITY			MAR. SEVERITY			APRIL SEVERITY			MAY SEVERITY			JUN. SEVERITY			JUL. SEVERITY		
	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	8.2 (16)	12.8 (25)	11.7 (23)	4.6 (9)	11.7 (23)	7.7 (15)	9.2 (18)	12.8 (25)	5.6 (11)	7.7 (15)	18.4 (36)	11.2 (22)	7.1 (14)	15.8 (31)	12.8 (25)	9.2 (18)	24.0 (47)	10.7 (21)
Middle	2.9 (5)	9.4 (16)	7.4 (13)	3.4 (6)	5.7 (10)	8.0 (14)	2.9 (5)	9.7 (17)	5.7 (10)	4.6 (8)	12.0 (21)	10.9 (19)	1.7 (3)	8.6 (15)	6.9 (12)	4.6 (8)	16.0 (28)	8.6 (15)
High	2.1 (2)	4.2 (4)	0.0 (0)	4.2 (4)	5.3 (5)	0.0 (0)	2.1 (2)	4.2 (4)	5.3 (5)	7.4 (7)	11.6 (11)	2.1 (2)	1.1 (1)	7.4 (7)	0.0 (0)	8.4 (8)	8.4 (8)	4.2 (4)
Total No.	(23)	(45)	(36)	(19)	(38)	(29)	(25)	(46)	(26)	(30)	(68)	(43)	(18)	(53)	(37)	(34)	(83)	(40)
Total %	4.9	9.7	7.7	3.6	8.6	6.2	5.4	10.3	5.2	6.4	14.6	9.2	3.9	11.4	7.9	7.3	17.8	8.6

ML - Mild
MOD - Moderate
SEV - Severe

() No. of Children

FIG 45(a). PERCENTAGE OF CHILDREN WITH MALARIA DURING THE SURVEY INDICATING THE MILD FORM OF MALARIA BY SOCIO-ECON CLASS (SEXES COMBINED)

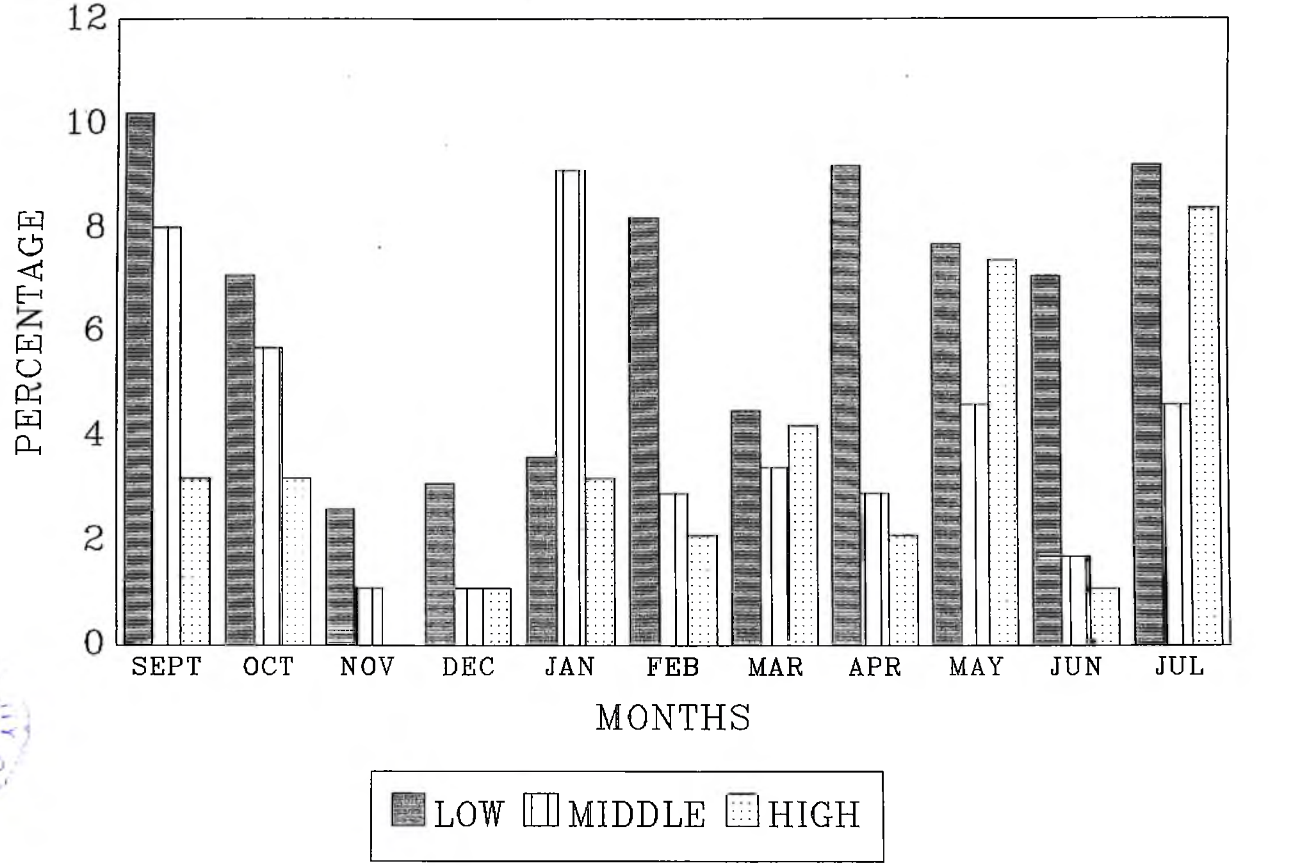


FIG 45(b). PERCENTAGE OF CHILDREN WITH MALARIA DURING THE SURVEY INDICATING THE MODERATE FORM OF MALARIA BY SOCIO-ECON CLASS (SEXES COMBINED)

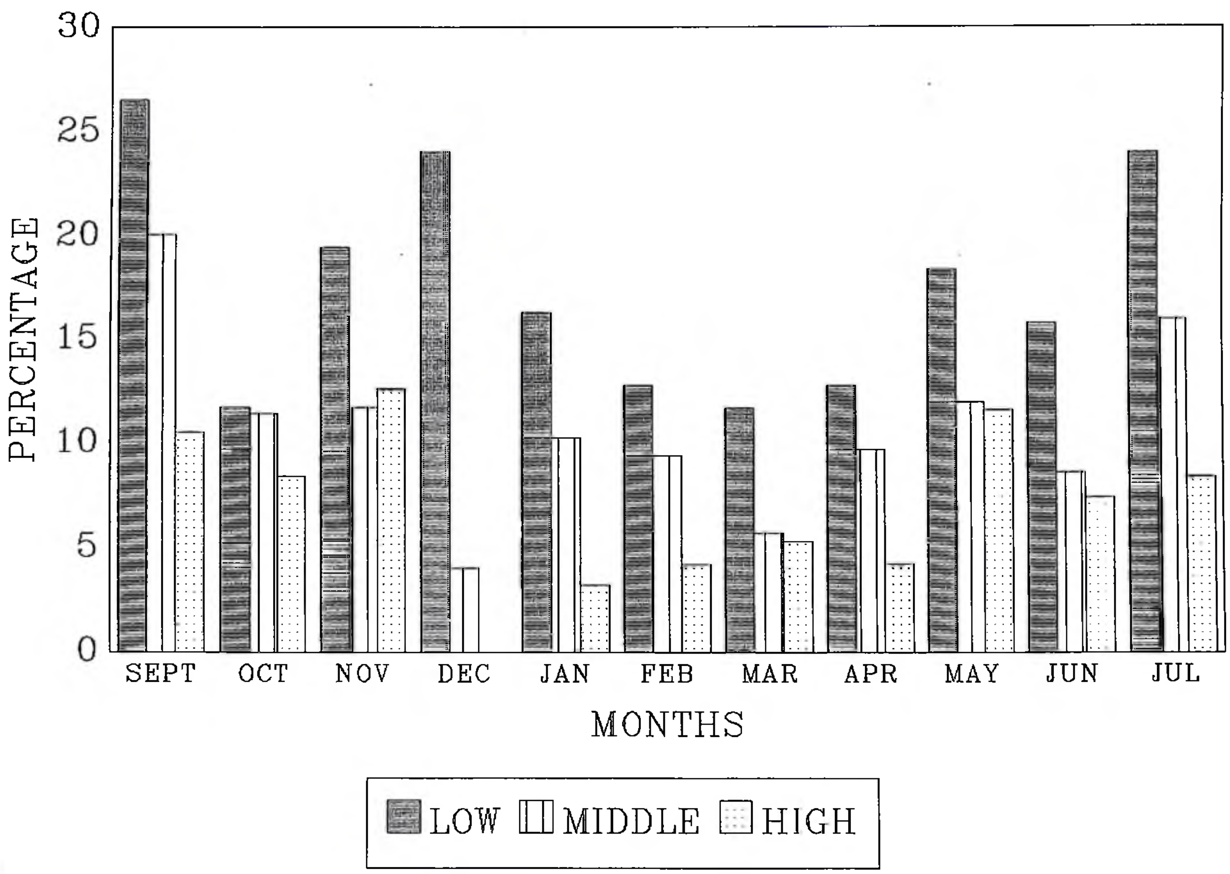
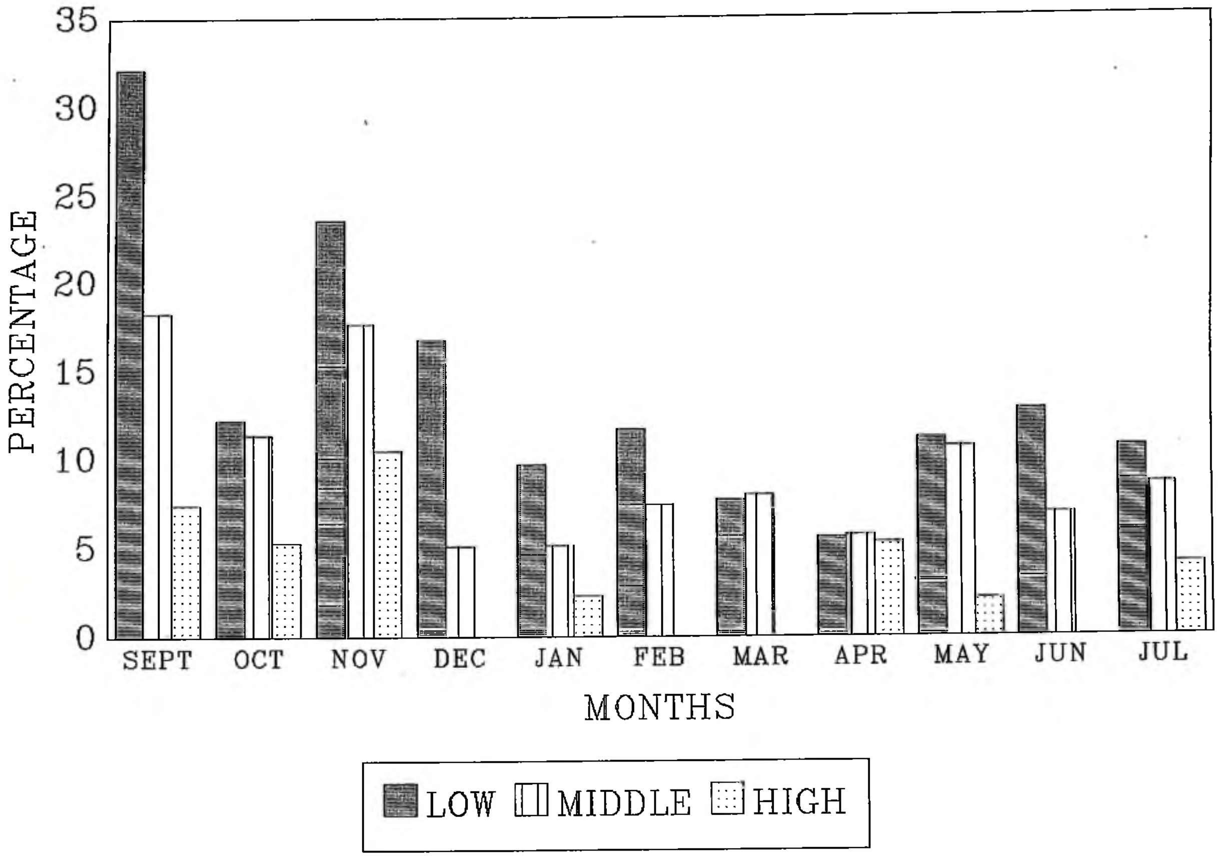


FIG 45(c). PERCENTAGE OF CHILDREN WITH MALARIA DURING THE SURVEY INDICATING THE SEVERE FORM OF MALARIA BY SOCIO-ECON CLASS (SEXES COMBINED)



4.4.5 PERCENTAGE OF CHILDREN WITH DIARRHOEA INDICATING OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

Table 4 and Fig 46 are summaries of prevalence of diarrhoea by socio-economic class.

In the month of September, about 10.5 percent of children had diarrhoea ranging between 1 to 3 occurrences and about 0.4 percent had diarrhoea exceeding 4 times. Among children who had diarrhoea ranging between 1 to 3 times, 13.8 percent were from low socio-economic class, 11.4 percent were from middle socio-economic class and 2.1 percent were from high socio-economic class. Among children who had diarrhoea over 4 times, only children from low socio-economic class had diarrhoea occurence over 4 times (1.0 percent).

During the month of October, 7.1 percent of pre-school children had diarrhoea ranging between 1 to 3 times. Among those who had diarrhoea, percentage was highest among children from low socio-economic class (9.2 percent) compared with middle socio-economic class (6.3 percent) and high socio-economic class (4.2 percent).

Similarly, in the month of November, 7.9 percent of children had diarrhoea ranging between 1 to 3 times. Among the children who had diarrhoea, percentage was highest among children from low socio-economic class (9.7 percent) compared with children from middle socio-economic class (8.6 percent) and those from high socio-economic class (3.2 percent).

The same pattern continued into the month of December. About 7.9 percent had diarrhoea ranging between 1 to 3 times. Among the children who had diarrhoea, 10.2 percent were from low socio-economic class, 7.4 percent were from middle socio-economic class and 4.2 percent were from high socio-economic class. The trend continued to the month of January, In the month of January, 5.4 percent of children suffered from diarrhoea. Among those who had diarrhoea about 7.7 percent were from low socio-economic class, 4.0 percent were from middle socio-economic class and 3.2 percent were from high socio-economic class.

Prevalence of diarrhoea among pre-school children was also reported in the month of February. About 4.7 percent of children were reported to have had diarrhoea. Among children who had diarrhoea, percentages were highest among those from low socio-economic class (5.1 percent) and those from middle socio-economic class (5.1 percent) compared with those from high socio-economic class (3.2 percent).

. In the month of March, 3.2 percent of children had diarrhoea. Out of those who had diarrhoea about 6.1 percent were from low socio-economic class, 1.7 percent were from the middle socio-economic class and no child from high socio-economic class class had diarrhoea in the month of March.

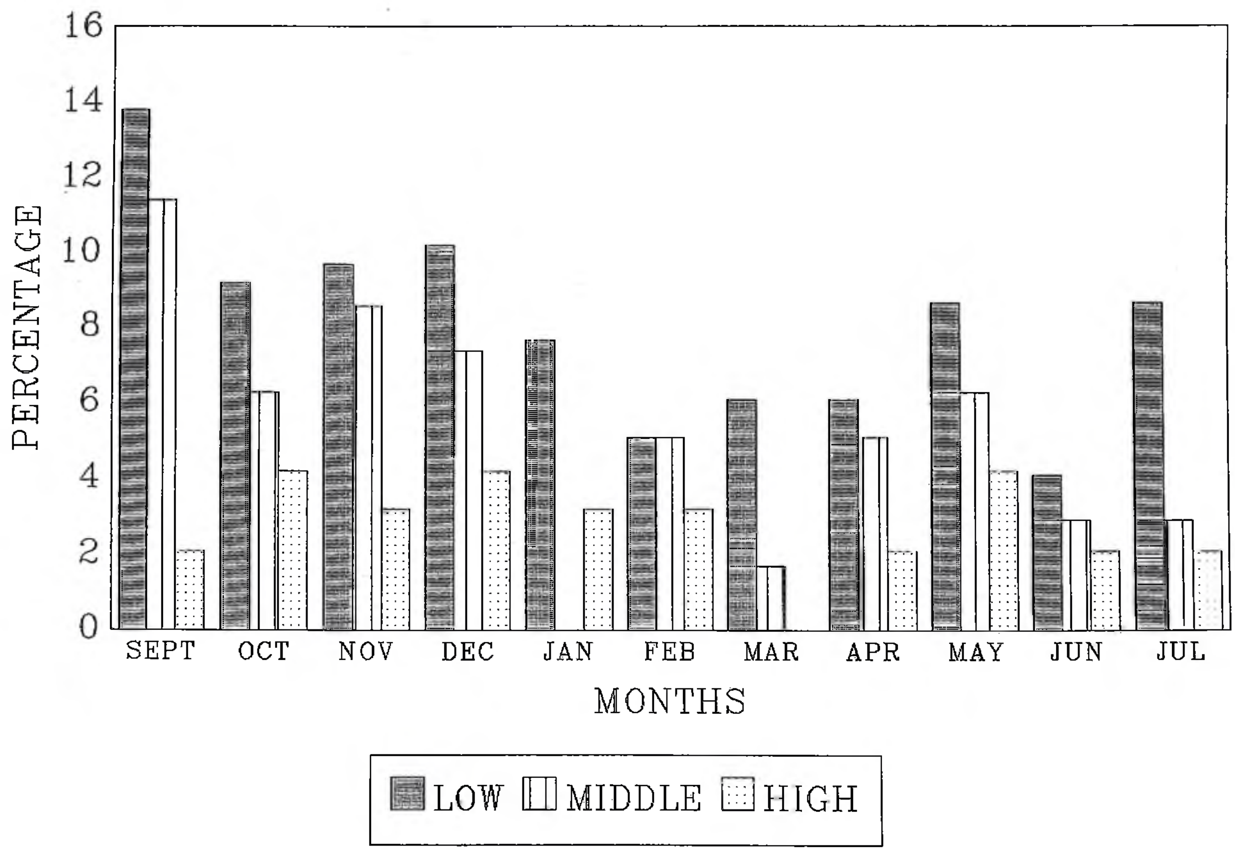
A similar trend was observed through out the months of survey. Among pre-school children who had diarrhoea, percentage was highest among children from low socio-economic class, followed by children from middle socio-economic class with least occurence among children from high socio-economic class.

THE PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE PERIOD OF FIELD SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

TABLE . 48

Socio Economic Class	Total		Sept. No. of Occurrence		Oct. 1-3 Times	Nov. 1-3 Times	Dec. 1-3 Times	Jan. 1-3 Times	Feb. 1-3 times	Mar. 1-3 Times	Apr. 1-3 Times	May 1-3 Times	Jun. 1-3 Times	Jul. 1-3 Times
	No	%	1-3	4+										
Low	196	42.0	13.8 (27)	1.0 (2)	9.2 (18)	9.7 (19)	10.2 (20)	7.7 (15)	5.1 (10)	6.1 (12)	6.1 (12)	8.7 (17)	4.1 (8)	8.7 (17)
Middle	175	37.6	11.4 (20)		6.3 (11)	8.6 (15)	7.4 (13)	4.0 (7)	5.1 (9)	1.7 (3)	5.1 (9)	6.3 (11)	2.9 (5)	2.9 (5)
High	95	20.4	2.1 (2)		4.2 (4)	3.2 (3)	4.2 (4)	3.2 (3)	3.2 (3)	0.0 (0)	2.1 (2)	4.2 (4)	2.1 (2)	2.1 (2)
Total No	466		(49)	(2)	(33)	(37)	(37)	(25)	(22)	(15)	(23)	(32)	(15)	(24)
Total %		100.0	10.5	0.4	7.1	7.9	7.9	5.4	4.7	3.2	4.9	6.9	3.2	5.2

FIG 46. PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)



4.4.6 **PERCENTAGE OF CHILDREN WITH DIARRHOEA INDICATING SEVERITY BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)**

Table 49 and Fig 47 are summaries of severity of diarrhoea among pre-school children in the month September by socio-economic class.

Among the children who had mild form of diarrhoea, percentage was highest among children from low socio-economic class (2.6 percent). Those children who had moderate form of diarrhoea, percentage was highest among those from middle socio-economic class (5.7 percent). Among children who had severe form of diarrhoea, percentage was highest among those from low socio-economic class (9.7 percent) compared with children from middle and high socio-economic classes (4.6 percent and 1.1 percent respectively).

A similar trend continued to the month of October. Among children who had mild and moderate forms of diarrhoea, percentages were highest among children from low and middle socio-economic classes (3.1 percent and 2.0 percent respectively). Those children who had severe form of diarrhoea, percentage was highest among children from low socio-economic class (4.1 percent) compared with children from middle and high socio-economic classes (2.9 percent and 2.1 percent respectively).

In the month of November, only children from middle Socio-economic class had mild form of diarrhoea (0.6 percent). Among children who had moderate form of diarrhoea, percentage was highest among those from low socio-economic class (3.6 percent).

Among those who had severe form of diarrhoea, percentage was highest among those children from low socio-economic class (6.1 percent) compared with children from middle and high socio-economic classes (5.7 percent and 2.1 percent respectively). The same pattern of severity was observed in the month of December.Percentages). of children who had mild and moderate forms of diarrhoea were highest among children from low socio-economic class (2.0 percent and 2.6 percent respectively).

Among children who had severe form of diarrhoea, percentage was highest among children from low socio-economic class (5.6 percent) compared with children from middle and high socio-economic classes (4.0 percent and 0.0 percent respectively).

Severity of diarrhoeal disease was also reported in the month of January. In the month of January, only children from low-socio-economic class had higher percentage of mild and moderate forms of diarrhoea (1.5 percent and 4.1 percent respectively). Among those who had severe form of diarrhoea, percentages were highest among children from middlle socio-economic class (2.3. percent) and children from low socio-economic class (2.0 percent). No child from high socio-economic class had severe form of diarrhoea in the month of January.

During the month of February, percentage of children who had mild form of diarrhoea was highest among children from middle socio-economic class (2.3 percent). Among those who had moderate form of diarrhoea, percentage was highest among children from low socio-economic class (3.1 percent). Among children who had severe form of diarrhoea, percentage was highest among children from high socio-economic class (2.1 percent) followed by children from low socio-economic class (1.5 percent) and children from middle socio-economic class (0.6 percent).

Similarly, in the month of March, only children from middle socio-economic class

(0.6 percent) had mild form of diarrhoea. Only children from low socio-economic class (2.6 percent) had moderate form of diarrhoea. Among children who had severe form of diarrhoea, percentage was highest among children from low socio-economic class (3.6 percent) compared with those from middle and high socio-economic classes (1.1 percent and 0.0 percent respectively).

