A SURVEY OF THE NUTRITIONAL STATUS OF WOMEN AT OTINIBI, A PERI-URBAN COMMUNITY NEAR ACCRA

BY

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ABSTRACT

The purpose of this study was to assess the effects of women's life circumstances on their health and nutritional status. The study included women of reproductive age (15 – 45 years old) and 74 women took part in the study.

Study–specific semi-structured questionnaires were used to collect dietary, socio–economic, demographic and workload data.

Urinary and random blood glucose determinations were used to test for the prevalence of diabetes mellitus. The subjects had mean (± SD) random blood glucose concentration of 87.01 ± 11.45ug/dL. None was identified to have diabetes mellitus. Blood haemoglobin and serum iron determinations were used to test for anaemia. The mean (± SD) blood haemoglobin and serum iron concentrations were respectively 11.41 ± 1.26 g/dL and 58.41 ± 19.22 µg/dL. About 60 % of the subjects were found anaemic. Protein and vitamin A status were also assessed. The average serum total protein was 9.14 ± 0.97 g/dL, mean serum albumin was 4.372 ± 6.400 g/dL and that of serum retinol, 33.79 ± 9.74 µg/dL. None of the subjects was found to be protein deficient and the prevalence of subclinical vitamin A deficiency was about 11%.

Body mass index (BMI) for each subject was computed from the height and weight measurements taken. The BMI values had a mean (± SD) of 22.492 ± 4.100 kg/m^2. Prevalence of underweight and obesity were 5% and 8% respectively. Waist – hip ratios (WHR) were calculated from the measurements of waist and hip circumferences. The mean (± SD) WHR was 0.859 ± 0.057. About 49% of the subjects had WHR values ≥ 0.85, indicating a risk of suffering from chronic diseases

such as diabetes mellitus and hypertension. The systolic and diastolic blood pressures of subjects were measured with an electronic sphygmomanometer. The mean values for the systolic and diastolic blood pressures were respectively 109.635± 11.355mmHg and 70.000 ± 8.365 mmHg. The prevalence of low blood pressure was 3% - 18% and that of high blood pressure was about 1% - 5%.

The waist-hip ratio showed significant positive correlation with income (r = 0.35), diastolic blood pressure (r = 0.32), systolic blood pressure (0.22) body mass index (r = 0.32) and inverse correlation with education (r = -0.33). The body mass index showed an association with serum retinol concentration (r = 0.41), systolic blood pressure (r = 0.53), diastolic blood pressure (r = 0.45), and education (r = -0.12). Blood haemoglobin concentration also showed positive correlation with serum iron concentration (r = 0.81) and education (r = 0.12). Serum albumin correlated significantly with serum total proteins (r = 0.81).

From the main findings of this study, it could be concluded that with the exception of the serum iron and blood haemoglobin statuses, the nutritional status of the women of childbearing age were generally good. The waist-hip ratio and body mass index measurements also indicated their nutritional status to be good.

Improving the level of education attained, and improving on the farming practice systems of the women would go a long way to enhance their nutrition and health status.

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May the Almighty God richly bless you all.

DECLARATION

I Richard Banson, do hereby declare that with the exception of quoted references to the literature, which have been duly cited herein, this work was conducted by me under the supervision of Dr Matilda Steiner-Asiedu. It a product of my Master of Philosophy thesis presented to the Department of Nutrition and Food Science, University of Ghana.

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Dr Matilda Steiner-Asiedu Richard Banson

(SUPERVISOR) (CANDIDATE)

DEDICATED TO

MY DEAR PARENTS

Mr. Josiah Duke – Banson and Madam Hannah Mensah, for the uncompromising principles that guided their lives and for their magnificent devotion to the family

ALL MY BROTHERS AND SISTERS

For their prayers and assistance, that has made everything worthwhile

SWEET UNCLE

Mr. Mensah Solomons

For more than I can say

AND AUGUSTINA ARYEE – BORTSIE

For all the care shown.

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CHAPTER ONE

1.0. INTRODUCTION

1.1. BACKGROUND STATEMENT

The nutritional status of women before, during and after pregnancy contributes a great deal to their own well-being and that of their children and other household members. The dual role of women as mothers and productive workers compromised by poor diets and ill health, affect not only their well-being but that of the whole family as well. A heavy workload may push a woman with marginal food intake into a state of malnutrition.

The vulnerability of women may stem from a multitude of factors, and in the majority of cases the origins of their vulnerability are found in factors specifically related to gender. This may be seen as the full range of personality traits, attitudes, feelings, values, behaviours and activities that society ascribes to the two sexes on a differential basis. Women lag behind men on virtually every indicator of social and economic status. They constitute a larger proportion of the poor in all societies and they are relatively powerless to change the conditions of their lives- to break the bonds of poverty or to improve their health and quality of life (WHO, 1992).

The nutrition of women is a critical part of their overall health status. It is related to among other things, food intake during their lifetime, the nourishment they received before birth, their energy output and work load, their power over resources for household food security, and their roles in the food chain. Poor diet, frequent acute and chronic infections, repeated pregnancies, prolonged lactation and a heavy burden of work may all contribute to serious physiological depletion and sometimes to overt malnutrition. In many countries, young women in their late teens appear hearty, healthy and attractive, but only ten or fifteen years later, they appear prematurely old, tired and unhealthy (Latham, 1997).

1.2. RATIONALE

The field of maternal nutrition focuses attention on females as mothers. It has often concentrated on their nutritional status mainly as it relates to the well-being of their infants and their ability to breastfeed, nurture and raise their children. The health and well-being of the mother herself has often been relatively neglected. Similarly, the field of maternal health has placed emphasis on providing services and help to women mainly to ensure successful pregnancies and lactation; this is also in the interest of the infant without so much concern for the mother (Latham, 1997).

This study therefore seeks to look at maternal health and nutritional status in the broad context of women's life circumstances by assessing the impact of their life situation on their health and nutritional status. The study seeks to pave the way to improve the lot of women and to give a better understanding to female nutrition and quality of life.

1.3.0. OBJECTIVES

1.3.1. GENERAL OBJECTIVE

To assess the nutrition and health situation of women of childbearing age, living in Otinibi, a peri-urban community in Accra, Ghana.

1.3.2. SPECIFIC OBJECTIVES

1. To assess health and nutritional status by means of

   Selected anthropometric measurements

   Blood pressure

   Blood haemoglobin

   Blood sugar

   Urinary glucose

   Serum retinol

   Serum total protein

   Serum albumin

   Serum iron

2. To describe the dietary intake of the women.

3. To identify factors that may affect food intake, health and nutritional status of the women specifically related to;

   Workload (physical activity)

   Socio-demographic and economic situation.

CHAPTER TWO

2.0. LITERATURE REVIEW

Women in developing countries face a lot of nutritional problems, the most common among these problems being deficiencies in energy, protein, iron, folic acid and vitamin A (Tinker and Koblinsky, 1993). These problems negatively influence the health and well-being of women and their children. Nutritional deficiencies pose a serious health concern not only because they are a direct cause of illness but also because poor nutritional status inhibits the proper functioning of the immune system, thereby increasing susceptibility to other diseases.

Using low birth weight (< 2,500 grams) as a rough indicator of poor maternal nutritional status, out of the 24 million low birth weight infants born in developing countries each year, over 50% is attributable to poor maternal nutritional status (Tinker and Koblinsky, 1993). This gives an indication of how many women are poorly nourished before or during pregnancy.

2.1. EDUCATION AND LIFE STYLE

Investing in human capital has proved to be one of the most effective means of reducing poverty and bringing about sustainable economic growth. Investment in the education of females has the highest return of any possible type of investment in developing countries. A study by the World Bank (FAO, 1998) showed that if women received the same amount of education as men, farm yields would rise by between 7%

and 22%, while increasing women's primary schooling alone could increase agricultural output by 24% (FAO, 1998).

The benefits of schooling for women are not limited to increased productivity. Education can also play a major role in raising the status of women and significantly improve household health and nutrition, reducing infant and child morbidity and mortality and reinforcing environmental conservation. Each individual year in school raises a woman's earnings by 15%, compared to 11% for a man (FAO, 1998).

In Ghana, the literacy rate of women has lagged behind the rate for men since colonial times. Female access to education is constrained by the prevailing social arrangements. Girls are socialised at an early age to help their mothers to carry out household chores and care for younger siblings, especially in rural areas. A frequent practice involves sending girls as housemaids to live with relatives, friends, or total strangers, who work in urban areas, in return for benefits to ease living conditions for the rest of the girls' family.

Currently, about 49% of adult females in Ghana are illiterate (Mensah-Quainoo, 1997). Illiteracy contributes to ill health among Ghanaian women in both direct and indirect ways. Uneducated women usually lack the knowledge and skills to care for themselves. For example, they are less likely to use modern contraceptives (Ghana Demographic and Health Survey, 1993). Uneducated women thus stand a higher reproductive health risk.

As knowledge is essential to nutrition, good nutrition is a precondition for development. Nutrition education for women and education in general, gives high returns. In Tamil Nadu, India, (FAO, 1998) mothers of healthy children were trained to become community nutrition workers. The beneficiaries numbered two million, with children between the ages of three and six in 20,000 villages. The result was a 55% reduction in the incidence of severe malnutrition (FAO 1998).

Education can help families and communities to identify crops that are suited to their local conditions and that will supply the nutrients needed to achieve an optimal dietary balance. Where these crops can easily be incorporated, the participation of women is essential since they are usually responsible for home gardens.

2.2. ROLES AND WORKLOAD OF WOMEN IN SOCIETY.

The two major roles conventionally described for women in all societies are their reproductive and productive functions. The reproductive function results in the birth of children while the productive function involves work, which may generate goods or cash income.

As part of the reproductive role, all responsibilities for child nurturing and care are placed on women, requiring a lot of time daily. Women's productive role also requires long hours of hard work each day.

The primary providers of care for young children in all cultures are women, and therefore the care of the child is inextricably linked with the situation of the household and women. Women and girls 6 - 18 years old are responsible for nearly all the childcare in developing countries and women spend a large proportion of their reproductive years under nutritional stress (McGuire & Popkin, 1988). In case of illness in the family women are the principal home health care providers. In Ghana, women are expected to perform all the household duties for the sustenance of the family, whether or not they work outside the home (Mensah-Quainoo, 1997). Girls, unlike boys, are expected to assist their mothers in caring for younger siblings, often carrying the latter on their backs for long periods.

The lack of resources, in the form of time, knowledge, and income, together with the subordination of women in many societies, constitutes a major cause of child malnutrition. In addition, mothers are themselves subject to nutritional stress, often combining pregnancy, lactation and frequent childbearing with heavy domestic and income-earning work (ICN, 1992). Rural women walk long distances to fetch water and fuel wood by carrying these on the head. Except in small fraction of households where water is piped into homes, urban women do the same. Women in urban areas, especially those living on the fringes and in the slum areas, have to make trips out of the house to fetch water, just like their rural counterparts. Women in urban areas face a high pressure of work. This is because they have to combine full-time formal wage-work or private work outside the home, with childcare and housekeeping. Besides helping with house chores, rural girls participate in farm work, helping their mothers to cart produce to the house and to market centers by head-load.

Girls may be under-privileged from birth with poor diets and fewer opportunities than boys may. Early marriage and closely spaced pregnancies further undermines their health. Malnourished women give birth to underweight infants, many of whom die and those who survive remain at risk because of poor care they receive from debilitated mothers and a lack of food in the home.

The experience of poverty is both shared and distributed within families. All suffer but some suffer more than others do. A symptom of deprivation is the way children have to be neglected as parents struggle to secure future food supplies, income and healthcare for the family. For the various vulnerable groups, women as mothers, daughters or wives will continue to have responsibility for the basic needs of others. Thus, a disproportionate amount of struggle falls on women.

Women often reach their vulnerability to nutritional stress as mothers during pregnancy, childbearing and lactation. However, women can be nutritionally vulnerable at other times. In terms of the allocation of resources and functioning of markets, there are three key reasons why women in developing countries are at a greater disadvantage than men, therefore more vulnerable and subject to deprivation and nutritional stress (ICN, 1992).

The first is the element of sex discrimination in access to resources or markets. This discrimination in markets acts against women in favor of men, and this continues no matter how much of the social sector budget is spent on women or how many women's projects are set up.

Secondly, women face additional tasks in reproduction and family maintenance. Women experience the tax on physical energy and time that biological reproduction demands. They are also expected to care for children and sick adults, to cook for the household. There are often additional tasks of collecting firewood and water. All of this must be carried out before income-earning work can be started. If women have to raise income and are entirely dependent on these efforts, as is the case for many households headed by females, then care for themselves and their children can suffer.

Thirdly, there is the question of allocation of resources, tasks and income within household economies. In many developing economies, especially African countries, there are several lines of production within the household level, and men and women hold separate income-generating activities. This also has an effect on incentives and response as women, involved in non-economic work, have restricted opportunities to take income-earning work. Economic distortions exist within those households as the terms of trade are biased against women. Outside, observers add to this bias against women, partly by making unjustifiable division between "production" and a number of other forms of work that are also vital for household subsistence, such as processing harvest produce for immediate consumption. These latter activities are given subordinate status as "housework."

These elements limit women's opportunities for social and economic independence. Attention to their thorough care will have benefits in terms of improving production and have a strong equity consideration (ICN, 1992).

Care for women require the same elements as other vulnerable and dependent groups; provision of time, attention, support and skills to meet their nutritional needs. Some of this care does come from husbands if women are married, and from extended family networks if they are unmarried or separated from their husbands. Technology that can reduce energy expenditure, credit and jobs for women, together with improved government social services such as crèches, healthcare and family planning are all part of care if that will improve women's nutritional status (ICN, 1992). Even where women are heads of household, they do not always enjoy the same authority as men and may have to refer issues or matters relating to children to male kin.

Many women are heads of household. Women head about a third of the farms in western Kenya, the range is 35%-50% in Zambia while southern Africa is known to have the highest percentage of female-headed households: 40%-60% in Lesotho and 35% in Swaziland (ICN, 1992). In Ghana, the Ghana Demographic and Health Survey (1993), showed about one-third (37.1%) of households to be headed by females.

Women as workers face the double burden of high-energy expenditure and low return for their effort. This combination may leave them trapped in a vicious cycle of hard work and income, unable to lead an independent existence. Seasonal problems of food shortages, high work levels and increased prevalence of infectious diseases can be exacerbated for women. Disproportionate work burdens fall on women, especially during periods of peak labor demand. The dual role of women as mothers and productive workers coupled with poor diets and ill health, affect not only their own well-being but also that of the whole family. A heavy workload may push a woman with marginal food intake over the brink into a state of malnutrition (Latham, 1997).

Women comprise 40% of the employed work force in low-income countries, are the sole income earners in a quarter of households, and provide a significant proportion of all agricultural labor (Sivard, 1985). Their economic contribution also includes production of non-marketed goods and services in the home that are responsible for the health and well-being of all the family members. Using standard economic accounting techniques, it is estimated that women's household production is worth 25%-40% of the world's gross national product (GNP) (Sivard, 1985).

Women are involved in every stage of food production, and although traditionally there is a gender-based division of labor, women tend to shoulder the larger share. In addition to food production activities, women have the burden of preparing and processing the food as well, while performing their fundamental role in the household.

Women in developing countries are largely farmers or engaged in agricultural activities. Almost 80% of economically active women in sub-Saharan Africa are engaged in agriculture (United Nations, 1991). In Ghana, farming is the single most important occupation for rural women who constitute 50% of all workers in agriculture and animal husbandry. A small proportion of women are classified as farmers and farm managers, representing only 25% of that category (Population Census, 1984). Women are also actively involved in agro-based industries such as gari-processing, palm oil and sheanut extraction.

Labor-saving technologies are an important factor in increasing production and improving people's quality of life as technological advances may have a high payoff in terms of improving food availability, creating employment opportunities, enhancing resource management and reducing environmental degradation. Although rural women are knowledgeable about traditional technology and its use, they have little possibility of adopting modern innovations and practices that could lighten their loads and improve returns.

The chain from farmer to consumer is long and often complicated and women's work along this food chain does not end with cultivating crops, fishing and tending animals. In developing countries, once the harvest is in or the catch landed, it is almost exclusively women who process and store food as well as selling it at markets. All these activities help to minimize waste and losses. In many rural areas, post-catch losses of fish alone amount to 25% or more. Women in fishing communities in Ghana have significantly reduced these losses by using special smoking ovens that allow them to process and distribute 60% to 90% of all fish farmed or caught (FAO, 1998).

The informal sector constitutes the most important source of employment for the majority of working urban women, in areas like trading, small-scale and cottage industries. Most informal sector workers are self-employed and cater for many children and dependents. Like rural women, urban women are also wholly responsible for domestic work although they are able to rely, largely, on paid assistants or unpaid family helpers. Removed from the support of immediate kin, urban women, however, experience increased conflicts between their domestic chores, employment and other responsibilities (National Program of Action, 1992). Over 80% of farms in Ghana are used either solely or mainly for subsistence production, with a higher proportion committed to cash crops in the south (MOA, 1986). Smallholders, especially women, using traditional techniques of hoe and cutlass and family labor, mainly undertake food production. The main obstacle to the adoption of new technology is the access to information, credit, input supplies and marketing (National Program of Action, 1992).

2.3. HEALTH AND NUTRITIONAL STATUS OF WOMEN

As in most developing countries, the cumulative and synergistic effects of many risk factors compromise the nutritional status of girls and women in sub-Saharan Africa. In numerous cultures, girls are seen as a net drain on family welfare. From birth onwards, girls may receive less food, nurturing, and healthcare than boys and this may have important effects on growth, development and survival. Socialization of girls to be acquiescent and self-sacrificing adds additional nutritional stress with respect to access to food (McGuire & Popkin, 1988). As girls grow to maturity, their economic contributions to their households increase, but cultural expectations for early marriage and childbearing detract from both their economic and biological well-being. Once married, the number of conflicts between women's roles increases.

Women of childbearing age are under the greatest stress. Their management of resources as mothers, wives, income earners and individuals determines the welfare of the women themselves and their families. Crucial conflicts face poor women in low-income countries as they attempt to fulfill their economic, biological and social roles at each stage in the life cycle, particularly during the childbearing years. Changes in behavior to enhance their contribution to one of their roles often create crucial negative effects on their other roles and activities because of the tremendous time, energy and economic constraints facing these women. The resources are interchangeable above certain minimal levels of requirements; however, resource shortages and bottlenecks preclude women from making significant substitutions among resources (McGuire & Popkin, 1988).

Poor women are expected to play the central role in childcare and food processing even when their economic roles also require extensive time and/or physical energy. Several conflicts may arise in the circumstances. The first is the situation in which women are expected to nurture the infant or preschooler and concurrently play an essential role in family economic life. This is the case particularly in societies where female-headed households abound or in areas where economic roles take the women away from the household and are otherwise incompatible with child care.

The second major area of conflict is the relationship between women's biological needs and their economic roles, household food security, and the intra-household food distribution. Women spend a greater proportion of their earnings on food than men do;

however, in most low-income societies women's roles involve them in food purchasing while male roles involve them in the purchases of other types of goods and services. Increased physical activity obviously increases the energy expenditure of women. If the quality or quantity of their diet is not improved accordingly, there will be adverse changes either in the household activities and/or in their nutritional status. In sub-Saharan Africa in particular, women devote enormous amount of time and energy to both their productive and their reproductive roles. The time- and energy-consuming nature of their tasks has significant implications for their own nutritional status and that of their children (Leslie et al., 1997a).

