EATING HABITS AND NUTRITIONAL STATUS OF HOSPITALIZED PATIENTS WITH SPECIFIC CHRONIC NON COMMUNICABLE DISEASES IN THREE MAJOR HOSPITALS IN ACCRA

BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTER OF SCIENCE (MSC) DIETETICS DEGREE

AUGUST, 2017

DECLARATION

This is to certify that this dissertation is the result of research undertaken by Afful Borto Chris under the supervision of Dr. Gladys Peprah Boateng and Dr. Joana Ainuson - Quampah towards the award of Master Science (MSc.) degree in Dietetics in the Department of Nutrition and Dietetics, School of Biomedical and Allied Health Sciences, University of Ghana, Legon.

In instances where references to works have been cited, full acknowledgement has been given. This work has not been submitted in whole or part to any institution for any award.

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ABSTRACT

Background: Eating habits and nutritional status can adversely affect an individual's health. Many patients on hospital admission do not eat and drink sufficiently which may put them at a greater risk of malnutrition. This may consequently lead to increased complications resulting in longer periods of hospital stay and slower response to treatment. Knowledge about their daily intakes may give an indication of malnourished patients and the pragmatic steps that need to be taken towards their care.

Aim: To assess the eating habits and nutritional status of hospitalized adults (18-60 years) with diabetes and hypertension.

Method: A cross-sectional study was conducted at the Ridge, Trust and Police Hospitals in Accra. A systematic sampling technique was used to recruit 70 patients with chronic non communicable diseases (hypertension and diabetes) aged 18-60 years on admission at the various hospitals. Information on socio-demographic characteristics and eating habits both on admission and before admission were obtained through the administration of a semi-structured questionnaire, a food frequency questionnaire (FFQ) and a 3 day 24-hour recall. To assess the nutritional status, combination of anthropometric measurements and biochemical data were used. Anthropometric indices (height, weight) were measured for each patient. Nutritional status was assessed using visceral fat, body fat, Body mass index (BMI), and serum albumin levels. Data was analyzed using SPSS (version 20). Associations between variables were obtained using chi-square. P-value ≤ 0.05 was considered significant.

Results: Out of the total number (70) of hospitalized patients used for the study about 65.7 % averagely ate two meals in a day while on admission. Mean BMI reading (27.1 kg/m^2) indicated a high prevalence of malnutrition among patients. Albumin scores obtained from the patients also showed that patients were at the borderline low (3.5g/dL) within the normal range which could also predispose them to a state of malnutrition. Fruit intake of the patients was inadequate. The mean energy intakes of the patients were below the dietary recommended intakes for both males and females.

Conclusion: The study revealed inadequate eating habits (like frequent intake of high caloric foods, saturated fats from animals and animal products, and two meals in a day while on admission) and poor nutritional status among the hospitalized patients. Positive lifestyle changes on the part of the patient could lead to an improved state of health and control of NCDs (hypertension and diabetes) and other harmful associated complications amongst these patients. There is a need for dietary intervention alongside medical and pharmacological practice to attain a total improved state of health.

DEDICATION

I dedicate this work to my mother, Her Empress Christina Afful, for inspiring me to carry out this study and supporting me all the way through.

A special feeling of gratitude goes to my three sisters, Henrietta Afful, Pheona Martha Afful, and Loretta Afful for their love, encouragement and sacrifice.

ACKNOWLEDGEMENT

It is an honour for me to thank my supervisors, Dr. Gladys Peprah Boateng and Dr. Joana Quampah-Ainuson whose encouragement, guidance and support from the initial to final level enabled me to develop insight into the subject.

My completion of this project could not have been successful without the support of Professor K. Tanoh-Debrah. To Professor E. W. K. Wiredu,-thank you for motivating me beyond my capacity to do more. You deserve an applause.

To my personal advisor who also doubles as a sister, Hetty Afful- thank you. Thanks to supportive people like Bishop Stephen Bosomtwe Ayensu, Mr. Hector Amoah and Mr. Samuel Kofi Bentum for their help and assistance in my research.

I again, say a big thank you to my research assistants Yaa Boadiwaa Amanfo, Samuel Sakar and Portia Dzivenu for their support. They always made themselves available whenever I needed them. To Mrs. Kate Opoku, and Alvin Ray Monney - I say a big thank you. The journey has been tough but you two inspired me in many ways.

I cannot express enough thanks to my childhood friends Abena Benewaa Boampong, Barbara Mensah, David Ampoty, Felix Abapugi, and Reuben Hayfron, - you might not know but you encouraged me a lot and I am grateful.