The same pattern of severity was observed through out the period of survey. Among children who had severe form of diarrhoea, percentage was highest among children from low socio-economic class, followed by children from middle socio-economic class with less severity among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE PERIOD
OF FIELD SURVEY INDICATING SEVERITY BY
SOCIO ECONOMIC CLASS (SEXES COMBINED)

TABLE 49

Socio Economic Class	Total		SEPT. SEVERITY			OCT. SEVERITY			NOV. SEVERITY			DEC SEVERITY			JAN. SEVERITY		
	No	%	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	196	42.0	2.6 (5)	2.6 (5)	9.7 (19)	3.1 (6)	2.0 (4)	4.1 (8)	0.0 (0)	3.6 (7)	6.1 (12)	2.1 (4)	2.6 (5)	5.6 (11)	1.5 (3)	4.1 (8)	2.0 (4)
Middle	175	37.6	1.1 (2)	5.7 (10)	4.6 (9)	1.7 (3)	1.7 (3)	2.9 (5)	0.6 (1)	2.3 (4)	5.7 (10)	1.1 (2)	2.3 (4)	4.0 (7)	0.0 (0)	1.7 (3)	2.3 (4)
High	95	20.4	0.0 (0)	1.1 (1)	1.1 (1)	2.1 (2)	0.0 (0)	2.1 (2)	0.0 (0)	1.1 (1)	2.1 (2)	1.1 (1)	3.2 (3)	0.0 (0)	0.0 (0)	3.2 (3)	0.0 (0)
Total No. / Total %	466	100.0	(7) 1.5	(16) 3.4	(28) 6.0	(11) 2.4	(7) 1.5	(15) 3.2	(1) 0.2	(12) 2.6	(24) 5.2	(7) 1.5	(12) 2.6	(18) 3.9	(3) 0.6	(14) 3.0	(8) 1.7

Socio Economic Class	FEB. SEVERITY			MAR. SEVERITY			APRIL SEVERITY			MAY SEVERITY			JUN. SEVERITY			JUL. SEVERITY		
	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	0.5 (1)	3.1 (6)	1.5 (3)	0.0 (0)	2.6 (5)	3.6 (7)	0.0 (0)	1.5 (3)	4.6 (9)	2.0 (4)	2.6 (5)	4.1 (8)	0.5 (1)	1.0 (2)	2.6 (5)	2.6 (5)	3.6 (7)	2.6 (5)
Middle	2.3 (4)	2.3 (4)	0.6 (1)	0.6 (1)	0.0 (0)	1.1 (2)	0.6 (1)	2.3 (4)	2.3 (4)	2.9 (5)	1.1 (2)	2.3 (4)	0.6 (1)	0.0 (0)	2.3 (4)	0.6 (1)	1.1 (2)	1.1 (2)
High	0.0 (0)	1.1 (1)	2.1 (2)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	1.1 (1)	1.1 (1)	2.1 (2)	1.1 (1)	1.1 (1)	1.1 (1)	1.1 (1)	0.0 (0)	1.1 (1)	0.0 (0)	1.1 (1)
Total No. / Total %	(5) 1.1	(11) 2.4	(6) 1.3	(1) 0.2	(5) 1.1	(9) 1.9	(1) 0.2	(8) 1.7	(14) 3.0	(11) 2.4	(8) 1.7	(13) 2.8	(3) 0.6	(3) 0.6	(9) 1.9	(7) 1.5	(9) 1.9	(8) 1.7

ML - Mild
MOD - Moderate
SEV - Severe

() No. of Children

FIG 47(a). PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE SURVEY INDICATING THE MILD FORM OF DIARRHOEA BY SOCIO-ECON CLASS (SEXES COMBINED)

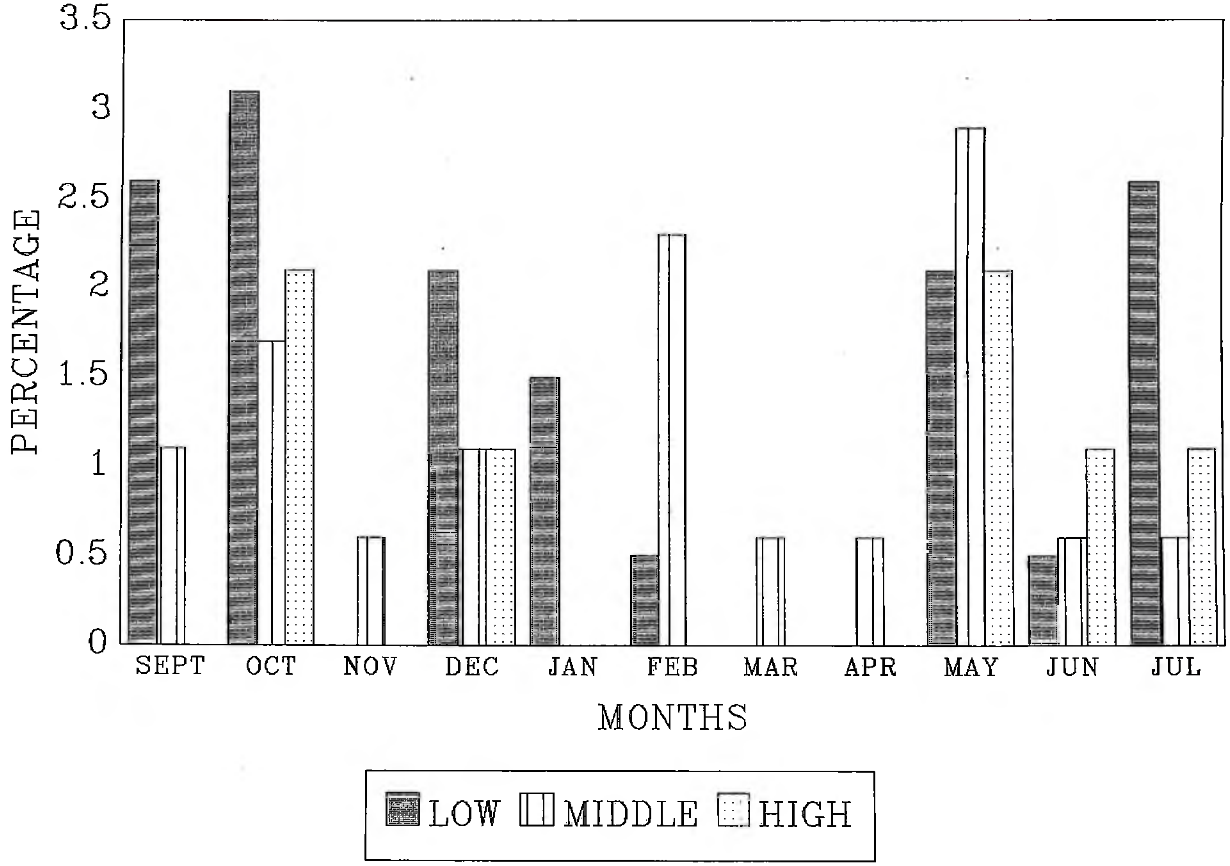


FIG 47(b). PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE SURVEY INDICATING THE MODERATE FORM OF DIARRHOEA BY SOCIO-ECON CLASS (SEXES COMBINED)

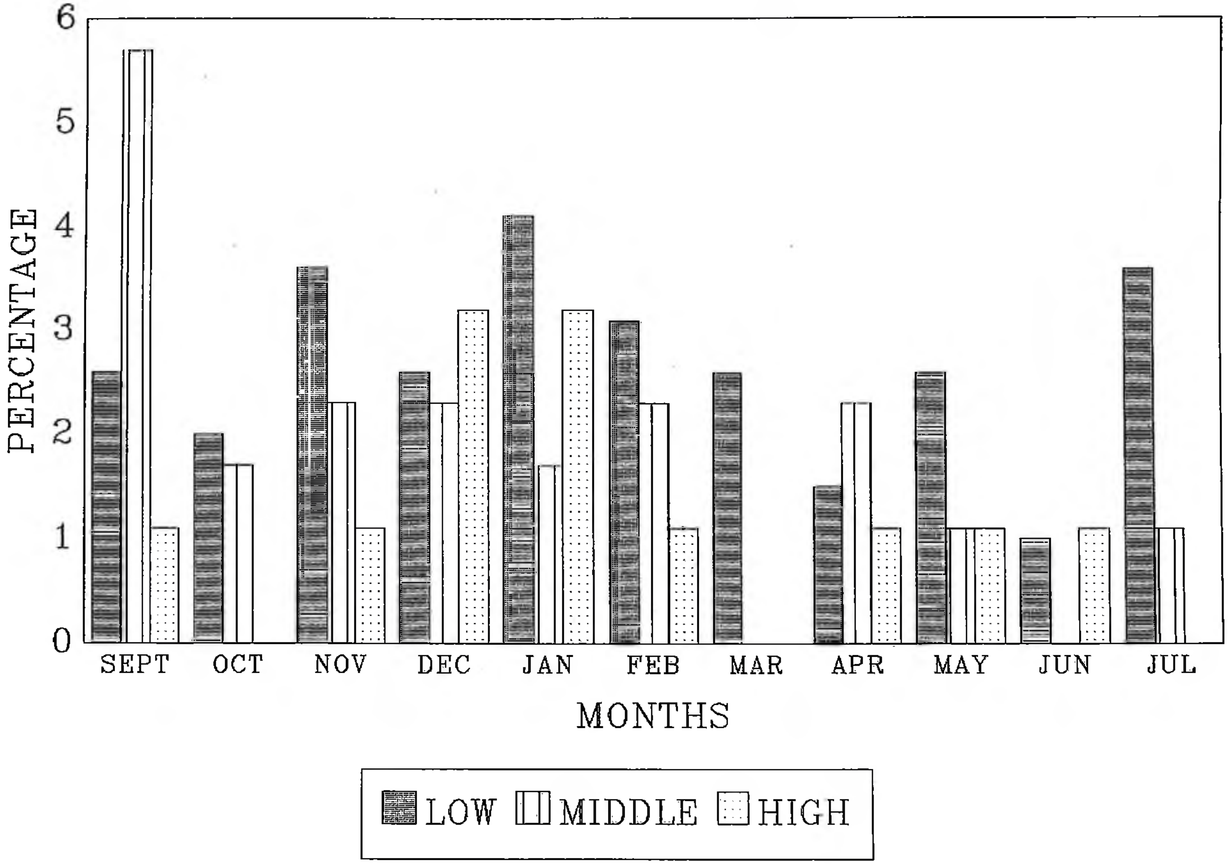
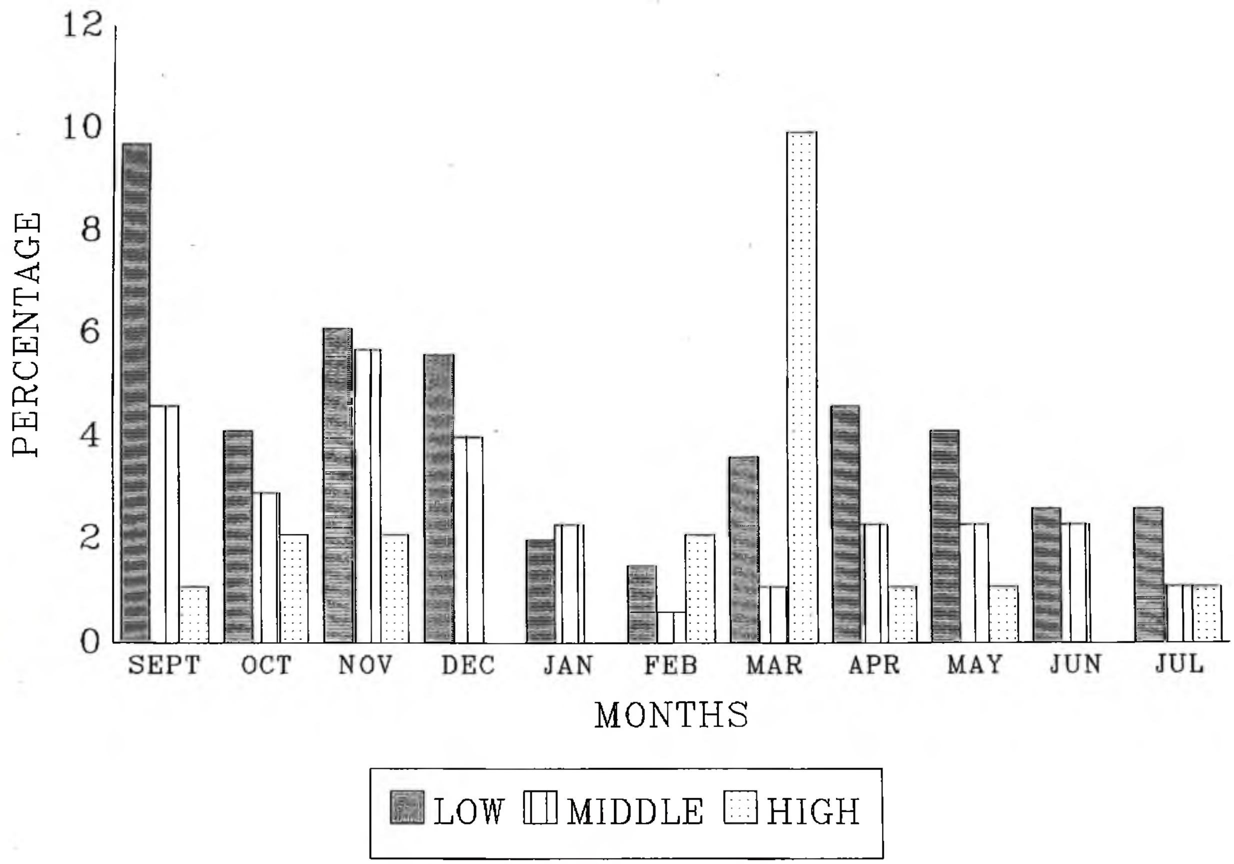


FIG 47(c). PERCENTAGE OF CHILDREN WITH DIARRHOEA DURING THE SURVEY INDICATING THE SEVERE FORM OF DIARRHOEA BY SOCIO-ECON CLASS (SEXES COMBINED)



4.4.7 PERCENTAGE OF CHILDREN WITH MEASLES INDICATING OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED).

Table 50 and Fig 48 are the summaries of prevalence of measles by socio-economic class.

During the month of September, about 2.1 percent of children were reported as having had measles. Among pre-school children who had measles, percentage was highest among children from low socio-economic class (3.1 percent) compared with children from middle and high socio-economic classes (2.3 percent and 0.0 percent respectively).

In the month of October, no child had measles. In the month of November, About 1.3 percent of pre-school children had measles. Among those who had measles, percentage was highest among children from low socio-economic class (1.5 percent) compared with children from middle and high socio-economic classes (1.1 percent and 1.1 percent respectively).

The number of pre-school children who had measles continued to decrease. In the month of December, only 0.6 percent of children had measles. Among those children who had measles, percentage was fairly distributed among the socio-economic classes (low socio-economic class 0.5 percent; middle socio-economic class 0.6 percent; and high socio-economic class 1.1 percent).

A similar trend continued to the month of January. In the month of January, 0.4 percent of pre-school children had measles. Among those who had measles, only children from low socio-economic class had measles (1.0 percent).

A reduced percentage of children with measles was also observed in the month of

February. In the month of February, about 0.4 percent of children had measles. Among those who had measles, 0.5 percent of the children were from low socio-economic class and 0.6 percent were from middle socio-economic class. None of the children from high socio-economic class had measles. The trend continued to the month of March. In the month of March, only 0.2 percent of the children had measles. Among those who had measles, only children from low socio-economic class had measles(0.5 percent). No child from middle and high socio-economic classes had measles in the month of March.

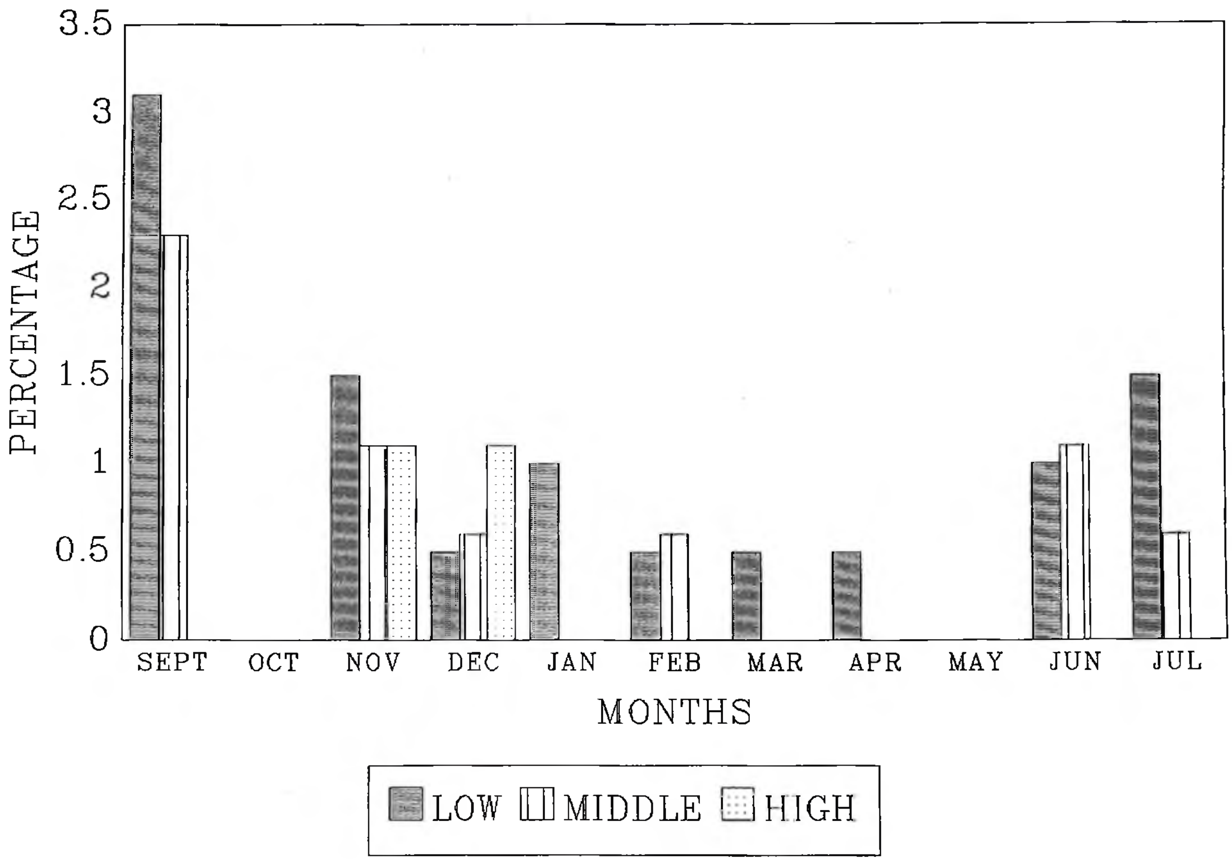
A similar observation was made through out the period of survey. Percentage of occurrence of measles was low compared with other infectious diseases. Among children who had measles, percentage was high among children from low socio-economic class followed by children from middle socio-economic class with less or no occurrence among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH MEASLES INFECTION DURING THE PERIOD OF FIELD SURVEY INDICATING THE OCCURRENCE BY SOCIO-ECONOMIC CLASS (SEXES COMBINED)

TABLE 50

Socio Economic Class	Total		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
	No.	%											
Low	196	42.0	3.1 (6)		1.5 (3)	0.5 (1)	1.0 (2)	0.5 (1)	0.5 (1)	0.5 (1)		1.0 (2)	1.5 (3)
Middle	175	37.6	2.3 (4)		1.1 (2)	0.6 (1)	0.0 (0)	0.6 (1)	0.0 (0)	0.0 (0)		1.1 (2)	0.6 (1)
High	95	20.4	0.0 (0)		1.1 (1)	1.1 (1)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)		0.0 (0)	0.0 (0)
Total No Total %	466	100.0	(10) 2.1		(6) 1.3	(3) 0.6	(2) 0.4	(2) 0.4	(1) 0.2	(1) 0.2		(4) 0.9	(4) 0.9

FIG 48. PERCENTAGE OF CHILDREN WITH MEASLES INFECTION DURING THE SURVEY INDICATING THE OCCURRENCE BY SOCIO ECONOMIC CLASS(SEXES COMBINED)



4.4.8 PERCENTAGE OF CHILDREN WITH MEASLES INDICATING SEVERITY BY SOCIO-ECONOMIC CLASS. (SEXES COMBINED).

Table 51 and Fig 49 give the summaries of severity of measles as it affects pre-school children by socio-economic class.

Among children who had mild and moderate forms of measles in the month of September, percentages were highest among those from middle socio-economic class (1.1 percent and 0.6 percent respectively). Among children who had severe form of measles, percentage was highest among children from low socio-economic class (2.0 percent). No child had measles in the month of October.

During the month of November, severity of measles was recorded. Only children from low socio-economic class had mild form of measles (0.5 percent). Among children who had moderate and severe form of measles, percentages were highest among those from high and middle socio-economic classes (1.1 percent) and (1.1 percent) respectively.

Similarly, in the month of December, only children from the middle socio-economic class had mild form of measles (0.6 percent). None of the children had moderate form of measles. Among the children who had severe form of measles, percentages were highest among children from high socio-economic class (1.1 percent) and children from low socio-economic class (0.5 percent).

The trend continued to the month of January. In the month of January, only children from low socio-economic class had moderate form of measles (1.0 percent). Severity was also observed in the month of February. Only children from middle socio-economic class (0.6 percent) had mild form of measles and only children from low socio-economic class (0.5 percent) had moderate form of measles. No child was reported as having had severe form of measles in the month of February.

In the months of March and April, severity of measles was observed among children from low socio-economic class (0.5 percent) for the month of March and (0.5 percent) for the month of April. There was no case of measles in the month of May.

This pattern continued throughout the period of survey. Percentage of children who had severe form of measles was highest among children from low socio-economic class. This was followed by children from middle socio-economic class. There was less severity of measles infection among children from high socio-economic class.

PERCENTAGE OF CHILDREN WITH MEASLES DURING THE PERIOD
OF FIELD SURVEY INDICATING THE SEVERITY BY
SOCIO ECONOMIC CLASS (SEXES COMBINED)

TABLE 51

Socio Economic Class	Total		SEPT. SEVERITY			OCT. SEVERITY			NOV. SEVERITY			DEC SEVERITY			JAN. SEVERITY		
	No	%	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	196	42	0.5 (1)	0.5 (1)	2.0 (4)	-	-	-	0.5 (1)	0.5 (1)	0.5 (1)	0.0 (0)	-	0.5 (1)	-	1.0 (2)	-
Middle	175	37.6	1.1 (2)	0.6 (1)	0.6 (1)	-	-	-	0.0 (0)	0.0 (0)	1.1 (2)	0.6 (1)	-	0.0 (0)	-	0.0 (0)	-
High	95	20.4	0.0 (0)	-	-	-	-	-	0.0 (0)	1.1 (1)	0.0 (0)	0.0 (0)	-	1.1 (1)		0.0 (0)	-
Total No.	466		(3)	(2)	(5)	-	-	-	(1)	(2)	(3)	(1)	-	(2)	-	(2)	-
Total %		100	0.6	0.4	1.1				0.2	0.4	0.6	0.2		0.4		0.4	

Socio Economic Class	FEB. SEVERITY			MAR. SEVERITY			APRIL SEVERITY			MAY SEVERITY			JUN. SEVERITY			JUL. SEVERITY		
	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV	ML	MOD	SEV
Low	0.0 (0)	0.5 (1)	-	-	-	0.5 (1)	-	-	0.5 (1)	-	-	-	0.0 (0)	0.5 (1)	0.5 (1)	0.5 (1)	0.5 (1)	0.5 (1)
Middle	0.6 (1)	0.0 (0)	-	-	-	0.0 (0)	-	-	0.0 (0)	-	-	-	0.6 (1)	0.6 (1)	0.0 (0)	0.6 (1)	0.0 (0)	0.0 (0)
High	0.0 (0)	0.0 (0)	-	-	-	0.0 (0)	-	-	0.0 (0)	-	-	-	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Total No.	(1)	(1)	-	-	-	(1)	-	-	(1)	-	-	-	(1)	(2)	(1)	(2)	(1)	(1)
Total %	0.2	0.2				0.2			0.2				0.2	0.4	0.2	0.4	0.2	0.2

ML - Mild
MOD - Moderate
SEV - Severe

() No. of Children

Fig.49(a) PERCENTAGE OF CHILDREN WITH MEASLES DURING THE PERIOD OF FIELD SURVEY INDICATING THE MILD FORM OF MEASLES BY SOCIO ECONOMIC CLASS(SEXES COMBINED)

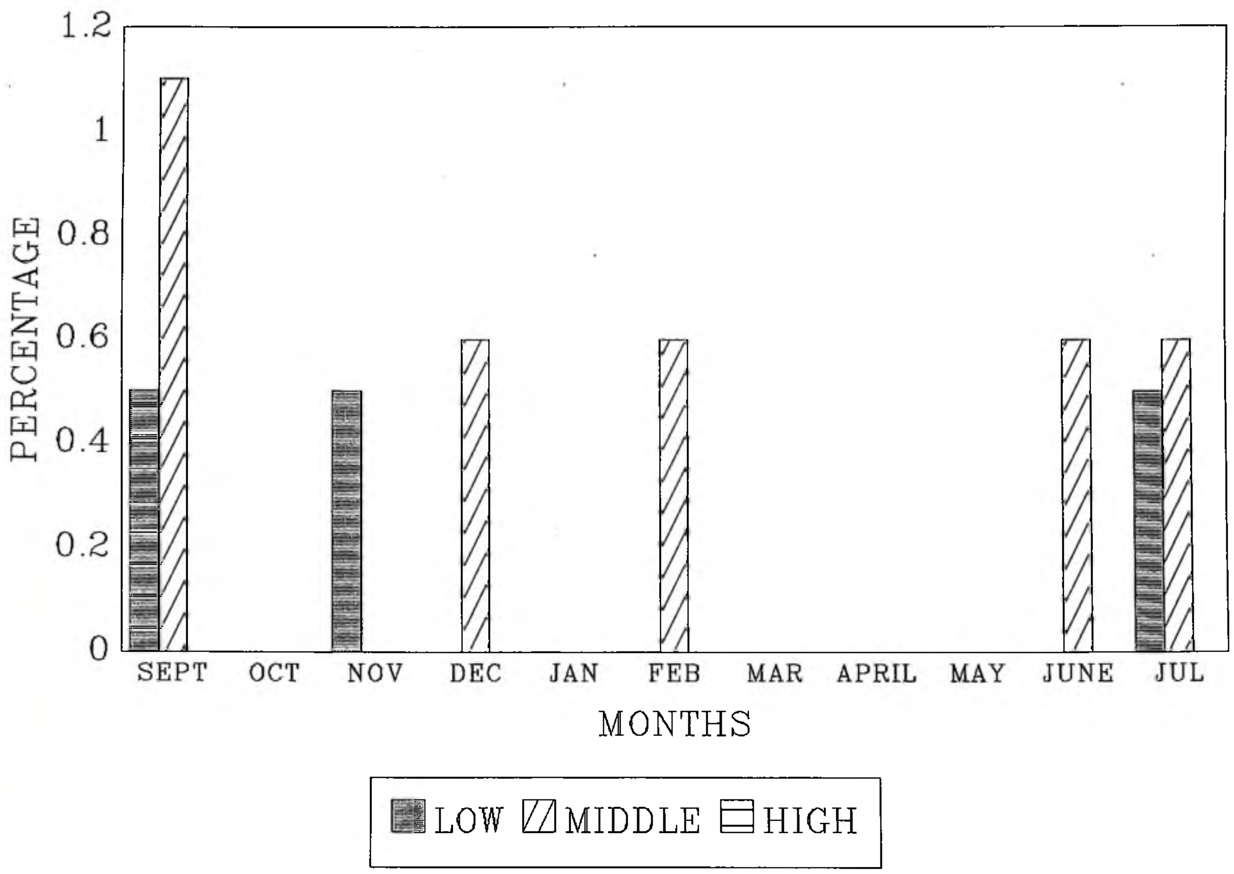


Fig.49(b) PERCENTAGE OF CHILDREN WITH MEASLES DURING THE PERIOD OF FIELD SURVEY INDICATING THE MODERATE FORM OF MEASLES BY SOCIO ECONOMIC CLASS(SEXES COMBINED)