The role of Women in decision-making in the household may increase where they earn their own income, therefore, female employment may benefit household nutrition. Although the income of women is often lower than that of men, if women have control of their income they may allocate more of it to food and health expenditures (Chatterjee & Lambert, 1990; Holboe-Ottesen et al, 1989). Poor women in most societies continue to undertake heavy physical activity during pregnancy and resume this activity soon after delivery of their children. These physical stresses may result in additional fetal loss and most likely lead to reduced gestation duration and/or birth weight (McGuire & Popkin, 1988). Moreover, decreases in work time or work productivity associated with childbirth and lactation may adversely affect the family's income and food security. In addition, repeated miscarriages, stillbirths, and fetal losses affect a mother's nutritional status (McGuire & Popkin, 1988).

While performing their productive role within and outside the home, women may be exposed to various environmental hazards that increase their risk of ill-health. For instance women may be more exposed to diseases spread through water, such as Schistosomiasis, because of their regular contact with water bodies to draw water for home use, or for economic activities. Whilst teenage girls may be infected with Schistosomias because of necessary water contact, teenage boys may become infected more from recreational contact like swimming (Mensah-Quainoo, 1997).

The biological advantage in longevity that women have over men is not reflected in life expectancy and mortality statistics in most developing countries. In developing countries, life expectancy is usually lower for women than for men in age classes below 50 years (Hamilton et al, 1984). This is made more evident by the higher mortality rates for women of childbearing age (between 15 and 45 years) and generally higher mortality rate for female children above five years of age. Complications associated with childbirth are among the five leading causes of death for women aged 15 – 45 years, and nutritional factors are prominent among these complications (Holmboe-Ottesen et al, 1989).

Although they often produce most of the food consumed in their homes, women in many countries are victims of food discrimination. In parts of Asia, for example, despite the fact that women and older girls do most of the heavy work, men and boys consume twice as many calories (FAO, 1998). Only 20% to 40% of all women of childbearing age in developing countries receive the minimum caloric requirement for a healthy, productive life. Women suffer a lot from micronutrient deficiencies some of which are iron, iodine and vitamin A (FAO, 1998).

Nutritional anemia is one of the leading causes of death among women (Hamilton et al, 1984). Iron-deficiency anemia is the most widespread nutritional problem affecting girls and women in sub-Saharan Africa (Leslie et al, 1997b). It is estimated that at least

50% of women in developing, and an estimated 60-70% of pregnant women are affected by anemia (Holmboe-Ottesen et al, 1989; FAO, 1998). Because of the seriousness of the problem of iron deficiency, series of meetings held in recent times led to various declarations by the participants to help curb the problem. The World Summit for Children was held in New York in 1990, followed by the Conference on Ending Hidden Hunger in Montreal, and culminating in 1992 with the International Conference on Nutrition in Rome. These led to declarations by heads of state of the participating states to work hard to reduce iron-deficiency anaemia in women of childbearing age to one-third of 1992 levels by the year 2000 (FAO/WHO, 1992). This limited goal, compared with the goals of virtually eliminating deficiencies of vitamin A and of iodine, is an admission of the fact that iron-deficiency anaemia is an intractable problem.

Women are, in essence, involved in a zero-sum game: a closed system in which time or energy devoted to any new effort must be diverted from their other activities (McGuire & Popkin, 1988). Taking advantage of new technology, market opportunities, or even social services- those benefits associated with economic development and improvements in the quality of life- often requires an initial investment of a woman's time, energy, or income. Moreover, this investment may mean sacrificing her own health and economic security of her family. The implications of women's overburdened condition are far-reaching; their participation and productivity in the economic system are adversely affected by their own malnutrition and their demanding household and mothering responsibilities for which acceptable purchased replacements are beyond their limited economic means (McGuire & Popkin, 1988).

2.3.1. MALNUTRITION AMONG WOMEN.

The nutritional status of women, particularly as it is affected by childbearing is, in part, a function of experiences of childhood and adolescence, and partly due to the inadequacy of current feeding (Leslie et al, 1997a; Mensah-Quainoo, 1997). In Ghana, undernutrition among children is partly due to limited awareness of the nutritional values of foods and partly to low household incomes. At birth, baby girls have a biological advantage of survival over boys. In Ghana, the nutritional status of girls has been found to be better during the first 36 months of life (Mensah-Quainoo, 1997).

Breast-feeding is universal in Ghana, regardless of the sex of the baby. The Ghana Demographic and Health Survey (1993) showed the rates for babies ever breast-fed to be slightly higher for females (97.6%) than for males (96.7%). The median duration of breast-feeding is also longer for girls (at 22.2 months) than for boys (at 21.0 months). At least for the first 35 months of life, girls have an edge over boys. Using the cut-off point of the US National Centre for Health Statistics/Centre for Disease Control/World Health Organisation (NCHS/CDC/WHO), the Ghana Demographic and Health Survey (1993) found 24.0% females and 28.0% males to be stunted (height-for-age), 10.8% females and 12.1% males to be wasted (weight-for-height) and 7.4% females and 8.6% males to be underweight (weight-for-age).

The equal treatment for boys and girls ceases as children grow older and differences in the socialisation of boys and girls start to appear. The problems then persist through childhood and are worsened by biological changes at puberty. Certain practices affect the nutrition of girls adversely. In Ghana, one such practice that cuts across most cultures is the restriction of girls to eating with their mothers, whilst boys eat with their fathers (Mensah-Quainoo, 1997; National Program of Action, 1992). At the same time, the prevailing social arrangements require that the greater and best part of the family meal, with more protein, be served to men. Girls therefore get the remnants with their mothers and consequently receive less food and/or protein. The same occurs in cultures in other developing countries (Mbago & Namfua, 1992).

Girls are required to do more work to help their mothers, within and outside the home. Inadequate nutrition combined with excessive work result in stunting and anaemia and other nutritional deficiencies that persist to pose problems in their later reproductive years.

Malnutrition is a major health problem among women, especially during pregnancy. In some Ghanaian societies, it is a taboo for a pregnant woman to eat food items like eggs and meat although these are highly nutritious and essential during pregnancy. A survey conducted by Orraca-Tetteh and Watson (1976), in Baafi in the Eastern Region, found pregnant women meeting only 75% and 60% of their recommended caloric and protein intake, respectively. Micronutrient deficiencies are also common among women in Ghana (Asibey-Berko & Addo, 1994; Mensah-Quainoo, 1997).

2.3.2. REPRODUCTIVE HEALTH

2.3.2.1. BIRTH RATE AND PARITY

In developing countries, women undergo many cycles of pregnancy and lactation during their reproductive lifespan. Reproductive cycles often start at an early age and take place at short intervals (Goldberg, 1997). The average number of births to women in developing countries ranges from 4 to 8. When the amount of time spent on breast-feeding is added to this a large proportion of Third World women's reproductive years are spent under the increased nutritional demands of pregnancy and lactation (Walker, 1997). MucGuire and Popkin (1990) estimated that from age 15 to 45 years the amount of time women are pregnant or breast-feeding ranges from 23% in Costa Rica to 61% in Bangladesh, with a typical range of 35 – 48% for Asian and African women.

Between the ages of 15 and 40 years, a typical woman spends half her time pregnant and lactating (WHO, 1991). Frequent reproductive cycles, particularly among women whose nutritional intakes are marginal are likely to contribute to deterioration in the mother's nutritional status.

Global figures on parity and births, when considered in isolation, suggest that women in the poorest countries (who are often chronically malnourished) successively achieve a high reproductive yield. Fertility in Ghana is characterised by frequent closely spaced births that start too early and continue to the other extreme of the reproductive years (Mensah-Quainoo, 1997). Too early onset of childbearing is in turn a consequence of early marriage and adolescent sexual activity. Among some ethnic groups, girls are betrothed early, even in infancy, and are married off at menarche; hence, they easily become pregnant before attaining full physical maturity (Mensah-Quainoo 1997).

2.3.2.2. TEENAGE PREGNANCY

In developing countries, 10 – 50% of births are to teenage mothers. Early childbearing is common where teenage marriage is the norm, such as in several countries in South Asia (Walker, 1997). Pregnancy during adolescence is associated with increased risks of obstetric complications and mortality (Royston & Armstrong, 1989).

It is not uncommon in Ghana, to see girls aged about 15 years, who are either pregnant or have had their first child. In 1993, the Ghana Demographic Health Survey found that 1.5 % of 15-year-olds had had their first child. In 1993, available data showed that, overall, 21% of all 15-19 year old teenage girls had already started childbearing and 18% of all pregnant women registering at health facilities, both private and public, were women between the ages of 15 and 19 years (MOH, 1993). At the other extreme, maternal and child health data showed that 14.5% of all registrants were over 35 years of age; and as many as 32.1% of all registrants already had at least four children (MOH, 1993).

2.3.2.3. MATERNAL MORTALITY

Globally, the main direct causes of maternal death are obstetric haemorrhage (30%), puerperal sepsis (20%), eclampsia (10-15%), abortion (7-30%) and obstructed labour (5-10%), all these conditions occur only during pregnancy (WHO, 1991). Some indirect causes are underlying conditions such as anaemia, diabetes, malaria, and essential hypertension, which are aggravated by pregnancy. Direct causes together with anaemia account for more than 80% of maternal deaths in developing countries (WHO, 1991).

In developing countries, chronic and acute maternal undernutrition are major contributory factors to both obstructed labour and anaemia (Poppitt and Prentice, 1993). The most common cause of obstructed labour is cephalo-pelvic disproportion, which is frequently a result of stunting of the mother due to chronic undernutrition during childhood and adolescence. Another cause is physical immaturity because, although fertile, adolescent girls still have 12-18% of pelvic growth to complete (WHO, 1991). In The Gambia, studies have shown that girls did not reach maximum bone mineral content until the age of 24 years, by which time many had completed two or three pregnancies (Lo et al, 1991). In Ghana, between the ages of 15 and 49 years, infectious and deficiency diseases are compounded by reproductive related disorders (Mensah-Quainoo, 1997).

During pregnancy, the need for iron increases 3-fold. In many developing countries, the requirement is almost impossible to meet, since women cannot even achieve the non-pregnant iron requirement. Even though there are problems with supply and compliance, iron supplementation has been shown to be effective in decreasing the anaemia (Yip, 1996).

2.4. IMPLICATIONS OF WORKLOAD AND TIME CONSTRAINTS ON NUTRITION AND HEALTH OF WOMEN.

Many primary health care strategies for maternal and child health require substantial time inputs by women. In the context of the limited free time available to many women in developing countries, failure to consider their time constraints may affect the success of health programmes. Women are responsible for many activities related to health and nutrition, such as food preparation, childcare and hygiene, and often make the initial decisions regarding use of health care.

Heavy workload can affect women's nutrition and health status in both direct and indirect ways. Examples of direct effects include increased energy use in heavy work that is not matched by a corresponding increase in food consumption, or "wear and tear" effects causing body pains, arthritis, or premature deliveries. Indirect effects may be mediated through changes in women's diet or dietary patterns, which may occur during periods of heavy work (Holmboe-Ottesen, 1988).

Studies have shown that women's workload is heavy, and varies with seasons. Bleiberg et al (1980) estimated the energy expenditure of females by season. In the dry season the women were found to have a total daily expenditure classified as moderate to very active, according to the FAO/WHO grading system, while in the rainy season their energy expenditure was classified as exceptionally active.

Berio (1984) found women in Pouyamba village, Central African Republic to work on the average, eight hours a day. Domestic tasks occupy more than three and a half-hours of women's day. In addition, women's time devoted to agricultural activities is equal to men's in the traditional Pouyamba village (Berio, 1984). The total time women allocate to work on yearly basis seems to average between 8 and 10 hours a day (Berio, 1984). In the peak seasons, women's total daily work time can amount to as much as fifteen hours (Holmboe-Ottesen, 1989).

In Ivory Coast, the National Household Food Consumption and Budgetary Survey in 1979 (Berio, 1984) showed that women had heavier workloads than men did. Girls work three and half-hours boys just over two hours a day. Females over sixty years old work almost four hours a day as compared to just about two hours for men in the same age group. Women thus have less time for rest, leisure, education and social activities. In general, children 10-14 years old, in addition to any time spent at school, work more than two and half hours a day. The women of Ivory Coast supply between 48 and 63% of the important food groups. They also play an essential role in the supply of vitamin-rich vegetable and green leaves. Expectedly, their role becomes even more important in the provision of largely home-produced food groups (staples, vegetables, leaves and fruits, fats and condiments) while they still provide on their own 38% of the money allocated to food purchases. In each house, on the average, women bring home 93% of the 665 litres of water and 95% 0of the 63kg wood needed for family life every week (Berio, 1984).

A heavy workload for women may lead to a poorer diet not only for their children and other members of their families but also for women themselves. The diet may be poor because there is less time for preparation and cooking. Bleiberg et al (1980) found in Upper Volta (Burkina Faso) that women skipped lunch because they were working in the fields at noon. Energy intakes are often below recommended values and women typically meet a smaller percentage of the requirements than men do. For example, in Burkina Faso, women were reported to consume only 0.8g animal protein compared with 10.3g consumed by men (McGuire & Popkin, 1990).

While performing their productive work within and outside the home, women are exposed to various environmental hazards that increase their risk of ill-health. In Ghana, for example, when using the traditional fuel-wood hearth or charcoal stove, all the smoke and harmful gases produced spread to fill up the kitchen atmosphere, and is inhaled by women during each session of meal preparation. In a study of 294 women in 15 rural communities in Ghana, Ardayfio – Schandorf (1990) found that cooking over open fuel wood stoves resulted in an almost 50% greater chance of stillbirth among pregnant women. Another study by Songsore and McGranahan (1996), in the Greater Accra Metropolitan Area, found a 40% higher likelihood of respiratory problems among urban women. The women were exposed to respiratory particulate and carbon monoxide emitted from the cooking fuels; the highest being from wood and charcoal. Nearly all rural women and many urban dwelling women are exposed to these emissions from cooking fires on a daily basis, posing a risk to their eyes and lungs.

In addition, the openings in the hearth allow much of the heat produced from burning the fuel to escape, thus consuming large quantities of fuel wood and charcoal for a given volume of cooking. Women therefore need to regularly spend additional time and energy or money to obtain fuel for cooking, and this adds to their already high workload.

The heavy work load for women does not only put them under constant strain that is detrimental to their health, but also leaves them little time to attend to their own health needs. For growing girls, excessive physical strain combined with inadequate nutrition results in significant stunting that predisposes them to difficult labour in later life.

CHAPTER THREE

3.0 METHODS

3.1 STUDY AREA

This study was undertaken at Otinibi, about 14 km from Accra. The community had no electricity. The source of drinking water was a pond on the outskirts of the village. This water was stagnant and slightly muddy, giving it a brown appearance. Another pond, which was used for bathing, was known to be infested with guinea worms. There were two boreholes in the community but due to the salty nature of the water, the inhabitants used water from these boreholes for other purposes than drinking. The people used pit latrines, very few of the inhabitants owned a pit latrine and there was one, which served the general community.

There was no health facility in the community- the inhabitants had to travel about a mile to the next town, Danfa, to attend clinic. The community had only a primary school. Most of the children attend the school but there is no encouragement from parents who would rather want their children to help them on their farms (some parents go to the school to call their children to accompany them to the farm). As a result, most of the girls drop out of school before they get to class six. Teenage pregnancy was reported to be a problem among the youth in the village.

The women were predominantly farmers. The main items cultivated on the farms were maize and cassava. Pepper and tomatoes were cultivated for subsistence. The farmlands were about two miles away from their homes, so they had to leave in the morning and return in the evening. Most households owned livestock (sheep, goats) and poultry. The houses were made of mud and plastered with cement. The roofs were either thatched or aluminium. Generally, the village looked clean, the streets were not littered with either human waste or refuse. But animal faeces were seen on the compounds of some of the households.

3.2. Study Population and Sample Size

To be eligible, a woman should not be pregnant, aged 15 – 45 years and willing to participate. Any eligible woman was allowed to participate out of free will. A total of 74 women, aged 15 – 45 years participated in the study.

3.3.0. NUTRITIONAL STATUS ASSESSMENT

3.3.1. ANTHROPOMETRY

The weights of the subjects were taken in kilograms (kg) using a Salter spring scale for adults (minimum scale division of 0.5 kg). The weights of subjects were taken with minimal clothing on, using standard procedures (Jellife and Jellife, 1989). Heights were measured in centimetres (cm) with a stadiometer (Holtain type), with a minimum scale division of 1.0 mm.

Waist and hip circumferences of the subjects were also measured in centimetres (cm) using a flexible tape measure. Waist and hip circumferences were measured by the methods described by Vijayalakshmi et al (1997).

3.3.2. BODY MASS INDEX

The Body Mass Index (BMI), an indicator of total fatness, was computed from the weights and heights using the formula:

$$BMI = \frac{\text{Weight (kg)}}{(\text{Height, in meters})^2}$$

The results obtained were grouped according to the classification shown in Table 3.1.

3.3.3. WAIST-TO-HIP RATIO

The waist-hip circumference ratio, WHR, an indicator of abdominal fatness, was calculated from the waist and hip measurements, using the formula;

$$WHR = \frac{\text{Waist circumference}}{\text{Hip circumference}}$$

(Source: WHO, 1995)

Results obtained from the WHR measurements were put into two categories according to a WHO (1995) report. Values greater than 0.85 formed one category whilst values less than or equal to 0.85 formed a second category.

3.3.4. DIETARY ASSESSMENT

Using a structured questionnaire (appendix A), the food consumption patterns of the women were studied.

3.4.0. CLINICAL APPRAISAL

3.4.1. BLOOD PRESSURE

The blood pressure (BP) of all participants was measured using an electronic sphygmomanometer. The blood pressure for every individual was taken at least three times and at different times, and the average taken. To measure the blood pressure, the subject was seated with the arm resting on a table and slightly bent so that the arm was at about the same level as the heart. Blood pressure was taken after the participant has rested for at least five minutes on arriving at the centre.

Results obtained were grouped according to the classification shown in Table 3.2

3.4.2. Skin, Goitre and Eye Examination

Skin examinations were done to look for skin rashes, and also palpation was used to check for the presence of goitre. Eye examination was conducted to identify eye lesions, Bitot's spots, and corneal ulcer and scars (Jellife and Jellife, 1989).

3.5.0. BIOCHEMICAL ASSESSMENT

3.5.1. Haemoglobin Determination

Venous blood was taken from each subject and a drop of the blood put on a disposable cuvette. The haemoglobin concentration was measured with the Hemocue system, an electronic haemoglobin reader. This system consists of a battery-operated portable photometer and the disposable cuvette, which serves as both the blood-collection device and the site where the reaction occurs. The Hemocue displayed a reading on a panel when a drop of blood was placed on the disposable cuvette and inserted into it.

Results obtained were grouped according to the classification shown in Table 3.3.

3.5.2. Blood Glucose Determination

For each subject, the random blood glucose was measured with a portable glucometer that consists of a battery operated photometer and a cuvette. The blood

Table 3.1. Guide to Interpretation of Body Mass Index in Adult Females

Classification	BMI(kg/m^2)
Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	30

Source: WHO, 1997

Table 3.2. Guide to Interpretation of Blood Pressures

Blood Pressure (mmHg)	Low	Normal	High
Systolic	< 100	100 – 140	> 140
Diastolic	< 60	60 – 90	> 90

Source: Medical Encyclopaedia, 1995

Table 3.3. Guide to Interpretation of Blood Haemoglobin Concentration in Adult Females

HB concentration (g/dl)	Interpretation
< 7.0	Severe anaemia
7.0 – 9.9	Moderate anaemia
10.0 – 11.9	Mild anaemia
12.0	Non-anaemic

Source: WHO, 1989

glucose was determined by placing a drop of the fresh venous blood on the cuvette and inserted into the glucose meter which displayed the values within a minute. Random blood glucose value exceeding 252mg/dl was used to indicate the high possibility of the presence of diabetes (WHO, 1997).