Finally to my late father, Prince Henry Ato Afful, - I say you were the man! To my caring, loving, and supportive mother, Oborfour my deepest gratitude. Your motherly love and encouragement is a total blue print. It was a great comfort and relief to know that you would move every mile to provide any help I needed. God richly bless you!!!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ADA	AMERICAN DIETETIC ASSOCIATION
BIA	BIO IMPEDENCE ANALYZER
BMI	BODY MASS INDEX
DM	DIABETES MELLITUS
DRI	DIETARY RECOMMENDED INTAKES
EN	ENTERAL NUTRITION
ENT	EAR, NOSE AND THROAT
FAO	FOOD AND AGRICULTURAL ORGANISATION
FFQ	FOOD FREQUENCY QUESTIONNAIRE
GDP	GROSS DOMESTIC PRODUCT
HC	HIP CIRCUMFERENCE
HPT	HYPERTENSION
IDNT	INTERNATIONAL DIETETICS & NUTRITION TERMINOLOGY
MOH	MINISTRY OF HEALTH
CNCDs	CHRONIC NON COMMUNICABLE DISEASES
NG	NASOGASTRIC

PEM	PROTEIN ENERGY MALNUTRITION
SPSS	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
T2DM	TYPE 2 DIABETES MELLITUS
WC	WAIST CIRCUMFERENCE
WHO	WORD HEALTH ORGANISATION
WHR	WAIST TO HIP RATIO

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Eating Habit can be defined as the way a person or group of people eats; eating habit looks at the type and quantity of food eaten, and when it is eaten (http://www.collinsdictionary.com).

It is affected by a multifaceted interchange of physiologic, psychosomatic, societal, and inherited factors that influence meal timing, quantity of food intake, and food preference (Grimm and Steinle, 2011). The eating habit of an individual or group could comprise insufficient or extreme nutritional consumption which can eventually affect the nutritional status of the individual.

Food intake counts as a key contributory factor to improved quality of life and wellbeing, in health as well as in the disease state. The following statement by Hippocrates in 400 BC "Food is your medicine – hence your medicine be your food" emphasizes the importance of food to health. The maintenance of good nutritional status among in-patients is very important as undernutrition is associated with risk of longer hospital stay, higher morbidity and mortality and increased cost of treatment (Gamaletson, Poulia, & Karageorgou, 2012). Safe nutritious food is the right of all hospitalized patients since 80 -100% these patients, according to literature, rely solely on food provided by the hospital. (Department of Health and Children, 2009; Allison, 2003).

Unfortunately, meals served in hospitals are not able to accommodate all social and cultural variations in food habits. A meal, no matter how carefully planned, serves its purpose only if it is eaten. Many factors alter a patient's eating patterns during hospitalization. Changes in eating habits, among hospitalized patients have been known to affect adequate food consumption and

may be a risk factor for poor nutritional status. This then may lead to malnutrition which according to some studies is prevalent in hospitals (Baghetto *et al.*,2010). These changes are known to be influenced by many factors.

Low appetite (McLymont *et al.*, 2003; Stanga *et al.*, 2003), meal quality issues and large portion sizes are some contributory factors to low food consumption in some hospitalized patients (Heartwell, 2004; Hong & Kirk, 1995). Some effects of drugs such as anorexia, nausea or gastrointestinal symptoms, have also been known to interfere with the normal desire to eat. Being on special diets such as texture modification or low salt, reduce the sensory appeal of food that have been estimated to double the risk of insufficient energy intake (Thibault *et al.*, 2011). Unsatisfactory food temperature is also one of the causes of food rejection in hospitalized patients (Heartwell, 2004; Stagna *et. al*., 2003). Food quality (aroma/smell, appearance and taste), delays in serving food, lack of variety or food preferences, social/religious orientations of patients in respect to food are some of the factors affecting the food intake of hospitalised patients (Heartwell, 2004).

Nutritional screening tools like anthropometry (weight, height, BMI) in addition to biochemical indices like serum albumin, prealbumin, etc. enable one to determine the nutritional status of hospitalized patients. Through this interventions can be planned to curb the problem of CNCDs (hypertension and diabetes) among patients.

Nor (2010), indicates that food served in hospitals has major influences on the overall patient satisfaction during a patient's hospital stay. Good eating habits and proper nutrition also protect in-patients against several chronic NCDs (World Cancer Research Fund Fund International,

2014; Rub *et al.,* 2009) like diabetes and hypertension which are now the cause of most mortalities and morbidities not only in Ghana but also worldwide.

1.2 Problem Statement

Inadequate nutrition intake as a result of various factors such as lack of appetite, variety or food preferences (Tanvir & Haboubi, 2010) and specific dietary recommendations such as texture change may affect eating habits of in-patients negatively. The changes in eating habits have been known to affect adequate food consumption which may be a risk factor for poor nutritional status. This then may lead to malnutrition which according to some studies is prevalent in hospitals (Beghetto *et al.,* 2010; Gout *et al.,* 2009; Thomas *et al.,* 2002). The prevalence of under-nutrition in hospitalized patients is estimated at 15-60% globally (Corkins *et al.,* 2013) and has a tendency to increase during hospital stay (Stratton *et al.,* 2003). A prevalence rate of 20% (Bosu, 2010) and 54.6% (Addo, *et al.,* 2012) of hypertension in adult populations aged 15 years and over seen among rural and urban populations respectively have been reported in Ghana.