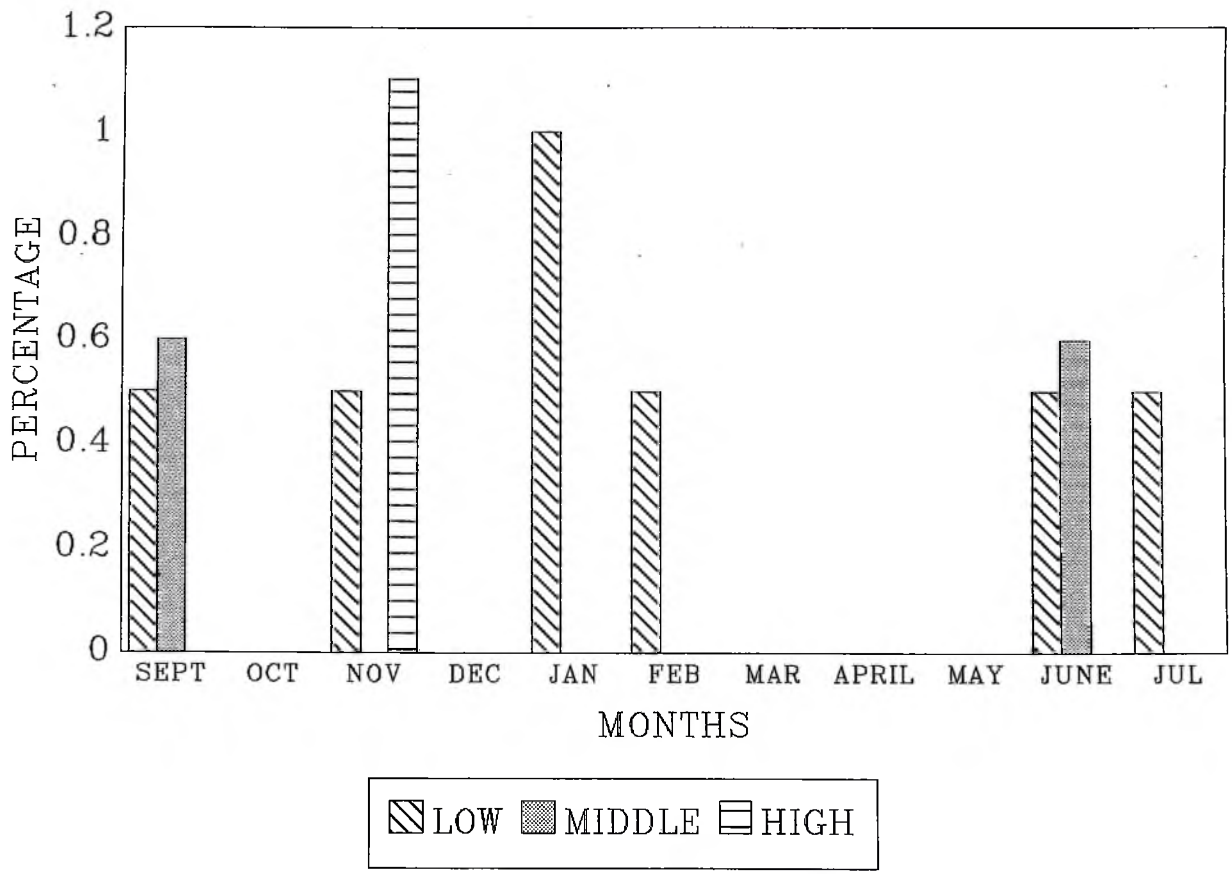
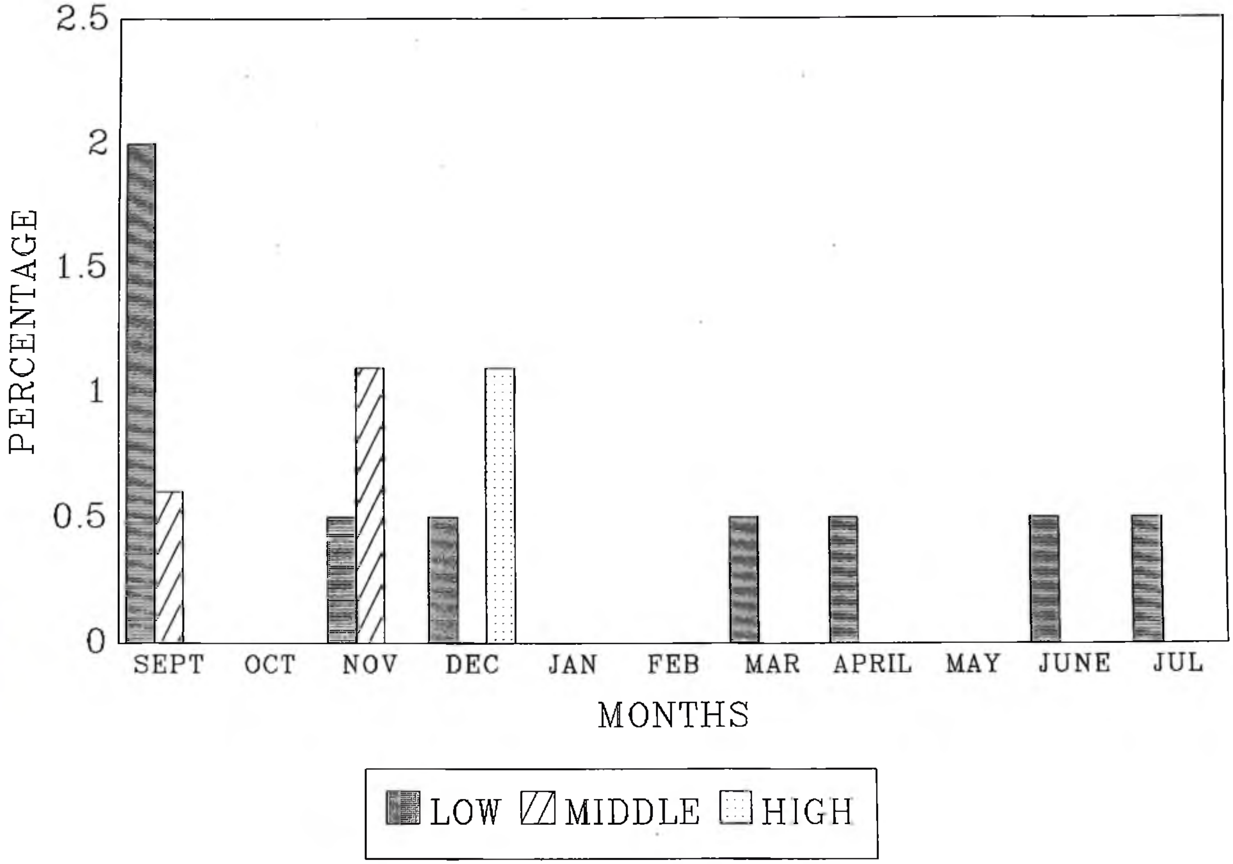


Fig.49(c) PERCENTAGE OF CHILDREN WITH MEASLES DURING THE PERIOD OF FIELD SURVEY INDICATING THE SEVERE FORM OF MEASLES BY SOCIO ECONOMIC CLASS(SEXES COMBINED)



4.4.9 REGRESSION ANALYSIS ON VARIABLES USED IN FACTOR ANALYSIS TO PRODUCE A MODEL TO PREDICT OUTCOME OF NUTRITION AND INFECTIONS.

Multiple regression analysis is the most widely used method for conducting multivariate analysis particularly when at least 3 variables are involved. In this section, this technique is applied in order to find out the contribution of each of the variables on nutritional status of the preschool children (as defined by weight, height and upper arm circumference) controlling other variables (In addition, sometimes it is desired to know how well all the variables taken together explain the variation in the dependent variable.

Since non-interval explanatory variables are included in the model, dummy variables were created. Table 52 gives the list of variables and dummies created for them. Other variables whose effects are controlled in the estimation of the equation are also included. A reference category is chosen for each variable in the equation. A stepwise regression procedure was applied to all variables selected.

In the first model, all the variables except - "Did you breastfeed this child"?, "How many times a day did you breastfeed this child?", At what age did you give your child milk from the bottle?" were taken as being significant at 5 percent level in explaining the nutritional status of the pre-school children. The R. square value is .79331, implying that about 79 percent of the variation in the weight of the pre-school children is explained by all the variables in the equation. This is a good fit, showing the importance of these variables in explaining the weight of the children.

VARIABLES USED IN REGRESSION ANALYSIS

TABLE 52

Group Variables	Dummy	Dummy bol
A. Dependent Variable I Weight	-	F7A2
B. Independent Variable		
1. Age (QIC)	-	QIC
2. Malnutrition/Disease Interaction (Fac 3)	No sickness not Malnourished, No sickness, malnourished Sick not malnourished Sick and malnourished	Fac 3 A* Fac 3 B Fac 3 C Fac 3 D
3. Living conditions (Sanitation)	Poor Good Very Good	Modp* ModG ModVG
4. Socio-Economic Class (SOC)	Low Middle High	SOCL* SOCM SOCH
5. Age Breastfeeding was stopped (QHI)	1 - 9 months 10-12 months 13-15 months 16-22 months & above	Q9hi Q9hd Q9he Q9hj*
6. Breastfed this child (Q9A)	Yes No	Q9A Q9A*
7. No. of times a day did you breastfeed this child (Q9E)	2-3 times 4-5 times on demand Not breastfed	Q9ef Q9eg Q9ee Q9en*
8. At what age did you give child milk from bottle (Q9P)	1-6 months 7-12 months 13-15 months & over	Q9PA Q9PA Q9PC

Regression Analysis on weight of Pre-school Children: Table 53 presents the variables remaining in the equation and the corresponding standardised (beta coefficient) and unstandardized coefficients. The standardized coefficient means that for each unit change in the independent variable, there is a standard deviation change in the independent variable with the effects of the variables controlled.

By far the largest positive influence on weight of all the pre-school children is that exerted by age. The coefficient is 1.752. This means that as the age of the child increases, weight also increases. As the age of the child increases, there is a corresponding increase in weight by about 1.75 kg, everything being equal. This is significant (p = 0.0001).

The coefficient shows that there is a negative relationship between the weight of the child and malnutrition/infectious disease interactions. The result shows that those children who are NSM have lower weight compared to the reference category. They are 2.1 kg lower than the reference category. This is significant (p=0.0001).

Those children who are SNM have 0.56kg lower than the reference category. This is not significant (p=0.086). The children who are SM have 2.39 kg lower than the reference category. This is highly significant (p=0.0001).

The table 53 also depicts a positive relationship between living conditions (Sanitary condition) in the household and the weight of the child. The regression coefficient indicates that children who come from families with good living conditions weighed more than those children from reference category (poor living conditions) by 0.40 kg. This is significant (p = 0.020).

Those children who come from families with very good living conditions weighed more than those from poor sanitary conditions by 1.3 kg. This is significant (p=0.0001) There is a positive relationship between socio-economic class and the weight. Those children who come from high socio-economic class weighed more than those from low socio-economic class. They are 1.00 kg more than children from low socio economic class, while those children from the middle socio-economic class weighed 0.54 kg.more than those from low socio- economic class.

This result goes to validate the hypothesis that children who come from high socioeconomic class tend to have less nutritional problems and therefore grow better than those children from low socio-economic class.

The table also shows that "age at which breastfeeding was stopped" is related positively with the weight of the child (p=0.04) with a coefficient of 0.41141. The result indicates that children whose breast-feeding was continued to the age of 22 months and over have higher weight than those children whose breast-feeding was stopped early in life. This is Statistically significant (p=0.03).

Following the group categories it can be inferred that age, living condition in the family, socio-economic class and the age at which breastfeeding was stopped have positive effects on the weight of the growing child while malnutrition and infectious disease interaction has negative effect on the weight of the child.

Table 53 : Regression on weight of children

Independent Variables	B-Coefficient	Beta	F-Ratio	Level of significant
Age	1.75147	.73423	1051.950	.000
Nutrition & Disease Interaction				
No sickness not malnourished (controlgroup)	RC	-	-	
No sickness, malnourished	-2.09502	-.29684	162.475	.000
Sick, not malnourished	-.56394	-.03864	2.962	.086
Sick and malnourished	-2.39106	-.21891	86.626	.000
Living Conditions (Sanitation)				
Poor	RC	-	-	
Good	.39986	.05469	5.445	.020
Very	1.28796	.13334	30.941	.000
Socio-economic class				
Low	RC	-	-	
Middle Class	.53774	.06451	8.291	.004
High Class	.99827	.09371	16.394	.001
What age did you stop breastfeeding	.41141	.04656	4.293	.039

F- Statistics = 174.63195
R Square = .79331
Multiple R = .89068
Significance = .00000
Constant = 7.75260
N = 466

Regression Analysis on height of Pre-School Children: Table 54 shows regression on height. The procedure selected the variables on Table 52. The R square value is 0.84977, implying that about 85 percent of the variations in the height of the children is explained by all the variables in the equation. This is a good fit, indicating the importance of these variables in explaining the height of the pre-school children.

Going through the categories it is observed that age exerts the largest influence on height of the pre-school children. The coefficient of 7.901 indicates a strong positive relationship between age and the height of the pre-school children. this means that as the age increases the height also increases by about 7.90cm, everything being equal, This is significant (p = 0.0001). The coefficient shows a strong positive relationship between height and the living conditions in the family. Children brought up in a very good environment with very good sanitation are taller than those brought up in a poor and insanitary condition by 4.80 cm. This is significant (p=0.0001).

Children from households with good living conditions are 1.47 cm taller than those from the reference category. This is significant (p=0.0009). By far another positive influence on height is that exerted by high socio-economic class, with a coefficient of 3.89317 (p=0.0001). This means that children from high socio-economic class are 3.89 cm taller that those from low socio-economic class. This is significant (p=0.00) and those children from the middle socio-economic group are 1.93 cm taller than those low socio-economic class. This is significant (p=0.002).

The coefficient also indicates a negative relationship between height of the children and the frequency of breastfeeding in a day, with a coefficient of 1.56925. This means that children who were not breast-fed are shorter by 1.57cm than those children who received breast-feeding. This is not statistically significant (p=0.08).

The coefficient shows a negative relationship between the height of the children and the malnutrition/infectious disease complex. The result indicates that those children who are NSM are shorter by 1.57cm than NSNM group. This is significant (p=0.004) Those children who are SNM are shorter by 2.90cm than NSNM group. This is significant (p-0.008). Those children who are SM are shorter by 1.97cm than NSNM group. This is statistically significant (p=0.022).

Sex exerts a negative influence on the height of the preschool children with a coefficient of -.084. This means that female children are shorter than male children by .84cm. This is not statistically significant (p=0.08).

It can be inferred that age, living condition, socio-economic class are positively associated with the height of the children while sex, malnutrition/infectious disease complex and number of times breast-feed a child in a day? are negatively associated with the height of the preschool children.

Table 54 : **Regression on Height of the Children**

Independent Variables	Coefficient	Beta	F-Ratio	Level of significance
<u>Age</u>	7,90121	.84921	1928.181	.000
<u>Living conditions</u> (MOD)				
Poor	RC	-	-	
Good	1,47380	.05168	6.892	.009
Very Good	4.79705	.12733	40.804	.000
<u>Socio-economic class</u>				
Low	RC	-	-	-
Middle Class	1.92896	.05932	9.718	.002
High	3.89317	.09369	22.619	.000
<u>Sex</u>				
Female	-.84062	-.03159	2.993	.084
Male	RC	-	-	
<u>Breastfeeding</u> No. of times breastfeed child in a day?	-1.56925	-.03190	3.040	.082
<u>Malnutrition/Infectious Disease Interaction</u> No. sickness not malnourished (control group)	RC	-	-	-
No sickness, malnourished	-1.57246	-.05712	8.284	.004
Sick, not malnourished	-2.90418	-.05102	7.123	.008
Sick and malnourished	-1.97017	-.4625	5.317	.022

F-Statistic = 257.37824

R Square = .84977

Multiple R = .92183

Constant = 67.29618

Significance = .00000

N = 466

Regression Analysis on Upper Arm circumference of Pre-School Children:

Table 55 shows the regression on upper arm circumference. The procedure selected the variables on Table 52.

The R square is .54102 indicating that about 54 percent of the variation in the upper arm circumference of the preschool children is explained by all the variables in the equation. This is a good fit depicting the importance of these variables in explaining the upper arm circumference of the preschool children.

Age exerts a positive influence on the upper arm circumference of the pre-school children, with the coefficient of .48118. This indicates that as the age increases the upper arm circumference increases in proportion of 0.48cm. This is significant (p=0.0001).

The coefficient shows a negative relationship between the upper arm circumference and malnutrition/infectious disease interaction. This means that children who are NSM have less upper arm circumference of 1.06cm than those children who are NSNM. This is significant (p=0.001). Those children who are SM have lesser upper arm circumference of 1.36cm than the children who are NSNM. This is highly significant (p=0.0001).

The Model also shows a positive association between the upper arm circumference and the living conditions (sanitation) in the family. The regression coefficient indicates that children from families with very good living conditions (sanitation) have higher upper arm circumference (0.73cm) than those children from families with poor living conditions. This is significant (p=0.0001).

Sex also exerts a negative influence on the upper arm circumference of the children. With a coefficient of -.176. This means that female children have less upper arm circumference than boys by .175 cm. This is not significant (p = 0.075).

Residence is positively associated with upper arm circumference with a coefficient of .32094. This means that children from urban area have higher upper arm circumference than those children from rural area. This is significant (p=0.005). socio-economic class exerts a great influence on the upper arm circumference of the pre-school children.The coefficient indicates that children from middle and high socio-economic classes have higher upper arm circumferences than those in the low socio-economic class by 0.44 cm and 0.41 cm respectively.

The Model also show a negative relationship between the upper arm circumference and the "number of times a child was breastfed in a day" With a coefficient of -.599. This means that those children who were not breast-fed at all have low upper arm circumference compared to those children who received breast-feeding. This is not significant (p=0.096)".

It is observed that age, living condition in the family residence and socio-economic class influence the upper- arm circumference positively while malnutrition/ infectious disease interaction, sex and the number of times a child was breastfed in a day show negative relationship with the upper arm circumference of the preschool children. The regression analysis gives R square of .54102. The B-coefficient and standardised Beta coefficient are shown in table 55. The F-Values are high and highly significant.

Table 55 : REGRESSION ON UPPER ARM CIRCUMFERENCE OF THE PRE-SCHOOL CHILDREN (SEXES COMBINED)

Independent Variables	R-Coefficient	Beta	F-Ratio	Level of significant
Age	.48118	.44574	176.459	.000
Residence		.10365	7.911	.005
Urban	.32094	-	-	-
Rural	RC			
Nutrition & Infectious Disease Interactions				
No sickness not malnourished	RC	-	-	-
No sickness, malnourished	-1.06073	-3.3211	97.954	.000
Sick and malnourished	-1.35715	-.27457	62.441	.000
Living Conditions (Sanitation)				
Poor	RC	-	-	.000
Very Good	.72546	.16597	23.135	
Socio-economic class				
Low	RC	-	-	
Middle Class	.44402	.11770	11.986	.001
High Class	.41419	.08591	6.026	.014
Sex				
Female	-.17571	-.05692	3.187	.075
Male	RC		-	
No. of times breastfeed a child in a day.	-.59860	.05339	2.785	.096

F-Statistics = 59.72198

R Square = .54102

Multiple R = .73554

Significant = .0000

Constant = 13.26953

Total = 466

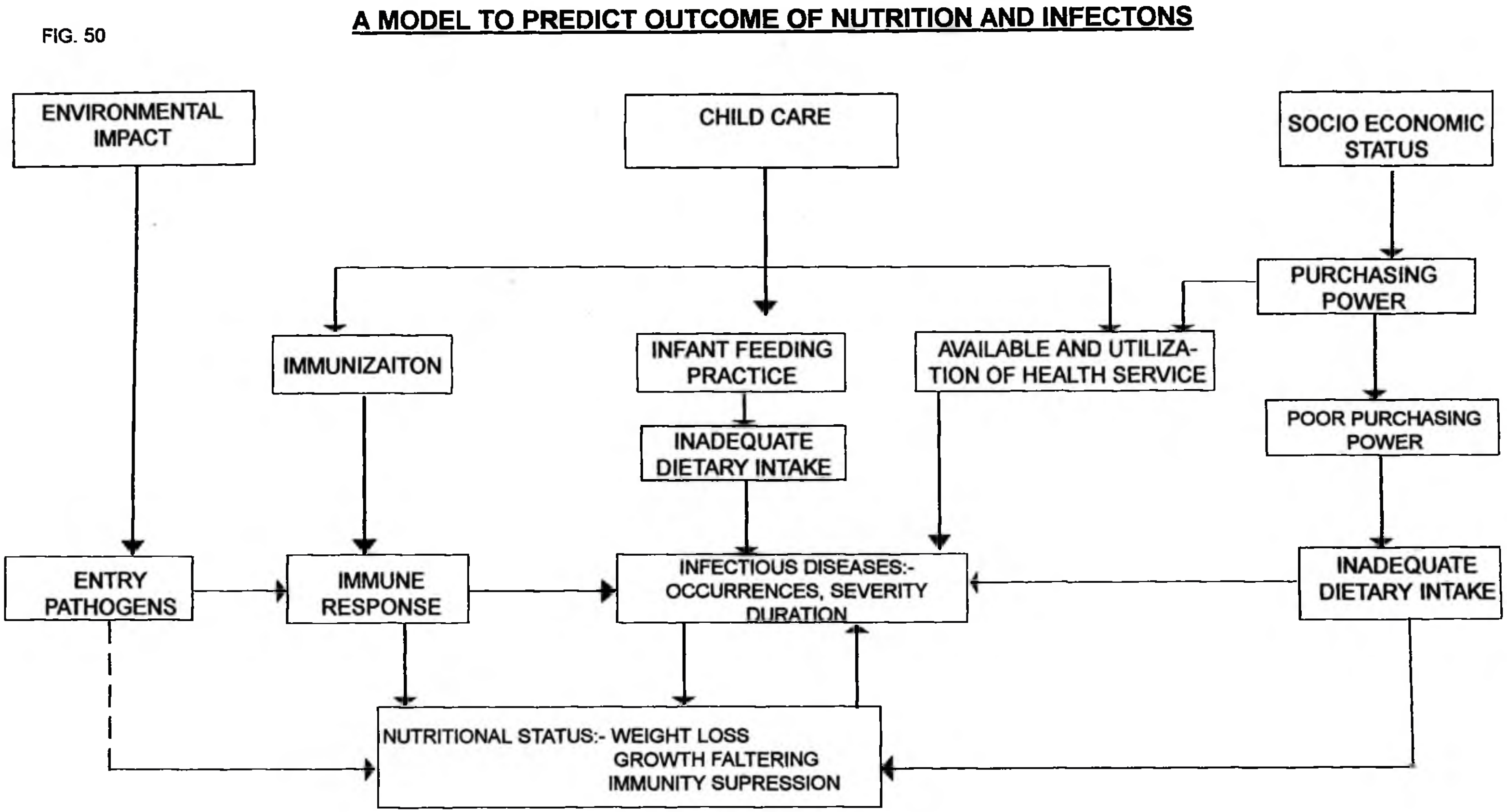
4.4.10 A MODEL TO PREDICT OUTCOME OF NUTRITION AND INFECTIONS.