3.5.3 Urine Glucose Determination

This is a qualitative quick test that detects the presence of glucose in a sample of urine. It is a glucose-specific test and no change occurs with other sugars. Glucose is determined enzymatically, using glucose oxidase, peroxidase, and a chromogen (ortho-tolidine). The intensity of the green or blue colour formed by the reaction is dependent on the glucose concentration in urine sample.

The method involved the use of 'clinistix' reagent strips. Fresh spot urine samples were collected from each subject, into a plastic specimen cap. The reagent strip (clinistix consisting of glucose and ascorbic test fields) was briefly (1 second) dipped into the urine sample in the specimen bottle. Any excess urine was drained from the reagent strip and after about 30 seconds, the strip was compared with a colour chart.

Yellow or light green test fields for glucose which had the intensity of the <0.5 g/l (50 mg/dl) colour field was considered normal. A blue colour developed if glucose was present at a concentration of 100 mg/dl or more (Burtis & Ashwood, 1994).

The sensitivity of the strip has been adjusted to take into account the presence of enzyme inhibitors normally present in urine. False positives may be produced by contamination of urine with hydrogen peroxide or a strong oxidising agent such as hypochlorite (bleach), and false negatives may occur with large quantities of ketones, ascorbic acid and salicylates. An ascorbic acid content of about 5 mg/dl of urine may disturb the glucose assay in low concentration. In order to obtain reliable information on glucose, if the ascorbic acid reaction was positive, the result was ignored.

3.5.3. Serum Preparation

About 10 ml of venous blood was taken from each subject and put in a centrifuge tube capped and covered with aluminium foil. This was centrifuged at 1000g for 10 minutes. The serum was then separated using a Pasteur pipette, into Eppendorf tubes which were covered with aluminium foil to prevent penetration by light. To prevent spoilage by bacterial growth and heat, the serum was kept in ice packs and transported to the laboratory where it was frozen in a freezer at about –20°C, for later analyses.

3.5.4. Serum Retinol Determination

The serum retinol was determined using the method of Bieri et al., (1979).

PRINCIPLE:

To a given volume (~100ul) of serum or plasma was added ethanol or methanol, to denature plasma proteins, and the retinol was extracted with a suitable organic solvent. After centrifugation, an aliquot of the organic phase was injected onto a normal or reversed high performance liquid chromatography (HPLC) column, followed by an eluting solvent of suitable polarity. Retinol, eluted as a sharp peak within 1 to 6 minutes, is detected by a sensitive ultraviolet (UV) detectors set at 325 – 328 nm. Retinol is quantified by use of peak height ratios or peak area ratios relative to an internal standard (retinyl acetate or other appropriate analogue) (IVACG Report, 1982).

PROCEDURE

To each 120μl of serum sample, 120μl of methanol was added and vortexed for 30 seconds. Five hundred micro litres (500μl) of hexane was added, vortexed for 2 minutes, and centrifuged at 10,000 rpm for 2 minutes. About 250μl of the top layer was removed with a Pasteur pipette and placed in a fresh Eppendorf tube. This was blown dry under a stream of nitrogen gas, reconstituted with 120μl methanol, and vortexed for 10 minutes. Twenty micro litres (20 μl) of it was manually injected into an HPLC system. Retinol was eluted isocratically after 4 minutes with methanol at a flow rate of 1ml/min using a Schimadzu (model) single pump delivery system. Retinyl acetate was used as the standard and eluted after 5 minutes. The samples were quantified from their absorbances at 325nm using a flow-through spectrophotometer (Schimadzu SPD 6A Udetector) and an integrated programmable recorder/printer (model C-R6A, Schimadzu Japan).

Aliquots of pooled serum from the Korle Bu Teaching Hospital were used as the quality control sample and analysed with each set of test sera evaluated.

The results obtained from the serum retinol determination were put into various categories according to the classification in Table 3.4.

3.5.5. Serum Iron Determination

The total serum iron was determined using a commercially available kit for serum iron quantitation, a colorimetric method (direct method) from Wako Pure Chemical Industries Ltd. Japan.

PRINCIPLES.

There are many methods available for determining serum iron. All colorimetric procedures have in common a reaction in which ferric iron (Fe^{+3}) is reduced to the ferrous state (Fe^{+2}) by the addition of a strong reducing agent such as hydrazine, ascorbic acid, thioglycolic acid, or hydroxylamine. Once the reduction has taken place, colorimetric reactions use an iron-complexing chromogenic agent to bind the ferrous iron. The more commonly used complexing agents are 3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine (FerroZine Iron Reagent), and tripyridyltriazine (TPZ) (Kaplan & Pesce, 1984). All colorimetric procedures employ the following reaction:

Fe^{+3} + Complexing chromogenic agent ---------> Coloured complex of Fe^{+2}

PROCEDURE

To 0.2 ml of distilled water, 0.2 ml of working buffer (acetate buffer, consisting of acetic acid and sodium hydroxide solution, and thioglycolic acid) was added and vortexed for 30 seconds. To this mixture, 0.2 ml of the serum sample was added and vortexed for 30 seconds.

One drop of a colouring reagent (2-Nitroso-5-(N propyl-N-sulfopropyl amino) phenol) was added, vortexed for about 30 seconds and kept at room temperature for five minutes. The absorbances were then read at 750 nm within 2 hours, using a spectrophotometer (model Hitachi U-1100 spectrophotometer, Hitachi Ltd. Japan).

To prepare a standard curve, the same procedure was used to prepare a standard curve, but in place of the serum sample, standard iron solutions at different but known concentrations were used. The absorbances were read at 750 nm and a plot of absorbance against concentration was made. From the standard curve, the serum iron concentrations of the subjects were extrapolated.

The interpretative guide shown in Table 3.5 was used for the assessment.

3.5.6. Determination of Serum Total Protein and Serum Albumin

Serum total protein was determined using the Biuret method (Copeland, 1994) and serum albumin by the Bromocresol Green method (Silverman and Christenson, 1994).

The results obtained from the analysis were grouped according to the classification in Table 3.6.

3.6. Analyses of Results

Data was stored in Epi Info version 6.04b (Center for Disease Control and Prevention, USA). The means ± SD of the variables were determined. Correlation analyses was carried out to find the strength of association among the variables. Microsoft Excel was used for graphical presentations.

Table 3.4. Interpretative Guide for Serum Retinol Assessment

Serum retinal concentration (µg/100ml)	Interpretation
< 10.0	Poor
10.0 – 20.0	Marginal
20 – 100	Adequate
> 100	Excess

Source: Solomons, 1995

Table 3.5. Interpretative Guide for Serum Iron Assessment

Iron status	Serum iron concentration (µg/dl)
Deficient	< 30.0
Low	30.0 – 59.9
Acceptable	≥ 60.0

Source: Sauberlich et al, 1976.

Table 3.6. Interpretative Guide for Serum Total Proteins and Albumin Assessment

Serum total protein concentration (g/dl)	Classification
< 6.0	Deficient
6.0 – 6.4	Low
6.5	Acceptable
Serum albumin concentration (g/dl)	
< 2.8	Deficient
2.8 – 3.4	Low
3.5	Acceptable

Source: Pike and Brown, 1975.

CHAPTER FOUR

4.0 RESULTS

4.1.0 Background Information

4.1.1 Age Distribution of Subjects

The participants were put into five age-groups within the range of 15 – 45 years. The 21 – 27 years class formed the least represented age-group (16.2%), as shown in Table 4.1.

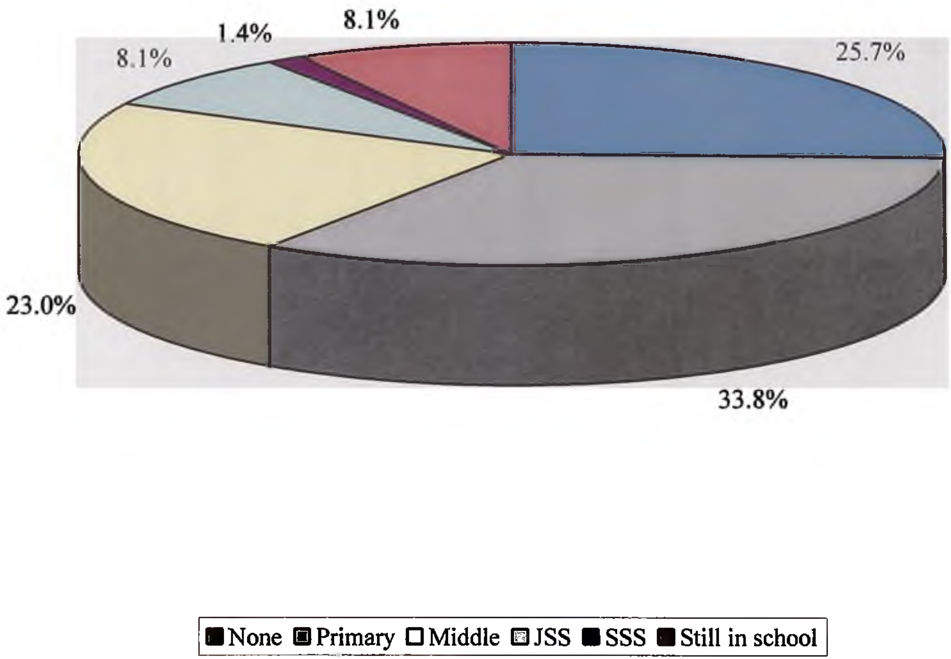
Table 4.1 Age Distribution of Subjects

	Subjects	
Age group(years)	Frequency	Percentage
15 – 20	14	18.9
21 – 27	12	16.2
28 – 33	17	23.0
34 – 40	16	21.6
41 – 45	15	20.3
Total	74	100

4.1.2 Education

The majority (33.8%) had had only primary education and 25.7% received no education at all. Among the subjects interviewed, 8.1% were still in school (Figure 4.1).

Figure 4.1. Women's Level of Education



4.1.3 Marital Status

Seventy-seven percent (57) were married and staying with their husbands, 17.6% (13) were single and never married before while 1.4% (1) and 4.1% (3) were widowed and divorced, respectively.

4.1.4 Number of Children Born to Subjects

Table 4.2 shows the number of children given birth to by the subjects with the corresponding frequencies and percentages.

Table 4.2 Number of Children Born to Subjects

Number of children	Subjects	
	Frequency	Percentage
0	15	20.3
1 – 3	24	32.4
4 – 6	30	40.5
7 – 9	5	6.8
Total	74	100.0

4.1.5 Occupation

Almost all the women (98%) were involved in agricultural activities but some had subsidiary occupations. The percentage engaged in only agricultural activities was about thirty-nine. And about forty-seven percent were engaged in non-agricultural activities such as selling cooked foods, provisions, dressmaking, etc., while 8.1% were still in school and 5.4% claimed to be housewives and did not work.

4.1.6 Income

Table 4.3 shows the estimates of the income ranges earned by the women.

Table 4.3 Income Estimates of Subjects

Income range (in cedis)	Number of subjects (%)
20,000.00 – 50,000.00	26 (35.1)
50,000.00 – 150,000.00	22 (29.7)
150,000.00 – 200,000.00	16 (21.7)
None	10 (13.5)
Total	74(100)

4.2.0 Anthropometry

4.2.1 Body Mass Index

Table 4.4 shows the mean values of weight, height and BMI of the women. Figures 4.2 and 4.3 show respectively, the overall nutritional status of the women and the nutritional status by age distribution, based on body mass index (BMI). The BMI values were within the range of 14.8 – 44.1 kg/m^2. On the whole, 67.6% (50) were of normal weight and 5.4% (4) were underweight.

The 15 – 20 years group showed the highest prevalence of underweight. A total of about 21% (3) in this age group were found underweight. The age groups 28 – 33, 34 – 40 and 41 – 45 showed no prevalence of underweight. But the age group 41 – 45 years recorded the highest prevalence (26.7%) (5) of obesity.

Using the cut-off point of 1.45m for height as recommended by the ACC/SCN (Leslie et al, 1997a), 96 percent of the women were of normal height while 4 percent were stunted.

Table 4.4 Mean (± SD) Weight, Height and BMI of Subjects

Age group(years)	Weight(kg) ± SD	Height(m) ± SD	BMI(kg/m^2) ± SD
15 – 20	46.93 ± 7.15	1.53 ± 0.07	19.92 ± 2.17
21 – 27	54.46 ± 7.13	1.55 ± 0.05	22.70 ± 2.72
28 – 33	57.53 ± 17.24	1.57 ± 0.05	23.34 ± 6.12
34 – 40	51.94 ± 8.86	1.53 ± 0.05	22.07 ± 2.89
41 – 45	57.63 ± 9.75	1.54 ± 0.06	24.22 ± 9.75
Overall mean	53.84 ± 11.51	1.54 ± 0.06	22.49 ± 4.10

4.2.2 Waist – Hip Ratio

Table 4.5 shows the waist, hip and the ratio between them. The waist – hip ratio of the women were found to be in the range 0.72 – 1.1. On the whole, 36 (48.6%) of the women had waist – hip ratio values greater than 0.85 (indicating that this percentage of the women are susceptible to developing chronic diseases such as (Figure 4.4).

Table 4.6 shows the waist – hip ratios among the various age groups in the women.

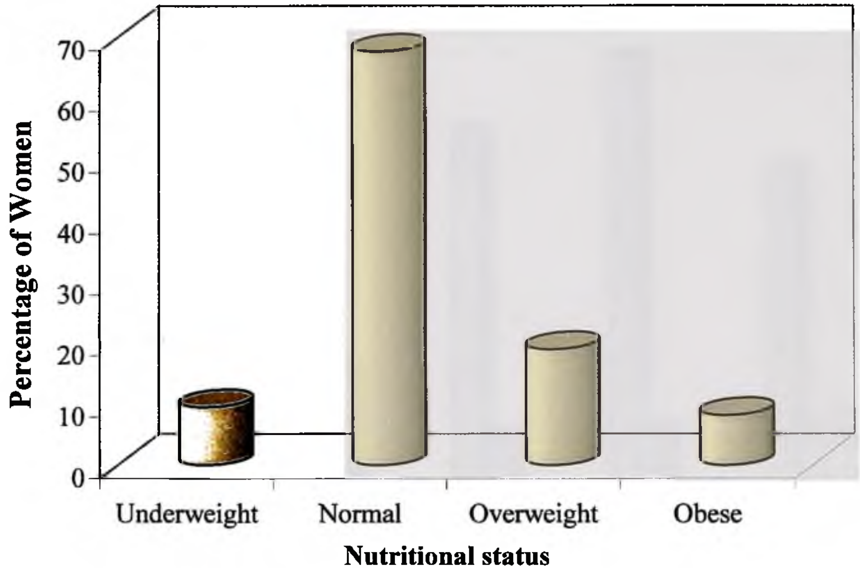
Table 4.5 Mean (± SD) Waist, Hip and Waist-Hip ratio of Subjects

Age group/years	Waist circumference ± SD (cm)	Hip circumference ± SD (cm)	Waist-hip-ratio ± SD
15 – 20	73.84 ± 5.87	89.01 ± 6.80	0.83 ± 0.04
21 – 27	78.81 ± 7.54	95.95 ± 5.86	0.82 ± 0.06
28 – 33	84.25 ± 11.10	96.71 ± 10.73	0.87 ± 0.05
34 – 40	82.13 ± 11.25	93.23 ± 8.37	0.88 ± 0.07
41 – 45	86.49 ± 10.48	98.72 ± 9.19	0.87 ± 0.04
Population mean	81.40 ± 10.47	94.76 ± 9.03	0.86 ± 0.06

Table 4.6 Distribution of Waist – Hip ratio By Age

Waist – to – hip ratio		
Age group/years	> 0.85 frequency (%)	0.85 frequency (%)
15 – 20	4 (28.6)	10 (71.4)
21 – 27	2 (16.7)	10 (83.3)
28 – 33	11 (64.7)	6 (35.3)
34 – 40	9 (56.2)	7 (43.8)
41 – 45	10 (66.7)	5 (33.3)

Figure 4.2. Nutritional Status of Women Based on BMI



Underweight --BMI < 18.5kg/m^2

Normal --BMI = 18.5 - 24.9 kg/m^2

Overweight -- BMI = 25.0 - 29.9 kg/m^2

Obese-- BMI ≥30 kg/m^2

Figure 4.3. Nutritional Status (Based on BMI) By Age Distribution

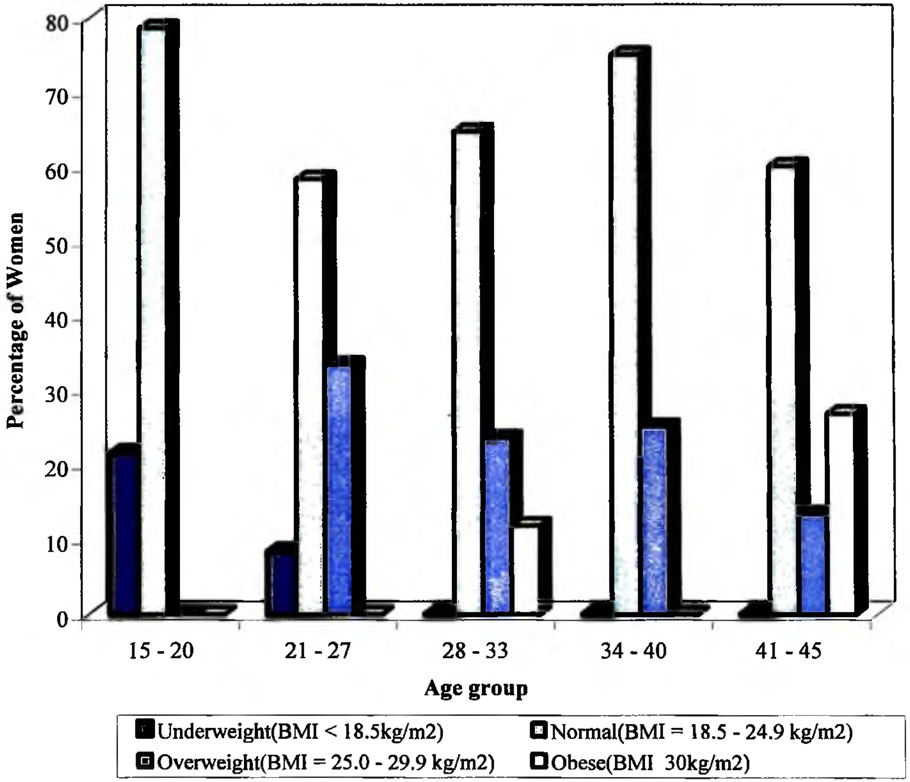
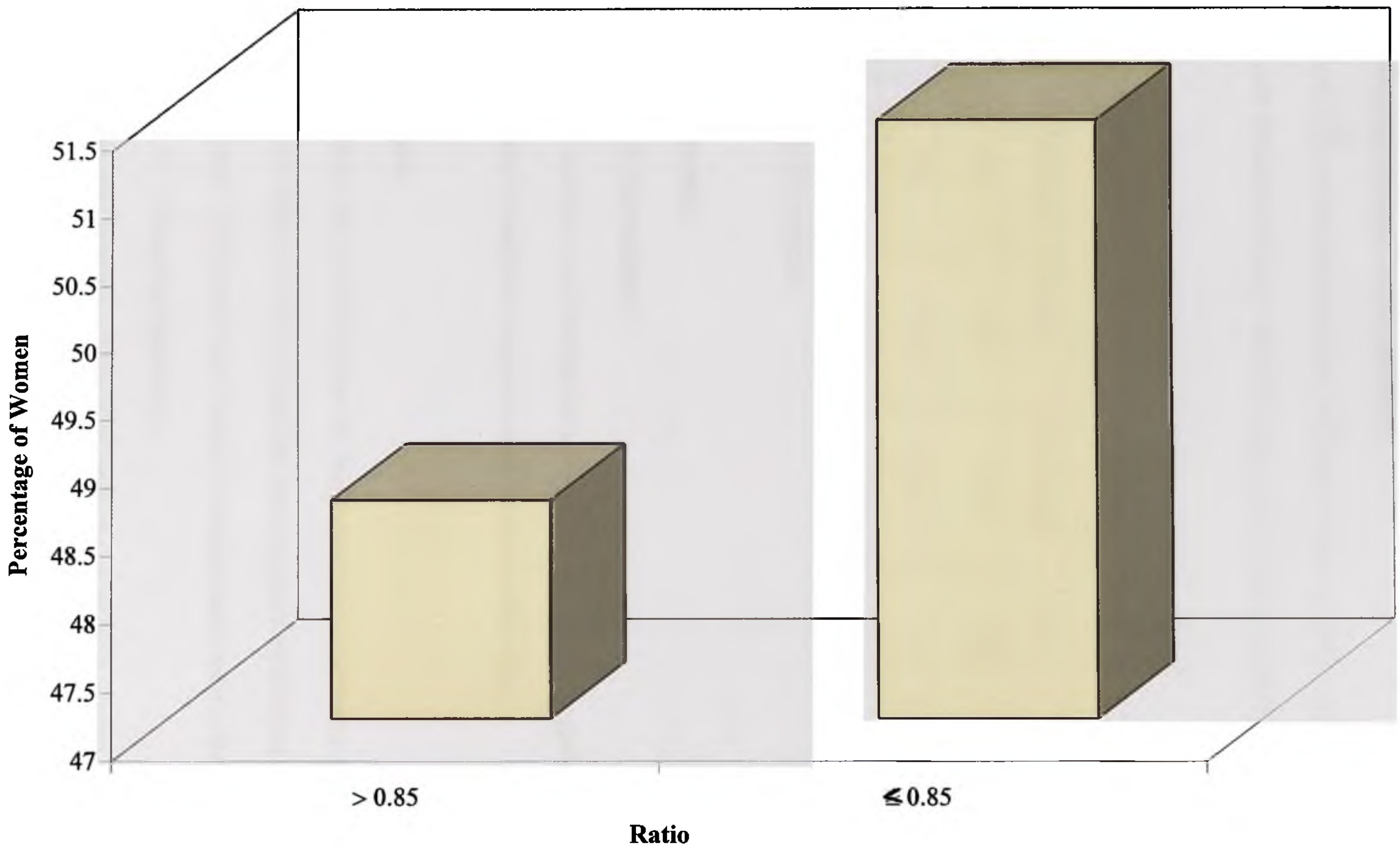