The WHO estimates that CNCDs account for about 34% deaths and 31% of disease burden in Ghana (MOH, 2011). In Ghana, about 86,200 persons die each year from NCDs with 55% of them aged less than 70 years of which 58% are males (MOH, 2012). According to the 2012 Annual Report of the Korle Bu Teaching Hospital, Diabetes and hypertension related diseases were among the top ten in-patient admission as well as mortality in 2011 (Korle Bu Teaching Hospital, 2012).

Healthy eating habits and proper nutrition have been found to protect in-patients against several chronic NCDs (Rub *et al.,* 2009). Appropriate nutrition, according to Ohlhorst *et al.,* (2013)

provides one of the most effective and least costly ways to decrease the burden of many chronic NCDs and their associated risk factors.

Although hospital administrations, through the central hospital kitchen, have provided food for hospitalized patients with the aim of ensuring good nutritional status (Edignton *et al.*, 2000), the problem of malnutrition still exists. In Ghana, nutrition screening upon hospital admission is not mandatory and referral rates for dietetic assessment of patients is not ideal (Barker *et al.*, 2011). There is therefore, paucity of information on the eating habits and nutritional status of hospitalized patients with chronic conditions. There is a need undertake a study into the area of healthy eating habit and its correlation to nutritional status amongst hospitalized patients since it contributes positively to the general wellbeing of these patients.

1.3 Significance of study

Malnutrition is a major challenge in hospitalized patients with chronic conditions (Cervero *et al.*, 2010). Eating habits and nutritional status of hospitalized individuals are difficult to change and require continuous effort in lifestyle and nutritional change (Proenca *et al.*, 2012). The prospect of this work is to establish a comprehensive baseline data on dietary intakes of hospitalized patients with chronic non communicable diseases (DM and HPT) and the effect on the nutritional statuses. This may give prior dietary knowledge to patients on the necessary dietary practices to adapt to in chronic conditions. It may also serve as a protocol for health professionals, in both clinical and food service, to adhere to when feeding hospitalized patients. It is therefore important that the healthcare team acts swiftly and appropriately to prevent a patient's physical

decline due to decreased nutritional intake exacerbated by illness and associated clinical interventions.

To assess the eating habits of hospitalized patients, monitoring by the appropriate health care team is required. The success of monitoring helps the health care team identify patients at a greater risk of nutritional deficiencies and to put appropriate interventions in place. The realization of the monitoring and screening process is dependent on nutritional markers which encompass dietary history, clinical history, anthropometric measurements, biochemical measurements and other recommended indices (Graham, 2014). This study could be a draft piece in developing policies which may highlight more on proper nutritional care and add to the body of knowledge.

1.4 Aim

To assess the eating habits and nutritional status of hospitalized adult patients (18-60 years) with Diabetes and Hypertension in three major hospitals in Accra.

1.5 Specific objectives

1. To describe the eating habits of diabetic and hypertensive patients while on admission, their normal eating habits, and classify their adequacy according to WHO standards.

2. To determine the prevalence of malnutrition among patients on admission.

3. To determine the nutritional content of meals consumed by patients on admission who had diabetes and hypertension.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter is made up of a discussion, a review of literature and studies related to this research. The chapter focuses on the eating habits and nutritional status of hospitalised patients with emphasis on patients with Type 2 diabetes and hypertension. The chapter again highlights on eating habits and nutritional status of diabetic and hypertensive patients and their link to serum albumin, Body fat, visceral fat, and BMI. Body mass index from several research works has been indicated to contribute positively to chronic conditions like hypertension, cardiovascular disease, diabetes mellitus, and other chronic diseases.

2.1 Structure of Literature Review

The related literature has been reviewed under subsections. The subsections were generated to categorise similar literature under three themes and to reflect the objective of this study. The themes are:

- Eating habits of Type 2 diabetics and hypertensives
- Nutritional status of diabetics and hypertensive patients
- Relationship between eating habits and chronic Non- Communicable Diseases

2.2 Eating Habits

Every human being eats food in order to survive. Eating habits capture how individuals select, prepare, dish out or consume food. It is a combination of several factors such as physiologic, psychosomatic, communal, and hereditary factors that influence meal timing, quantity of food intake, and food preference (Grimm and Steinle, 2011). Contreras (2002), also argue that eating habits are influenced by socio-cultural beliefs, ethnicity, moral values and norms and their effective links associated with food consumption. It is therefore important to consume food in the right amount and right timings with emphasis on the quality and quantity for effective metabolism and energy. Understanding why we eat and the motivational factors driving food choices is therefore important in addressing the epidemics of diabetes and hypertension and this cannot be underestimated.