Fig 50 displays a model that can be used to predict outcome of Nutrition and Infections. Regression analysis shows that children who were brought up in environment with insanitary conditions suffered more from infections compared to those children brought up in environments with good and very good sanitary conditions. Those children brought up in environments with poor sanitary conditions tend to have low weight-for-age, low mid-upper-arm circumference for-age, and low height-for-age compared with their age groups.

In terms of child's care and infants feeding practices, regression analysis indicates that those children whose breast-feeding continued to the age of 22 months and over, weighed more. They were taller than those children whose breast-feeding was stopped early in life.This is statistically significant(p=0.03). Those children who were not breast-fed at all have low upper-arm circumference compared to those children who received breast-feeding.

Regression analysis also showed a positive relationship between socio-economic class, weight-for-age, height-for-age and mid-upper-arm circumference of the pre-school children. Those children who were from high socio-economic class weighed more. They had higher mid-upper-arm circumferences. They were taller compared with their age groups who were from low socio-economic class.

FIG. 50


A MODEL TO PREDICT OUTCOME OF NUTRITION AND INFECTONS
ENVIRONMENTAL IMPACT
CHILD CARE
SOCIO ECONOMIC STATUS
PURCHASING POWER
IMMUNIZAITON
INFANT FEEDING PRACTICE
AVAILABLE AND UTILIZA-TION OF HEALTH SERVICE
POOR PURCHASING POWER
INADEQUATE DIETARY INTAKE
ENTRY PATHOGENS
IMMUNE RESPONSE
INFECTIOUS DISEASES:- OCCURRENCES, SEVERITY DURATION
INADEQUATE DIETARY INTAKE
NUTRITIONAL STATUS:- WEIGHT LOSS
GROWTH FALTERING
IMMUNITY SUPRESSION

CHAPTER 5

DISCUSSION

5.1.1 MALNUTRITION/INFECTIOUS DISEASE INTERRACTION AND EFFECTS ON THE NUTRITIONAL STATUS OF THE PRE-SCHOOL CHILDREN.

5.1.2. MEAN WEIGHT-FOR-AGE

The results of malnutrition and infectious diseases complex in this study indicate the interactions of malnutrition and infectious diseases on the nutritional status of the pre-school children. Low body weight, poor growth, low upper arm circumference, low skinfold thickness, low head circumference, low chest circumference, low mid arm muscle circumference low body fat, low buttocks circumference, low upper thigh circumference, low lower thigh circumference, low calf circumference and low haemoglobin level among SM group were the evidence of interactions of malnutrition and infectious diseases on the nutritional status of the pre-school children.

Generally, the growth patterns of SM group were inferior to those of NSNM group through out the study.

These findings are similar to that of Falusi (1985) in Ibadan-Nigeria. She observed significant differences between the children using various anthropometric measurements. These differences in growth were the result of a combination of malnutrition and chronic or recurrent acute infections. Similarly Chen et al (1987) in rural Bangladesh reported gross disparity in the weights and heights of infants and children aged one to eleven years.

A striking feature of this study is the rapidity with which PEM developed. At the age of 2 weeks about 65.0 percent of infants were given milk from the bottles

(Table 42). About 35.0 percent of the infants have been taken off the breast (Table 41). At this age more than 17.1 percent of the infants had diarrhoea (Table 34). Mean body weight of SM group was significantly($p<0.05$) lower than those of the other three groups (NSNM,NSM and SNM).

A similar observation was made by Asibey-Berko (1982) on the rapid development of PEM among the newly weaned rats who were placed on low dietary protein. He noted that body weights of the malnourished rats fell continuously until an approximate minimum of 31.0gm per animal was recorded on the 5th week. Accordingly, the well-nourished rats (which had been gaining weight) were significantly ($p<0.05$) heavier than the malnourished rats, that by the 6th week the well-nourished rats weighed about 10 times more than the malnourished rats.

In the present study, weight changes followed the age increase closely with SM group lagging behind. The same pattern of growth in weight continued throughout early childhood. At the end of the study period, mean weight of the NSNM group was significantly ($p<0.05$) higher than those of the other three groups (NSM, SNM and SM). Mean weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean weight of the NSM group was significantly ($p<.05$) higher than that of the SM group. Mean weight of the SM group was inferior to the other three groups.

Various studies have shown that infectious diseases contribute significantly to weight faltering in infants. Reddy et al (1986) in India observed flattening of growth curves for children under five years during the acute stage of measles. These children showed significantly lower weight gain in the first 3 months of follow up than the control.

Duggan and Milner (1986) in Kenya, and Black et al (1984) in rural Bangladesh and Mata et al (1972) in Guatamala, have reported significant loss of weight in children after the attack of whooping cough, mumps, respiratory tract infection and measles. This was the pattern with the present study. Mean weight of the SM group was inferior to the other three groups. This was an evidence of interaction of malnutrition and infectious diseases on the nutritional status of the children.

The problem of weight faltering was reported by Tomkins et al (1983) during the outbreak of infectious hepatitis in Nigeria. He observed that the disease was more severe among the well-fed persons but deaths were negligible. But the undernourished persons had a greater severity and a high case fatality.

Similar findings have been reported by Orraca-Tetteh (1964) on the protein metabolism in the growing rats infected with Nippostrongylus muris. He observed that lower haematological indices and serum protein changes occurred during infection. The changes were severe in infected rats fed on diet of low protein value. He therefore stressed the need for improvement of the protein values of diets of the people of Ghana and emphasised that measures aimed at improving the nutritional status of the people should take into account the synergistic effect of infectious diseases and malnutrition.

Another observation made from this study is that among the NSNM group at the age of 36 months through 60 months, weight-for-age of a very few children exceeded that of the NCHS/WHO median weight-for-age for their age groups. One possible explanation is that these children may have been obese or it may be that the mothers of these children did not give the precise age of their children. This is a common occurrence among the uneducated mothers in the rural areas.

The results obtained in the present study on the effect of malnutrition and infectious diseases on the nutritional status of the pre-school children are significant. One interesting feature that emerged was the synergism between malnutrition and infectious diseases in causing low body weights among the pre-school children. The weights of the pre-school children who were SM were significantly ($p<0.05$) lower throughout all ages compared to other groups (NSNM; NSM; SNM). This study demonstrates synergism between malnutrition and infectious diseases, in which the combined effect was greater than the sum of the impact of each condition.

5.1.3 MEAN LENGTH/HEIGHT-FOR-AGE OF PRE-SCHOOL CHILDREN.

The results also indicate that the SM group was the shortest in length/height than the other groups (NSNM, NSM and SNM). The nsnm group continued to grow in height throughout all ages. At the age of 60 months the NSNM group was significantly ($p<0.05$) taller than the other three groups (NSM, SNM and SM). The SNM group was significantly ($p<0.05$) taller than the other two groups (NSM and SM). The NSM group was significantly ($p<0.05$) taller than the SM group.

Fletcher et al (1988) observed that Jamaican children who had been undernourished 5-8 years before, were found to be significantly shorter than their siblings and these in turn were shorter than the control group from the same school. Balcazar and Cobas (1991) stressed that malnutrition occurring very early in life left severe deficits on height and head circumference which seemed likely to be permanent.

Further scrutiny of the results showed that children who were SNM showed significantly ($p<0.05$) better nutritional status as compared to the children who were

NSM. This brings attention to the importance of good nutrition in the proper development of the children and more especially during the time of an illness and during convalescence.

Rowland's (1988) study of infection and growth in Gambian children portrays the importance of good nutrition in the traditional setting. He reported that Bakan children grew better than their NCHS counterparts during the first 3 months of life, despite high disease prevalence, indicating that the quantity and quality of feeding was adequate not only for normal growth but for compensatory or catch-up growth after illness episodes. The result also showed that among NSNM group at the age of 36 months through 60 months, height-for-age of a few pre-school children exceeded that of the NCHS/WHO standard. The reason may be that these children were obese or it may be that mothers of these children did not give the precise age of theit childern.Generally, mean height-for-age of NSNM group was superior to the other three groups (NSM,SNM and SM) through out the study.

5.1.4 CHILDREN'S CHEST/HEAD RATIO.

According to Jelliffe et al (1989) chest and head circumferences are almost equal at birth, giving a chest -to- head ratio of about 1.0. In well nourished infants, the chest circumference increases faster than the head circumference after the 6th month of life, leading to a chest - to- head ratio greater than 1. When the infants nutrition is poor and inadequate in quality and quantity, the nutrient needed for proper development of chest muscles will not be available resulting in reduced chest diameter, hence, chest-to-head ratio becomes less than 1 or at best equals 1.

The mean chest -to-head circumference ratio among NSNM group begun at 0.99 and increased beyond 1 at age 24 months. Among SM group, the ratio remained under 1 till age 36 months. This explains that nutrition which was made available to NSNM group was adequate in quality and quantity.

5.1.5 MEAN INCREASE IN WEIGHT-FOR-AGE AND LENGTH/HEIGHT-FOR-AGE/3 monthlv OF PRE-SCHOOL CHILDREN.

Mean increase in weight and length/height of children were measured as 3 monthly changes in weights and lengths/heights. Mean values were based on the NCHS/WHO standard.

Mean increase in weight and length/height of the NSNM group exceeded the NCHS/WHO standard. Mean values of the SNM group compared favourably with the NCHS/WHO standard. Mean increase in weights and lengths/heights of the NSM, SM groups were below the NCHS/WHO standard.

Similarly, Mata et al (1972) in Guatemala found that those children in the tercile group with the highest frequency of viral infection during the first 6-months of life, as determined by bi-weekly faecal cultures, grow more slowly than those with a lesser frequency of viral infections.

The practical consequences of repeated infectious diseases are impaired growth, possibly with actual loss of weight and lean body mass and importantly, the frequent precipitation of nutritional disease in children already on a borderline. Their effects are cumulative when there is not enough time for full recovery from one infectious episode before the next one comes along. The individual may then be progressively depleted to the point where an illness seemingly no worse than many of the preceding ones is sufficient to precipitate clinical signs of malnutrition. The effects are reciprocal, because not only does infection worsen the nutritional status, but the poorer nutritional status also results in increased frequency and severity of infection.

What is noticeable and of significance in the present study is that the effect of infectious disease per se on the nutritional status of the children is less severe compared to that imposed by malnutrition alone. Mean increase in weight-for-age length/height-for-age of SNM group was higher than that of NSM group. Mean increases in weight-for-age and length/height-for-age of SM group was inferior to the other three groups (NSNM,NSM and SNM) throuh out the study period. The significance of these findings is that the impact of infectious diseases on predisposed malnourished children is greater than the sum of the impact of each condition.

This study therefore reinforces the importance of adequate diets of high-nutrient-dense foods for the pre-school children. It also indicates that measures aimed at improving the nutritional status of the pre-school children should take into account the synergistic effect of infectious diseases and malnutrition.

5.2 PREVALENCE OF DISEASES AND INFANT FEEDING PRACTICES.

The study on prevalence of diarrhoeal disease indicates that the overall prevalence of diarrhoea rises with age and reaches a peak at 12 months and 24 months. The gradual increase in prevalence in infancy and observed first peak at 12 months coincides with age of introduction of supplementary foods. The observed second peak at 24 months coincide with the age at which children are left crawling on the floor. There is, in general, greater exposure to contamination in area with poor hygiene and improper sanitation.

Traditionally Nigerian culture demands that every child be given unrestricted breastfeeding. A mother owes it to the health and proper development of her child to breastfeed on demand. Mothers milk is universally accepted as the most suitable food during the first stages of life. This belief is reflected by the "Song of Lawino" which states:

> "Because I know
> The customs of our People
> When a child cries
> Let him suck
> From the breast.
> There is no fixed time
> For Breast-feeding.
> When the child cries
> It may be he is ill;
> The first medicine for a child
> Is the breast.
> Give him milk
> And he will stop crying."
> (from "Song of Lawino" by Okot p'Bitek).

Most mothers claimed that breastfeeding is absolutely necessary for the proper development of a child. A mother who does not breast -feed her child is actually frowned at by the society. In addition to being a clean source of important nutrients, prolonged breastfeeding is also viewed as contributing to children's well-being through the stimulation of emotional ties between mother and the child.

Similar beliefs on the importance of breastfeeding have been shared by Armar (1989), Rutstein (1991), Bankole and Olaleye (1991). The Declaration and Plan of Action adopted from 1990 Summit for Children encouraging breast-feeding past the second birthday while giving adequate complementary feeds (SCN News 1992). Practically all Nigerian children (97.0 percent) are breastfed for some period of time (NDHS, 1990). In the present study 99.2 percent of the children from the urban area and 99.1 percent of the pre-school children from the rural area were breastfed.

At 4-6 months of age breast milk is not enough to meet the nutritional needs of the growing child and therefore giving other additional food to the infant is recommended. Thus, the first peak of diarrhoea corresponds with the period of supplementation. These could be of several reasons; after 4-6 months of age the protection against infections provided by the maternal anti-bodies in the breast-milk diminishes making the baby vulnerable to infections.

The supplementary food now introduced to the infants may not be prepared hygienically or not stored in a healthy environment or not fed hygienically. Infants may be fed by hands which are not properly washed after use of the toilet. Infants often receive food which is contaminated. There is, in general, greater exposure to contamination in areas with poor hygiene and an inadequate supply of water and improper sanitation. In addition, the infant is introduced for the first time to certain "pathogens", and does not have a natural immunity to these organisms established yet.

Early weaning appears to be the rule in the case of children from the urban area. While as many as 46.4 percent of the urban children were taken off the breast by 7-9 months of age, 37.4 percent of the rural children were taken off the breast at the age of 13-15 months. Barros and Victora (1990) observed similar trends towards early weaning among Brazilian children. They attributed it to prevalence of severe PEM and diarrhoea among children in Brazil.

The danger of early weaning can be seen in relation to the age of introduction of artificial milk. From Table 42 and Fig 41, it can be seen that artificial milk was introduced as early as the first two weeks of life. This tends to support the findings of Cherian, (1981) that weaning foods are introduced unusually early in Nigeria.

In the weaning period extra dangers from infections, mainly diarrhoeal disease are frequent (Alam et al, 1989). The immunity acquired from maternal antibodies is now less effective and the infants are still too young to build up their own immunity to protect them against diseases.

Therefore at the weaning period diarrhoea diseases are again common. Also when children begin to move about, they put whatever they pick up in their mouths, and so they are highly vulnerable to infections, considering the inadequate basic amenities and the low standard of sanitation prevailing at places where these children live. Under similar conditions, other workers have found early weaning with artificial milk acting as a source of infections to infants (Brown et al, 1989; Victora et al, 1989; Barros and Victora, 1990).

Exclusive breastfeeding is rare in Nigeria (NDHS, 1990), and in other parts of the World (Barros and Victora, 1990). Studies that have examined the duration of full breastfeeding and/or patterns of supplementation have found that liquid supplements are given to a substantial proportion of infants already during the first few months of life (Anderson et al, 1983; Chayovan et al 1990; Zohoori et al 1991). For instance, a recent cross-national study (Grummer-Strawn and Trussel 1991) which examined the duration of full breast- feeding, found that the mean duration of full breastfeeding was shorter than 4 months, the recommended WHO standard, in 17 of the countries examined.

The results from the present study of full and partial breastfeeding and breastfeeding supplementation suggest that while the duration of breastfeeding is relatively long, the duration of exclusive breastfeeding is very short. Similar observations were made by Elo et al (1991). Infants are on the average given water and other liquids before they reach three months of life, with potentially dangerous implications for diarrhoeal diseases.

Teran (1991), Victoria et al (1987) stated that most infants in the developing countries are breastfed from birth and the problem with adequate lactation is not in its initiation but its maintenance. The WHO (1981) study on contemporary breastfeeding pattern has revealed that early supplementary feeding occurs more often in traditional societies than usually envisaged. Commey et al (1985) had reported on similar incidence.

The present study shows that from age one day to two weeks of life, 50.0 percent of the urban children have received supplementary feedings and 81.5 percent of the children from rural area had also been supplemented. The types of supplementary foods consisted of liquids -milk and paps. Milk formula was preferred in urban area by majority of mothers and a small proportion of rural mothers.

The dependence of rural mothers on more expensive processed commercial weaning cereals/milk formula, in spite of their constrained economic circumstances, is of concern. These commercial weaning foods are expensive and provide children with less solid food than they require, thus increasing the risk of undernourishment. In addition, commercial milk may be overdiluted by the mothers to make them last longer.

Another important observation with possible nutritional consequences to the health of the infants is bottle feeding practices. About 84.5 percent of the infants were given tea and commercial milk from feeding bottles before the age 3 months, with potentially dangerous implications for diarrhoeal diseases and other infections.

September to January are usually the hottest months in Nigeria when diarrhoea is endemic. Diarrhoeal diseases are however much more prevalent in areas where water shortages are acute, as in the dry and hot areas in Nigeria. In the present study the percentage of children who had diarrhoea was higher in the month of September through January. These findings are similar to those reported by Molbak et al, (1990) in Guinea Bissau. Seasonality in diarrhoeal diseases, in both morbidity and mortality, has been found elsewhere (Greenwood et al, 1987a). The months of February, March, April and June are seasons of low diarrhoea incidence. During this time only a small percentage of children had diarrhoea.

Sex of the child was also introduced into the model because there is evidence from various studies (Stinson, 1985) that boys are less buffered against environmental stresses. Secondly to see whether there are sex differentials in diarrhoea prevalence as a result of the sex preference of the parents. The data did not support the existence of a significant sex difference in diarrhoea prevalence. A similar observation was made by Gamimratne (1991), Khan et ai (1991).

Place of residence emerged as a strong predictor of diarrhoeal diseases in children. For urban children the prevalence during the season of high diarrhoea incidence, the percentage was low (6.7 percent) compared to 15.0 percent for rural children, reflecting the poor environmental and living conditions of the families living in rural areas.

5.3 INFLUENCE OF SOCIO- ECONOMIC FACTORS ON DISEASE PREVELANCE AND SEVERITY

When the children were grouped into social strata and were compared, differences in the prevalence and severity of infectious diseases among the children emerged. The results reveal high incidence of infectious diseases among children from low socioeconomic class followed by the middle socio-economic class with the least occurrence among children from high socio-economic class.

The severity of infectious diseases as it affects the children according to socio-economic class was also assessed. It was observed that the severity was highest among the children from low socio-economic class followed by middle socio-economic class with less severity among children from high socio-economic class.

The results also showed that children from low socio-economic class had about 2.5 times higher probability of having infectious diseases than those children from high socio-economic class. This reflection is true because those who are seeking modern medical care (preventive or curative) are also more likely than others to be educated, to be knowledgeable about matters relating to health care, and to adopt good hygienic practices.

5.4 A MODEL TO PREDICT OUTCOME OF NUTRITION AND INFECTIONS

In order to develop a model which can be used to predict outcomes of nutrition and infectious, variables in factor analysis were used in regression analysis (Fig.50). Broeck et al (1993) studied the association between nutritional status (marasmus and kwashiorkor) and mortality risk in children of a 0-5 years in the rural area of Bwamanda, Zaire. They used standard deviation scores (SDS). The relative risks were very high for weight-for-age (WFA) below -4 SDS, arm circumference-for-age (ACFA) below -4 SDS, and kwashiorkor. Long-term mortality from extreme malnutrition was increased even when the baseline WFA was below -2SDS. Muscle wasting (mild malnutrition) did carry an increased mortality risk.

In this study (Fig 50) socio-economic variables, living conditions in the household (environmental sanitation) and malnutrition/infectious disease interractious were used to predict the outcome of nutritional status (as expressed in weight, height and upper arm circumference) of the preschool children using linear regression analysis. The coefficient shows a negative relationship between the weight of the child and malnutrition/infectious disease complex. This means that mean body weight of the NSM group was 2.1kg lower than that of NSNM group. Mean body weight of the SNM was .56 kg lower than that of NSNM group. Mean body weight of the SM group was 2.4 kg lower than that of the NSNM group.

The coefficient depicts a positive relationship between living conditions in the household and the weight of the child. It shows that those children who come from families with very good living conditions (very good sanitation) have higher weight by 1.29 kg than those from households with poor living conditions. Those children who come from families with good sanitation have higher weight by 0.40 kg than those from families with poor sanitation. This is significant (p=0.05).

The regression coefficient shows that children who come from high socio-economic class have higher weight (1.0 kg) than those from low socio- economic class. Those from middle socio-economic class also have higher weight (0.54 kg) than those from low socio- economic class.

The height of the pre-school children was introduced into the model. The coefficient shows that those children who were NSM were 1.57 cm shorter than the reference category. Those children who were SNM were 2.90 cm shorter than those who were NSNM. The coefficient also shows that those children who were SM were 1.97 cm shorter than NSNM group. There was a positive relationship between height and living condition in the household. Those children who come from homes with very good living conditions were taller by 4.797 cm than those from families with poor living conditions. These children from household with good living conditions were 1.47 cm taller than those from families with poor living condition.

The regression coefficient also shows positive relationship with socio-economic class. Those children from high socio-economic class were 3.89 cm taller than those from low socio-economic class. Children who were from middle socioeconomic class were 1.93 cm taller than the reference category. This is significant (p = 0.002).

When the upper arm circumference of the children was introduced into the model there was a negative relationship between the upper arm circumference and the malnutrition/infectious disease interactions. Children who were NSM have less upper arm circumference by 1.06 cm than the reference category. Those children who were SM have 1.36 cm less upper arm circumference than those who were NSNM.

The model depicts a positive relationship between living condition in the household and the upper arm circumference. Children who come from households with very good living conditions have higher upper arm circumference than the reference category by 0.73 cm. There was also a positive relationship between upper arm circumference and socio- economic class. Those children who were from middle and high socio- economic classes have higher upper arm circumferences than those in the reference category by 0.414 cm and 0.444 cm respectively.

Most other studies including the present study have found a clear association between nutritional status and mortality/morbidity. It is likely that the high incidence of diarrhoea, respiratory infections, malaria and measles led to the association between malnutrition and morbidity in the preschool children in the present study. Other factors possibly leading to malnutrition, and at the same time enhancing morbidity include extreme poverty, poor availability of medical care and poor water quality.

It has been suggested that children who are wasted come from poorer environment and are more likely to be from low socioeconomic class (Tomkins 1986). Many malnourished children with infections appear to suffer particularly severe forms of illness with a high prevalence of complications. A mild respiratory infection develops into pneumonia; measles appears to develop in a very dangerous form with many complications; diarrhoea is associated with particularly severe fluid, electrolyte, nitrogen and mineral losses.

The findings of this study reiterate the fact that levels of under nutrition and morbidity among pre-school children are high in some areas in Akwa Ibom State of Nigeria. It also shows that groups of children at very high risk of being poorly nourished and highly infected by infectious diseases can be identified based on socio-economic class and other demographic characteristics.

CHAPTER 6

6.1 SUMMARY.CONCLUSION AND RECOMMENDATIONS

6.1.1 SUMMARY AND CONCLUSIONS:

The environment plays a very important role in a child's growth and health. These roles can be separated into four main aspects as follows:

1. Sanitation facility and type of water supply have been implicated in the synergism of malnutrition and infections.
2. Socio-economic and cultural variables on child's rearing practices are well established.
3. Repeated episodes of infectious diseases in conjunction with insufficient dietary intake are important factors leading to growth faltering in young children.
4. Maternal attributes have been shown to be the most important cause of malnutrition.

Attempts have been made to provide data in support of these views. The main aim of this study was to investigate this interaction with respect to all four aspects. The situation has been hypothesized as follows:

1. Childhood diarrhoeal diseases are greater in areas with defective sanitation/water supply than in areas with good sanitation.
2. Children from high socio-economic class tend to have less infectious diseases than children from low socioeconomic class.

Four hundred and sixty six (466) pre-school children formed the target population for this study. They were assigned into four groups according to their nutritional status using a 2x2 factorial design. Group I were the children who had no infectious diseases and were not malnourished (NSNM). They formed the control group and they were 42.9 percent (n=200). Group 2 were pre-school children who had no infectious diseases but were malnourished (NSM). They were 18.4 percent (n=86).

Group 3 were pre-school children who had infectious diseases but were not malnourished (SNM). They were 18.7 percent (n=87). Group 4 were the pre-school children who had infectious diseases and were malnourished (SM). They formed 20.0 percent (n=93). Weight-for-age, height-for-age, skinfold thickness, head circumference, chest circumference, upper arm circumference, arm muscle circumference, total body fat, buttocks circumference, upper thigh circumference, lower thigh circumference, calf circumference and haemoglobin level of the children were assessed.