Figure 4.4. Waist - Hip Ratio of Women



4.2.3 Relationship between WHR and BMI

Table 4.7 shows the distribution of WHR as it relates to BMI. About 11% were overweight with abdominal obesity while 8% had overall obesity and abdominal obesity.

Table 4.7 Relationship between WHR and BMI*

	BMI				
WHR	Underweight	Normal	Overweight	Obese	Total
≥ 0.85	1.4	28.4	10.8	8.1	48.7
< 0.85	4.0	39.2	8.1	0.0	51.3
Total	5.4	67.6	18.9	8.1	100.0

* Values are given in percentages

4.3.0 Clinical Appraisal

4.3.1 Skin and Eye Examination

None of the subjects was identified to suffer from skin rashes or goitre. About 55.4% (41) of the subjects had Bitot's spots or other lesions on their eyes.

4.3.2 Blood Pressure

Table 4.8 shows the overall picture of blood pressure distribution among the women. Table 4.9 and Table 4.10 also indicate the blood pressure distribution among the women according to age. The systolic and diastolic blood pressures were in the ranges of 89 – 147mmHg and 57 – 99mmHg respectively.

Using the systolic pressure, 17.6% (13) were found to have systolic pressures below the accepted normal values of between 100mmHg and 140mmHg, 1.4% (1) were found to have higher than normal systolic pressure while the majority, 81.1% (60) had normal systolic blood pressure. Based on the diastolic blood pressure, 2.7% (2) of the subjects to have lower than normal diastolic blood pressures of between 60 – 90mmHg, 91.1% (68) had normal diastolic blood pressure and 5.4% (4) had above normal diastolic blood pressure.

Table 4.8 Distribution of Blood Pressures of Subjects

	Number of subjects (%)	
Blood pressure	Systolic blood pressure	Diastolic blood pressure
Low	13 (17.6)	2 (2.7)
Normal	60 (81.0)	68 (91.9)
High	1 (1.4)	4 (5.4)
Total	74 (100.0)	74 (100.0)

Table 4.9 Distribution of Systolic Blood Pressure by Age

Systolic blood pressure			
Age group (years)	Low (%)	Normal (%)	High (%)
15 – 20	5 (35.7)	9 (64.3)	0 (0)
21 – 27	2 (16.7)	10 (83.3)	0 (0)
28 – 33	1 (5.9)	16 (94.1)	0 (0)
34 – 40	2 (12.5)	13 (81.3)	1 (6.2)
41 – 45	3 (20.0)	12 (80.0)	0 (0)

Table 4.10 Distribution of Diastolic Pressure by Age

	Diastolic blood pressure		
Age group/years	Low (%)	Normal (%)	High (%)
15 – 20	1 (7.1)	12 (85.7)	1 (7.1)
21 – 27	0 (0)	12 (100)	0 (0)
28 – 33	0 (0)	15 (88.2)	2 (11.8)
34 – 40	1 (6.3)	14 (87.5)	1 (6.3)
41 – 45	0 (0)	15 (100)	0 (0)

4.4 Time Spent Working

The time spent by the women working was estimated. This included income-generating activities and household chores. On the average, each woman was found to spent between 5 and 9 hours daily performing the activities mentioned above.

4.5.0 Biochemical Assessment

Tables 4.11, 4.12 and 4.13 show the mean values of the biochemical indices measured.

4.5.1 Anaemia Prevalence Based on Blood Haemoglobin Concentration

Using haemoglobin concentration to determine anaemia prevalence, 1.4% and 50%, of the women were found to be severely and mildly anaemic respectively (Figure 4.5). Figure 4.6 shows the prevalence of anaemia as pertains to each age group. The haemoglobin concentrations of the women were in the range of 8.6 – 14.5μg/dl.

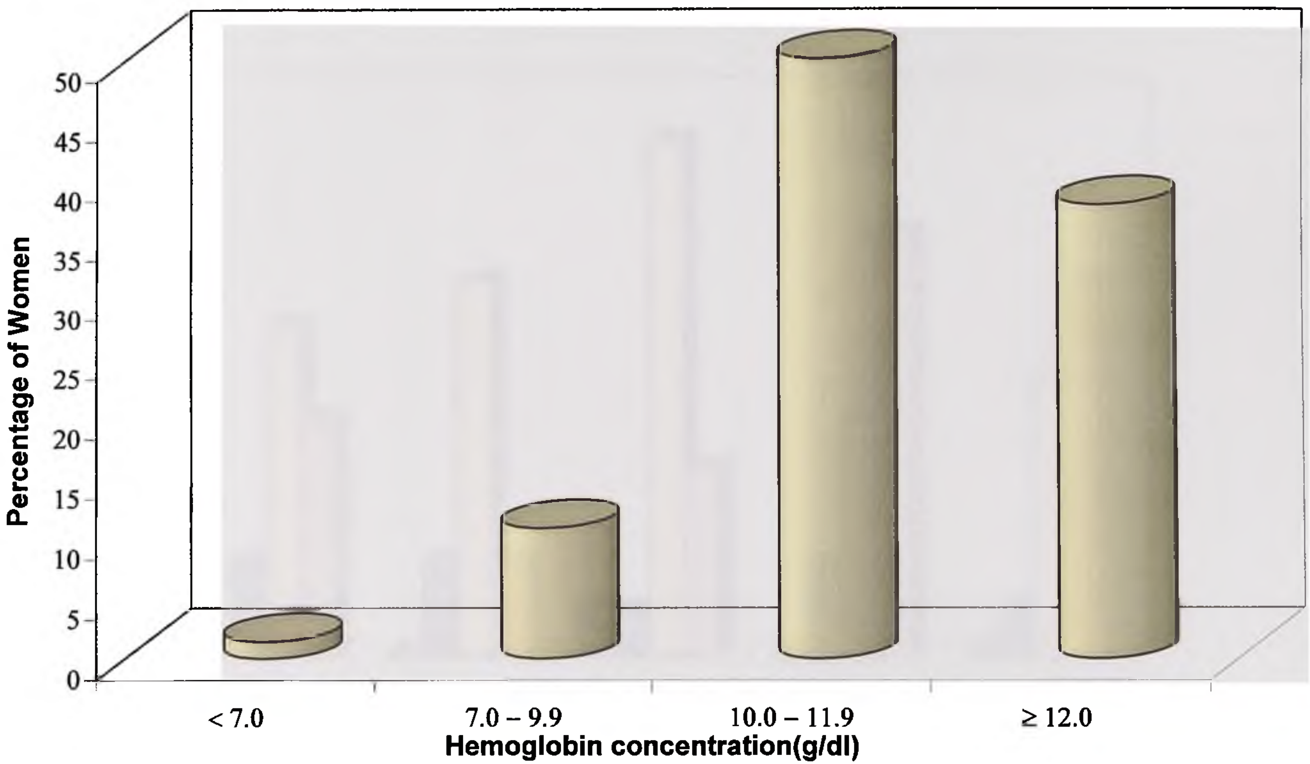
4.5.2 Anaemia Prevalence Based on Serum Iron Concentration

The results of the serum iron concentrations showed that, about 59% had serum iron concentration below the levels considered adequate (Sauberlich et al 1976). The details are as shown in Table 4.11. The range for serum iron concentrations determined was 27.50 – 97.5µg/dl.

Table 4.11 Serum Iron Status Distribution of Subjects

Serum iron status	Frequency	Percentage
Deficient	8	10.8
Low	36	48.7
Normal	30	40.5
Total	74	100.0

Figure 4.5. Prevalence of Anaemia among Women



< 7.0 = Severe anemia 7.0 - 9.9 = Moderate anemia
10.0 - 11.9 = Mild anemia ≥30 = Non-anemic

Figure 4.6. Prevalence Anaemia Among Women By Age Distribution

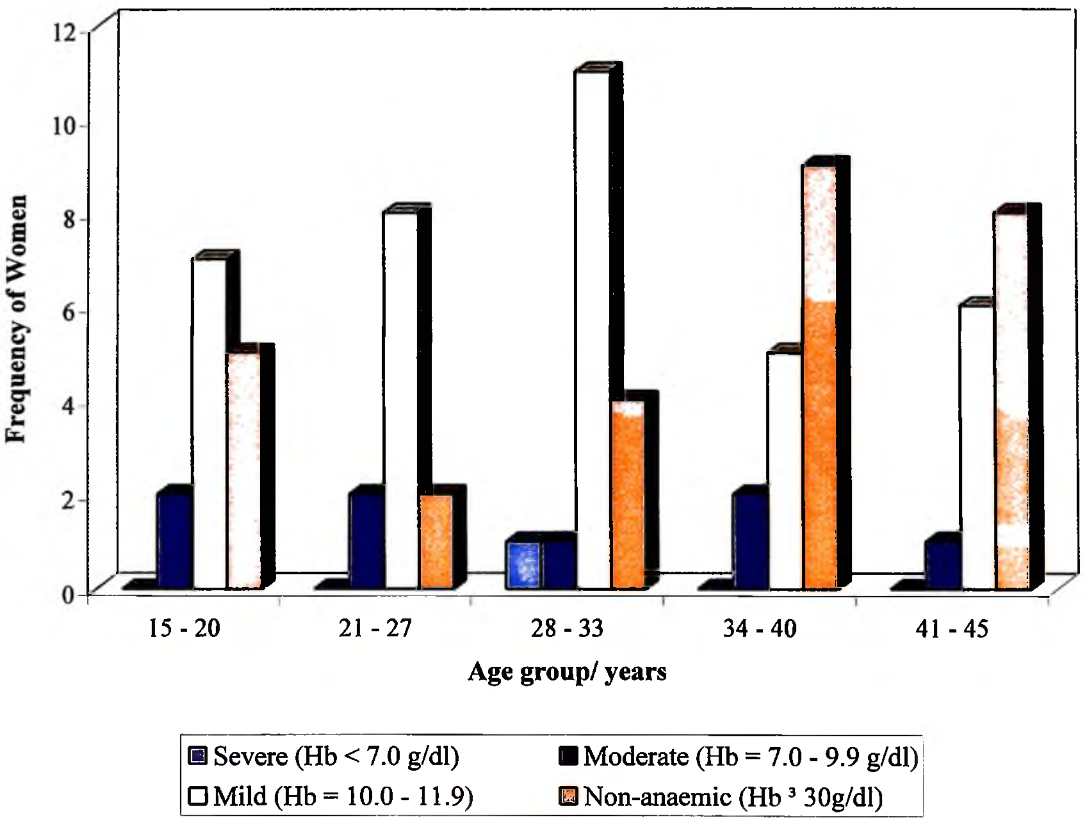


Table 4.12 Mean Values of Hb[1], Fe[2] and Retinol[3]

Age group	Hb ± SD (g/dl)	Fe ± SD (μg/dl)	Retinol ± SD (μg/dl)
15 – 20	11.46 ± 1.33	56.16 ± 20.75	28.65 ± 9.43
21 – 27	10.90 ± 0.83	46.38 ± 15.95	34.71 ± 9.25
28 – 33	11.25 ± 0.90	54.41 ± 17.62	38.96 ± 7.43
34 – 40	11.61 ± 1.68	63.47 ± 17.43	42.46 ± 10.59
41 – 45	11.83 ± 1.28	67.83 ± 23.26	33.80 ± 10.27
Overall mean	11.41 ± 1.26	58.41 ± 19.22	33.79 ± 9.74

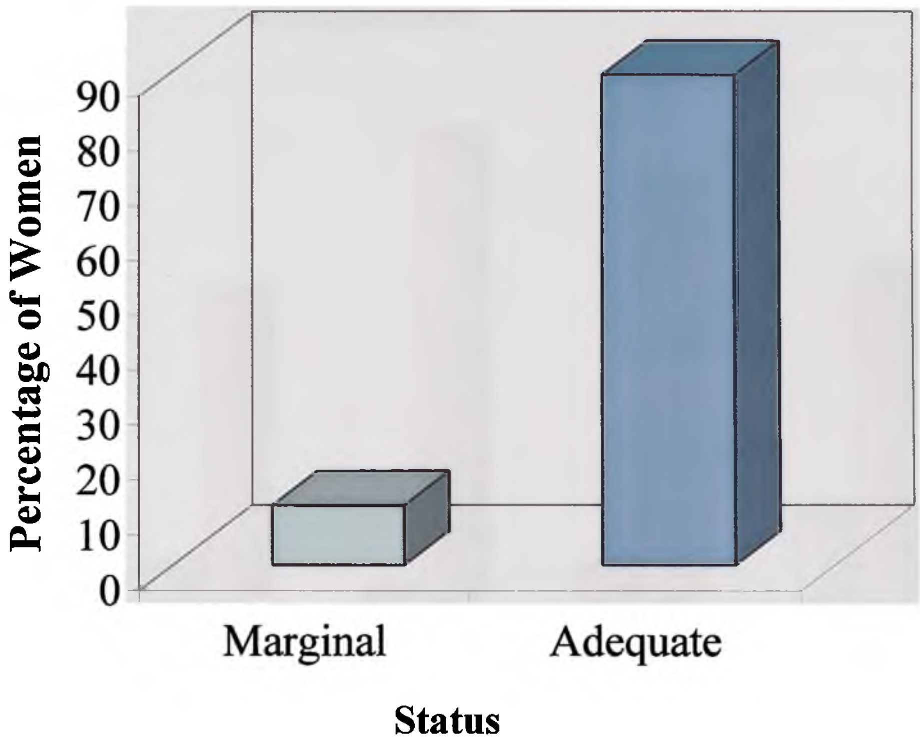
1 = Blood haemoglobin concentration   2 = Serum iron concentration

3 = Serum retinol concentration

4.5.3 Serum Retinol

Analysis of the biochemical data revealed that none of the subjects had serum retinol levels below 10 μg/dl; on the whole, 10.8% had subclinical deficiency (i.e. marginal vitamin A status) with levels between 10μg/dl and 20μg/dl of serum retinol (Figure 4.7). Figure 4.8 shows the serum retinol status of the women by age. Their serum retinol concentrations were in the range of 10.55 – 55.65μg/dl.

Figure 4.7. Serum Retinol Status of Women



Marginal : Serum retinol = 10 - 20 μg/100ml

Adequate : Serum retinol = 20 - 100μg/100ml

Figure 4.8. Serum Retinol Status of Women by Age Distribution

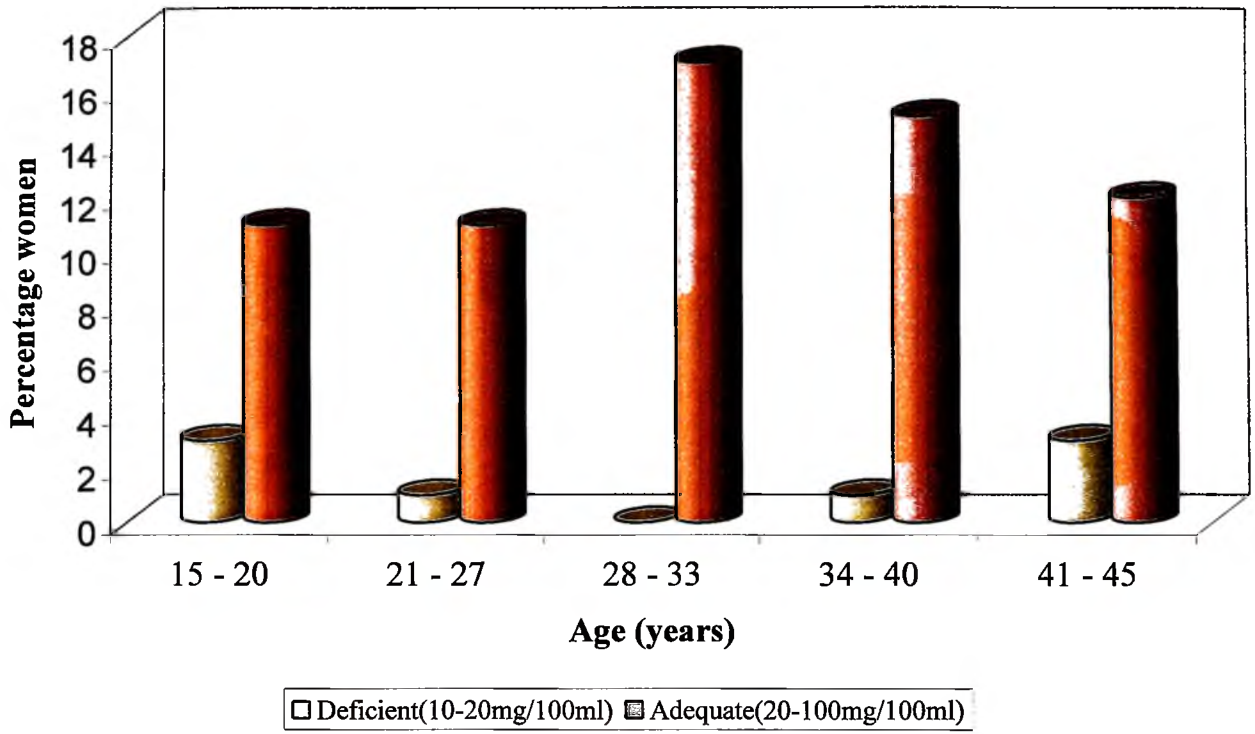


Table 4.13 Serum Total Protein[1], Albumin[2] And Blood Glucose[3] Subjects (Means ± SD)

Age group	1 (g/dl)	2 (g/dl)	3 (mg/dl)
15 – 20	9.13 ± 0.94	4.48 ± 0.41	89.21 ± 13.41
21 – 27	9.25 ± 1.42	4.40 ± 0.58	84.50 ± 7.71
28 – 33	9.25 ± 0.83	4.34 ± .027	84.47 ± 8.21
34 – 40	8.81 ± 0.78	4.27 ± 0.36	87.69 ± 14.90
41 – 44	9.39 ± 0.97	4.40 ± 0.41	83.80 ± 25.29
Population mean	9.14 ± 0.97	4.37 ± 6.40	87.01 ± 11.45

1 = Serum total protein concentration 2 = Serum albumin concentration

3 = Blood glucose concentration

4.5.4 Serum Total Proteins and Albumin

With respect to serum total proteins and serum albumin levels, all the women had adequate levels, showing serum concentrations of 6.5 μg/dl or more for serum total proteins and 3.5 μg/dl or more for the serum albumin. The determinations showed the serum total protein and albumin concentrations of the women to be in the ranges of 7.70 – 12.50μg/dl and 3.66 – 5.62μg/dl respectively.