Hippocrates, the father of medical practice has in the early times highlighted on the significance of nutrition as an essential part of therapy during sickness. In an attempt to improve upon nutritional status and recovery from sickness, most hospitalized individuals depend on hospital meals (Department of Health and Children, 2009). Food, again, is offered to hospitalized individuals as a form of welcome to hospital wards upon admission (Rub *et al.*, 2009). The central kitchen plays an essential role in providing nourishment to in-patients to help attain and maintain a good nutritional status. Re-emphasising the role of the central kitchen in the recovery process, Edignton *et.al.*, (2000) indicate that the hospital central kitchen's primary role in the recovery process of hospitalized patients, is to provide nourishment to ensure good nutritional status. Food quality (temperature, aroma/smell, appearance and taste), quantity (volume or weight), delays in serving food, lack of variety or food preferences, social/religious orientations

of patients in respect to food are some of the factors affecting the food intake of hospitalised patients (Heartwell, 2004).

2.2.1 Factors Affecting Eating Habits

Some factors affecting our eating habits include sense of taste, appearance, temperature, quantity, and quality of food served. Again, one's educational qualification could affect the food eaten in the sense that the more individuals know about nutrition the more cautious they are about the food they consume. In relation to diabetes and hypertension individuals must be mindful of foods with high glycemic index and salt intake respectively (Alipour, 2009). Changing lifestyle trends like consumption of high caloric foods, salt, and sugar intake have been associated with the etiology of CNCDs (WHO, 2003).

Santos *et al.*, (2011) in a study on food intake and nutritional status analysis of a climacteric women´s group from a Brazilian Medical School Hospital assessed the eating habits of the 53 study participants with a mean age of 54 ± 8 years. using a validated food frequency questionnaire adapted to the Brazilian population. In the research anthropometric indices evaluated included body weight and height, skinfolds and body circumferences, and physical activity evaluated by a validated questionnaire. Results from the study indicated a mean daily caloric intake of 1780±570 kcal/day, with a mean carbohydrates value corresponding to 51 ± 11%, proteins to 17 ± 7% and lipids to 33 ± 6% of total caloric intake. The mean intakes for sodium and phosphorus were above the daily recommended intakes whiles values obtained for calcium, magnesium, and zinc were below the required daily recommendations. Fiber, folate, vitamin E, potassium, and calcium from their meals showed values lower than estimated average requirements. Projected BMI values were 29 ± 6 kg/m2 and hip/waist ratio 0.86 ±0.16. It was

observed that inadequate dietary patterns existed among the patients with most of them consuming lower than recommended micronutrients on daily basis. The mean number of meals per day was 4 which consisted of the three main meals (breakfast, lunch, supper) alongside a snack. Results from the study showed that the patients were in the class I obesity zone.

In another study by Skerett & Walter (2010), findings of their work to define a healthy diet encouraged healthy eating habits such as a reduction in the consumption of saturated and trans fats, three main meals in a day and other positive lifestyle traits lead to an improved state of health and wellbeing which consequently leads to a reduction in contracting NCDs.

Animal and animal products in a study by Wang & Beydoun (2009) indicated the effect of animal and animal products on overweight, obesity, and the double burden of NCDs. Meats were seen to be high in energy and fat content which were associated with the above mentioned condition.

Majority of work done on eating behavior and nutritional status of hospitalized individuals with chronic diseases have been in the developed nations hence more research is needed in developing countries like Ghana. Eating habits of individuals are very difficult to study and demand gradual steps to achieve nutritionally set goals (Foreyt, 2012) but with gradual efforts these changes are achieved (Gans, 2011).

Dietitians, doctors, and other medical professionals therefore could better work with patients to avert the onset of crisis.

2.2.2 Contribution of hospital food to eating habits and therefore nutritional status of hospitalized patients

Although results of nutritional interventions vary, the issue of addressing hospital malnutrition has been shown to improve the clinical outcomes of patients (Baker, 2011). Several research papers have highlighted the importance of nutritional interventions provided by hospital food and this has been shown to reduce burden caused by disease, length of stay on admission, expensive treatment cost, and general nutritional status of hospitalized patients (Somanchi et al., 2011).

Malnutrition therefore has a negative effect on both patient and the healthcare system. Some hospitals have adopted to provision of energy dense oral nutrition supplements that make available macronutrients and micronutrient (from the food group sources) for patients to meet up with their dietary recommended intakes (Baldwin & Weekes, 2011).