An interesting feature that emerged was the synergism between malnutrition and infectious diseases in causing low body weight, poor growth, low skinfold thickness, low head circumference, low chest circumference, low upper arm circumference, low arm muscle circumference, low buttocks circumference, low upper thigh circumference, low lower thigh circumference and low haemoglobin level among the SM group. Mean body weight of the NSNM group was significantly ($p<0.05$) higher throughout all ages when compared with other three groups (NSM, SNM and SM).

Mean weight of the SNM group was significantly ($p<0.05$) higher than those of the NSM and SM groups. Mean weight of the NSM group was significantly ($p<0.05$) higher than that of the SM group. Mean weight of the SM group was inferior to those of the other three groups through out the period of study.

It is concluded that malnutrition control strategies therefore must focus on this most vulnerable groups, that is pre-school children. They must focus on an approach based on adequate diets of high-nutrient-dense foods. With emphasis on exclusive breast- feeding of 4 months duration and adequate weaning foods. Improvements in water supply and domestic hygiene. Control of infectious diseases and easy access to primary health care. Most importantly, they should regard PEM as only one, a very important one, of a number of co-factors contributing to morbidity and mortality from infections.

6.1.2 RECOMMENDATIONS

In Nigeria working mothers are allowed maternity leave of 12 weeks (6 weeks pre-natal and 6 weeks post-natal) with pay. All nursing mothers are allowed to be off duty one hour earlier every day until the baby attains the age of one year. One of the solutions to the short duration of exclusive breast-feeding may therefore be the extension of post- natal period of maternity leave. If instead of the rigid six weeks pre-natal and six weeks post-natal maternity leave, mothers are given the option to arrange the 3 months period with their doctors, more time may be spent on breastfeeding. Therefore, a new law or administrative directive is necessary to allow for optional arrangements of maternity leave for the pregnant women by their doctors. Guide lines on such arrangements should be drawn up by the Nigerian Medical Council.

Education of mothers should be taken into account while planning and implementing any programme. There is an immediate need to create awareness among socio-economically disadvantaged mothers, especially in the rural areas, about appropriate supplementary feeding. It is recommended that informal discussion, demonstration and teaching methods be adopted to train mothers about preparation of low-cost, high-nutrient-dense weaning foods for children.

Evidences abound in the study to show that income is more critical at low income levels to food consumption than it is at high income level. This suggests that efforts to improve the nutritional standard of the society through increases in incomes should be directed more at the low income group than at the high income groups.

A long term measure for improving the incomes of many poor households is the reduction of the level of unemployment especially in the urban areas. Encouraging investment in agricultural based industries like flour mills, fruit processing and canning industries (for fruits like oranges, pineapples and tomatoes) grain preservation and packaging industries may go a long way to reduce unemployment in the rural areas.

The price of high protein foods has negative effect on the nutritional standard of the society. Policy efforts, therefore, should be geared towards reducing the prices of high protein foods.

The need to intensify family planning campaign in order to control the growth of families beyond desired sizes is necessary. Public education on the ill-effect of large family sizes on nutrition is necessary to arouse the urge to reduce family sizes. Lectures on legal ways of birth control are recommended for the relevant public especially in the rural areas.

Education is positively related to the quality of food consumed in any society. Improvements in the educational level of the society is necessary for better nutrition. More informal educational programmes which concentrate on the nutritional well-being of the household should be mounted. Adult education and literacy campaigns should include elements of home economics for housewives and other general programmes designed to break certain cultural barriers to nutritional improvements.

In order to bring about improved nutritional status under conditions of high rates of infectious disease morbidity and much malnutrition, it is recommended that a good immunization programme be mounted particularly if it includes vaccines against measles.

In poor areas especially in rural areas, diarrhoea is a highly common disease, and it is closely related to environmental and socio-economic variables. It is therefore recommended that profound political and social changes are needed to improve the living condition of a large segment of the population and thereby decrease the burden of preventable infectious diseases.

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APPENDIX 1

QUESTIONNAIRE

1. CHILD

a. Name: ....

b. Health Centre: ....

c. Age (Date of birth): .... d. Group: ....

e. I.D. No.: .... f. Sex: ....

h. Date first seen: ....

i. Religion: ....

j. Name of the Father: ....

k. Name of the Mother: ....

2. FATHER

a. Father's address: ....

b. Level of education attained (Tick correct box)

No. School; [ ] Primary; [ ] Modern II; [ ] Secondary School; [ ]

Post-secondary school (sixth form, polytechnic, teachers training) [ ]

University graduate [ ] Post graduate [ ]

c. i. Main occupation: ....

ii. Status: ....

iii. Where: ....

d. Subsidiary occupation: ....

i. Where: ....

3. MOTHER

a. Mother's address: ....

b. Level of education attained (Tick correct box)

No. School; Primary; Modern II; Secondary School;

[ ] [ ] [ ] [ ]

Post-secondary school (sixth form, polytechnic teaching training) [ ]

University graduate [ ] Post graduate [ ]

c. i. Main occupation: ....

ii. Status: ....

iii. Where: ....

d. Subsidiary occupation: ....

i. Where: ....

4. LIVING ACCOMMODATION

(a) i. Type of residence (Tick correct box)

Own; Rented; Family House; Others specify

[ ] [ ] [ ] [ ]

b. Type of Furniture (Tick correct box)

Arms chairs only; [ ] Arm chairs with foam [ ],

Beds, mattresses and cupboard [ ],

Bed, mattresses and wardrobes [ ]

Other specify ....

d. Bathing facility (Tick correct box)

Bucket [ ] Shower [ ]; Bathing tub + shower [ ]

f. Do you own any of the following items (Tick correct box)

i. Radio Yes [ ] ; No [ ]

ii. Television (black and white) Yes [ ] ; No [ ]

iii. Television (coloured) Yes [ ]; No [ ]; iv. Video Yes [ ]; No [ ]

v. Refrigerator/Deep freezer Yes [ ] ; No [ ]

vi. Car Yes [ ] ; No [ ]

vii. Lorry/Bus/Tractor Yes [ ] ; No [ ]

viii. Bicycle Yes [ ] ; No [ ]

ix. Motor Cycle Yes [ ] ; No [ ]

g. i. Toilet facility (Tick correct box)

None [ ] ; Pit latrine [ ]; Pan latrine [ ]

Water closet [ ] Public Toilet [ ]

h. i. Cooking facility (Tick correct box)

Gas cooker [ ]; Kerosene stove [ ]; Coal pot [ ]; fire wood stove [ ]

j. i. Source of water supply (Tick correct box)

Private pump [ ]; Public stand by pump [ ] Well [ ]; Ponds [ ]

APPENDIX 2

Anthropometric Measurement

	1st Visit	3 Months	6 Months	9 Months	12 Months
i. Height (cm)					
ii. Weight (kg)					
iii. Wt. for age					
iv. Height for age					
v. Wt for ht					
b. **Skinfolds (mm)**					
I. Biceps					
ii. Triceps					
iii. Subscapular					
iv. Sura-iliac					
c. **Total skinfold**					
d. **Body Fat %**					
e. **Body Girth (cms)**					
I. Head circumfrence					
ii. Chest circumfrence					
iii. Upper Arm Circumfrence					
iv. Butocks					
v. Upper Thigh					
vi. Lower Thigh					
vii. Calf					
f. Haemoglobin determination					

APPENDIX 3

INFANT FEEDING PRACTICES

a. Did you breastfeed this child (Tick correct box)

Yes [ ] No [ ]

b. If No, why not? (Tick correct box)

i. Child could not suck [ ]

ii. Not enough milk [ ]

iii. Sore nipples [ ]

iv. Mother was ill [ ]

v. Others specify ....

c. When did you start breastfeeding your child (after delivery)?

i. Some hours [ ]

ii. Half a day [ ]

iii. 1 day [ ]

iv. 2 days [ ]

v. 3 days [ ]

d. Until then what did you give your baby?

i. Nothing [ ]

ii. Water [ ]

iii. Gruel (pap) [ ]

iv. Glucose [ ]

e. How many times a day did you breastfeed your child?

i. 2 times [ ]

ii. 3 times [ ]

iii. 4 times [ ]

iv. 5 times [ ]

v. On demand [ ]

f. At what age did you stop breastfeeding your child?
(Tick correct box).

1-3 Months	4-6 Months	7-9 Months	10-12 Months	13-15 Months	16-18 Months	19-21 Months
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

22-24 and over months [ ]

g. Did you give your baby any milk from bottle?

Yes [ ] No [ ]

h. At what age did you start giving your child milk
(Tick correct box)

1-3 Months	4-6 Months	7-9 Months	10-12 Months	13-15 Months	16-18 Months	19-21 Months
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

APPENDIX 4

INFECTIOUS DISEASE OCCURRENCES IN 12 MONTHS

Name of the child: .... Group No. ....

Address: ....

Age: .... Sex: .... I.D. No. ....

Diseases	Date	No. of Times	Duration	Mild	Moderate	Severe
1. Acute Respiratory Tract Infections						
2. Diarrhoea						
3. Measles						
4. Malaria						

APPENDIX 5

WEIGHT

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----- O N E W A Y -----

Variable AGE6.FIR AGE 6M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	54.1556	18.0519	70.7411	.0000
Within Groups	84	21.4353	.2552		
Total	87	75.5909			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	34	7.4118	.4996	.0857	7.2375	TO	7.5861
Grp 2	14	6.0000	.3922	.1048	5.7735	TO	6.2265
Grp 3	10	7.1000	.5676	.1795	6.6939	TO	7.5061
Grp 4	30	5.7000	.5350	.0977	5.5002	TO	5.8998
Total	88	6.5682	.9321	.0994	6.3707	TO	6.7657

GROUP	MINIMUM	MAXIMUM
Grp 1	7.0000	8.0000
Grp 2	5.0000	7.0000
Grp 3	6.0000	8.0000
Grp 4	4.0000	6.0000
TOTAL	4.0000	8.0000

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----- O N E W A Y -----

Variable AGE6.FIR AGE 6M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .3572 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	Groups	Grp 4	Grp 2	Grp 3	Grp 1
5.7000	Grp 4				
6.0000	Grp 2				
7.1000	Grp 3	*	*		
7.4118	Grp 1	*	*		

----- O N E W A Y -----

Variable AGE6.SEC AGE 6M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	77.1543	25.7181	66.1379	.0000
Within Groups	84	32.6639	.3889		
Total	87	109.8182			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	34	8.5000	.6629	.1137	8.2687	TO	8.7313
Grp 2	14	6.9286	.2673	.0714	6.7743	TO	7.0829
Grp 3	10	8.0000	.6667	.2108	7.5231	TO	8.4769
Grp 4	30	6.5000	.6823	.1246	6.2452	TO	6.7548
Total	88	7.5455	1.1235	.1198	7.3074	TO	7.7835

GROUP	MINIMUM	MAXIMUM
Grp 1	8.0000	10.0000
Grp 2	6.0000	7.0000
Grp 3	7.0000	9.0000
Grp 4	5.0000	7.0000
TOTAL	5.0000	10.0000

----- O N E W A Y -----

Variable AGE6.SEC AGE 6M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .4409 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
6.5000	Grp 4				
6.9286	Grp 2	*			
8.0000	Grp 3	*	*		
8.5882	Grp 1	*	*	*	

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----- O N E W A Y -----

Variable AGE6.THR AGE 6M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	87.9094	29.3031	68.6346	.0000
Within Groups	84	35.8633	.4269		
Total	87	123.7727			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	34	9.500	.6629	.1137	9.2687	TO	9.7313
Grp 2	14	7.6429	.4972	.1329	7.3558	TO	7.9300
Grp 3	10	8.9000	.5676	.1795	8.4939	TO	9.3061
Grp 4	30	7.2333	.8584	.1567	6.9128	TO	7.5539
Total	88	8.3409	1.1928	.1271	8.0882	TO	8.5936

GROUP	MINIMUM	MAXIMUM
Grp 1	9.0000	11.0000
Grp 2	7.0000	8.0000
Grp 3	8.0000	10.0000
Grp 4	6.0000	8.0000
TOTAL	6.0000	10.0000

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----- O N E W A Y -----

Variable AGE6.THR AGE 6M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .4620 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.2333	Grp 4				
7.6429	Grp 2				
8.9000	Grp 3	*	*		
9.4412	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AGE6.FTH AGE 6M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	130.2204	43.4068	114.4468	.0000
Within Groups	84	31.8591	.3793		
Total	87	162.0795			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	34	10.4118	.4996	.0857	10.2375	TO	10.5861
Grp 2	14	8.2857	.4688	.1253	8.0150	TO	8.5564
Grp 3	10	9.9000	.5676	.1795	9.4939	TO	10.3061
Grp 4	30	7.7333	.7849	.1433	7.4402	TO	8.0264
Total	88	9.1023	1.3649	.1455	8.8131	TO	9.3915

GROUP	MINIMUM	MAXIMUM
Grp 1	10.0000	11.0000
Grp 2	8.0000	9.0000
Grp 3	9.0000	11.0000
Grp 4	7.0000	9.0000
TOTAL	7.0000	11.0000

----- O N E W A Y -----

Variable AGE6.FTH AGE 6M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .4355 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.7333	Grp 4				
8.2857	Grp 2	*			
9.9000	Grp 3	*	*		
10.4118	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AGE6.FIV AGE 6M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	156.2754	52.0918	269.6952	.0000
Within Groups	84	16.2246	.1932		
Total	87	172.5000			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	11.1176	.3270	.0561	11.0035 TO 11.2318
Grp 2	14	9.0714	.2673	.0714	8.9171 TO 9.2257
Grp 3	10	10.8000	.6325	.2000	10.3476 TO 11.2524
Grp 4	30	8.1667	.5307	.0969	7.9685 TO 8.3648
Total	88	9.7500	1.4081	.1501	9.4517 TO 10.0483

GROUP	MINIMUM	MAXIMUM
Grp 1	11.0000	12.0000
Grp 2	9.0000	10.0000
Grp 3	10.0000	12.0000
Grp 4	8.0000	10.0000
TOTAL	8.0000	12.0000

----- O N E W A Y -----

Variable AGE6.FIV AGE 6M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .3108 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
8.1667	Grp 4				
9.0714	Grp 2	*			
10.8000	Grp 3	*	*		
11.1176	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG12.FIR AGE 12M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	52.9520	17.6507	69.3729	.0000
Within Groups	77	19.5912	.2544		
Total	80	72.5432			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	9.1000	.3051	.0557	8.9861	TO	9.2139
Grp 2	19	7.7895	.4189	.0961	7.5876	TO	7.9914
Grp 3	15	8.4667	.5164	.1333	8.1807	TO	8.7526
Grp 4	17	7.0000	.7906	.1917	6.5935	TO	7.4065
Total	81	8.2346	.9523	.1058	8.0240	TO	8.4451

GROUP	MINIMUM	MAXIMUM
Grp 1	9.0000	10.0000
Grp 2	7.0000	8.0000
Grp 3	8.0000	9.0000
Grp 4	6.0000	8.0000
TOTAL	6.0000	10.0000

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----- O N E W A Y -----

Variable AG12.FIR AGE 12M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .3567 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.0000	Grp 4				
7.7895	Grp 2	*			
8.4667	Grp 3	*	*		
9.1000	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG12.SEC AGE 12M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	85.5097	28.5032	157.6416	.0000
Within Groups	77	13.9224	.1808		
Total	80	99.4321			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	9.9333	.2537	.0463	9.8386 TO 10.0281
Grp 2	19	8.1579	.6021	.1381	7.8677 TO 8.4481
Grp 3	15	9.0000	.3780	.0976	8.7907 TO 9.2093
Grp 4	17	7.2941	.4697	.1139	7.0526 TO 7.5356
Total	81	8.7901	1.1149	.1239	8.5436 TO 9.0366

GROUP	MINIMUM	MAXIMUM
Grp 1	9.0000	10.0000
Grp 2	7.0000	9.0000
Grp 3	8.0000	10.0000
Grp 4	7.0000	8.0000
TOTAL	7.0000	10.0000

----- O N E W A Y -----

Variable AG12.SEC AGE 12M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .3007 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.2941	Grp 4				
8.1579	Grp 2	*			
9.0000	Grp 3	*	*		
9.9333	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG12.THR AGE 12M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	119.1279	39.7093	133.6830	.0000
Within Groups	77	22.8721	.2970		
Total	80	142.0000			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	10.6333	.4901	.0895	10.4503 TO 10.8164
Grp 2	19	8.4737	.5130	.1177	8.2264 TO 8.7209
Grp 3	15	9.2667	.5936	.1533	8.9379 TO 9.5954
Grp 4	17	7.5294	.6243	.1514	7.2084 TO 7.8504
Total	81	9.2222	1.3323	.1480	8.9276 TO 9.5168

GROUP	MINIMUM	MAXIMUM
Grp 1	10.0000	11.0000
Grp 2	8.0000	9.0000
Grp 3	9.0000	11.0000
Grp 4	7.0000	9.0000
TOTAL	7.0000	11.0000

----- O N E W A Y -----

Variable AG12.THR AGE 12M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .3854 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.5294	Grp 4				
8.4737	Grp 2	*			
9.2667	Grp 3	*	*		
10.6333	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG12.FTH AGE 12M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	153.4818	51.1606	153.5578	.0000
Within Groups	77	25.6540	.3332		
Total	80	179.1358			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	11.2333	.4302	.0785	11.0727 TO 11.3940
Grp 2	19	8.7895	.5353	.1228	8.5315 TO 9.0475
Grp 3	15	9.6000	.6325	.1633	9.2498 TO 9.9502
Grp 4	17	7.7059	.7717	.1872	7.3091 TO 8.1027
Total	81	9.6173	1.4964	.1663	9.2864 TO 9.9482

GROUP	MINIMUM	MAXIMUM
Grp 1	11.0000	12.0000
Grp 2	8.0000	10.0000
Grp 3	9.0000	11.0000
Grp 4	7.0000	10.0000
TOTAL	7.0000	12.0000

----- O N E W A Y -----

Variable AG12.FTH AGE 12M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .4081 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

```
                 G G G G
                 r r r r
                 p p p p

                 4 2 3 1
Mean     GROUPS

7.7059   Grp 4
8.7895   Grp 2   *
9.6000   Grp 3   * *
11.2333  Grp 1   * * *
```

WEIGHT

----- O N E W A Y -----

Variable AG12.FIV AGE 12M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	183.1139	61.0380	135.4892	.0000
Within Groups	77	34.6885	.4505		
Total	80	217.8025			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	11.7333	.7849	.1433	11.4402	TO	12.0264
Grp 2	19	8.9474	.2294	.0526	8.8368	TO	9.0579
Grp 3	15	9.9333	.2582	.0667	9.7903	TO	10.0763
Grp 4	17	7.9412	.9663	.2344	7.4443	TO	8.4380
Total	81	9.9506	1.6500	.1833	9.5858	TO	10.3155

GROUP	MINIMUM	MAXIMUM
Grp 1	10.0000	13.0000
Grp 2	8.0000	9.0000
Grp 3	9.0000	10.0000
Grp 4	6.0000	10.0000
TOTAL	6.0000	13.0000

----- O N E W A Y -----

Variable AG12.FIV AGE 12M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .4746 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
7.9412	Grp 4				
8.9474	Grp 2	*			
9.9333	Grp 3	*	*		
11.7333	Grp 1	*	*	*	

Variable AG24.FIR AGE 24M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	80.1317	26.7106	34.8777	.0000
Within Groups	82	62.7985	.7658		
Total	85	142.9302			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	38	11.3421	1.1217	.1820	10.9734	TO	11.7108
Grp 2	14	9.6429	.4972	.1329	9.3558	TO	9.9300
Grp 3	19	10.4211	.7685	.1763	10.0506	TO	10.7915
Grp 4	15	8.8000	.4140	.1069	8.5707	TO	9.0293
Total	86	10.4186	1.2967	.1398	10.1406	TO	10.6966

GROUP	MINIMUM	MAXIMUM
Grp 1	10.0000	14.0000
Grp 2	9.0000	10.0000
Grp 3	9.0000	12.0000
Grp 4	8.0000	9.0000
TOTAL	8.0000	14.0000

----- O N E W A Y -----

Variable AG24.FIR AGE 24M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6188 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
8.8000	Grp 4				
9.6429	Grp 2	*			
10.4211	Grp 3	*	*		
11.3421	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG24.SEC AGE 24M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	103.1742	34.3914	33.9152	.0000
Within Groups	82	83.1514	1.0140		
Total	85	186.3256			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	38	11.9211	1.3230	.2146	11.4862	TO	12.3559
Grp 2	14	9.9286	.4746	.1269	9.6545	TO	10.2026
Grp 3	19	10.8421	.6882	.1579	10.5104	TO	11.1738
Grp 4	15	9.0667	.7037	.1817	8.6770	TO	9.4564
Total	86	10.8605	1.4806	.1597	10.5430	TO	11.1779

GROUP	MINIMUM	MAXIMUM
Grp 1	10.0000	15.0000
Grp 2	9.0000	11.0000
Grp 3	10.0000	12.0000
Grp 4	8.0000	10.0000
TOTAL	8.0000	15.0000

----- O N E W A Y -----

Variable AG24.SEC AGE 24M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7121 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.0667	Grp 4				
9.9286	Grp 2	*			
10.8421	Grp 3	*	*		
11.9211	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG24.THR AGE 24M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	138.2093	46.0698	40.4790	.0000
Within Groups	82	93.3256	1.1381		
Total	85	231.5349			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	12.6316	1.3837	.2245	12.1768 TO 13.0864
Grp 2	14	10.2143	.5789	.1547	9.8800 TO 10.5486
Grp 3	19	11.1579	.7647	.1754	10.7893 TO 11.5265
Grp 4	15	9.4000	.7368	.1902	8.9920 TO 9.8080
Total	86	11.3488	1.6504	.1780	10.9950 TO 11.7027

GROUP	MINIMUM	MAXIMUM
Grp 1	11.0000	16.0000
Grp 2	10.0000	12.0000
Grp 3	10.0000	12.0000
Grp 4	8.0000	11.0000
TOTAL	8.0000	16.0000

----- O N E W A Y -----

Variable AG24.THR AGE 24M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7544 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.4000	Grp 4				
10.2143	Grp 2	*			
11.1579	Grp 3	*	*		
12.6316	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG24.FTH AGE 24M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	177.6373	59.2124	54.3197	.0000
Within Groups	82	89.3860	1.0901		
Total	85	267.0233			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	13.2895	1.3736	.2228	12.8380 TO 13.7410
Grp 2	14	10.5000	.6504	.1738	10.1244 TO 10.8756
Grp 3	19	11.5263	.5130	.1177	11.2791 TO 11.7736
Grp 4	15	9.6667	.8165	.2108	9.2145 TO 10.1188
Total	86	11.8140	1.7724	.1911	11.4339 TO 12.1940

GROUP	MINIMUM	MAXIMUM
Grp 1	12.0000	16.0000
Grp 2	10.0000	12.0000
Grp 3	11.0000	12.0000
Grp 4	9.0000	12.0000
TOTAL	9.0000	16.0000

----- O N E W A Y -----

Variable AG24.FTH AGE 24M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7383 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.6667	Grp 4				
10.5000	Grp 2	*			
11.5263	Grp 3	*	*		
13.2895	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG24.FIV AGE 24M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	211.9105	70.6368	73.6804	.0000
Within Groups	82	78.6128	.9587		
Total	85	290.5233			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	13.9474	1.2934	.2098	13.5222 TO 14.3725
Grp 2	14	10.9286	.2673	.0714	10.7743 TO 11.0829
Grp 3	19	11.8947	.3153	.0723	11.7428 TO 12.0467
Grp 4	15	10.0000	1.0000	.2582	9.4462 TO 10.5538
Total	86	12.3140	1.8488	.1994	11.9176 TO 12.7103

GROUP	MINIMUM	MAXIMUM
Grp 1	12.0000	17.0000
Grp 2	10.0000	11.0000
Grp 3	11.0000	12.0000
Grp 4	8.0000	12.0000
TOTAL	8.0000	17.0000

----- O N E W A Y -----

Variable AG24.FIV AGE 24M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6923 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
10.0000	Grp 4				
10.9286	Grp 2	*			
11.8947	Grp 3	*	*		
13.9474	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.FIR AGE 36M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	314.9848	104.9949	98.5762	.0000
Within Groups	103	109.7068	1.0651		
Total	106	424.6916			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	14.0816	1.0574	.1511	13.7779	TO	14.3854
Grp 2	24	11.5833	1.0598	.2163	11.1358	TO	12.0309
Grp 3	20	12.3000	.6569	.1469	11.9925	TO	12.6075
Grp 4	14	9.0000	1.3009	.3477	8.2489	TO	9.7511
Total	107	12.5234	2.0016	.1935	12.1397	TO	12.9070