4.5.5 Urine and Blood Glucose

None of the subjects had glucose in the urine and all of them had blood glucose concentrations below 140.0μg/dl, (i.e. below the cut-off point for the indication of diabetes mellitus). The blood glucose concentrations were in the range of 58 - 128μg/dl.

4.6 Dietary Assessment

The dietary information in this study is principally qualitative, and was only meant to describe the dietary patterns of the women of childbearing age. The most commonly consumed foods were banku, fufu and rice.

In lesser frequency, other foods consumed were yam, cocoyam and sweet potatoes. Figures 4.9 – 4.14 show the consumption of some selected foods.

Figure 4.9 Consumption of Selected Foods Rich in Vitamin A

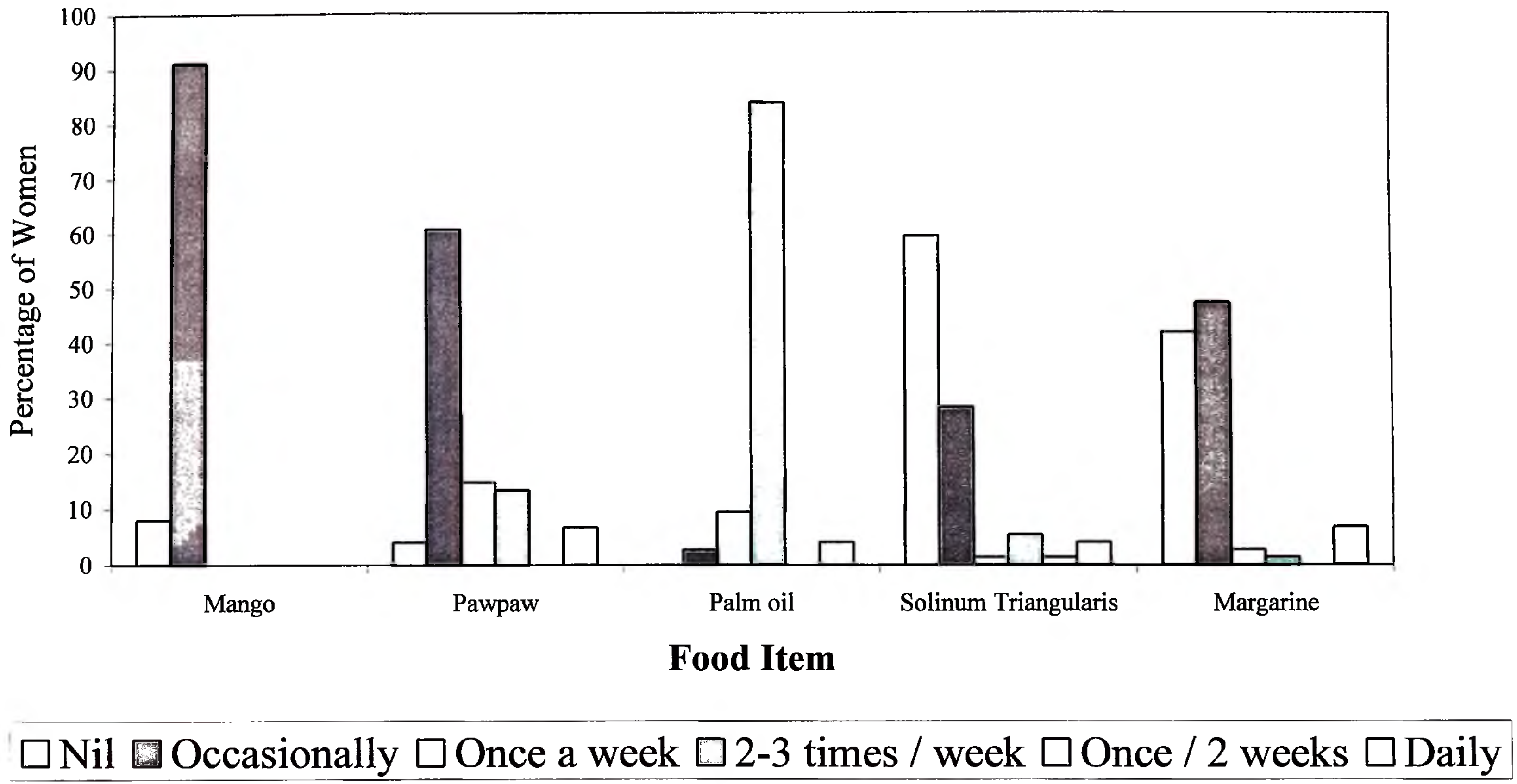


Figure 4.10 Consumption of Selected Protein Foods from Plant Sources

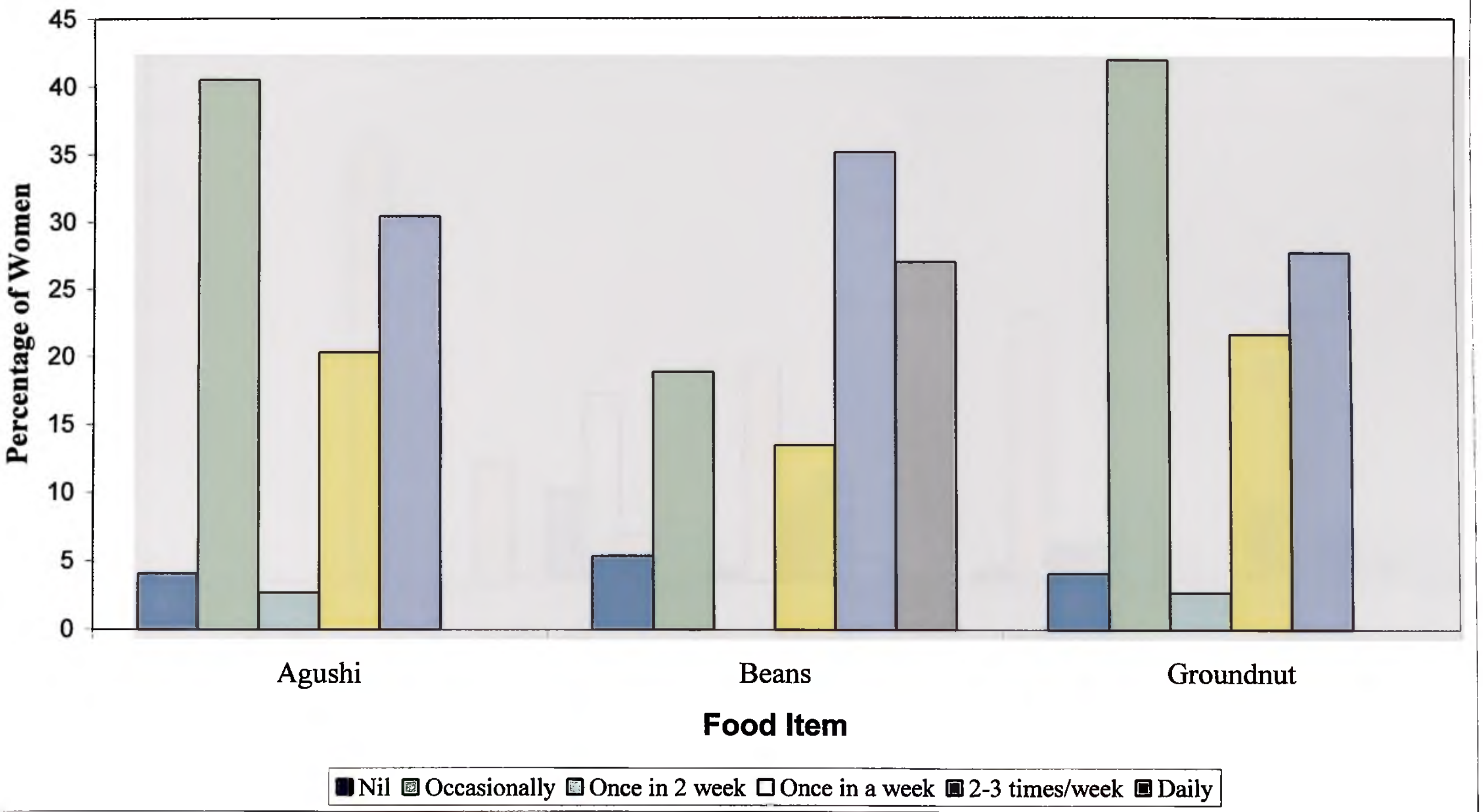


Figure 4.11 Consumption of Selected Protein-rich Foods from Animal Sources

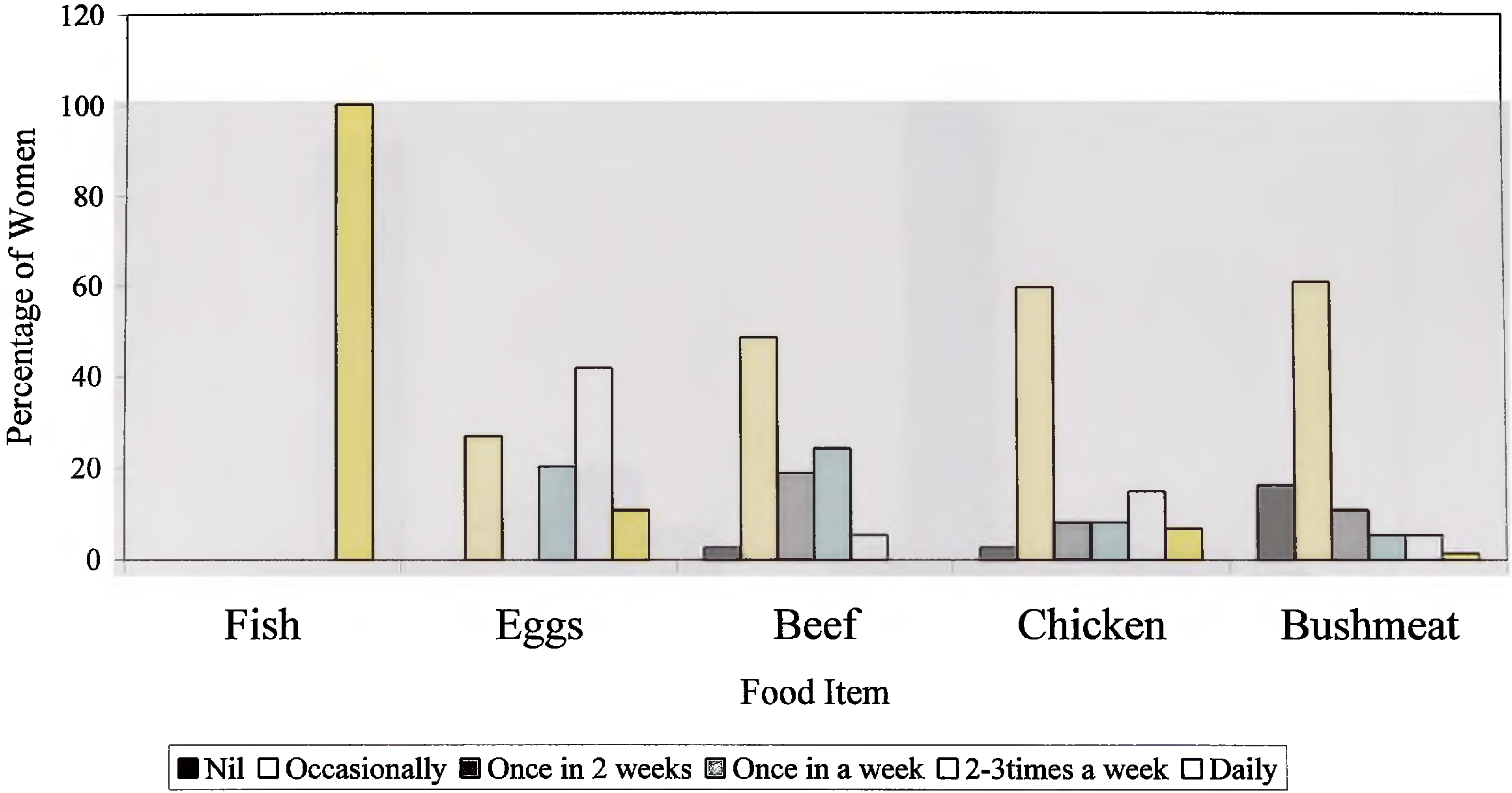


Figure 4.12. Consumption of Plant Foods Rich in Iron Enhancers

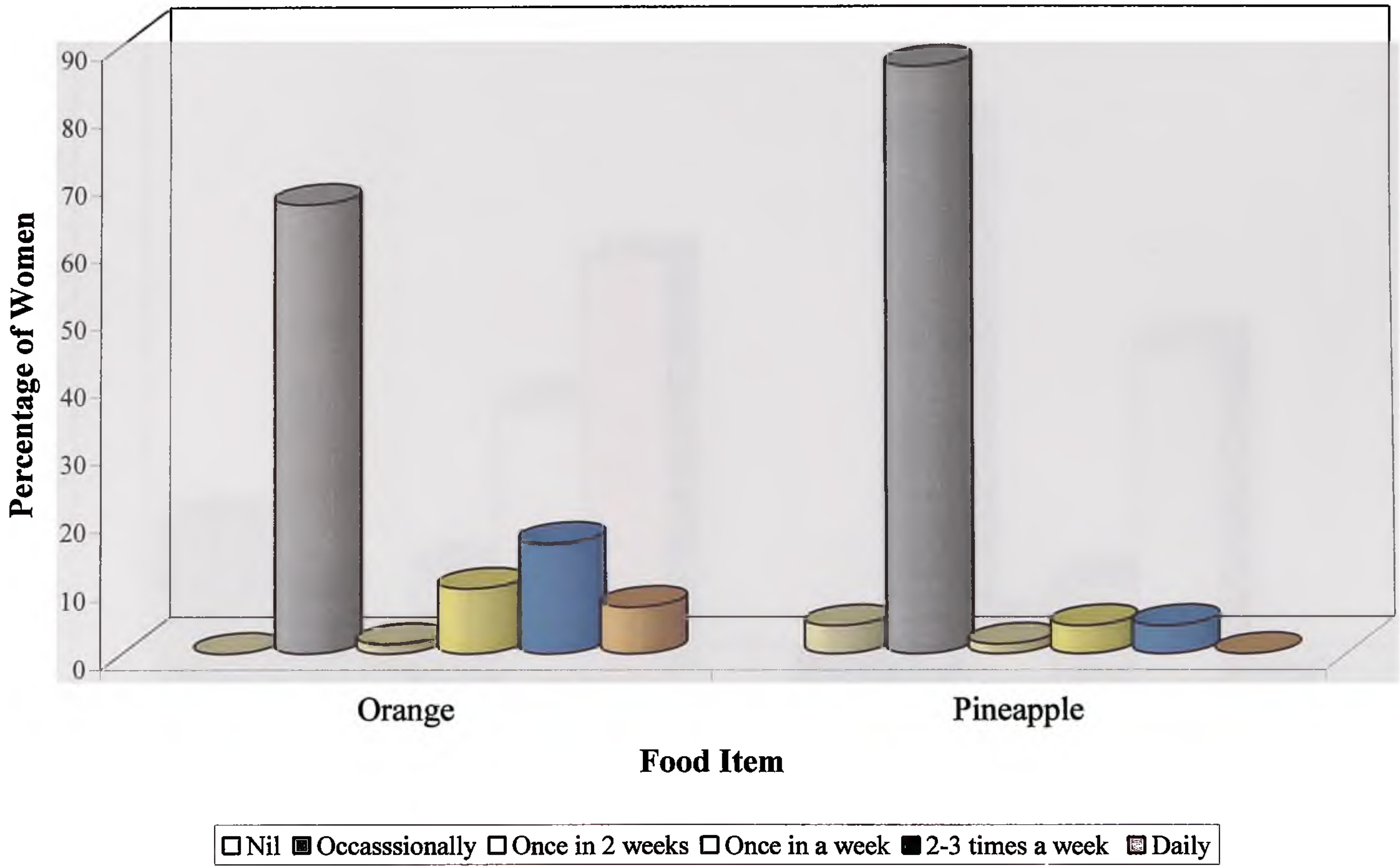


Figure 4.13. Consumption of Selected Plant Foods rich in Iron

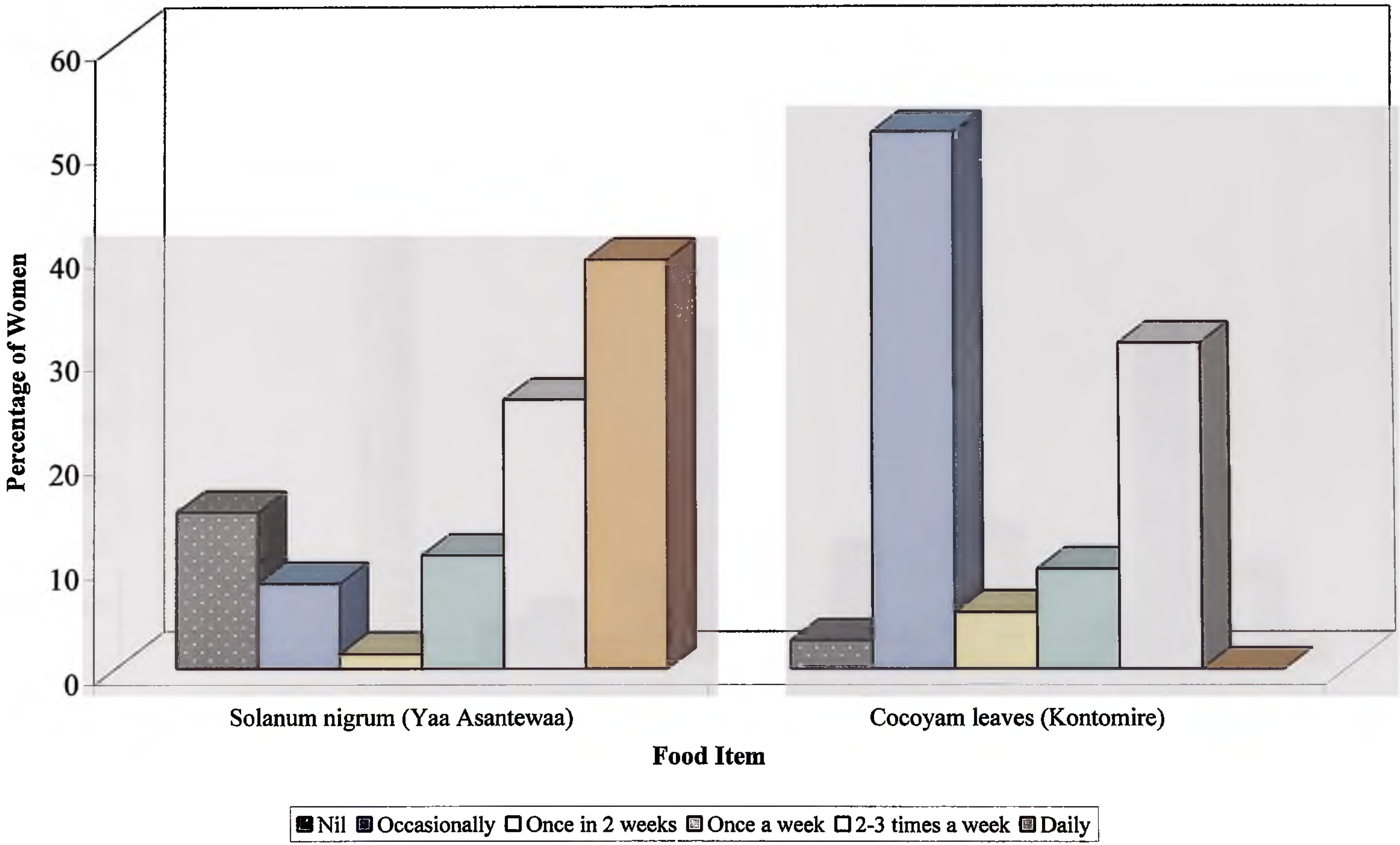
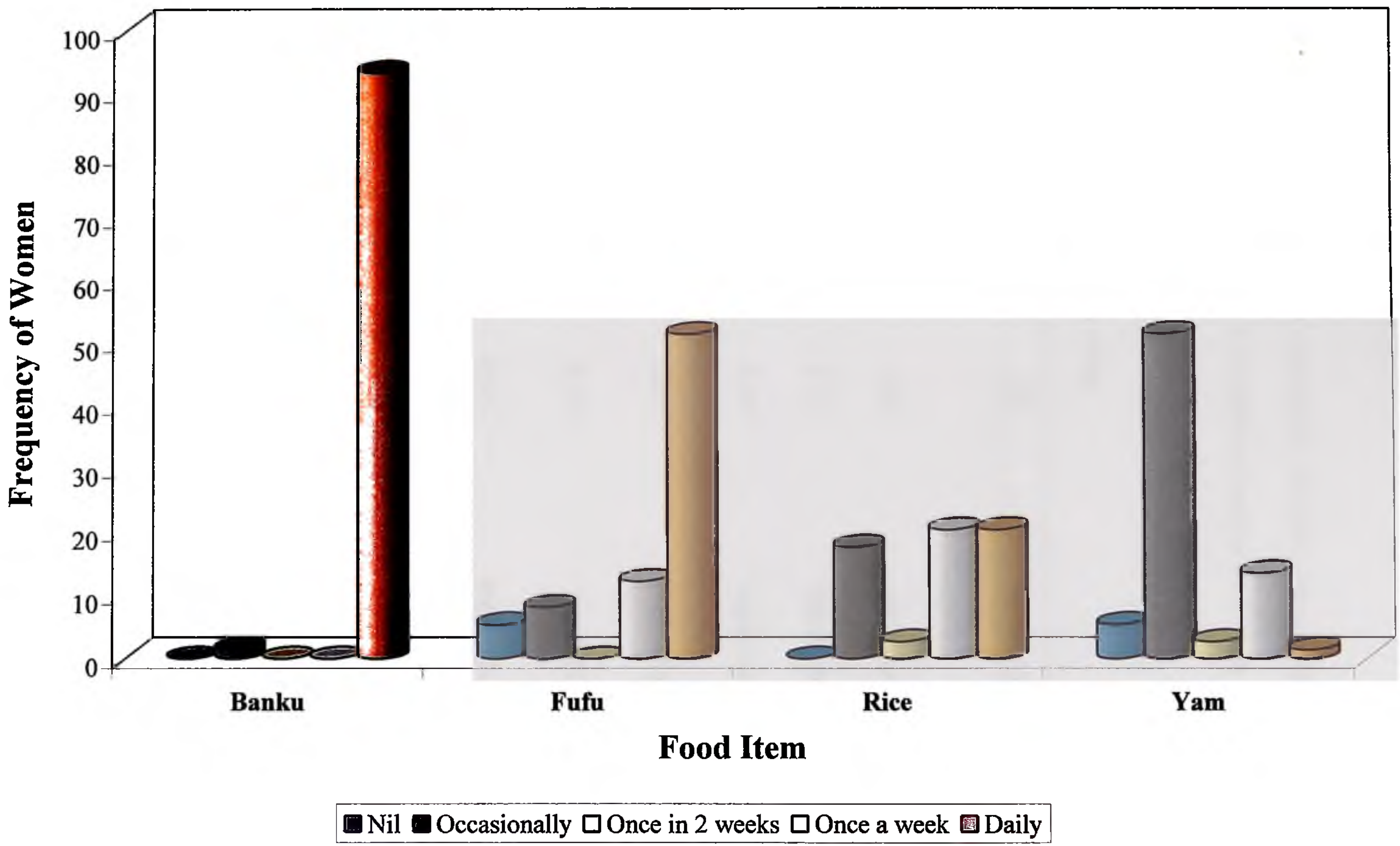


Figure 4.14 Consumption of Selected Foods Rich in Carbohydrate



4.7. Correlation Analyses

To find out the strength of the association between the variables measured, correlation analyses were carried out, at a confidence interval of 95% ($p < 0.05$). The results are as tabulated in Tables 4.14.

Table 4.14 Regression Analyses (n = 74)

Variables	r	R*	Remarks
BMI versus:			
Age	0.30	0.09	significant[2]
WHR	0.32	0.10	significant
Systolic blood pressure	0.53	0.28	significant
Diastolic blood pressure	0.45	0.20	significant
Income	0.46	0.18	significant
Level of education	-0.12	0.01	insignificant
Retinol	0.41	0.17	significant

1. r = Correlation coefficient

2. $R^* = r^2$

3. Significant level of r for a sample size of 74 = 0.159

Source: Steel and Torrie, 1980

Table 4.14 Regression Analyses (continued)

Variables	r	R*	Remarks
WHR versus			
Age	0.41	0.17	significant[2]
Systolic blood pressure	0.22	0.05	significant
Diastolic blood pressure	0.32	0.10	significant
Level of education	- 0.33	0.11	significant
Income	0.35	0.12	significant
Age versus working time	0.38	0.14	significant
Education versus			
Hb	0.12	0.01	insignificant
Number of Children born	- 0.40	0.16	significant
Albumin versus total protein	0.63	0.40	significant
Hb versus Serum iron	0.81	0.66	significant

1. r = Correlation coefficient
2. $R^* = r^2$
3. Significant level of r for a sample size of 74 = 0.159

Source: Steel and Torrie, 1980

CHAPTER FIVE

DISCUSSION

5.1.0 BACKGROUND INFORMATION

5.1.1 Education

Generally, the level of education reached by the women was low (Figure 4.1). Level of education has been documented (FAO, 1998) to have an impact on agricultural output and for that matter the nutrition of women. Providing women with basic education would help raise agricultural productivity and incomes, for better-educated farmers are likely to adopt new technologies. A study by the UN (FAO, 1998), found that providing ten years of education for every woman would have a more direct effect in reducing child mortality. Education can help women to identify crops that are suited to their local conditions and that will supply them the nutrients needed to achieve optimum dietary balance.

The Ghana Demographic and Health Survey (1993) showed uneducated women to be less likely to use modern contraceptives and hence to be at higher reproductive risk. Thus, using level of education as an indicator, the women in this study are at a high reproductive health risks. Their level of education was found to be quite low and education was found to be inversely related to number of children born to the women. About 47% had a total of at least four children at the time of the study. Some (7%) had at least seven children. Education will thus help them adopt better methods of birth control and also help them make healthier choices when it comes to number of children to bear and also birth-spacing. Education will in effect, play a vital role in improving their overall nutrition and health status.

5.1.2 OCCUPATION AND INCOME

Improvements in household welfare depend not only on the level of income, but also on who earns the income. Women tend to spend a disproportionate amount of their income on food for the family compared to men (Holmboe-Ottesen et al, 1989). In this present study, with the levels of income observed among the women, they can be classified as low income earners. The women may be considered poor but with their secondary occupations, apart from farming, they are likely to earn frequent incomes even though they may be in small amounts. Since women's income tends to come in smaller and more frequent amounts than men's, it may be more readily spent on daily subsistence needs. As income is a critical determinant of a household's ability to obtain food, poverty is a major threat to food security. The women thus require improved access to resources that will raise their income levels. There are nutritional benefits associated with women's incomes. Women's incomes has been associated with better nutritional status of their children(Tripp, 1981).

5.2.0 ANTHROPOMETRY

Height has been advocated as a useful index of socio-economic conditions in developing societies as populations that are poorly fed and subject to repeated infections rarely grow well in either childhood or adolescence and fail to achieve adult stature which commensurate with their full genetic potential (Gopalan, 1987). The percentage of women found stunted in this study, based on their height measurements, suggests a long term energy deficiency in childhood and adolescence. This explains the observed stunted or adult stature attained. However, the high percentage (96%) having acceptable height is suggestive that majority had good nutrition in childhood and adolescence. Short stature has been associated with negative outcomes, including reduced work capacity and reproductive outcomes (Bouzina et al, 1989, Royston and Armstrong 1989).

Body mass index (BMI) has been recommended as the ideal index for identifying chronically energy deficient adults in a community (Shetty and James, 1994). It has been used as a simple anthropometric indicator that reflects the body's energy stores. Based on BMIs, a large percentage (Figure 4.2) of women in this present study could be said to have good nutrition. However, the percentage identified to be underweight, suggests that a section of them had poor nutrition. Among those found to be underweight, 75 percent were in the age group of 15 – 20 years and 18 percent were from the 21 –27 age group (Figure 4.3). These are the ages at which women are likely to be selective of what they eat and also hold the notion that 'slim is beautiful'. This could be a contributory factor to their present state of undernutrition as observed in this study. Another factor may be inadequate food availability or access to food. Thus, they may be compelled to consume less calories and this is reflected as low BMIs. The consequences of adult malnutrition goes beyond maternal risk of underweight babies. The ability of women to be effective at and to cope effectively with domestic chores are markedly dependent on their body mass. Sickness, days off work, days sick in bed and death rates, all increase with increasing malnutrition (Shetty and James, 1994).

There is also behavioural adaptation in physical activity patterns that accompanies low BMI state (Latham, 1989; Santyanarayana et al., 1977). Thus, those observed to have low BMIs, (<18.5 kg/m^2), are likely to show behavioural adaptation in physical activity patterns. This behavioural adaptation accompanying low BMI states is mainly related to the individual's allocation of time and energy to different productive and leisure activities and to the estimation of the biological and economic consequences of these altered behavioural patterns. In rural India and Ethiopia, studies on men and women (Ferro-Luzzi et al., 1992) have shown that individuals with varying degrees of chronic energy deficiency spent fewer hours in a day working than did individuals in the same socio-cultural milieu with BMIs greater than 18.5. The productive activity of normal and chronic energy deficient Ethiopian also revealed that those with BMIs less than 18.5, spent less time on productive activities in a day. They had increased levels of rest time per day. It has also been shown (Naidu et al., 1991) that women with better nutritional status (BMIs greater than 18.5), also have better histories of maternal and infant nutrition. A low BMI state, indicative of chronic energy deficiency, is a particularly important aspect of the nutritional risks of which women experience during the reproductive years. This risk can also be exacerbated by early marriage. Women in this study who had low BMIs (< 18.5) are likely to experience poor lactational performance. Poor maternal status exemplified by a low BMI is associated with greater morbidity (Garcia and Kennedy, 1994) and poorer post-partum outcomes such as lower breast milk output and underweight children (Merchant et al., 1990).