In a study by Iff *et al*., (2008) on hospital catering services and its goal of meeting the nutritional requirements of patients, the food consumed by patients were analysed and compared to standards set by the German Nutrition Society. Results from the study indicated that energy and carbohydrate contents of the foods examined were below the set recommendations. The research went ahead to conclude that frequent quality control is vital to patients' satisfaction in catering services provided by the hospital. Foods provided by the hospital kitchen need to be tailored to meet the demands of patients with different conditions to optimize nutritional support. Donini *et al.*, (2008) in a research sought to verify the quality of food provided by the hospital kitchen in terms of time of food distribution, food temperature, and by use of subjective assessment inferred that, patients' preference was not observed in serving of meals thereby leading to food wastage. The reseacrh highlighted that over the years patients' satisfaction with

portion sizes, temperature of meals served, and quality of meals have improved from 18 % in 2002 to 48.3 % in 2006. The research highlighted the need for hospitalized patients to receive food services they aprreciate but added that, it should be of good nutritional value.

2.2.3 Demographic, socio-economic and integration factors affecting Eating Behavior

Burns (2004) states that the food habits of an individual can be traced as far back to foods consumed by earlier generational lines of affiliation. All these factors can affect the choice of food consumed by hospitalized individuals in a given health facility at a given point in time which in effect can affect their nutritional status.

Wandela *et al.,* (2008) confirmed what Burns (2004) stated earlier by adding that modernization has also led to high consumption of fast foods like burgers, fried foods, and frequent consumption of high caloric foods in our present day. A session of the UN special rapporteur (2010) again, reports that the rates of NCDs like diabetes, and CVDs are now increasing in developing countries and attributed that to the adoption of Western cultures (United Nation Special Rapporteur on the right to food, 2010).

People of different cultures in Ghana consume various foods for aesthetic, social prestige, physical health and other reasons. Obesity, a lifestyle condition due to physical inactivity and poor eating habits, which negatively affect nutritional status has been studied in several groups. Ideal body perception and shape influence the eating habits of individuals. In Ghana, overweight and obesity is seen to represent a good state of life. Globally about 1.3 billion individuals fall in the category of overweight and obese (Kelly *et. al.,* 2008). Because of the alarming rate of overweight and under nutrition in the year 2008, a report was presented to the UN Human rights council to combat the global goal of overweight and under nutrition (De Shutter, 2012).

2.3 Nutritional Status of hospitalized patients

Malnutrition is a common problem in most hospitalized individuals (Allison et al., 2000). Inconsistencies in nutrition, ranging from under nutrition, which is common among hospitalized patients, to over nutrition, is termed malnutrition. One of the contributory factors of malnutrition is inappropriate dietary intake (Barker et al., 2011). The degree of malnutrition is dependent on the disease condition for instance diabetes and hypertension and varies between 15% – 60% according to global statistical data (Corkins *et al.,* 2010; Lim *et al.,* 2012; Tappenden *et al.,* 2013) and is usually a combination of cachexia and malnutrition (Muscaritoli *et al.,* 2010).

Appropriate nutrition plays an important role in the prevention of some chronic Non Communicable Diseases (CNCDs) like diabetes and hypertension (World Cancer Research Fund International, 2014). Inconsistencies in nutrition, ranging from under nutrition, which is common among hospitalized patients, to over nutrition, is termed malnutrition. One of the contributory factors of malnutrition is inappropriate dietary intake (Barker *et al.,* 2011).

Most times there is lack of awareness on the part of patients in relation to their nutritional status and the possible way to correct it if there is (The Patients Association, 2011). Out of 1311 inpatients used for a study on malnutrition in the hospital setting 62 % of those studied defined good eating as having a right mix of carbohydrates, protein, and fats. A quarter of the patients believed having a mix of fruits and vegetables 5 times a day was regarded good nutrition. Intake of fruits and vegetables, whole grains, lean meats and low fat dairy products in another study appear to be the main nutritional requirements to promote general health and wellbeing (Bannerman *et al.,* 2015).

The most common form of malnutrition among patients is protein-energy malnutrition (PEM) and the first step to detect and treat PEM is to assess the patient's nutritional status. Again, patients on admission have been shown to be at a greater risk of malnutrition (Schindler *et al.*, 2010) and more complications are associated with individuals with chronic conditions (Deutz *et al.*, 2014). Nutritional status is the condition of the body influenced by diet, levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity (Alberda , 2006). It shows the degree to which physiologic needs for nutrients are met. There is no universal method for assessment of nutritional status although a thorough assessment should include the following: history taking, evaluation of dietary intake, anthropometric measurements, serum protein tests, and administering screening tools (Pirlich & Lochs, 2001). Nutritional status can be identified through the use of nutritional screening tools like BMI, waist to hip ratio, MUAC etc. and it is an easy and inexpensive method for rapid evaluation to detect patients at risks for malnutrition or in a more detailed form as a nutritional assessment (Green & Watson 2005; Kondrup et al. 2003). In view of the fact that nurses have close contact with patients and are responsible for their individualized nursing care, they have a key role in assessing patients' nutritional status, as well as planning and implementing nutritional interventions (Tappenden *et al.*, 2013).