GROUP	MINIMUM	MAXIMUM
Grp 1	12.0000	16.0000
Grp 2	9.0000	13.0000
Grp 3	11.0000	13.0000
Grp 4	6.0000	10.0000
TOTAL	6.0000	16.0000

----- O N E W A Y -----

Variable AG36.FIR AGE 36M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7298 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.0000	Grp 4				
11.5833	Grp 2	*			
12.3000	Grp 3	*	*		
14.0816	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.SEC AGE 36M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	351.5357	117.1786	111.4288	.0000
Within Groups	103	108.3148	1.0516		
Total	106	459.8505			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	14.6122	.9534	.1362	14.3384	TO	14.8861
Grp 2	24	11.8750	.9918	.2025	11.4562	TO	12.2938
Grp 3	20	12.8000	.8335	.1864	12.4099	TO	13.1901
Grp 4	14	9.2857	1.4899	.3982	8.4255	TO	10.1460
Total	107	12.9626	2.0828	.2014	12.5634	TO	13.3618

GROUP	MINIMUM	MAXIMUM
Grp 1	13.0000	17.0000
Grp 2	10.0000	14.0000
Grp 3	12.0000	14.0000
Grp 4	6.0000	11.0000
TOTAL	6.0000	17.0000

----- O N E W A Y -----

Variable AG36.SEC AGE 36M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7251 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.2857	Grp 4				
11.8750	Grp 2	*			
12.8000	Grp 3	*	*		
14.6122	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.THR AGE 36M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	379.6714	126.5571	110.8278	.0000
Within Groups	103	117.6184	1.1419		
Total	106	497.2897			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	15.1020	1.0655	.1522	14.7960 TO 15.4081
Grp 2	24	12.2500	.7940	.1621	11.9147 TO 12.5853
Grp 3	20	13.2000	1.0052	.2248	12.7295 TO 13.6705
Grp 4	14	9.5714	1.5046	.4021	8.7027 TO 10.4401
Total	107	13.3832	2.1660	.2094	12.9680 TO 13.7983

GROUP	MINIMUM	MAXIMUM
Grp 1	13.0000	18.0000
Grp 2	11.0000	13.0000
Grp 3	12.0000	15.0000
Grp 4	6.0000	12.0000
TOTAL	6.0000	18.0000

----- O N E W A Y -----

Variable AG36.THR AGE 36M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7556 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.5714	Grp 4				
12.2500	Grp 2	*			
13.2000	Grp 3	*	*		
15.1020	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.FTH AGE 36M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	410.8674	136.9558	122.3248	.0000
Within Groups	103	115.3196	1.1196		
Total	106	526.1869			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	15.5306	1.1920	.1703	15.1882	TO	15.8730
Grp 2	24	12.5417	.8836	.1804	12.1685	TO	12.9148
Grp 3	20	13.6000	.6806	.1522	13.2815	TO	13.9185
Grp 4	14	9.7857	1.2514	.3344	9.0632	TO	10.5082
Total	107	13.7477	2.2280	.2154	13.3206	TO	14.1747

GROUP	MINIMUM	MAXIMUM
Grp 1	14.0000	18.0000
Grp 2	11.0000	14.0000
Grp 3	13.0000	15.0000
Grp 4	7.0000	11.0000
TOTAL	7.0000	18.0000

----- O N E W A Y -----

Variable AG36.FTH AGE 36M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7482 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
9.7857	Grp 4				
12.5417	Grp 2	*			
13.6000	Grp 3	*	*		
15.5306	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.FIV AGE 36M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	451.8654	150.6218	145.4305	.0000
Within Groups	103	106.6767	1.0357		
Total	106	558.5421			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	15.9592	1.1895	.1699	15.6175 TO 16.3009
Grp 2	24	12.7083	.7506	.1532	12.3914 TO 13.0253
Grp 3	20	13.9000	.3078	.0688	13.7559 TO 14.0441
Grp 4	14	10.0000	1.3587	.3631	9.2155 TO 10.7845
Total	107	14.0654	2.2955	.2219	13.6255 TO 14.5054

GROUP	MINIMUM	MAXIMUM
Grp 1	14.0000	19.0000
Grp 2	12.0000	14.0000
Grp 3	13.0000	14.0000
Grp 4	7.0000	12.0000
TOTAL	7.0000	19.0000

----- O N E W A Y -----

Variable AG36.FIV AGE 36M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7196 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
10.0000	Grp 4				
12.7083	Grp 2	*			
13.9000	Grp 3	*	*		
15.9592	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.FIR AGE 48M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	296.7672	98.9224	85.1917	.0000
Within Groups	100	116.1175	1.1612		
Total	103	412.8846			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	16.0816	.9539	.1363	15.8076	TO	16.3556
Grp 2	15	13.4000	.7368	.1902	12.9920	TO	13.8080
Grp 3	23	14.8696	1.3586	.2833	14.2821	TO	15.4571
Grp 4	17	11.4706	1.2307	.2985	10.8378	TO	12.1034
Total	104	14.6731	2.0021	.1963	14.2837	TO	15.0624

GROUP	MINIMUM	MAXIMUM
Grp 1	15.0000	18.0000
Grp 2	12.0000	14.0000
Grp 3	13.0000	17.0000
Grp 4	9.0000	13.0000
TOTAL	9.0000	18.0000

----- O N E W A Y -----

Variable AG48.FIR AGE 48M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7620 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
11.4706	Grp 4				
13.4000	Grp 2	*			
14.8696	Grp 3	*	*		
16.0816	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.SEC AGE 48M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	325.5004	108.5001	75.4079	.0000
Within Groups	100	143.8842	1.4388		
Total	103	469.3846			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	16.5306	1.0821	.1546	16.2198 TO 16.8414
Grp 2	15	13.7333	.7037	.1817	13.3436 TO 14.1230
Grp 3	23	15.3478	1.4336	.2989	14.7279 TO 15.9678
Grp 4	17	11.7059	1.4902	.3614	10.9397 TO 12.4721
Total	104	15.0769	2.1347	.2093	14.6618 TO 15.4921

GROUP	MINIMUM	MAXIMUM
Grp 1	15.0000	18.0000
Grp 2	13.0000	15.0000
Grp 3	13.0000	18.0000
Grp 4	10.0000	14.0000
TOTAL	10.0000	18.0000

----- O N E W A Y -----

Variable AG48.SEC AGE 48M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .8482 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
11.7059	Grp 4				
13.7333	Grp 2	*			
15.3478	Grp 3	*	*		
16.5306	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG48.THR AGE 48M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	346.2541	115.4180	86.8020	.0000
Within Groups	100	132.9671	1.3297		
Total	103	479.2212			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	16.9388	.8268	.1181	16.7013 TO 17.1763
Grp 2	15	13.9333	.5936	.1533	13.6046 TO 14.2621
Grp 3	23	15.6522	1.3688	.2854	15.0603 TO 16.2441
Grp 4	17	12.0000	1.8371	.4456	11.0554 TO 12.9446
Total	104	15.4135	2.1570	.2115	14.9940 TO 15.8329

GROUP	MINIMUM	MAXIMUM
Grp 1	16.0000	18.0000
Grp 2	13.0000	15.0000
Grp 3	14.0000	18.0000
Grp 4	10.0000	15.0000
TOTAL	10.0000	18.0000

----- O N E W A Y -----

Variable AG48.THR AGE 48M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .8154 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
12.0000	Grp 4				
13.9333	Grp 2	*			
15.6522	Grp 3	*	*		
16.9388	Grp 1	*	*	*	

WEIGHT

----- O N E W A Y -----

Variable AG48.FTH AGE 48M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	366.7373	122.2458	102.1062	.0000
Within Groups	100	119.7242	1.1972		
Total	103	486.4615			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	17.3265	.7469	.1067	17.1120 TO 17.5411
Grp 2	15	14.2667	.4577	.1182	14.0132 TO 14.5202
Grp 3	23	16.0435	1.2961	.2703	15.4830 TO 16.6039
Grp 4	17	12.2353	1.8210	.4417	11.2990 TO 13.1716
Total	104	15.7692	2.1732	.2131	15.3466 TO 16.1919

GROUP	MINIMUM	MAXIMUM
Grp 1	16.0000	19.0000
Grp 2	14.0000	15.0000
Grp 3	14.0000	19.0000
Grp 4	10.0000	15.0000
TOTAL	10.0000	19.0000

----- O N E W A Y -----

Variable AG48.FTH AGE 48M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7737 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
12.2353	Grp 4				
14.2667	Grp 2	*			
16.0435	Grp 3	*	*		
17.3265	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.FIV AGE 48M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	399.0253	133.0084	98.0960	.0000
Within Groups	100	135.5901	1.3559		
Total	103	534.6154			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	17.7143	.7906	.1129	17.4872 TO 17.9414
Grp 2	15	14.5333	.5164	.1333	14.2474 TO 14.8193
Grp 3	23	16.4783	1.3440	.2802	15.8971 TO 17.0594
Grp 4	17	12.4118	1.9704	.4779	11.3987 TO 13.4248
Total	104	16.1154	2.2783	.2234	15.6723 TO 16.5584

GROUP	MINIMUM	MAXIMUM
Grp 1	15.0000	20.0000
Grp 2	14.0000	15.0000
Grp 3	15.0000	19.0000
Grp 4	9.0000	16.0000
TOTAL	9.0000	20.0000

----- O N E W A Y -----

Variable AG48.FIV AGE 48M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .8234 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
12.4118	Grp 4				
14.5333	Grp 2	*			
16.4783	Grp 3	*	*		
17.7143	Grp 1	*	*	*	

APPENDIX 6

HEIGHT

----- O N E W A Y -----

Variable AGE6.FIR AGE 6M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	58.3322	19.4441	11.0604	.0000
Within Groups	84	147.6715	1.7580		
Total	87	206.0036			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	67.0265	.8103	.1390	66.7438 TO 67.3092
Grp 2	14	65.3071	.9988	.2669	64.7304 TO 65.8838
Grp 3	10	66.6600	1.1257	.3560	65.8548 TO 67.4652
Grp 4	30	65.3400	1.8720	.3418	64.6410 TO 66.0390
Total	88	66.1364	1.5388	.1640	65.8103 TO 66.4624

GROUP	MINIMUM	MAXIMUM
Grp 1	66.0000	68.8000
Grp 2	63.0000	66.4000
Grp 3	65.0000	68.5000
Grp 4	60.0000	67.5000
TOTAL	60.0000	68.8000

----- O N E W A Y -----

Variable AGE6.FIR AGE 6M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .9375 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 2	Grp 4	Grp 3	Grp 1
65.3071	Grp 2				
65.3400	Grp 4				
66.6600	Grp 3	*	*		
67.0265	Grp 1	*	*		

HEIGHT

----- O N E W A Y -----

Variable AGE6.SEC AGE 6M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	124.8981	41.6327	13.6586	.0000
Within Groups	84	256.0391	3.0481		
Total	87	380.9372			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	71.1329	1.1712	.2009	70.7472 TO 71.5645
Grp 2	14	67.9286	1.4128	.3776	67.1128 TO 68.7443
Grp 3	10	70.2000	1.7353	.5487	68.9587 TO 71.4413
Grp 4	30	69.1667	2.3321	.4258	68.2958 TO 70.0375
Total	88	69.8557	2.0925	.2231	69.4123 TO 70.2990

GROUP	MINIMUM	MAXIMUM
Grp 1	68.0000	73.0000
Grp 2	66.0000	70.0000
Grp 3	67.0000	72.5000
Grp 4	63.0000	72.0000
TOTAL	63.0000	73.0000

----- O N E W A Y -----

Variable AGE6.SEC AGE 6M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.2345 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 2	Grp 4	Grp 3	Grp 1
67.9286	Grp 2				
69.1667	Grp 4	*			
70.2000	Grp 3	*			
71.1559	Grp 1	*	*		

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----- O N E W A Y -----

Variable AGE6.THR AGE 6M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	226.4030	75.4677	16.3024	.0000
Within Groups	84	388.8560	4.6292		
Total	87	615.2590			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	74.7000	1.6315	.2798	74.1307 TO 75.2693
Grp 2	14	70.3571	1.5984	.4272	69.4342 TO 71.2800
Grp 3	10	73.4000	2.5617	.8101	71.5675 TO 75.2325
Grp 4	30	72.0167	2.6829	.4898	71.0149 TO 73.0185
Total	88	72.9466	2.6593	.2835	72.3831 TO 73.5100

GROUP	MINIMUM	MAXIMUM
Grp 1	70.0000	78.0000
Grp 2	68.0000	73.0000
Grp 3	69.0000	77.0000
Grp 4	66.0000	76.5000
TOTAL	66.0000	78.0000

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----- O N E W A Y -----

Variable AGE6.THR AGE 6M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.5214 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 2	Grp 4	Grp 3	Grp 1
70.3571	Grp 2				
72.0167	Grp 4	*			
73.4000	Grp 3	*			
74.7000	Grp 1	*	*		

----- O N E W A Y -----

Variable AGE6.FTH AGE 6M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	411.9328	137.3109	35.1216	.0000
Within Groups	84	328.4049	3.9096		
Total	87	740.3377			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	78.0353	1.2682	.2175	77.5928 TO 78.4778
Grp 2	14	72.6214	1.7392	.4648	71.6172 TO 73.6256
Grp 3	10	76.2900	2.3487	.7427	74.6098 TO 77.9702
Grp 4	30	73.9533	2.5350	.4628	73.0068 TO 74.8999
Total	88	75.5841	2.9171	.3110	74.9660 TO 76.2022

GROUP	MINIMUM	MAXIMUM
Grp 1	74.0000	80.0000
Grp 2	70.0000	76.0000
Grp 3	72.0000	79.2000
Grp 4	68.0000	78.5000
TOTAL	68.0000	80.0000

----- O N E W A Y -----

Variable AGE6.FTH AGE 6M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.3981 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 2	Grp 4	Grp 3	Grp 1
72.6214	Grp 2				
73.9533	Grp 4	*			
76.2900	Grp 3	*	*		
78.0353	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AGE6.FIV AGE 6M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	628.3325	209.4442	59.8919	.0000
Within Groups	84	293.7511	3.4970		
Total	87	922.0836			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	81.0618	1.0739	.1842	80.6871 TO 81.4365
Grp 2	14	74.6357	1.7399	.4650	73.6312 TO 75.6403
Grp 3	10	78.9500	2.0620	.6520	77.4750 TO 80.4250
Grp 4	30	75.8233	2.4780	.4524	74.8980 TO 76.7486
Total	88	78.0136	3.2556	.3470	77.3238 TO 78.7034

GROUP	MINIMUM	MAXIMUM
Grp 1	78.0000	82.2000
Grp 2	72.0000	78.0000
Grp 3	75.0000	81.2000
Grp 4	70.0000	80.3000
TOTAL	70.0000	82.2000

----- O N E W A Y -----

Variable AGE6.FIV AGE 6M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.3223 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 2	Grp 4	Grp 3	Grp 1
74.6357	Grp 2				
75.8233	Grp 4				
78.9500	Grp 3	*	*		
81.0618	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG12.FIR AGE 12M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	306.4161	102.1387	37.3115	.0000
Within Groups	77	210.7841	2.7375		
Total	80	517.2002			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	76.0467	1.8524	.3382	75.3550 TO 76.7384
Grp 2	19	73.8263	1.7201	.3946	72.9973 TO 74.6554
Grp 3	15	75.1467	.7873	.2033	74.7107 TO 75.5826
Grp 4	17	70.8706	1.7560	.4259	69.9677 TO 71.7734
Total	81	74.2728	2.5426	.2825	73.7106 TO 74.8351

GROUP	MINIMUM	MAXIMUM
Grp 1	75.0000	84.5000
Grp 2	68.0000	75.6000
Grp 3	73.3000	77.0000
Grp 4	67.6000	74.0000
TOTAL	67.6000	84.5000

----- O N E W A Y -----

Variable AG12.FIR AGE 12M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.1699 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
70.8706	Grp 4				
73.8263	Grp 2	*			
75.1467	Grp 3	*	*		
76.0467	Grp 1	*	*		

----- O N E W A Y -----

Variable AG12.SEC AGE 12M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	416.3956	138.7985	32.9315	.0000
Within Groups	77	324.5365	4.2148		
Total	80	740.9321			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	79.4800	2.3510	.4292	78.6021 TO 80.3579
Grp 2	19	76.5737	2.1949	.5035	75.5158 TO 77.6316
Grp 3	15	78.1733	.9558	.2468	77.6440 TO 78.7026
Grp 4	17	73.4471	2.0116	.4879	72.4128 TO 74.4813
Total	81	77.2901	3.0433	.3381	76.6172 TO 77.9631

GROUP	MINIMUM	MAXIMUM
Grp 1	76.0000	89.0000
Grp 2	70.0000	78.9000
Grp 3	76.3000	80.4000
Grp 4	69.6000	77.4000
TOTAL	69.6000	89.0000

----- O N E W A Y -----

Variable AG12.SEC AGE 12M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.4517 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
73.4471	Grp 4				
76.5737	Grp 2	*			
78.1733	Grp 3	*	*		
79.4800	Grp 1	*	*	*	

HEIGHT

----- O N E W A Y -----

Variable AG12.THR AGE 12M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	545.4274	181.8091	29.6976	.0000
Within Groups	77	471.3958	6.1220		
Total	80	1016.8232			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	82.7467	2.9081	.5309	81.6608	TO	83.8326
Grp 2	19	78.9947	2.5266	.5796	77.7769	TO	80.2125
Grp 3	15	80.6733	1.1756	.3035	80.0223	TO	81.3244
Grp 4	17	75.8471	2.3964	.5812	74.6150	TO	77.0792
Total	81	80.0346	3.5651	.3961	79.2462	TO	80.8229

GROUP	MINIMUM	MAXIMUM
Grp 1	77.0000	93.0000
Grp 2	72.0000	82.0000
Grp 3	78.5000	83.5000
Grp 4	71.6000	80.5000
TOTAL	71.6000	93.0000

----- O N E W A Y -----

Variable AG12.THR AGE 12M THIR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.7496 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
75.8471	Grp 4				
78.9947	Grp 2	*			
80.6733	Grp 3	*			
82.7467	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG12.FTH AGE 12M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	733.4260	244.4753	28.0787	.0000
Within Groups	77	670.4231	8.7068		
Total	80	1403.8491			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	85.6067	3.5253	.6436	84.2903 TO 86.9230
Grp 2	19	80.9895	2.8769	.6600	79.6029 TO 82.3761
Grp 3	15	82.5600	1.6453	.4248	81.6489 TO 83.4711
Grp 4	17	77.6235	2.7743	.6729	76.1971 TO 79.0500
Total	81	82.2840	4.1890	.4654	81.3577 TO 83.2102

GROUP	MINIMUM	MAXIMUM
Grp 1	78.6000	97.0000
Grp 2	73.2000	84.5000
Grp 3	79.7000	85.5000
Grp 4	72.6000	82.7000
TOTAL	72.6000	97.0000

----- O N E W A Y -----

Variable AG12.FTH AGE 12M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.0865 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
77.6235	Grp 4				
80.9895	Grp 2	*			
82.5600	Grp 3	*			
85.6067	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG12.FIV AGE 12M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	790.3130	263.4377	28.1429	.0000
Within Groups	77	720.7761	9.3607		
Total	80	1511.0891			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	86.2667	3.7370	.6823	84.8713	TO	87.6621
Grp 2	19	81.3947	2.9277	.6717	79.9836	TO	82.8059
Grp 3	15	83.0000	1.6797	.4337	82.0698	TO	83.9302
Grp 4	17	78.0000	2.7613	.6697	76.5802	TO	79.4198
Total	81	82.7840	4.3461	.4829	81.8229	TO	83.7450

GROUP	MINIMUM	MAXIMUM
Grp 1	79.0000	98.4000
Grp 2	73.5000	85.0000
Grp 3	80.0000	86.0000
Grp 4	73.0000	83.0000
TOTAL	73.0000	98.4000

----- O N E W A Y -----

Variable AG12.FIV AGE 12M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.1634 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
78.0000	Grp 4				
81.3947	Grp 2	*			
83.0000	Grp 3	*			
86.2667	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG24.FIR AGE 24M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	243.7853	81.2618	31.0880	.0000
Within Groups	82	214.3423	2.6139		
Total	85	458.1276			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	85.4316	.8727	.1416	85.1447 TO 85.7184
Grp 2	14	82.7714	1.9781	.5287	81.6293 TO 83.9136
Grp 3	19	84.2211	1.2843	.2946	83.6020 TO 84.8401
Grp 4	15	80.9000	2.7464	.7091	79.3791 TO 82.4209
Total	86	83.9407	2.3216	.2503	83.4429 TO 84.4384

GROUP	MINIMUM	MAXIMUM
Grp 1	83.0000	87.4000
Grp 2	79.0000	85.6000
Grp 3	82.0000	86.6000
Grp 4	74.0000	84.5000
TOTAL	74.0000	87.4000

----- O N E W A Y -----

Variable AG24.FIR AGE 24M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.1432 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
80.9000	Grp 4				
82.7714	Grp 2	*			
84.2211	Grp 3	*	*		
85.4316	Grp 1	*	*	*	

HEIGHT

----- O N E W A Y -----

Variable AG24.SEC AGE 24M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	417.0671	139.0224	33.6933	.0000
Within Groups	82	338.3417	4.1261		
Total	85	755.4088			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	88.0842	1.6634	.2698	87.5375 TO 88.6309
Grp 2	14	84.6286	2.1406	.5721	83.3926 TO 85.8645
Grp 3	19	86.4842	1.7157	.3936	85.6573 TO 87.3112
Grp 4	15	82.1467	2.9691	.7666	80.5024 TO 83.7909
Total	86	86.1326	2.9811	.3215	85.4934 TO 86.7717

GROUP	MINIMUM	MAXIMUM
Grp 1	84.0000	92.2000
Grp 2	81.0000	88.2000
Grp 3	83.0000	89.5000
Grp 4	75.0000	86.0000
TOTAL	75.0000	92.2000

----- O N E W A Y -----

Variable AG24.SEC AGE 24M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.4363 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
82.1467	Grp 4				
84.6286	Grp 2	*			
86.4842	Grp 3	*	*		
88.0842	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG24.THR AGE 24M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	632.9596	210.9865	36.5930	.0000
Within Groups	82	472.7925	5.7658		
Total	85	1105.7521			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	90.5711	2.3033	.3737	89.8140 TO 91.3281
Grp 2	14	86.5071	2.3526	.6287	85.1488 TO 87.8655
Grp 3	19	88.4684	2.0213	.4637	87.4942 TO 89.4427
Grp 4	15	83.1800	3.0590	.7898	81.4860 TO 84.8740
Total	86	88.1558	3.6068	.3889	87.3825 TO 88.9291

GROUP	MINIMUM	MAXIMUM
Grp 1	85.0000	96.2000
Grp 2	83.0000	90.4000
Grp 3	84.0000	92.5000
Grp 4	76.0000	88.0000
TOTAL	76.0000	96.2000

----- O N E W A Y -----

Variable AG24.THR AGE 24M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.6979 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
83.1800	Grp 4				
86.5071	Grp 2	*			
88.4684	Grp 3	*	*		
90.5711	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG24.FTH AGE 24M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	954.8926	318.2975	41.9546	.0000
Within Groups	82	622.1107	7.5867		
Total	85	1577.0034			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	93.4737	2.6987	.4378	92.5866 TO 94.3607
Grp 2	14	88.4786	2.5274	.6755	87.0193 TO 89.9379
Grp 3	19	90.5947	2.5251	.5793	89.3777 TO 91.8118
Grp 4	15	84.3800	3.3255	.8586	82.5384 TO 86.2216
Total	86	90.4384	4.3073	.4645	89.5149 TO 91.3619

GROUP	MINIMUM	MAXIMUM
Grp 1	86.0000	101.0000
Grp 2	85.0000	92.8000
Grp 3	85.0000	96.0000
Grp 4	77.0000	90.0000
TOTAL	77.0000	101.0000

----- O N E W A Y -----

Variable AG24.FTH AGE 24M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.9477 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
84.3800	Grp 4				
88.4786	Grp 2	*			
90.5947	Grp 3	*	*		
93.4737	Grp 1	*	*	*	

HEIGHT

----- O N E W A Y -----

Variable AG24.FIV AGE 24M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1314.3583	438.1194	42.7367	.0000
Within Groups	82	840.6301	10.2516		
Total	85	2154.9884			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	38	96.1053	3.3514	.5437	95.0037	TO	97.2068
Grp 2	14	90.3571	2.7903	.7457	88.7461	TO	91.9682
Grp 3	19	92.5263	2.9414	.6748	91.1086	TO	93.9440
Grp 4	15	85.4000	3.4651	.8947	83.4811	TO	87.3189
Total	86	92.5116	5.0352	.5430	91.4321	TO	93.5912