The dietary assessment showed that the women consumed a variety of macro and micronutrient food sources. The staple food was mainly maize. Cassava was also consumed in large quantities in the form of fufu and gari (Figure 4.13). It may be inferred that their food intake was at least adequate to ensure healthy weights as against their heights. The low prevalence of underweight (Figure 4.2) among them shows that a section of them had poor or undernutrition.

Incidence of overweight and obesity was found among the women (Figure 4.2). Obesity was observed among the age groups of 28 – 33 and 41 – 45 years old. Of the percentage found to be obese, the majority were in the age group of 41 – 45 (Figure 4.3). High BMIs have been associated with a higher prevalence of diabetes mellitus and glycosuria (Satynarayana, 1976). Obesity may increase their risk of developing chronic diseases such as diabetes and cardiovascular diseases. Hara (1996) has shown that the incidence of diabetes mellitus in obese people was twice as much as in their non-obese counterparts, and the rate increased with the level of obesity among Japanese-Americans living in Hawaii.

Significant positive associations were established between BMI and blood pressures of women in this present study (Table 4.13). These observations are not surprising since the blood pressures are expected to increase with increasing body weights (Medical Encyclopaedia, 1995). Their blood pressures (Tables 4.8 and 4.9) revealed that some of the women to had blood pressures higher than normal. These women are therefore likely to be hypertensive.

The waist and hip measurements revealed that significant number of the women had WHR values considered too high (Figure 4.4). WHO (1995) has indicated high WHRs greater than 0.85 with risk of morbidity and mortality for chronic diseases such as myocardial infarction, stroke, diabetes and cancer. Thus, from this, a substantial number of the women can be said to be at risk of some of these mentioned chronic diseases. Furthermore, the WHR was observed to be associated positively with the diastolic ($r = 0.32$) (Table 4.14) and the systolic ($r = 0.22$) (Table 4.14) blood pressures. This is in agreement with other studies (Blair et al., 1984; Larsson et al., 1984) which have reported that WHR is positively related to both systolic and diastolic blood pressures. A high WHR has been shown to be hazardous to health (Lapidus et al., 1984). Lakshmi et al (1997), in a case control study, reported high BMI and/or WHR to be associated with increased prevalence of hypertension and hypercholestrolaemia. Again the WHR of the women was positively associated with BMI, and this is in agreement with the study by Laskshmi et al (1997). This relationship is expected because as total fatness increases, abdominal fatness is likely to increase. Thus, quite a number of the women are likely to suffer from chronic diseases such as hypertension, diabetes mellitus and myocardial infarction. Vuvor (1998), in a population based study, concluded that as the WHR of subjects increased, the incidence of diabetes also increased.

The observed inverse associations observed between the level of education and, BMI (r = -0.26) (Table 4.14) and WHR (r = -0.33) (Table 4.14) can be explained by the fact that those who had attained higher levels in education know better, the health risks associated with fatness, hence these are more likely to check their body weight to avoid or minimise the risks. But the positive associations observed between income and BMI (r = 0.46) (Table 4.14), and WHR (r = 0.35) (Table 4.14), can be attributed to the fact that those who had higher incomes had better access to food since they could afford to buy more food and thus, likely to eat more than those who earned lower incomes. Thus, the higher income earners tended to consume more food or reduce their physical activities thereby gaining more weight and this showed up as high BMI and WHR values.

5.3.0 BIOCHEMICAL STUDY

5.3.1 Urine and Blood Sugar

None of the subjects had sugar in the urine and they all had normal levels of blood sugar (< 140 μg/dl). From this it may be inferred that none had diabetes. However, a lower random blood glucose is not enough criteria to exclude diabetes. since intra-abdominal fat accumulation is associated with insulin resistance and increased insulin secretion (WHO, 1997), the women are likely to be at risk of developing diabetes.

Urine tests are of less value diagnostically as the blood glucose level must be above the renal threshold of 165-180 mg/dl for glucose to appear in the urine, at which level it is far above the normal physiological value (Watson and Royle, 1991).

5.3.2 SERUM RETINOL

Only a few of the women showed marginal vitamin A status (i.e. subclinical deficiency), with the majority showing adequate levels of serum retinol (Figure 4.7). This suggests the likelihood of adequate intake of vitamin A-rich foods by the majority. The problem of the marginal vitamin A status may be attributable to either low intake of vitamin A-rich foods or insanitary conditions in the community. In this study, domestic animal faeces were seen in almost all the households visited, waste water was allowed to flow freely on the compounds and behind the houses. These practices may promote infections and pose a threat to health. Infections may result in the suppression of the synthesis of transport proteins such as albumin and retinol-binding proteins by hepatocytes (Rosales et al, 1996). These transport proteins may get diverted into the extracellular spaces, thus leading to decreased serum levels of retinol. The low serum retinol levels can also be due to deficiency in zinc even though vitamin A intake may be adequate. Alcohol dehydrogenase, a zinc metalloenzyme, present in the liver and other organs, is responsible for the oxidation of vitamin A (retinol) and other primary and secondary alcohols (Cavalieri, 1974). Thus, if zinc is lacking in the diet, it may show up as low levels of serum retinol as vitamin A utilisation is impeded. Zinc plays a vital role in the syntheses of alcohol dehydrogenase. This relationship may explain the response of night blindness in some alcoholic patients to zinc supplementation and not to vitamin A (McLaren, 1981).

The main sources of vitamin A to the women were palm soup and palm oil. Due to its oily nature, it may also contribute significantly to their total energy intake. Mangoes and pawpaw, other rich sources of vitamin A, were consumed in large quantities when in season. Majority (Figure 4.9) consumed palm oil at least twice or three times in a week with about 4 percent consuming some palm oil everyday. Palm soup was also consumed appreciably; 70 percent claimed to consume it two or three times in a week, with some 18 percent and 4 percent consuming it once in a week and once every two weeks, respectively. Lartey et al (1993), in a study to determine the dietary intake of vitamin A in rural Ghanaian households around Accra, also identified palm soup to be an important contributor to the vitamin A intakes of the households studied.

5.3.3 TOTAL SERUM PROTEINS AND ALBUMIN

The total serum proteins and albumin levels of the women revealed their protein status to be acceptable. This suggests that their protein intake was acceptable and that protein-energy malnutrition may not be a problem among the women. There was an association observed between the serum albumin levels and serum total protein (r = 0.63) (Table 4.14). Albumin forms the most abundant protein in human plasma (forming some 40 to 60% of the total protein) (Silverman and Christenson, 1994) and thus changes in albumin levels would affect the level of serum total proteins.

Protein deficiency decreases vitamin A utilisation (Arroyave et al, 1961). Thus, it is not surprising that the women had good serum protein levels and also adequate serum retinol levels. Adequate protein intake promotes vitamin A utilisation. Their sources of protein were from both animal and plant sources. All the women consumed some fish everyday. Meat was also eaten but not as often as fish. Chicken was also eaten appreciably (Figure 4.11), thus contributing significantly to their total protein intake. Among the plant sources, melon seeds, locally known as agushi, was highly patronised (Figure 4.10).

5.3.4 Anaemia and Iron Deficiency

The high prevalence of anaemia among the women is not surprising. Anaemia has been identified as a major problem among women (Asibey-Berko and Addo, 1994; Scrimshaw, 1991).

Their serum iron concentrations revealed that majority had serum iron concentrations below acceptable levels (Table 4.8). Thus, the observed anaemia is likely to be due to iron deficiency. Different studies carried out on women of childbearing age showed similar findings (Asibey-Berko and Addo, 1994; Scrimshaw, 1991; McGuire and Popkin, 1988). Two-thirds of children and women of childbearing age in most developing countries are estimated to suffer from iron deficiency, one-third of them having the more severe form of the disorder (Scrimshaw, 1991).