Poor nutritional status has been associated with unfavorable effects like lower response to treatment, consequent longer stay in hospital, and finally death (Mirmiran *et. al.*, 2011). Individuals with less than 80% expected total body protein levels have demonstrated increased mortality and 10% or greater unintentional weight loss has been associated with adverse outcomes and prolonged hospitalization. Mortality is commonly witnessed in lean yet healthy

individuals with muscle mass loss over 35% and consequent fat loss over 70% (Feldman *et al.*, 2015).

A study in the UK on malnutrition matters in hospitalized patients showed that training on nutritional care, screening, and increased education on nutritional status and the role of administrators in providing nutritional support to hospitalized individuals has become an issue of national and political concern both in the UK (British Association for Parenteral and Enteral Nutrition, 2010) and other places (Agency for Clinical Innovation, 2011).

Studies have proven that nutritional status of individuals with chronic NCDs has a link with the rate of progression of the disease (WHO and FAO, 2002).

A cross sectional study in Scotland looked at the dietary intakes of rehabilitation patients (Bannerman *et al.,* 2015) which sought to determine whether nutritional standards in foods consumed by elderly geriatric orthopedic patients were being met. They argued that food and fluids play a central role in the management of malnutrition in patients. Food provisions from the major course meals in a day as well as snacks from trolley services and ward provisions were evaluated and measured to know their nutritional contents and impact on patient. Results from the study showed that food provisions to patients were significantly lesser than standards set for energy and protein for nutritionally-well patients although patients consumed close to three quarter of the foods provided (Bannerman *et al.,* 2015).

In some hospitals in other countries a menu rich in energy and protein is provided for patients but a study carried out in Sweden (Arveby, 1995) and Germany (Herman, Gebhardt, & Kluthe, 1996) concluded that the use of energy and protein dense menus is not very common worldwide.

A shortfall in providing adequate nutrition by the hospital central kitchen is one of the contributory factors that lead to under-nutrition among this group. Increased rate of mortality, length of stay on admission, and general morbidity have all been associated with poor food intake and has been seen to affect 30-40% of adult in-patients in Western countries (Pirlich *et al.*, 2003). Failure on the part of hospitals to meet the nutritional needs of hospitalised patients, therefore, puts lives at risk while encouraging unacceptable dietary habits among in-patients.

2.3.1 Nutritional Status: Nutritional Assessment

Nutritional assessment is the evaluation of nutrition needs of individuals based upon appropriate biochemical, anthropometric, physical, and dietary data to determine nutrient needs and recommended appropriate nutrition intake including enteral and parenteral nutrition (American Dietetic Association, 2007). Comprehensive nutritional assessment begins with food and nutrient related history, relevant anthropometric measurement, nutrition focused physical findings, biochemical data, client family history and effect of clinical status (Hood, 2015). Weight loss is perhaps the most validated parameter of nutritional status (Jensen *et al.*, 2012). Following the history, a thorough physical examination may be performed. Attention should be directed toward findings of soft-tissue wasting, hydration status, evidence of vitamin and mineral deficiencies, height, weight, and body mass index (BMI).

2.3.2 Nutritional Assessment: Anthropometric Measures

The single most universal inexpensive, noninvasive method used to assess the size, proportion and composition of the human body is anthropometry and it is a reflection of inadequate or excess food intake among other parameters (WHO, 2004). The anthropometrical parameters

measured in nutritional assessment include weight in kilograms, height in meters and BMI as a measure of weight in kilograms divided by the height in metre squared. Anthropometric measurement includes current weight and height, Weight history, BMI, Fat free mass and fat mass (Nuttall, 2015).

2.3.3 Height, weight, body mass index, visceral fat and body fat

Height should ideally be measured with a stadiometer. However, it is possible to estimate height by arm span or knee-height measurement in some subjects who are unable to stand (Jensen *et al.*, 2012).

Weight measurement is performed with the subject standing on a scale, and shoes and other heavy garments removed. Severe weight loss has been associated with impaired physiology, poor outcomes, and prolonged hospitalization (Feldman *et al.*, 2009).

2.3.3.1 Body Mass Index

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2) (WHO, 2004). Body mass index is one of the most commonly used and simplest anthropometric measures (Heyward, 2001). The proposed categories of BMI by the National Institutes of Health include underweight (< 18.5 kg/m^2), desirable (18.5 kg/m^2-24.9 kg/m^2), overweight (25 kg/m^2-29.9 kg/m^2), and obese (≥30 kg/m^2) (Jensen *et al.*, 2012).

2.3.3.2 Body Fat Percentage (BFP)

The body fat of an individual is the sum mass of fat divided by the total body weight. There are two types of fat and classification is based on the location of the fat (visceral or subcutaneous). Fat free mass (lean body mass) refers to the entire compositional weight of the body (muscles, bones, and body water) excluding fat (Livestrong Foundation, 2015) and this has a direct correlation to overweight and obesity which are risk factors for T2DM and hypertension.