GROUP	MINIMUM	MAXIMUM
Grp 1	87.0000	105.0000
Grp 2	86.0000	95.0000
Grp 3	86.0000	99.0000
Grp 4	78.0000	92.0000
TOTAL	78.0000	105.0000

----- O N E W A Y -----

Variable AG24.FIV AGE 24M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.2640 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
85.4000	Grp 4				
90.3571	Grp 2	*			
92.5263	Grp 3	*			
96.1053	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG36.FIR AGE 36M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	835.9722	278.6574	37.9286	.0000
Within Groups	103	756.7299	7.3469		
Total	106	1592.7021			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	94.2755	1.4978	.2140	93.8453 TO 94.7057
Grp 2	24	91.3750	2.9461	.6014	90.1310 TO 92.6190
Grp 3	20	93.8000	.7847	.1755	93.4327 TO 94.1673
Grp 4	14	85.8571	5.8026	1.5508	82.5068 TO 89.2075
Total	107	92.4346	3.8763	.3747	91.6916 TO 93.1775

GROUP	MINIMUM	MAXIMUM
Grp 1	90.0000	97.0000
Grp 2	82.0000	94.0000
Grp 3	92.0000	96.0000
Grp 4	72.0000	93.0000
TOTAL	72.0000	97.0000

----- O N E W A Y -----

Variable AG36.FIR AGE 36M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.9166 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
85.8571	Grp 4				
91.3750	Grp 2	*			
93.8000	Grp 3	*	*		
94.2755	Grp 1	*	*		

----- O N E W A Y -----

Variable AG36.SEC AGE 36M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1186.1132	395.3711	41.5395	.0000
Within Groups	103	980.3494	9.5180		
Total	106	2166.4626			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	97.0653	2.2361	.3194	96.4230 TO 97.7076
Grp 2	24	93.1875	3.3841	.6908	91.7585 TO 94.6165
Grp 3	20	95.7000	1.2503	.2796	95.1149 TO 96.2851
Grp 4	14	86.9643	5.8654	1.5676	83.5777 TO 90.3508
Total	107	94.6187	4.5209	.4370	93.7522 TO 95.4852

GROUP	MINIMUM	MAXIMUM
Grp 1	91.0000	101.0000
Grp 2	83.0000	97.5000
Grp 3	93.0000	99.0000
Grp 4	73.0000	95.0000
TOTAL	73.0000	101.0000

----- O N E W A Y -----

Variable AG36.SEC AGE 36M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.1815 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
86.9643	Grp 4				
93.1875	Grp 2	*			
95.7000	Grp 3	*	*		
97.0653	Grp 1	*	*		

----- O N E W A Y -----

Variable AG36.THR AGE 36M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1596.6168	532.2056	43.8218	.0000
Within Groups	103	1250.9114	12.1448		
Total	106	2847.5282			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	99.7286	2.7668	.3953	98.9338 TO 100.5233
Grp 2	24	94.9167	3.9112	.7984	93.2651 TO 96.5682
Grp 3	20	97.6550	1.6901	.3779	96.8640 TO 98.4460
Grp 4	14	88.0286	6.0596	1.6195	84.5298 TO 91.5273
Total	107	96.7308	5.1830	.5011	95.7374 TO 97.7242

GROUP	MINIMUM	MAXIMUM
Grp 1	92.0000	104.0000
Grp 2	84.0000	101.0000
Grp 3	94.0000	102.0000
Grp 4	74.0000	97.4000
TOTAL	74.0000	104.0000

----- O N E W A Y -----

Variable AG36.THR AGE 36M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.4642 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
88.0286	Grp 4				
94.9167	Grp 2	*			
97.6550	Grp 3	*	*		
99.7286	Grp 1	*	*	*	

HEIGHT

----- O N E W A Y -----

Variable AG36.FTH AGE 36M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1990.0555	663.3518	43.6364	.0000
Within Groups	103	1565.7847	15.2018		
Total	106	3555.8402			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	102.0551	3.3842	.4835	101.0831 TO 103.0271
Grp 2	24	96.4583	4.3362	.8851	94.6273 TO 98.2893
Grp 3	20	99.2600	2.1160	.4731	98.2697 TO 100.2503
Grp 4	14	89.0143	6.1927	1.6551	85.4388 TO 92.5898
Total	107	98.5710	5.7919	.5599	97.4609 TO 99.6811

GROUP	MINIMUM	MAXIMUM
Grp 1	93.0000	108.0000
Grp 2	85.0000	104.0000
Grp 3	95.0000	105.0000
Grp 4	75.0000	99.2000
TOTAL	75.0000	108.0000

----- O N E W A Y -----

Variable AG36.FTH AGE 36M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.7570 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
89.0143	Grp 4				
96.4583	Grp 2	*			
99.2600	Grp 3	*	*		
102.0551	Grp 1	*	*	*	

HEIGHT

----- O N E W A Y -----

Variable AG36.FIV AGE 36M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	2413.7141	804.5714	42.4176	.0000
Within Groups	103	1953.6882	18.9678		
Total	106	4367.4022			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	104.2796	4.0235	.5748	103.1239 TO 105.4353
Grp 2	24	98.0000	4.7936	.9785	95.9759 TO 100.0241
Grp 3	20	100.8000	2.5721	.5751	99.5962 TO 102.0038
Grp 4	14	89.9286	6.3393	1.6943	86.2684 TO 93.5888
Total	107	100.3430	6.4189	.6205	99.1127 TO 101.5733

GROUP	MINIMUM	MAXIMUM
Grp 1	94.5000	112.0000
Grp 2	86.0000	107.0000
Grp 3	96.0000	108.0000
Grp 4	76.0000	101.0000
TOTAL	76.0000	112.0000

----- O N E W A Y -----

Variable AG36.FIV AGE 36M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 3.0796 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
89.9286	Grp 4				
98.0000	Grp 2	*			
100.8000	Grp 3	*	*		
104.2796	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.FIR AGE 48M FIR VIS 0M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	591.5950	197.1983	50.6561	.0000
Within Groups	100	389.2887	3.8929		
Total	103	980.8837			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	102.2449	.8409	.1201	102.0034 TO 102.4864
Grp 2	15	99.0000	2.0000	.5164	97.8924 TO 100.1076
Grp 3	23	101.8304	1.0262	.2140	101.3867 TO 102.2742
Grp 4	17	95.8353	4.1547	1.0077	93.6992 TO 97.9714
Total	104	100.6375	3.0860	.3026	100.0374 TO 101.2376

GROUP	MINIMUM	MAXIMUM
Grp 1	100.0000	104.0000
Grp 2	94.0000	101.0000
Grp 3	99.0000	103.5000
Grp 4	87.0000	100.2000
TOTAL	87.0000	104.0000

----- O N E W A Y -----

Variable AG48.FIR AGE 48M FIR VIS 0M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.3952 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
95.8353	Grp 4				
99.0000	Grp 2	*			
101.8304	Grp 3	*	*		
102.2449	Grp 1	*	*		

----- O N E W A Y -----

Variable AG48.SEC AGE 48M SEC VIS 3M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	836.3618	278.7873	55.1799	.0000
Within Groups	100	505.2334	5.0523		
Total	103	1341.5953			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	104.4898	1.4789	.2113	104.0650 TO 104.9146
Grp 2	15	100.3000	2.2345	.5769	99.0626 TO 101.5374
Grp 3	23	103.3783	1.5785	.3291	102.6957 TO 104.0609
Grp 4	17	96.7941	4.1498	1.0065	94.6605 TO 98.9277
Total	104	102.3817	3.6090	.3539	101.6799 TO 103.0836

GROUP	MINIMUM	MAXIMUM
Grp 1	101.0000	107.0000
Grp 2	95.0000	102.0000
Grp 3	100.0000	107.0000
Grp 4	88.0000	102.0000
TOTAL	88.0000	107.0000

----- O N E W A Y -----

Variable AG48.SEC AGE 48M SEC VIS 3M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.5894 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
96.7941	Grp 4				
100.3000	Grp 2	*			
103.3783	Grp 3	*	*		
104.4898	Grp 1	*	*		

----- O N E W A Y -----

Variable AG48.THR AGE 48M THR VIS 6M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1105.2979	368.4326	46.9450	.0000
Within Groups	100	784.8175	7.8482		
Total	103	1890.1154			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	106.7429	2.4692	.3527	106.0336 TO 107.4521
Grp 2	15	101.6333	2.6081	.6734	100.1890 TO 103.0777
Grp 3	23	105.0391	2.1838	.4553	104.0948 TO 105.9835
Grp 4	17	97.9059	4.2721	1.0361	95.7094 TO 100.1024
Total	104	104.1846	4.2838	.4201	103.3515 TO 105.0177

GROUP	MINIMUM	MAXIMUM
Grp 1	102.0000	115.0000
Grp 2	96.0000	104.0000
Grp 3	101.0000	110.5000
Grp 4	89.0000	103.4000
TOTAL	89.0000	115.0000

----- O N E W A Y -----

Variable AG48.THR AGE 48M THR VIS 6M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.9809 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
97.9059	Grp 4				
101.6333	Grp 2	*			
105.0391	Grp 3	*	*		
106.7429	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.FTH AGE 48M FTH VIS 9M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1362.1639	454.0546	47.4618	.0000
Within Groups	100	956.6746	9.5667		
Total	103	2318.8385			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	108.6857	2.8239	.4034	107.8746 TO 109.4968
Grp 2	15	102.8333	2.9500	.7617	101.1997 TO 104.4670
Grp 3	23	106.6565	2.7429	.5719	105.4704 TO 107.8426
Grp 4	17	98.9176	4.2319	1.0264	96.7418 TO 101.0935
Total	104	105.7962	4.7448	.4653	104.8734 TO 106.7189

GROUP	MINIMUM	MAXIMUM
Grp 1	103.0000	114.0000
Grp 2	97.0000	106.0000
Grp 3	102.0000	114.0000
Grp 4	91.0000	105.0000
TOTAL	91.0000	114.0000

----- O N E W A Y -----

Variable AG48.FTH AGE 48M FTH VIS 9M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.1871 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
98.9176	Grp 4				
102.8333	Grp 2	*			
106.6565	Grp 3	*	*		
108.6857	Grp 1	*	*	*	

----- O N E W A Y -----

Variable AG48.FIV AGE 48M FIV VIS 12M
By Variable GROUPS

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	1650.7417	550.2472	45.2265	.0000
Within Groups	100	1216.6487	12.1665		
Total	103	2867.3904			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	110.5429	3.4067	.4867	109.5643 TO 111.5214
Grp 2	15	104.0000	3.1736	.8194	102.2425 TO 105.7575
Grp 3	23	108.1304	3.2306	.6736	106.7334 TO 109.5274
Grp 4	17	99.8000	4.2499	1.0307	97.6149 TO 101.9851
Total	104	107.3096	5.2762	.5174	106.2835 TO 108.3357

GROUP	MINIMUM	MAXIMUM
Grp 1	104.0000	117.0000
Grp 2	98.0000	108.0000
Grp 3	103.0000	117.0000
Grp 4	92.0000	106.5000
TOTAL	92.0000	117.0000

----- O N E W A Y -----

Variable AG48.FIV AGE 48M FIV VIS 12M
By Variable GROUPS

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 2.4664 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUPS	Grp 4	Grp 2	Grp 3	Grp 1
99.8000	Grp 4				
104.0000	Grp 2	*			
108.1304	Grp 3	*	*		
110.5429	Grp 1	*	*	*	

APPENDIX 7

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	34.4617	11.4872	13.0975	.0000
Within Groups	84	73.6729	.8771		
Total	87	108.1345			

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6622 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUP	Grp 4	Grp 2	Grp 1	Grp 3
12.4900	Grp 4				
13.3571	Grp 2	*			
13.8794	Grp 1	*			
13.8800	Grp 3	*			

AGE: 2

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	44.1280	14.7093	21.1840	.0000
Within Groups	77	53.4656	.6944		
Total	80	97.5936			

AGE: 2

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .5892 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUP	Grp 4	Grp 3	Grp 2	Grp 1
12.6294	Grp 4				
13.4267	Grp 3	*			
13.6421	Grp 2	*			
14.5867	Grp 1	*	*	*	

AGE: 3

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	44.0029	14.6676	16.7641	.0000
Within Groups	82	71.7454	.8749		
Total	85	115.7484			

AGE: 3

- - - - - O N E W A Y - - - - -

Variable UPARM
By Variable GROUP

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6614 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.82	2.96	3.06

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUP	Grp 4	Grp 3	Grp 2	Grp 1
13.4933	Grp 4				
14.2421	Grp 3	*			
14.2857	Grp 2	*			
15.3579	Grp 1	*	*	*	

AGE: 4

----- O N E W A Y -----

Variable UPARM
By Variable GROUP

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	69.0716	23.0239	23.4418	.0000
Within Groups	103	101.1636	.9822		
Total	106	170.2351			

AGE: 4

----- O N E W A Y -----

Variable UPARM
By Variable GROUP

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7008 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUP	Grp 4	Grp 2	Grp 3	Grp 1
13.5214	Grp 4				
14.4958	Grp 2	*			
14.8650	Grp 3	*			
15.8102	Grp 1	*	*	*	

AGE: 5

----- O N E W A Y -----

Variable UPARM
By Variable GROUP

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	198.2917	66.0972	77.6275	.0000
Within Groups	100	85.1467	.8515		
Total	103	283.4384			

AGE: 5

----- O N E W A Y -----

Variable UPARM
By Variable GROUP

Multiple Range Tests: Duncan test with significance level .05

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6525 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE:

Step	2	3	4
RANGE	2.81	2.95	3.05

(*) Indicates significant differences which are shown in the lower triangle

Mean	GROUP	Grp 4	Grp 2	Grp 3	Grp 1
13.3294	Grp 4				
14.5933	Grp 2	*			
15.1000	Grp 3	*			
16.9531	Grp 1	*	*	*	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1 GROUP: 1

Number of valid observations (listwise) = 34.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.89	1.39	7.3	13.1	34	HAEMAGLOBI
UPARM	13.88	.81	12.0	15.5	34	
LOWERTHI	20.45	2.05	16.3	25.6	34	LOWERTHIGH
UPPERTHI	24.41	2.46	18.2	30.0	34	UPPERTHIGH
BUTTOCKS	41.82	4.08	23.4	48.4	34	
HEADCIRC	45.63	1.16	42.0	48.5	34	HEADCIRCUM
SKINFOLD	265.41	55.20	184.0	416.0	34	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1 GROUP: 2

Number of valid observations (listwise) = 14.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	9.89	1.63	7.3	11.7	14	HAEMAGLOBI
UPARM	13.36	.94	12.0	15.5	14	
LOWERTHI	19.59	1.49	16.6	22.0	14	LOWERTHIGH
UPPERTHI	23.39	1.64	20.6	25.5	14	UPPERTHIGH
BUTTOCKS	40.44	2.75	35.5	46.7	14	
HEADCIRC	44.86	1.03	42.8	46.8	14	HEADCIRCUM
SKINFOLD	253.43	45.25	188.0	334.0	14	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1 GROUP: 3

Number of valid observations (listwise) = 10.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.89	1.51	8.8	13.1	10	HAEMAGLOBI
UPARM	13.88	.89	11.8	14.8	10	
LOWERTHI	20.13	1.34	18.8	23.0	10	LOWERTHIGH
UPPERTHI	23.72	1.71	21.4	27.0	10	UPPERTHIGH
BUTTOCKS	42.09	2.98	39.0	48.6	10	
HEADCIRC	45.27	1.11	43.8	47.5	10	HEADCIRCUM
SKINFOLD	270.68	35.89	198.0	334.0	10	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 1 GROUP: 4

Number of valid observations (listwise) = 30.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	9.75	1.57	7.3	12.0	30	HAEMAGLOBI
UPARM	12.49	1.07	10.0	15.0	30	
LOWERTHI	17.95	1.51	14.8	21.4	30	LOWERTHIGH
UPPERTHI	21.41	2.07	16.6	25.0	30	UPPERTHIGH
BUTTOCKS	38.29	2.19	33.0	43.5	30	
HEADCIRC	44.15	1.23	42.0	46.5	30	HEADCIRCUM
SKINFOLD	208.27	33.87	162.0	292.0	30	

AGE: 2 GROUP: 1

Number of valid observations (listwise) = 30.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.77	1.19	8.8	13.5	30	HAEMAGLOBI
UPARM	14.59	.91	12.5	15.8	30	
LOWERTHI	22.03	1.23	19.0	24.0	30	LOWERTHIGH
UPPERTHI	26.23	1.78	22.0	30.2	30	UPPERTHIGH
BUTTOCKS	46.27	2.39	40.0	52.0	30	
HEADCIRC	47.98	.83	46.5	49.6	30	HEADCIRCUM
SKINFOLD	302.00	46.99	204.0	394.0	30	

AGE: 2 GROUP: 2

Number of valid observations (listwise) = 19.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	9.99	1.41	7.3	12.0	19	HAEMAGLOBI
UPARM	13.64	.60	13.0	14.8	19	
LOWERTHI	20.13	1.10	18.0	22.6	19	LOWERTHIGH
UPPERTHI	23.74	1.29	21.6	26.2	19	UPPERTHIGH
BUTTOCKS	42.69	1.86	40.2	48.0	19	
HEADCIRC	46.18	1.20	43.5	48.4	19	HEADCIRCUM
SKINFOLD	265.00	50.71	176.0	360.0	19	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 2 GROUP: 3

Number of valid observations (listwise) = 15.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.75	1.06	8.7	12.0	15	HAEMAGLOBI
UPARM	13.43	.89	11.5	14.8	15	
LOWERTHI	20.54	2.01	17.0	24.8	15	LOWERTHIGH
UPPERTHI	24.79	2.06	21.0	30.0	15	UPPERTHIGH
BUTTOCKS	44.53	3.22	40.2	54.6	15	
HEADCIRC	46.86	1.30	45.0	49.0	15	HEADCIRCUM
SKINFOLD	268.13	41.15	212.0	374.0	15	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 2 GROUP: 4

Number of valid observations (listwise) = 17.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	9.85	1.67	7.3	12.0	17	HAEMAGLOBI
UPARM	12.63	.87	11.0	14.0	17	
LOWERTHI	18.97	1.33	16.3	22.0	17	LOWERTHIGH
UPPERTHI	22.62	1.88	19.0	27.0	17	UPPERTHIGH
BUTTOCKS	41.27	2.63	36.0	45.6	17	
HEADCIRC	45.81	1.69	43.2	49.3	17	HEADCIRCUM
SKINFOLD	252.59	51.85	178.0	340.0	17	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 3 GROUP: 1

Number of valid observations (listwise) = 38.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.64	1.01	10.0	13.1	38	HAEMAGLOBI
UPARM	15.36	1.13	13.5	19.2	38	
LOWERTHI	23.77	1.62	20.7	27.6	38	LOWERTHIGH
UPPERTHI	29.08	2.52	25.6	39.6	38	UPPERTHIGH
BUTTOCKS	49.37	2.16	45.0	54.2	38	
HEADCIRC	49.47	1.03	47.3	51.6	38	HEADCIRCUM
SKINFOLD	300.63	53.38	206.0	408.0	38	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 3 GROUP: 2

Number of valid observations (listwise) = 14.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.26	1.32	7.3	12.0	14	HAEMAGLOBI
UPARM	14.29	.72	13.3	15.8	14	
LOWERTHI	21.21	1.05	19.1	23.0	14	LOWERTHIGH
UPPERTHI	25.80	.86	24.4	27.2	14	UPPERTHIGH
BUTTOCKS	46.76	1.47	44.2	49.0	14	
HEADCIRC	48.45	1.32	46.5	50.6	14	HEADCIRCUM
SKINFOLD	268.00	43.34	194.0	352.0	14	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 3 GROUP: 3

Number of valid observations (listwise) = 19.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.92	.95	9.0	12.0	19	HAEMAGLOBI
UPARM	14.24	.76	13.0	16.0	19	
LOWERTHI	21.58	1.44	18.2	24.4	19	LOWERTHIGH
UPPERTHI	26.63	1.06	24.0	28.6	19	UPPERTHIGH
BUTTOCKS	46.77	1.79	41.0	49.2	19	
HEADCIRC	48.78	1.05	46.4	50.6	19	HEADCIRCUM
SKINFOLD	278.32	48.81	186.0	364.0	19	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 3 GROUP: 4

Number of valid observations (listwise) = 15.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	9.51	1.65	7.0	11.7	15	HAEMAGLOBI
UPARM	13.49	.74	12.2	15.0	15	
LOWERTHI	17.59	1.65	15.0	20.0	15	LOWERTHIGH
UPPERTHI	24.89	1.85	20.4	27.8	15	UPPERTHIGH
BUTTOCKS	44.35	2.46	40.0	48.2	15	
HEADCIRC	47.11	1.50	45.5	50.5	15	HEADCIRCUM
SKINFOLD	275.53	46.46	176.0	376.0	15	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 4 GROUP: 1

Number of valid observations (listwise) = 49.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.73	.89	7.3	13.1	49	HAEMAGLOBI
UPARM	15.81	.95	13.6	18.4	49	
LOWERTHI	24.72	1.34	22.0	28.5	49	LOWERTHIGH
UPPERTHI	30.17	1.30	27.5	33.0	49	UPPERTHIGH
HEADCIRC	49.80	1.09	47.0	52.0	49	HEADCIRCUM
BUTTOCKS	51.96	1.73	48.2	55.8	49	
SKINFOLD	311.18	53.89	190.0	422.0	49	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 4 GROUP: 2

Number of valid observations (listwise) = 24.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.04	.89	8.7	12.0	24	HAEMAGLOBI
UPARM	14.50	1.15	13.5	18.6	24	
LOWERTHI	22.38	1.63	20.5	28.2	24	LOWERTHIGH
UPPERTHI	27.30	1.13	25.0	30.2	24	UPPERTHIGH
BUTTOCKS	47.69	1.63	44.0	50.5	24	
HEADCIRC	48.81	1.15	46.5	50.4	24	HEADCIRCUM
SKINFOLD	250.92	66.43	150.0	392.0	24	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 4 GROUP: 3

Number of valid observations (listwise) = 20.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.28	.85	10.0	13.1	20	HAEMAGLOBI
UPARM	14.86	.67	13.7	16.5	20	
LOWERTHI	22.97	1.16	21.0	25.2	20	LOWERTHIGH
UPPERTHI	28.50	.66	27.0	29.8	20	UPPERTHIGH
BUTTOCKS	48.76	1.42	46.4	50.7	20	
HEADCIRC	49.39	1.12	47.2	51.6	20	HEADCIRCUM
SKINFOLD	263.90	45.99	150.0	332.0	20	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 4 GROUP: 4

Number of valid observations (listwise) = 14.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.41	1.36	7.3	12.0	14	HAEMAGLOBI
UPARM	13.52	1.20	10.7	15.2	14	
LOWERTHI	20.23	1.67	16.5	22.2	14	LOWERTHIGH
UPPERTHI	25.09	2.85	19.0	28.0	14	UPPERTHIGH
BUTTOCKS	44.36	3.58	34.8	48.5	14	
HEADCIRC	47.19	2.24	41.5	50.2	14	HEADCIRCUM
SKINFOLD	253.00	38.00	204.0	338.0	14	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 5 GROUP: 1

Number of valid observations (listwise) = 49.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	12.15	.53	11.6	13.0	49	HAEMAGLOBI
UPARM	16.95	.86	14.6	18.8	49	
LOWERTHI	24.66	1.64	21.5	30.5	49	LOWERTHIGH
UPPERTHI	30.69	2.21	24.0	36.0	49	UPPERTHIGH
HEADCIRC	50.73	.62	49.5	51.7	49	HEADCIRCUM
BUTTOCKS	53.89	2.38	50.0	62.5	49	
SKINFOLD	306.08	33.07	242.0	402.0	49	

22 Aug 96 SPSS for MS WINDOWS Release 6.1

AGE: 5 GROUP: 2

Number of valid observations (listwise) = 15.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.71	1.28	8.8	12.0	15	HAEMAGLOBI
UPARM	14.59	.68	13.3	16.0	15	
LOWERTHI	22.28	.76	21.0	23.6	15	LOWERTHIGH
UPPERTHI	28.09	1.39	25.5	30.0	15	UPPERTHIGH
HEADCIRC	49.23	.78	47.9	51.0	15	HEADCIRCUM
BUTTOCKS	49.43	1.65	47.5	52.0	15	
SKINFOLD	223.47	32.09	174.0	286.0	15	