In the Greater Accra region of Ghana, from 1986 to 1988, one of the five leading causes of maternal deaths in hospitals was found to be anaemia and this accounted for some 14 percent of the deaths (Mensah-Quainoo, 1997).

The consequences of anaemia are numerous. Anaemia may result in increased risks of giving birth to low-birthweight babies (who face greater risk of mortality), deficits in cognitive ability, and work capacity (McGuire and Popkin, 1988; Pollit, 1993) and more frequently, increases the risk of death from haemorrhage (Royston and Armstrong, 1989) which forms the single largest cause of maternal death in developing countries.

The comparatively high prevalence of anaemia observed among the age groups 15 – 20 years, 21 – 27years, and 28 – 33 years (Figure 4.6), may be attributed to high rate of iron loss through menstruation. The highest prevalence shown by the 28 – 33 years group may be due to the fact that this is the age at which women are very active in reproduction and hence blood loss though menstruation and frequent pregnancies could lead to high prevalence of anaemia as shown in this study. The 41 – 45 years group also showed some anaemia and this may be due to the fact that after frequent pregnancies and menstruation, lost blood might not have been adequately replenished.

The high prevalence of iron deficiency in the women does not commensurate with the dietary assessment. Their main animal sources of iron (heme iron) were poultry, beef and bush meat. These were consumed in appreciable frequencies. A plant locally known as Yaa Asantewaa (Solinum Nigrum), a rich source of iron was highly consumed by the inhabitants with majority using some for food preparation everyday (Figure 4.12). Thus to some extent their iron intake is less associated with their iron status.

The high prevalence of anaemia and iron deficiency among the women as indicated by their blood haemoglobin and serum iron concentrations, may be attributable to various factors such as the amount of the nutrient consumed in a meal, absorption modifiers, the species of the iron compound, nutrient status of the host, other host-related factors and interactions among the factors. The monthly losses of blood in women may contribute to this high prevalence of anaemia and iron deficiency. Even though the women consumed some heme iron, by comparison, their main source of iron was from plants which is less absorbed, compared to heme iron. Plant (non-heme) iron, is relatively poorly absorbed (Scrimshaw, 1991). For instance, only low quantities: 1.6 percent from black beans, 4.4 percent from lettuce and 7 percent from soybeans, can be taken in by the body. In contrast, 20 percent of the iron from red meat, in the form of heme iron can be absorbed. Iron from poultry and fish can be equally assimilated, the concentrations may be lower though. The consumption of a meal can influence the amount of iron that is retained. Thus, the bioavailability of iron is affected by several (dietary) factors, and the adaptation process may occur when iron intake is low. For example, if a meal contains both heme and non-heme iron, the former will improve the absorption of the latter. Vitamin C enhances the utilisation of iron, but substances like tannin from tea as well as fibre and phytates from plants inhibit it. The diets of the women might have contained iron-absorption inhibitors such as phytates and fibre. From the dietary assessment, oranges and pineapples which are rich sources of vitamin C were less consumed by the women (Figure 4.13). These were consumed only occasionally.

Hence the poor serum iron status may be to diets deficient in adequate levels of vitamin C and other enhancers of iron absorption.

Iron deficiency is not caused by dietary imbalances only, it may occur even when the diet is adequate in iron. Chronic blood loss caused by hookworm and schistosomiasis and the excessive storage of iron as hemosiderin, as a result of malaria. Abnormal uterine bleeding may be another cause. Nutrition security depends not only on food at the household level but also on factors such as clean water and sanitation. The main source of drinking water for the inhabitants of the settlement was a pond on the outskirts of the community (they did not enjoy portable drinking water). The women are therefore likely to be infested by worms which may be present in the intestines and cause occult bleeding thereby, contributing to iron loss and hence the high prevalence of iron deficiency found among the women.

5.4.0 WORKLOAD

On the average, the women in this study spent a total of between 5 and 9 hours daily on income generating activities, food preparation and care. Fetching of water for household use was mainly a chore for the women and girls. They walked to the outskirts of the town to fetch water. A typical woman-farmer spent about 2 – 4 hours on the farm and another 0.5 – 1 hour to collect wood for fuel. During the farming (raining) seasons, they spend longer hours on the farms. They indicated that they usually leave home quite early in the morning, by 5:00AM and return late around 6:00 PM to 6:30PM. Similar studies have been reported from other developing countries (McGuire and Popkin, 1990; Abbi et al, 1991). Bleiberg et al (1980), on the energy expenditure of females and found their expenditure to be moderately active to very active during the dry season. In the rainy season, Bleiberg et al (1980), concluded that females' energy expenditure were exceptionally high. Berio (1984) found the women of Pouyomba village in the Central African Republic to work on the average, eight hours daily. The women's time devoted to agricultural activities equalled that of men.

This is likely to affect the nutrition of the entire household since longer hours on the farm would mean the women spent less time cooking meals and also less time may be allotted for personal care and care for other household members, especially children. Thus, lesser time may be spent on domestic work and more time spent on farm work. Heavy workload may affect the women's nutrition and health in various ways, including increased energy demand for heavy work that is not matched by a corresponding increase in food consumption, or "wear and tear" effects causing body pains, arthritis, or premature deliveries, change in the women's diet or dietary patterns, which may occur during periods of heavy work (Holmboe-Ottesen, 1988).

Firewood was the main source of fuel for cooking. Charcoal was also used appreciably. The smoke that result from the burning of the wood in their traditional fuel-wood hearth or the charcoal stove may fill the kitchen and be inhaled each time meals are prepared and this is likely to have adverse effect on their health (especially their lungs and eyes). The Bitot's-like spots that were identified on the eyes of the women are likely to be the effect of the use of firewood and charcoal as fuel for cooking.

A study involving 294 women in 15 communities in Ghana found almost 50 percent greater chance of stillbirth among pregnant women as a result of cooking over open fuel wood stoves (Ardayfio-Schandorf, 1993).

The association observed between age and working time indicates that as the women grew older, their responsibilities also increases. At this time the family size might also have increased and even if less time is spent on farming activities, more time would be allocated to childcare, food preparation and income-generating activities.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the findings of this study, the following conclusions were arrived at:

The majority (67.6%) of the women assessed by anthropometry were of normal weight while the rest were underweight, overweight or obese. The 41 – 45 year group showed the highest prevalence of obesity, while underweight was predominant among the group aged 15 – 20 years. Overweight was found in all the age groups except the 15 – 20 year group.

Body mass index (BMI) was found to increase with serum retinol, serum total proteins, waist-to-hip ratio (WHR) and blood pressure.

Based on BMI and WHR values, more than half (51%) might be at risk of developing chronic diseases such as myocardial infarction, stroke, hypertension and diabetes. Body mass index was significantly associated with WHR, blood pressures, income and serum retinol.

Majority of the women assessed, showed adequate vitamin A status, with about 11% having subclinical vitamin A status (based on serum retinol concentration).

Protein status in all the women was adequate, showing that PEM was not a problem among the women.

The majority (62.2%) of the women were anaemic and in addition, over half were found to have serum iron concentrations below the normal recommended values (≥ 60.0).

Among the socio-economic variables investigated, income had a significant association with BMI and WHR. In addition, even though weak, level of education was found to be inversely associated with BMI and WHR, and positively with blood haemoglobin level.

With the exception of serum iron and haemoglobin concentrations as indicators of nutritional status, the overall nutritional and health status of the women were fairly good.

6.2 Recommendations

Since the women were predominantly farmers, the farming systems should be designed to encourage mix cropping so as to provide them with a balanced diet. Strategies such as crop diversity, cultivation of indigenous crops and vegetable gardens should be employed to increase the food base and supplement staple foods. Access by farmers to co-ordinated advice on nutrition and production-related issues are very critical in this regard.

Under-exploited food plants and indigenous species should be identified and the women encouraged to use these in order to improve household food security, enhance the nutritional status of the women and widen the species base in cropping systems.

Since education has high returns on health and nutrition status of individuals, the women should be encouraged to send their female children to school just as they send the males to school. Moreover, they themselves may enrol in adult literacy classes to help improve their lot and benefit from nutrition education. This will improve productivity both in the short and long term.

The women's ability to generate income must be enhanced in order to maximise their incomes to improve their quality of life and to ensure household food and nutrition security. This can be achieved through the formation of women groups to raise money for their welfare through gari processing, bakery etc.

To reduce the prevalence of overweight and obesity, those found to have high BMI would have to reduce their weight by way of exercise and reduction in food intake. Those found underweight would also have to increase their weight appreciably to normal level. In this regard nutrition education is recommended

Provision of safe drinking water in the community will have a very good impact on the health and nutritional status of the women of childbearing age in the community.

Since anaemia was found to be a problem among the women, periodic iron supplementation will help improve the iron status of the women. In addition, education directed at household sanitation, hygiene and increase in the intake of food sources rich in iron absorption enhancers will help curb the problem of anaemia.

Since the subjects form only a fraction of women of child-bearing age even in the Greater Accra region, it is recommended that similar studies be conducted in other communities in the region to give a representative picture of the nutrition and health status of women of childbearing age in the region. Similar studies can be carried out in the entire country to give a picture of the situation of women in the nation to draw meaningful conclusion. This will help plan properly on the health and nutrition issues concerning women and their children.

REFERENCES

1. **Abbi, R. Gujral, S. and Gopaldas, T. (1991).** The impact of maternal work status on the nutrition and health status of children. Food and Nutrition Bulletin. 13(1) Pp. 20 – 25.

2. Administrative Committee on Co-ordination/Sub-committee on Nutrition (1990). Women and nutrition. ACC/SCN Symposium Report. Nutrition Policy Discussion Paper no. 6 Geneva: United Nations.

3. **Ardayfio-Schandorf E. (1993).** Women's Health Status in Africa, Environmental perspectives from Rural Communities. Health-Care-Women-International.; 14(4): 375-86.

4. **Arrovaye G., Viteri F., Behar M., and Scrimshaw N.W. (1961).** Serum and liver vitamin A palmitate in severe protein malnutrition (kwashiorkor). American Journal of Clinical Nutrition; 9; 180 – 185.

5. **Asibey-Berko, E. and Addo F. (1994).** The Ghanaian Micronutrient Situation (Past, Present and Future Outlook). A document of the Micronutrient Malnutrition Working Group. Pp. 1 – 45.

6. **Berio A.J., (1984).** The analysis of time allocation and activity patterns in nutrition and rural development planning. Food and Nutrition Bulletin; 6(1) 53-68.

7. **Bieri J.G., Teresa J.T., and Catignani G.L. (1979).** Simultaneous determination of ?-tocopheral and retinol in plasma or red cells by high pressure liquid chromatography. The Am. J. of Clin. Nutr. 32: Pp. 2143-2149.

8. **Blair, D., Habicht, J.P., Ehtan, A.H., Slyvester, S.D., and Abraham, S. (1984).** Evidence for an increased risk for hypertension with centrally located body fat and the affect of the race and sex on this risk. Am. J. Epidemoil.; 119: 526 – 540.

9. **Bleiberg, F., Brun, T.A., Goiham, S., and Gouba, E. (1980).** Duration of activities and energy expenditure of female farmers in dry and rainy seasons in Upper Volta. Br. J. Nutr.; 43, Pp. 71-82.

10. **Burtis, C.A. and Ashwood, E.R. (1994).** Tietz textbook of clinical chemistry. 2nd edition. WB Sanders Company.

11. **Bouzina, R., Bates, C.J., van der Beek, J., Brubacher, G., Chandra, R.K., Hallberg, L., Hescker, J., Mertz, W., Pretrazik, K., Pollitt, E., Pradilla, A., Suboticanec, K., Sandsticanec, K., Sandstend, H., Schalch, W., Spurr, G.B., and Westenofer, J. (1989).** Workshop on functional significance of mild-to-moderate malnutrition. Am. J. Clin. Nutr; 50: 172 – 176.

12. **Cavalieri, R. R. (1974).** Trace elements, In: Modern Nutrition in Health and Disease Dietotherapy. (Robert S and Maurice E Shills Eds.), 5th edition, pp. 382 – 385. Kimpton Publishers, London.

13. **Chatterjee, M. and Lambert, J. (1990).** Women and nutrition: Reflections from India and Pakistan Women and Nutrition. ACC/SCN Symposium Report Nutrition Policy Discussion Paper no. 6. Geneva: Unite Nations.

14. **Copeland, R.A. (1994).** Methods for protein analysis: a practical guide to laboratory protocols. Pp 39-42.

15. FAO (1993) Food & Nutrition Paper 23 Rev. 1 Nutrition Programmes Service FAO Policy and Nutrition Division Rome Pp. 81-97.

16. FAO/WHO (1992). International Conference on Nutrition: Final Report of the Conference. Rome.

17. **Ferro-Luzzi, A., Sette, S., Franklin, M. and James, W.P.T. (1992).** A simplified approach to assessing adult chronic energy deficiency. Eur. J. Clin. Nutr. 46: 173 – 186.

18. **Garcia, M, and Kennedy, E. (1994).** Assessing the linkages between low body mass index and morbidity in adults: Evidence from four developing countries. European Journal of Clinical Nutrition 44, Suppl. 173-186.

19. Ghana Demographic and Health Survey (1993). Government of Ghana, Ghana Statistical Service and Macro International Inc., Accra, Ghana and Calverton, Maryland, USA.

20. **Goldberg, G. R. (1997).** Reproduction: a global nutritional challenge. Proceedings of the Nutrition Society; (56) 319-333.

21. **Gopalan, C. (1987).** Heights of populations – an index of their nutrition and socio-economic development. Bull. Nutr. Found. Ind. 9:1 – 4.

22. **Hamilton, S., Popkin, B. and Spider, D. (1984).** Women and nutrition in third world countries. Food and Nutrition Bulletin 10(3) pp. 8-15.

23. **Hara, H. (1996).** Incidence of NIDDM and its risk factors in Japanese-Americans living in Hawaii and Los Ageles. Diabet Med. 13(9 suppl 6): S133-42.

24. **Holmboe-Ottesen, G. Mascarenhas, O. and Wande, M. (1988).** Women's role in food production and nutrition: Implications for their quality of life. Food and Nutrition Bulletin 10(3) 8-14.

25. ICN,(1992). Nutrition: the Global Challenge 2nd edition. International Conference on Nutrition, Dec. 1992 pp. 3-8.

26. IVACG Report,(1982). Biochemical methodology for the assessment of vitamin A status. The Nutrition Foundation, Washington D. C. pp. 14-19.

27. **Jellife, D.B. and Jellife, E.F.P. (1989).** Community Nutritional Assessment, with Special Reference to less Developed Countries, Oxford Medical Publications.

28. **Kaplan, L.A. and Pesce, A.J. (1984).** Clinical Chemistry- theory, analysis, and correlation. The CV Mosby Company Toronto.

29. **Lapidus, L., Bengtsson, C., Larsson, B., Pennert, K., Rybo E., and Sjostrom, L. (1984).** Distribution of adipose tissue and risk of cardiovascular disease and death: a 12-year follow up of participants in the population of women in Gothenburg, Sweden. Br. Med. J.; 289: 1257 – 1261.

30. **Larsson, B., Svardsudd, K., Welin, L., Welhemsen, L., Bjorntorp, P., and Tibblin, G. (1984).** Abdominal adipose tissue distribution, obesity and risk of cardiovascular disease and death, 13 year follow-up of participants in the study of men born in 1913. Br. Med. J.; 288: 1401 – 1404.

31. **Lakshmi, V., Tripuraribhutla, K. P., Ram, T.C.R., Kodavanti, R.M., Eswaran, P., and Krishnasway, K. (1997).** Abdominal Adiposity and Metabolic Alterations in Hypertension – A Case Control study. Asia Pacific Journal of Clinical Nutrition; 6(3): 181 – 185.

31. **Lartey, A., Oracca-Tetteh, R. and Asibey-Berko, E. (1993).** Vitamin A intake of some rural Ghanaian households. Department of Nutrition and Food Science. University of Ghana, Legon.

32. **Latham, M.C. (1989):** Nutrition and work performance, energy intakes and human wellbeing in Africa. Proc. XIV Int. Cong. Nutr., Seoul, pp. 314 – 317.

33. **Latham, M.C. (1997):** Human nutrition in the developing world (FAO food & nutrition series no. 29) Pp. 45-56, Rome.

34. **Leslie, J. (1992):** Women's lives and women's health: using social science research to promote better health for women. J. Wom. Health 1(4): 307 – 18.

35. **Leslie, J., Ciemins, E., and Essama, B.S. (1997a.):** Female nutritional status across lifespan in sub-Saharan Africa. 1. Prevalence patterns. Food and Nutrition Bulletin 18(1) Pp. 21-32.

36. **Leslie, J., Essama, S.B., and Ciemins, E. (1997b):** Female nutritional status across the lifespan in sub-Saharan Africa. 2. Causes and consequences. Food and Nutrition Bulletin 18(1) Pp. 44-54.

37. **Lo, C.W., Jarjou, L.M.A., Poppit, S.D., Cole, T.J., Necr, R. and Prentice, A. (1991):** Delayed Development of Bone Mass in West African Adolescents In: Osteoporosis 90: Third International Symposium on Osteoporosis. Vol. 1. Pp. 73 – 77 (Christiansen C and Overgaard, eds.). Aalborg, Denmark: Handelstrykkerier Aalborg Aps.

38. **Mbago, M.C.Y. and Namfua, P.P. (1992):** Some determinants of nutritional status of one- to four-year-old children in low-income urban areas of Tanzania. Journal of Tropical Paediatrics 38, 299 – 306.

39. **McLaren, D.S. (1981).** Nutrition and its Disorders; 3rd edition. Longman Group ltd. London.

40. **McGuire, J.S. and Popkin, B.M. (1988).** The zero-sum game: A framework for examining women and nutrition. Food and Nutrition Bulletin 10(3), 27 – 32.

41. **McGuire, J. and Popkin, B.M. (1990).** Beating a Zero-Sum Game: Women and Nutrition in the Third World. In: Women and Nutrition. ACC/SCN Symposium Report Nutrition Policy Discussion Paper No. 6 Geneva: United Nations.

42. Medical Encyclopedia (1995) The World Book, Your Guide to Good Health. World Book, Inc. a Scott Fetzer company, Chicago.

43. **Mensah-Quainoo, E. (1997).** Improving Women's Health: The Ghana Experience 1997 (Draft). Pg. 1-47

44. **Merchant, K., Martorell, R. and Haas, J.D. (1990).** Maternal and foetal responses to the stress of lactation concurrent with pregnancy and short recuperative intervals. Amer. J. Clin. Nutr. 52:2 pp 280 – 288.

45. MOA (1986). Ministry of Agriculture, sample census of agriculture In: National Program of Action on the follow-up to the World Summit for Children, The child cannot wait, Accra.

46. MOH (1993). Republic of Ghana, Ministry of Health, Ghana. Annual Report, Maternal and Child Health and Family Planning.

47. **Naidu, A.N., Neela, J. and Rao, N.P. (1991).** Maternal body mass index and birth weight. Nutr. News. 12, National Institute of Nutrition, Hyberadad.

48. National Programme of Action (1992). A National Programme of Action on the follow-up to the World Summit for Children, The child cannot wait, Accra.

49. **Oracca-Tetteh, R. and Watson, J.D. (1976).** A Reassessment of the Nutritional Status of the Population of Baafi after the Initiation of a Modest Applied Nutrition Programme, Department of Nutrition and Food Science, University of Ghana, Legon.

50. **Pike, R.L. and Brown, M.L. (1975).** Nutrition: An Integrated Approach. 2nd edition. John Wiley & Sons Inc. New York.

51. **Pollit, E. (1993).** Iron deficiency and cognitive function. Annual review of Nutrition 13, 521 – 537.