The percentage of body fat differs according to gender with women having more body fat percentage than men (Blaak, 2001). This is so because of demands of childbearing and other hormonal functions. Body fat helps to determine the level of fitness for and individual. The normal cut-offs for males and females are $\leq 35\%$ and $< 25\%$ respectively. A higher than the normal value for body fat as a result of a sedentary lifestyle and high caloric intake indicates the presence of overweight or obesity which have a direct link on diabetes and hypertension. A minor problem associated with this measurement if carried out with the BIA machine is that if the electrodes are not properly cleaned it could give wrong values.

In a study by Blaak (2001) results from the research work indicated that women have more fat (both body and visceral) composition than men. This, he attributed to the fact that fat oxidation in women is lower than men thereby making them liable to storing fat in adipose tissues after consumption of food.

2.3.3.3 Albumin

It is vital to consider literature on albumin since it is the main protein made by the liver which contributes positively to cellular activities and drug metabolism. In hospitalized patients a lower than normal level of albumin is linked with increased morbidity and mortality (Amaral *et al.*,

2008). One of the main benefits associated with albumin is an indicator of malnutrition (Cabrerizo, *et al.,* 2015). Extraction of albumin from the blood can be obtained from serum portion. Albumin again can be measured in urine. Albumin is responsible for the transport of microscopic molecules through the blood for example, bilirubin, calcium, magnesium, etc. (Nicholson *et al.,* 2000). It shows a reflection of protein utilisation by the body. Decreased albumin may occur when the body does not get or absorb enough nutrients. Low levels of albumin are commonly seen in older patients. The normal range for albumin for every individual should be between 3.4 to 5.4 g/dL depending on the particular laboratory visited. Elevated albumin levels may be due to high protein consumption and dehydration. Albumin results therefore help determine the nutritional status of an individual.

2.3.3.4 Nutritional assessment: Food and nutrient related history

One of the focuses in nutritional assessment is the food and nutrient related diet history (Tappenden *et. al*., 2013). This includes assessment of previous diet history and diet orders and adequacy, current diet history and orders and adequacy (Murphy *et al.*, 2016). Also evaluated are the effect of the delivery and access routes and frequency of feeding, energy, macronutrient, micronutrient and fluid requirements (klek *et. al*., 2015).

2.3.3.5 Nutritional assessment: Nutrition Focused Physical Findings

These assessments undertaken as part of nutritional assessment to determine nutritional status should include but not to be limited to the following, fluid (hydration, ascites, edema, input and output chart), signs and symptoms of malnutrition (over-nutrition and nutritional deficiencies),

and functional status (swallowing status, physical condition, and mental condition) (Ministry of Health-Ghana, 2010).

2.4 Relationship between Eating habits and Nutritional Status

2.4.1 Eating habits and BMI

Research has proven that 20–40% of hospitalized individuals are malnourished (Pirlich *et al.*, 2005) and again, most adults upon admission have decreased body weights and nutritional status (Corish *et al.*, 2004). Findings from a research work showed that 58% of hospitalized adult patients were at a risk of being malnourished (Thorsdottir *et al.*, 2005) and 47% when relocated to their individual homes after admission were also indicated as malnourished (Tappenden *et al.*, 2013).

Good eating habits and proper nutrition have been found to protect in- patients against several chronic non communicable diseases (Rub *et al.*, 2009). However, eating habits and nutritional status of hospitalized individuals are difficult to change and require continuous effort in lifestyle and nutritional change (Proenca *et al.*, 2012).

Unhealthy eating habits like high fat intake, frequent consumption of saturated fats, and low fibre intake have been implicated in several research works with obesity and overweight (Al- Rethaiaa et al., 2010) which in effect could lead to CNCDs (Oladimeji *et al.*, 2014).

In a report by World Cancer Research Fund International (2014), the link between diet and non-communicable diseases was highlighted and showed that what people consume and their

nutritional status can promote or surpress risk of CNCDs. Their research sought to prove that aside the health risks imposed by obesity, overweight, food and general diet, these conditions themselves are major contributors of illness. The report mentioned that negative conditions lead to elevated lab indices like cholesterol, blood pressure, and resistance to insulin action. The report further adds facts and figures on the effect of CNCDs on human life and survival. Consumption of healthy diets which include foods high in fibre such as whole grains and roots tubers have reduced with a shift to the consumption of high fat and high caloric foods over the past decade; all accounting for the growing preavalence of CNCDs. Regular consumption of fruits and vegetables reduces the risk of diabetes, obesity, cardiovascular diseases and some forms of cancer (Dauchet *et al.,* 2006). High blood pressure, high blood cholesterol levels, insulin malfunction and unintended inflammatory responses which lead to the increased mortality rates were associated with overweight and obesity. The issue of eating red and processed meats was also discussed and seen to contribute to cancer such as colorectal cancer. Arguments in the report showed that regular consumption of saturated and trans fats especially from cooking oils and red meats were contributors to chronic diseases. High sodium or salt intake were also linked to elevated blood pressure and its consequent effect on cardiac output. Regular consumption of energy densed foods and refined carbohydrates were also linked to overweight and obesity with its consequent contribution to NCDs (WHO, 2002).