AGE: 5 GROUP: 3

Number of valid observations (listwise) = 23.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	11.13	1.13	8.0	13.0	23	HAEMAGLOBI
UPARM	15.10	.96	13.5	16.8	23	
LOWERTHI	24.03	1.61	21.5	27.5	23	LOWERTHIGH
UPPERTHI	29.46	2.01	25.0	33.5	23	UPPERTHIGH
HEADCIRC	50.24	1.89	47.2	57.5	23	HEADCIRCUM
SKINFOLD	238.00	55.32	116.0	330.0	23	

AGE: 5 GROUP: 4

Number of valid observations (listwise) = 17.00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
HAEMAGLO	10.39	1.14	7.3	11.8	17	HAEMAGLOBI
UPARM	13.33	1.19	11.0	15.2	17	
LOWERTHI	20.88	2.24	17.5	24.5	17	LOWERTHIGH
UPPERTHI	26.05	3.00	21.0	31.0	17	UPPERTHIGH
HEADCIRC	48.72	1.04	46.3	50.4	17	HEADCIRCUM
SKINFOLD	224.00	44.11	168.0	326.0	17	

APPENDIX 8 Mean increase WEIGHT

21 May 98 SPSS for MS WINDOWS Release 6.0

----- O N E W A Y -----

Variable AGE6.V3 AGE 6M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	1.0882	.2879	.0494	.9878 TO 1.1887
Grp 2	14	.9286	.2673	.0714	.7743 TO 1.0829
Grp 3	10	.9000	.3162	.1000	.6738 TO 1.1262
Grp 4	30	.8000	.4842	.0884	.6192 TO .9808
Total	88	.9432	.3823	.0408	.8622 TO 1.0242

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	2.0000
Grp 2	.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	2.0000

Variable AGE6.V6 AGE 6M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	1.0000	.0000	.0000	1.0000 TO 1.0000
Grp 2	14	.7143	.4688	.1253	.4436 TO .9850
Grp 3	10	.9000	.3162	.1000	.6738 TO 1.1262
Grp 4	30	.7333	.4498	.0821	.5654 TO .9013
Total	88	.8523	.3569	.0380	.7767 TO .9279

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	1.0000
Grp 2	.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	.0000	1.0000
TOTAL	.0000	1.0000

Variable AGE6.V9 AGE 6M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	.9118	.2879	.0494	.8113 TO 1.0122
Grp 2	14	.6429	.4972	.1329	.3558 TO .9300
Grp 3	10	1.0000	.0000	.0000	1.0000 TO 1.0000
Grp 4	30	.5000	.5085	.0928	.3101 TO .6899
Total	88	.7386	.4419	.0471	.6450 TO .8323

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	.0000	1.0000
Grp 3	1.0000	1.0000
Grp 4	.0000	1.0000
TOTAL	.0000	1.0000

Variable AG6.V12 AGE 6M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	.7059	.4625	.0793	.5445 TO .8673
Grp 2	14	.7857	.4258	.1138	.5399 TO 1.0316
Grp 3	10	.9000	.3162	.1000	.6738 TO 1.1262
Grp 4	30	.4333	.6789	.1240	.1798 TO .6868
Total	88	.6477	.5475	.0584	.5317 TO .7637

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

----- O N E W A Y -----

Variable AG12.V3 AGE 12M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	.8333	.3790	.0692	.6918	TO	.9749
Grp 2	19	.3684	.5973	.1370	.0805	TO	.6563
Grp 3	15	.5333	.5164	.1333	.2474	TO	.8193
Grp 4	17	.2941	.7717	.1872	-.1027	TO	.6909
Total	81	.5556	.5916	.0657	.4247	TO	.6864

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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----- O N E W A Y -----

Variable AG12.V6 AGE 12M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	.7000	.4661	.0851	.5260	TO	.8740
Grp 2	19	.3158	.7493	.1719	-.0453	TO	.6769
Grp 3	15	.3333	.4880	.1260	.0631	TO	.6036
Grp 4	17	.1765	.3930	.0953	-.0256	TO	.3785
Total	81	.4321	.5687	.0632	.3063	TO	.5579

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	.0000	1.0000
TOTAL	-1.0000	1.0000

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Variable AG12.V9 AGE 12M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	.6000	.4983	.0910	.4139	TO	.7861
Grp 2	19	.3158	.7493	.1719	-.0453	TO	.6769
Grp 3	15	.3333	.4880	.1260	.0631	TO	.6036
Grp 4	17	.1765	.8090	.1962	-.2395	TO	.5924
Total	81	.3951	.6457	.0717	.2523	TO	.5378

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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Variable AG12.V12 AGE 12M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	30	.5000	.6297	.1150	.2649	TO	.7351
Grp 2	19	.1579	.5015	.1150	-.0838	TO	.3996
Grp 3	15	.3333	.6172	.1594	-.0085	TO	.6751
Grp 4	17	.2353	.6642	.1611	-.1062	TO	.5768
Total	81	.3333	.6124	.0680	.1979	TO	.4687

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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----- O N E W A Y -----

Variable AG24.V3 AGE 24M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	.5789	.5004	.0812	.4145 TO .7434
Grp 2	14	.2857	.4688	.1253	.0150 TO .5564
Grp 3	19	.4211	.6925	.1589	.0873 TO .7548
Grp 4	15	.2667	.7988	.2063	-.1757 TO .7090
Total	86	.4419	.6059	.0653	.3119 TO .5718

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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----- O N E W A Y -----

Variable AG24.V6 AGE 24M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	.7105	.4596	.0746	.5595 TO .8616
Grp 2	14	.2857	.4688	.1253	.0150 TO .5564
Grp 3	19	.3158	.5824	.1336	.0351 TO .5965
Grp 4	15	.3333	.8165	.2108	-.1188 TO .7855
Total	86	.4884	.5890	.0635	.3621 TO .6147

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

Variable AG24.V9 AGE 24M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	38	.6579	.4808	.0780	.4999	TO	.8159
Grp 2	14	.2857	.8254	.2206	-.1909	TO	.7623
Grp 3	19	.4211	.5073	.1164	.1766	TO	.6655
Grp 4	15	.2667	.5936	.1533	-.0621	TO	.5954
Total	86	.4767	.5887	.0635	.3505	TO	.6030

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-2.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-2.0000	1.0000

----- O N E W A Y -----

Variable AG24.V12 AGE 24M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	38	.6579	.4808	.0780	.4999	TO	.8159
Grp 2	14	.4286	.6462	.1727	.0555	TO	.8017
Grp 3	19	.3684	.4956	.1137	.1296	TO	.6073
Grp 4	15	.3333	.7237	.1869	-.0675	TO	.7341
Total	86	.5000	.5688	.0613	.3780	TO	.6220

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

WEIGHT

----- O N E W A Y -----

Variable AG36.V3 AGE 36M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.5102	.5818	.0831	.3431 TO .6773
Grp 2	24	.2917	.8065	.1646	-.0489 TO .6322
Grp 3	20	.5000	.5130	.1147	.2599 TO .7401
Grp 4	14	.2857	.6112	.1634	-.0672 TO .6386
Total	107	.4299	.6311	.0610	.3089 TO .5509

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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----- O N E W A Y -----

Variable AG36.V6 AGE 36M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.4898	.7107	.1015	.2857 TO .6939
Grp 2	24	.3750	.7697	.1571	.0500 TO .7000
Grp 3	20	.4000	.5026	.1124	.1648 TO .6352
Grp 4	14	.2857	.7263	.1941	-.1336 TO .7051
Total	107	.4206	.6873	.0664	.2888 TO .5523

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

----- O N E W A Y -----

Variable AG36.V9 AGE 36M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	.4286	.6770	.0967	.2341	TO	.6230
Grp 2	24	.2917	.6903	.1409	.0002	TO	.5831
Grp 3	20	.4000	.5982	.1338	.1200	TO	.6800
Grp 4	14	.2143	.5789	.1547	-.1200	TO	.5486
Total	107	.3645	.6500	.0628	.2399	TO	.4891

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

----- O N E W A Y -----

Variable AG36.V12 AGE 36M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	.4490	.6789	.0970	.2540	TO	.6440
Grp 2	24	.1667	.5647	.1153	-.0718	TO	.4051
Grp 3	20	.3000	.6569	.1469	-.0075	TO	.6075
Grp 4	14	.2143	.6993	.1869	-.1895	TO	.6180
Total	107	.3271	.6555	.0634	.2015	TO	.4527

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

Variable AG48.V3 AGE 48M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.4082	.4966	.0709	.2655 TO .5508
Grp 2	15	.3333	.6172	.1594	-.0085 TO .6751
Grp 3	23	.4348	.5898	.1230	.1797 TO .6898
Grp 4	17	.2353	.7524	.1825	-.1516 TO .6222
Total	104	.3750	.5777	.0566	.2627 TO .4873

GROUP	MINIMUM	MAXIMUM
Grp 1	.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

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Variable AG48.V6 AGE 48M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.4082	.6429	.0918	.2235 TO .5928
Grp 2	15	.2000	.6761	.1746	-.1744 TO .5744
Grp 3	23	.3043	.4705	.0981	.1009 TO .5078
Grp 4	17	.2941	.5879	.1426	-.0081 TO .5964
Total	104	.3365	.6011	.0589	.2196 TO .4534

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

Variable AG48.V9 AGE 48M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.3878	.5707	.0815	.2238 TO .5517
Grp 2	15	.3333	.6172	.1594	-.0085 TO .6751
Grp 3	23	.3043	.7648	.1595	-.0264 TO .6351
Grp 4	17	.2353	.4372	.1060	.0105 TO .4601
Total	104	.3365	.6011	.0589	.2196 TO .4534

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	.0000	1.0000
TOTAL	-1.0000	1.0000

Variable AG48.V12 AGE 48M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	.4082	.5369	.0767	.2539 TO .5624
Grp 2	15	.2000	.7746	.2000	-.2290 TO .6290
Grp 3	23	.4348	.6624	.1381	.1484 TO .7212
Grp 4	17	.1765	.5286	.1282	-.0953 TO .4482
Total	104	.3462	.6037	.0592	.2287 TO .4636

GROUP	MINIMUM	MAXIMUM
Grp 1	-1.0000	1.0000
Grp 2	-1.0000	1.0000
Grp 3	-1.0000	1.0000
Grp 4	-1.0000	1.0000
TOTAL	-1.0000	1.0000

APPENDIX 9

Mean increase HEIGHT

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Variable AGE6.V3 AGE 6M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	4.0706	.6093	.1045	3.8580 TO 4.2832
Grp 2	14	2.6214	.6693	.1789	2.2350 TO 3.0079
Grp 3	10	3.5400	.7412	.2344	3.0098 TO 4.0702
Grp 4	30	3.8267	.6797	.1241	3.5729 TO 4.0805
Total	88	3.6966	.8173	.0871	3.5234 TO 3.8698

GROUP	MINIMUM	MAXIMUM
Grp 1	2.0000	4.8000
Grp 2	2.0000	3.7000
Grp 3	2.0000	4.2000
Grp 4	2.0000	4.5000
TOTAL	2.0000	4.8000

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Variable AGE6.V6 AGE 6M V 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	3.5382	.6015	.1032	3.3284 TO 3.7481
Grp 2	14	2.4286	.4340	.1160	2.1780 TO 2.6792
Grp 3	10	3.2000	.8919	.2821	2.5619 TO 3.8381
Grp 4	30	2.8500	.6907	.1261	2.5921 TO 3.1079
Total	88	3.0886	.7595	.0810	2.9277 TO 3.2496

GROUP	MINIMUM	MAXIMUM
Grp 1	2.0000	5.0000
Grp 2	2.0000	3.0000
Grp 3	2.0000	4.5000
Grp 4	2.0000	4.5000
TOTAL	2.0000	5.0000

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Variable AGE6.V9 AGE 6M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	3.3294	.5323	.0913	3.1437 TO 3.5151
Grp 2	14	2.2643	.3225	.0862	2.0781 TO 2.4505
Grp 3	10	2.8900	.3843	.1215	2.6151 TO 3.1649
Grp 4	30	1.9300	.3415	.0624	1.8025 TO 2.0575
Total	88	2.6330	.7527	.0802	2.4735 TO 2.7924

GROUP	MINIMUM	MAXIMUM
Grp 1	2.0000	4.0000
Grp 2	2.0000	3.0000
Grp 3	2.2000	3.4000
Grp 4	1.2000	2.6000
TOTAL	1.2000	4.0000

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Variable AGE6.V12 AGE 6M V 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	34	3.0000	.3885	.0666	2.8645 TO 3.1355
Grp 2	14	2.0143	.0535	.0143	1.9834 TO 2.0451
Grp 3	10	2.6600	.4526	.1431	2.3362 TO 2.9838
Grp 4	30	1.8700	.3019	.0551	1.7573 TO 1.9827
Total	88	2.4193	.6149	.0656	2.2890 TO 2.5496

GROUP	MINIMUM	MAXIMUM
Grp 1	2.0000	4.0000
Grp 2	2.0000	2.2000
Grp 3	2.0000	3.0000
Grp 4	.9000	2.2000
TOTAL	.9000	4.0000

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Variable AG12.V3 AGE 12M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	3.4333	.7590	.1386	3.1499 TO 3.7168
Grp 2	19	2.7053	.6205	.1423	2.4062 TO 3.0043
Grp 3	15	2.9800	.2859	.0738	2.8217 TO 3.1383
Grp 4	17	2.5765	.6006	.1457	2.2677 TO 2.8852
Total	81	2.9988	.7149	.0794	2.8407 TO 3.1568

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.5000
Grp 2	2.0000	3.4000
Grp 3	2.0000	3.3000
Grp 4	1.6000	3.4000
TOTAL	1.0000	4.5000

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Variable AG12.V6 AGE 12M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	3.2667	.7680	.1402	2.9799 TO 3.5535
Grp 2	19	2.4211	.5084	.1166	2.1760 TO 2.6661
Grp 3	15	2.5000	.5555	.1434	2.1924 TO 2.8076
Grp 4	17	2.4000	.6103	.1480	2.0862 TO 2.7138
Total	81	2.7444	.7510	.0834	2.5784 TO 2.9105

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	2.0000	3.1000
Grp 3	2.0000	3.2000
Grp 4	1.0000	3.1000
TOTAL	1.0000	4.0000

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Variable AG12.V9 AGE 12M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	2.8600	.7328	.1338	2.5864 TO 3.1336
Grp 2	19	1.9947	.4552	.1044	1.7753 TO 2.2141
Grp 3	15	1.8200	.7163	.1850	1.4233 TO 2.2167
Grp 4	17	1.7176	.5950	.1443	1.4117 TO 2.0236
Total	81	2.2247	.8069	.0897	2.0463 TO 2.4031

GROUP	MINIMUM	MAXIMUM
Grp 1	1.4000	4.0000
Grp 2	1.2000	2.8000
Grp 3	.5000	3.0000
Grp 4	1.0000	2.7000
TOTAL	.5000	4.0000

Variable AG12.V12 AGE 12M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	30	.6600	.2415	.0441	.5698 TO .7502
Grp 2	19	.4053	.0780	.0179	.3677 TO .4429
Grp 3	15	.4400	.0828	.0214	.3941 TO .4859
Grp 4	17	.3765	.0970	.0235	.3266 TO .4264
Total	81	.5000	.2031	.0226	.4551 TO .5449

GROUP	MINIMUM	MAXIMUM
Grp 1	.4000	1.4000
Grp 2	.3000	.5000
Grp 3	.3000	.6000
Grp 4	.2000	.5000
TOTAL	.2000	1.4000

Variable AG24.V3 AGE 24M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	2.6789	.9127	.1481	2.3789 TO 2.9790
Grp 2	14	2.0000	.2801	.0749	1.8383 TO 2.1617
Grp 3	19	2.2368	.6326	.1451	1.9319 TO 2.5418
Grp 4	15	1.2467	.3662	.0945	1.0439 TO 1.4495
Total	86	2.2209	.8665	.0934	2.0351 TO 2.4067

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.8000
Grp 2	1.5000	2.6000
Grp 3	1.0000	3.5000
Grp 4	1.0000	2.0000
TOTAL	1.0000	4.8000

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Variable AG24.V6 AGE 24M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	2.4605	.6816	.1106	2.2365 TO 2.6846
Grp 2	14	1.8786	.3766	.1006	1.6611 TO 2.0960
Grp 3	19	1.9842	.4879	.1119	1.7490 TO 2.2194
Grp 4	15	1.0333	.2968	.0766	.8690 TO 1.1977
Total	86	2.0116	.7422	.0800	1.8525 TO 2.1708

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	2.2000
Grp 3	1.0000	3.0000
Grp 4	.5000	2.0000
TOTAL	.5000	4.0000

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Variable AG24.V9 AGE 24M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	2.9026	.5957	.0966	2.7068 TO 3.0984
Grp 2	14	1.9714	.2301	.0615	1.8385 TO 2.1043
Grp 3	19	2.1263	.6172	.1416	1.8288 TO 2.4238
Grp 4	15	1.2000	.4140	.1069	.9707 TO 1.4293
Total	86	2.2826	.8195	.0884	2.1069 TO 2.4583

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.8000
Grp 2	1.5000	2.4000
Grp 3	1.0000	3.5000
Grp 4	.5000	2.0000
TOTAL	.5000	4.8000

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Variable AG24.V12 AGE 24M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	38	2.5526	.6857	.1112	2.3273 TO 2.7780
Grp 2	14	1.8786	.3766	.1006	1.6611 TO 2.0960
Grp 3	19	1.8789	.5534	.1269	1.6122 TO 2.1457
Grp 4	15	1.0200	.3028	.0782	.8523 TO 1.1877
Total	86	2.0267	.7857	.0847	1.8583 TO 2.1952

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	2.2000
Grp 3	1.0000	3.0000
Grp 4	.5000	2.0000
TOTAL	.5000	4.0000

Variable AG36.V3 AGE 36M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	2.8306	.8537	.1220	2.5854 TO 3.0758
Grp 2	24	1.6875	.7776	.1587	1.3592 TO 2.0158
Grp 3	20	1.9500	.5356	.1198	1.6993 TO 2.2007
Grp 4	14	1.0357	.3079	.0823	.8580 TO 1.2135
Total	107	2.1748	.9786	.0946	1.9872 TO 2.3623

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	3.5000
Grp 3	1.0000	3.0000
Grp 4	.5000	2.0000
TOTAL	.5000	4.0000

Variable AG36.V6 AGE 36M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	2.6429	.6693	.0956	2.4506 TO 2.8351
Grp 2	24	1.6875	.7776	.1587	1.3592 TO 2.0158
Grp 3	20	1.9550	.5336	.1193	1.7053 TO 2.2047
Grp 4	14	1.0643	.4069	.1087	.8294 TO 1.2992
Total	107	2.0935	.8519	.0824	1.9302 TO 2.2567

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	3.5000
Grp 3	1.0000	3.0000
Grp 4	.5000	2.4000
TOTAL	.5000	4.0000

Variable AG36.V9 AGE 36M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	2.3878	.7211	.1030	2.0888 TO 2.5030
Grp 2	24	1.5833	.6370	.1300	1.3143 TO 1.8523
Grp 3	20	1.6050	.5853	.1309	1.3311 TO 1.8789
Grp 4	14	1.0214	.2607	.0697	.8709 TO 1.1720
Total	107	1.8215	.7477	.0723	1.6782 TO 1.9648

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	3.0000
Grp 3	1.0000	3.0000
Grp 4	.5000	1.8000
TOTAL	.5000	4.0000

Variable AG36.V12 AGE 36M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	2.2143	.7269	.1038	2.0055 TO 2.4231
Grp 2	24	1.5000	.5108	.1043	1.2843 TO 1.7157
Grp 3	20	1.5400	.5471	.1223	1.2839 TO 1.7961
Grp 4	14	.9143	.3439	.0919	.7157 TO 1.1128
Total	107	1.7579	.7605	.0735	1.6122 TO 1.9037

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	4.0000
Grp 2	1.0000	3.0000
Grp 3	1.0000	3.0000
Grp 4	.5000	1.8000
TOTAL	.5000	4.0000

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Variable AG48.V3 AGE 48M Vel 3M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	2.1837	.7758	.1108	1.9608	TO	2.4065
Grp 2	15	1.3000	.5278	.1363	1.0077	TO	1.5923
Grp 3	23	1.5696	.7022	.1464	1.2659	TO	1.8732
Grp 4	17	1.0176	.2351	.0570	.8967	TO	1.1385
Total	104	1.7298	.8041	.0788	1.5734	TO	1.8862

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	3.5000
Grp 2	.5000	2.0000
Grp 3	1.0000	3.5000
Grp 4	.5000	1.8000
TOTAL	.5000	3.5000

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Variable AG48.V6 AGE 48M Vel 6M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean		
Grp 1	49	2.1796	.7670	.1096	1.9593	TO	2.3999
Grp 2	15	1.3333	.5876	.1517	1.0079	TO	1.6587
Grp 3	23	1.5957	.6977	.1455	1.2939	TO	1.8974
Grp 4	17	1.0529	.1505	.0365	.9756	TO	1.1303
Total	104	1.7442	.7919	.0777	1.5902	TO	1.8982

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	3.5000
Grp 2	.5000	2.0000
Grp 3	1.0000	3.5000
Grp 4	1.0000	1.5000
TOTAL	.5000	3.5000

Variable AG48.V9 AGE 48M Vel 9M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	2.0469	.6789	.0970	1.8519 TO 2.2419
Grp 2	15	1.2000	.5278	.1363	.9077 TO 1.4923
Grp 3	23	1.6174	.6692	.1395	1.3280 TO 1.9068
Grp 4	17	.9529	.2478	.0601	.8255 TO 1.0803
Total	104	1.6510	.7367	.0722	1.5077 TO 1.7942

GROUP	MINIMUM	MAXIMUM
Grp 1	1.0000	3.5000
Grp 2	.5000	2.0000
Grp 3	1.0000	3.5000
Grp 4	.5000	1.6000
TOTAL	.5000	3.5000

Variable AG48.V12 AGE 48M Vel 12M
By Variable GROUPS

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp 1	49	1.8571	.6785	.0969	1.6622 TO 2.0520
Grp 2	15	1.1667	.4880	.1260	.8964 TO 1.4369
Grp 3	23	1.4957	.5889	.1228	1.2410 TO 1.7503
Grp 4	17	.8824	.3779	.0916	.6881 TO 1.0766
Total	104	1.5183	.6947	.0681	1.3832 TO 1.6534

GROUP	MINIMUM	MAXIMUM
Grp 1	.5000	3.0000
Grp 2	.5000	2.0000
Grp 3	1.0000	3.0000
Grp 4	.4000	1.5000
TOTAL	.4000	3.0000

APPENDIX 10

- - - - - - - - - - - F A C T O R A N A L Y S I S - - - - - - - - - - -

Analysis number 1 Listwise deletion of cases with missing values

	Mean	Std Dev	Label
BATH	2.18026	.51818	
COOK	1.82833	.81948	
FURN	2.25751	.78849	
PA_OCCU	1.79185	.79624	
PAR_EDU	1.56652	.71908	
PROPTY	1.81116	.89848	
LIVING	1.97210	.76571	
WATER	2.12232	.71245	
TRANSP	1.55150	.77773	

Number of Cases = 466

Correlation Matrix:

	BATH	COOK	FURN	PA_OCCU	PAR_EDU	PROPTY	LIVING
BATH	1.00000						
COOK	.49844	1.00000					
FURN	.26511	.20502	1.00000				
PA_OCCU	.37781	.50211	.16434	1.00000			
PAR_EDU	.45256	.58875	.23523	.63459	1.00000		
PROPTY	.51208	.69776	.20843	.50706	.55872	1.00000	
LIVING	.15904	.08489	.10097	.05042	.06782	.11424	1.00000
WATER	.43529	.60330	.13522	.40512	.43534	.51658	.10876
TRANSP	.47852	.43906	.11509	.31774	.39378	.49405	.04395

	WATER	TRANSP
WATER	1.00000	
TRANSP	.34761	1.00000

1-tailed Significance of Correlation Matrix:

' . ' is printed for diagonal elements.

- - - - - - - - - - - - F A C T O R A N A L Y S I S - - - - - - - - - - -

Factor Matrix:

	Factor 1	Factor 2
COOK	.83321	-.09430
PROPTY	.82510	-.05487
PAR_EDU	.77976	-.10345
BATH	.71791	.16726
PA_OCCU	.70777	-.16639
WATER	.70692	-.05659
TRANSP	.63730	-.11017
LIVING	.16631	.82379
FURN	.33453	.52435

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
BATH	.54337	*	1	4.04486	44.9	44.9
COOK	.70314	*	2	1.04719	11.6	56.6
FURN	.38685	*				
PA_OCCU	.52862	*				
PAR_EDU	.61873	*				
PROPTY	.68381	*				
LIVING	.70629	*				
WATER	.50293	*				
TRANSP	.41829	*				