52. **Poppit, S.D, and Prentice, A.M. (1993).** Maternal Nutritional Deficiencies in Developing Countries. In: Birth Risks, (J. D. Baun, ed.). Pp. 71 – 82. New York: Raven Press.

53. Ghana Population census 1984 In: National Program of Action on the follow-up of the World Summit for Children, The child cannot wait, Accra, 1992.

54. **Rosales, F.J., Ritter, S.J, Zolfghani, R., Smith J.E. and Ross, A.C. (1996).** The mechanism of inflammation-induced hyporetinemia. A report of XVII IVACG Meeting, Guatemala City, Guatemala. Pg. 98.

55. **Royston, E. and Armstrong, S. (1989).** Preventing maternal deaths. Geneva: In: World Health Organisation, 1995 (Technical Report Series, No. 854): 368 – 369.

56. **Santyanarayana, K. (1976).** Diabetes in a Heterogeneous Urban Population. Nutr. News (National Institute of Nutrition, Hyderabad, India) 10: 13 – 21.

57. **Sauberlich, H.E., Dowdy, R.P., and Skala, J.H. (1976).** Laboratory Tests for the Assessment of Nutritional Status. CRC Press, Inc. Cleveland, Ohio.

58. **Scrimshaw, N.S., (1991).** Iron Deficiency. Scientific American October 1991: 46 – 52.

59. **Shetty, P.S. and James, W.P.T. (1994).** Body Mass Index: A Measure of Chronic Energy Deficiency in Adults. Food & Nutrition Paper No. 56. FAO Geneva.

60. **Silverman, L.M. and Christenson, R.H. (1994).** Amino acids and proteins. In: Tietz Textbook of clinical chemistry (Burtis, C.A. and ER Ashwood Eds.) 2nd edition. Pp. 692-695 WB Sanders Co. USA.

61. **Sivard, R.L. (1985).** Women ...a world Survey. In: The zero-sum game: A framework for examining women and nutrition. Judith S. McGuire & Barry M. Popkin. Food and Nutrition Bulletin 10(3) 1988 pp. 27-32.

62. **Solomons, N.W. (1995).** Vitamin A and developing Countries. International Child Health; VI (i): 33 – 47.

63. **Songsore, J. and McGranahan, G. (1996).** Women and Household Care in the Greater Accra Metropolitan Area, Ghana. Stockholm Environmental Inst.

64. **Steel, G.D., and Torrie, J.H. (1980).** Principles and Procedure of Statistics. McGraw – Hill Book Company, Inc. New York.

65. **Tinker, A. and Koblinsky, M.A. (1993).** Making Motherhood safe. In: Women's Health and Nutrition: Report on Women's Health and Nutrition Seminar Sponsored by the World Bank, Rockefeller Foundation Study and Conference Centre Bellagis, Italy. Pg. 1-47.

66. **Tripp, R. B. (1981).** Farmers and Traders: Some Economic Determinants of Nutritional Status in Northern Ghana. Journal of Tropical Paediatrics 27: 15 – 22.

67. United Nations, 1991: The World's Women 1970-1990: Trends and Statistics. In: National Programme of Action (1992). A National Programme of Action on the follow-up to the World Summit for Children, The child cannot wait, Accra.

68. **Vijayalashmi, K., Parasanna, K.T, Thummala, C.R.R., Mallikharjuna, R.K., Parvathi, E., and Kamala, K. (1997).** Abdominal adiposity and metabolic alterations in hypertension- a case control study. Asia Pacific Journal of Clinical Nutrition 6(3): 180 – 185.

69. **Vuvor, F.M.K. (1998).** Population-based study of prevalence of diabetes mellitus and its associated risk factors in adult Ghanaians in the Greater Accra region. Master of Philosophy thesis, University of Ghana, Legon.

70. **Walker, S.P. (1997).** Nutritional Issues for Women in Developing Countries. Proceedings of the Nutrition Society. 56: 345-356.

71. **Watson, J. E. and Royle, J. A. (1991).** Medical – Surgical and Related Physiology. ELBS, London.

72. World Food Day (1998). Women feed the world. Telefood, food for all. FAO of the UN.

73. WHO (1989). **DeMayer, E., Dallman, P., Gurney, J.M., Hallberg, L., Sood, S.K., Srikantia, S.G.** Preventing and Controlling Iron Deficiency Anemia through primary

health care: a guide for health administrators and programe managers: world health organisation.

74. World Health Organisation (1991). Maternal Mortality: A Global Factbook. Geneva: United Nations.

75. WHO (1992). Women's Health: across ages & frontier WHO/Geneva. Pp. V-9.

76. WHO (1995). Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. Geneva. World Health Organisation, (Technical Report Series, No. 854): 368 – 369.

77. WHO (1997). Obesity, Preventing and Managing the Global Epidemic. Report of a WHO Consultation on obesity. Geneva, 3-5 June 1997 pp. 9.

78. **Yip, R. (1996).** Iron supplementation: is it effective? American Journal of Clinical Nutrition 1996(63) 853-855 (editorial).

APPENDIX A: SAMPLE QUESTIONNAIRE

SURVEY OF THE NUTRITION SITUATION OF WOMEN

AT OTINIBI, GHANA.

1999

HOUSEHOLD SURVEY QUESTIONNAIRE.

SECTION A: PERSONAL DATA.

1. Name...(RESP-NAME)
2. ID # .... (ID).
3. Hse. #............... (HSE #).
4. Age (in completed years) .... (RESP-AGE)
5. Religion (tick the appropriate answer) (RELGN)

1. Christian	2. Islam	3. Other (specify)

6. Marital status (MARI-STAT)

1. Married	2. Single, never married	3. Widowed	4. Divorced, seperated

7. How many children do you have? (#-DEPENDS)

1. 1 – 3	2. 4 – 5	3. 6 – 9	4. > 9	5. None

8. Who is the head of your household or family? (HHH)

1. Husband	2. Self	3. Other (Specify)

9. Are you a permanent resident of this community? (RESI-STAT)

1. Yes [ ] 2. No [ ]

10. Are you pregnant? (PREG-STAT)

1. Yes [ ] 2. No [ ]

11. What is your ethnic origin? (ETHNC)

1. Ewe	2. Fanti	3. Ga
4. Hausa	5. Twi	6. Other (specify)

SECTION B: SOCIO-ECONOMIC DATA

12. What is the highest level of education you completed?

1. P 1	2. P2	3. P3	4. P4	5. P5
6. P6	7. M1	8. M2	9. M3	10. M4
11. S1	12. S2	13. S3/JSS	14. S4	15. S5
16. S6/SSS	17. VOC./CATE	18. ISLAMIC	STILL IN SCHL	NONE

13. What work do you do? (OCCUP)

1. FARMER	2. FOOD VENDOR	3. PETTY TRADER	4. SEAMSTRESS
5. SALARIED WORKER	DON'T WORK	OTHER (SPECIFY)	

14. How much do you earn in a month? ....cedis (INCOME)

15. Types of animals reared by household (ANIM-TYP)

1. GOAT	2. SHEEP	3. PIG
4. CHICKEN	5. DUCKS	6. OTHER (SPECIFY)

16. Do you consume any of these animals? (CONSUM-TYP)

1. Yes [ ] 2. No [ ]

17. If yes, specify...............

18. Do you sell any? (SELL-TYP)

1. Yes [ ] 2. No [ ]

19. If yes, specify...............................

20. Types of crops grown by household (CROPS-GRWN)

1. CASSAVA	2. YAM	3. COCOYAM	4. MAIZE	5. PEPPER
6. TOMATO	7. PLANTAIN	8. GARDEN EGG	9. OTHERS (SPECIFY)	

21. Which of these do you consume? .... (CRPS-CONS)

LIVING CONDITIONS

22. Type of house (HSE-TYP)

1. Single household building 2. Multiple-household building

23. Major building material of the house (BLD-MATRL)

1. STRAW	2. CLAY	3. WOOD	4. BRICKS	5. CEMENT

24. Type of roofing (RF-TYP)

1. STRAW	2. OLD ALUMINIUM	3. NEW ALUMINIUM	4. SLATE	5. OTHER(SPECIFY)

25. Location of kitchen (LOCT-KTCN)

1. Inside the house 2. Outside the house

26. What is your major source of energy for cooking? (CK-ENRGY)

1. Wood	2. Gas	3. Charcoal	4. Other (specify)

27. Where do you store food? (FD-STORE)

1. Ventilated cupboard 2. Open storage 3. No food is stored

28. What is your primary source of drinking water? (SRCE-DRK-WATER)

1. POND	2. BORE HOLE	OTHER(SPECIFY)

29. Where do you defecate? (PLCE-DEFCATE)

1. Private pit latrine	2. Public pit latrine	3. Open space	4. Other(specify)

30. Type of healthcare (HTH-CARE)

1. Hospital	2.Traditional medicine	3. Self-medication	4. Other(specify)

SECTION D: DIT FREQUENCY DATA.

Semi-quantitative food frequency questionnaire.

Please indicate how often you eat these foods and the amount by ticking the appropriate column.

FOODS	CODE	FREQUENCY							PORTIONS		
		N	O	1/2/w	1/W	2-3/W	1/D	2/D	S	M	L
Carbohydrates	100										
Rice											
Yam											
Banku											
Apkle											
Fufu											
Gari											
Cocoyam											
Atomo											
Others(specify											
Proteins											
Fish											
Eggs											
Beans											
Agushi											
Chicken											

Please indicate how often you eat these foods and the amount by ticking the appropriate column.

FOODS	CODE	FREQUENCY							PORTIONS		
		N	O	1/2/w	1/W	2-3/W	1/D	2/D	S	M	L
Proteins (contd.)											
Milk											
Bushmeat											
Snails											
Beef											
Others(specify)											
Green Leafy veg.											
Kontomire											
Bokoboko											
Yaa Asantewa											
Ayoyo											
Others(speciy)											
Fruits											
Pawpaw											
Mango											
Orange											
Pineapple											
Cashew											
Others(specify)											
Soups											
Palm											
Groundnut											
Kontomire											
Others(specify)											

N =Nil O = Occasionally 1/2/w = Once in two weeks 1/w = Once in a week

2-3/w = Two to three times a week D = Daily

SECTION E: PHYSICAL ACTIVITY.

1. What time do you go to bed in the evening? .... Pm. (SLEEP-TIME)

2. What time do you get up in the morning? .... Am. (WAKE-TIME)

3. What do you in the morning? ....(MORNING-ACT)

4. How long does it take you? ....mins. (ACT-TIME)

5. Please indicate below the other activities you undertake during the day and the approximate time it takes you for each activity.

ACTIVITY	TIME TAKEN

SECTION F: ANTHROPOMETRIC MEASUREMENTS.

1. Height ……………….m. (HGT)

2. Weight……………….kg. (WGT)

3. Waist circumference…………………..cm. (WST-CIRC)

4. Hip circumference……………………..cm. (HIP-CIRC)

SECTION G: PHYSICAL APPRAISAL.

1. Blood pressure ……………………………mmHg (BLD-PRES)

A SKIN EXAMINATION

1. Is there a rush on the skin? (SKN-RSH)

1. Yes [ ] 2. No [ ]

2. If yes, where is it concentrated? (LOC-RSH)

1. All over the body
2. On the buttocks
3. On the knee
4. At the elbow

3. Presence of goitre (by palpitation) (GOITER)

1. Yes [ ] 2. No [ ]

4. If yes, state grade............ (GOITER-GRADE)

B. EYE EXAMINATION

1. Is there any eye lesion? (EYE-LESION)

1. No
2. Yes, on white part of eye
3. Yes on the cornea

C. XEROPHTHALIA (XEROPH)

1. Bitot's spots
2. Corneal xerosis
3. Corneal ulcer < 1/3
4. Corneal ulcer > 1/3
5. Corneal scar
6. No xerophthalmia
7. Other eye lesion

<u>SECTION H: BIOCHEMICAL DATA</u>

1. Was participant's blood sample taken?

1. Yes [ ] 2. No [ ]

2. If no, state reason.......................................

3. Was participant's urine sample collected?

1. Yes [ ] 2. No [ ]

4. If no, state reason...

5. Blood haemoglobin concentration.......................... (HB-CONC)

6. Serum Retinol concentration................................ (RET-CONC)

7. Blood Sugar concentration.................................. (BLD-SUGAR)

8. Presence of sugar in urine (URINE-SUGAR)

1. Yes [ ] 2. No [ ]

9. Serum albumin concentration.............................. (SER-ALB)

10. Serum total protein concentration........................ (TOT-PROT)

11. Serum iron concentration................................ (SER-FE-CONC)

THANK YOU!

APPENDIX B: List of Indices Measured in the Study

ID*	BMI	WHR	SBP	DBP	BG	STP	SAL	HB	SRE	SFE
1	20.80	0.90	102	70	84	8.90	4.60	11.1	35.57	47.50
2	20.70	0.80	111	80	77	10.60	5.25	12.2	20.13	95.00
3	20.00	0.87	95	60	86	9.30	4.75	10.1	28.48	50.50
4	29.30	0.89	116	80	79	8.50	4.12	9.9	30.15	29.50
5	21.10	0.89	113	71	83	9.60	4.71	11.5	46.70	32.50
6	24.00	0.80	99	62	80	8.65	4.21	13.4	18.99	97.50
7	28.40	0.96	102	70	91	9.90	4.83	8.7	42.57	27.50
8	22.90	0.72	110	67	77	9.50	4.24	10.8	29.42	45.00
9	24.60	0.93	124	70	83	10.10	4.85	9.7	34.62	29.00
10	23.20	0.82	97	58	92	9.65	4.87	12.3	36.92	67.50
11	24.40	0.87	107	68	82	10.40	4.25	11.0	39.02	42.50
12	20.70	0.85	96	66	128	8.20	4.18	12.2	33.19	80.00
13	18.60	0.81	92	61	97	8.80	3.80	11.0	18.34	58.50
14	26.20	1.10	110	73	87	9.10	4.58	10.6	41.48	45.00
15	19.30	0.87	108	61	78	10.50	4.42	9.8	33.34	27.50
16	27.40	0.85	115	73	84	8.80	3.70	11.2	45.58	56.50
17	21.60	0.91	111	74	92	7.80	3.67	3.5	54.59	72.00
18	20.20	0.76	114	69	79	10.70	5.10	12.1	42.09	80.00
19	19.60	0.90	106	68	86	7.90	4.14	10.6	32.63	47.50
20	24.20	0.82	106	71	70	10.00	4.75	12.8	39.09	97.50
21	18.80	0.90	118	72	101	9.25	3.87	11.0	28.15	65.00
22	18.60	0.88	105	61	95	8.48	4.03	11.4	29.53	59.00
23	21.00	0.86	116	74	72	9.40	4.92	10.7	28.79	48.50
24	19.70	0.84	106	63	76	7.70	4.29	11.6	42.41	45.00
25	21.70	0.89	93	65	76	7.80	3.93	11.8	30.40	50.00
26	21.70	0.94	104	78	86	8.70	4.23	13.9	33.51	82.50
27	26.00	0.87	111	65	98	9.10	4.45	11.9	38.38	47.50
28	21.60	0.92	118	75	83	8.60	4.13	10.2	32.72	50.00
29	19.10	0.81	101	59	105	9.70	4.24	8.8	29.79	28.50
30	19.60	0.89	115	80	88	8.90	4.77	12.3	46.22	65.00
31	22.90	0.84	120	69	80	9.00	4.50	13.7	25.96	72.00
32	19.90	0.88	105	63	82	9.30	4.12	11.2	44.92	50.00
33	24.40	0.88	112	73	99	8.20	4.24	12.2	38.79	97.50
34	26.90	0.87	114	73	99	9.50	4.12	14.5	25.67	82.50
35	19.40	0.83	101	63	91	9.00	4.43	10.7	35.42	40.00
36	21.20	0.88	104	60	101	8.90	4.17	10.2	25.68	32.50
37	23.20	0.82	113	67	83	10.20	4.41	10.6	42.32	32.50
38	22.30	0.88	112	81	96	9.30	4.05	13.0	42.53	82.50
39	24.60	0.75	113	68	77	8.30	4.10	11.4	33.86	50.00
40	23.20	0.84	106	65	82	10.00	4.99	12.9	38.81	97.50
41	20.30	0.85	92	62	81	8.00	3.82	12.3	23.00	75.00
42	18.80	0.85	125	85	84	8.60	4.20	11.8	38.91	45.00

APPENDIX B contd.: List of Indices Measured in the Study

ID*	BMI	WHR	SBP	DBP	BG	STP	SAL	HB	SRE	SFE
43	32.00	0.92	124	71	80	10.00	4.95	12.8	55.65	95.0
44	29.40	0.93	137	95	93	8.25	4.26	13.1	54.78	62.50
45	23.00	0.91	125	74	80	8.00	4.23	10.2	43.81	47.50
46	19.50	0.88	101	62	82	9.30	4.38	10.9	22.31	30.50
47	21.90	0.84	107	72	73	8.10	4.34	10.7	46.10	58.50
48	23.10	0.81	119	84	87	8.15	4.23	11.1	39.05	46.50
49	20.40	0.87	93	66	111	9.70	4.36	11.5	24.10	40.00
50	28.60	0.90	127	68	95	9.30	4.25	10.2	29.02	45.00
51	26.30	0.92	110	79	79	8.10	4.40	12.3	36.22	72.50
52	20.30	0.85	102	70	81	11.80	4.83	11.6	39.89	78.50
53	24.70	0.83	118	67	99	12.50	5.62	10.9	34.61	32.50
54	20.70	0.84	111	69	97	10.70	3.68	12.2	22.36	72.50
55	20.60	0.87	102	66	82	9.80	4.17	12.0	38.57	50.00
56	44.10	0.91	140	95	94	9.60	4.35	12.1	46.76	62.50
57	20.60	0.80	106	60	118	9.60	4.53	9.6	31.34	28.00
58	20.30	0.89	147	99	58	8.91	4.72	12.0	32.81	75.00
59	21.00	0.84	106	57	82	8.20	4.31	8.6	21.82	28.50
60	26.40	0.84	131	63	97	7.80	3.66	10.4	311.95	32.50
61	19.70	0.81	107	66	79	9.20	4.36	12.2	47.71	70.00
62	20.50	0.78	98	67	70	10.60	5.10	12.5	28.48	72.50
63	18.30	0.78	100	64	80	8.10	4.38	10.4	15.86	32.50
64	21.50	0.83	99	71	92	10.10	4.67	9.8	24.61	29.50
65	18.50	0.80	106	63	92	8.10	4.35	12.2	32.97	65.00
66	29.30	0.92	114	77	108	8.50	4.07	10.0	33.13	40.00
67	20.20	0.75	105	69	72	8.10	4.19	10.0	16.98	56.50
68	20.70	0.94	108	76	85	8.80	3.93	10.6	41.98	32.50
69	14.80	0.87	99	63	94	10.40	5.04	11.4	10.55	49.00
70	21.90	0.80	103	72	81	8.20	4.06	10.4	36.25	29.00
71	21.90	0.84	95	66	102	8.90	3.87	12.0	20.36	72.50
72	22.30	0.81	124	75	79	8.30	4.67	13.9	35.32	80.00
73	17.60	0.83	89	64	83	10.40	3.91	12.4	11.44	80.00
74	22.20	0.82	122	77	84	8.60		11.8	34.50	62.50

* ID = Identification number BMI = Body Mass Index (kg/m^2)

WHR = Waist – hip ratio SBP = Systolic blood pressure (mmHg)

DBP = Diastolic blood pressure (mmHg) STP = Serum total protein (µg/dl)

SAL = Serum albumin (µg/dl) HB = Blood hemoglobin (µg/dl)

SRE = Serum retinol (µg/dl) SFE = Serum iron (µg/dl)