Results from another study on assessment of nutritional status and its impact on quality of life of hospitalized patients stated that malnutrition and anorexia were both common conditions in hospitalized patients thereby leading to a deterioration in the quality of life in these patients (Rani *et al.,* 2015). Protein energy malnutrition in this study was a common co-morbid factor in

these hospitalized individuals thus called for more pragmatic solutions to be provided to patients (Ubesie & Ibeziakor, 2012). It is worth knowing that anorexia due to disease state of these patients decreased protein energy intake consequently accounting for the increased rate of protein energy malnutrition in these patients (Landi *et al*., 2016).

Dietary restrictions due to increased catabolism and altered metabolism as a result of poor medical conditions also lead to the problem of protein energy malnutrition (Kalanta-Zadeh *et al.,* 2004). In chronic conditions with the prevalence of malnutrition it has been proven that a positive correlation exists between quality of life and nutritional status if the right steps are followed (Tappenden *et al.,* 2013).

2.4.2 Relationship between nutritional status and BMI, Visceral Fat, albumin, and Body fat percentage

In a study involving 34 hospitals to ascertain the nutrtional risk and nutritional status at admission and discharge among Chinese Hospitalized Patients it was observed that patients with a nutritional risk factor (BMI < 18.5) had a longer average hospital stay and more prone to complications than those without such risks. Anhropometric indicesand laboratory indicators were performed during the first 24 hours of admission and also at discharge. Values obtained from the BMI ranges indicated that at admission, the proportion of patients with nutritional risk, body mass index (BMI) < 18.5 kg/m^2, and moderate to severe malnutrition were 40.12%, 8.92%, and 26.45%, respectively, whereas at discharge, these percentages were 42.28%, 8.91%, and 30.57%, respectively. This was compared to the length of hospital stay and it was observed that patients with nutritional risks had a longer stay in the hospital. Conclusions drawn from the

research indicated a higher rate of malnutrition at discharge than observed on admission and again iterated clinical outcome of patients unsuccessful (Zhu *et al.,* 2017).

To study the effect of serum albumin concentration in type 2 diabetics in order to decide when to start with protein restriction diets Viswanathan *et al.,* (2004) used a total number of 139 diabetic patients in South India. Fasting blood sugar, urea, and creatinine were tested for each patient. Patients were classified into macroalbuminuria and nephrotic syndrome. It was observed that patients who recorded heavy proteinuria had low albumin.

Serum albumin has been used in several studies in planning interventions and a lower than the normal range of serum albumin has been associated with reduced quality of life and mortality (Pupim *et al.,* 2006). Serum albumin remains an important screening tool in determining a patient's nutritional status thereby accounting for its widespread use in most clinical and research works. A serum albumin result of <2.5 g/dl has been indicated to cause a 20 times higher risk of death as compared to ranges between 4.0 and 4.5 g/dL (Mehrotra *et al.,* 2011).

In an observational cohort study by Mehrtra *et al.,* (2011) on hospitalised patients it was seen that serum albumin could be used to determine the health status of these patients. Patients who had lower than the recommended serum albumin levels (3.4-5.4g/dL) were more nutritionally at risk than those who had albumin levels within the normal among the two groups studied. Serum albumin detected to predict all cause, relating to heart, and infection connected mortality in both groups.

Hood (2015) undertook a research to assess the nutritional status in adult laboratory medicine. Serum proteins which encompass not only albumin but also transferrin, prealbumin, and retinol binding protein and these indicators were seen to affect malnutrition in diverse ways.

Serum albumin in a study by Ikizler, (2012) was seen to have a more predictive power in all disease conditions. Coupled with other strong biochemical indicators it was highlighted in the research that serum albumin gives the etiology of the disease conditions that lead to specific clinical manifestations. Further monitoring of response to targeted treatment can be achieved through changes in serum albumin concentrations.

2.5 Chronic Non Communicable Diseases

Chronic Non Communicable Diseases (CNCDS) are conditions that occur in individuals over a period of time and for which there are no known causative agents that are not transmitted from one affected individual to another (Daar *et al.,* 2007).

According to the World Health Organization's (WHO) definition, chronic diseases encompass diabetes, hypertension, cardiovascular diseases like stroke, carcinogenic conditions and chronic respiratory diseases. Worldwide statistics for the prevalence of chronic diseases are estimated at 60% of the total death record of 58 million and 44% of premature deaths (WHO, 2010). Ghana, however, has a prevalence of about 24% (WHO, 2014). According to the Ministry of Health (MOH), the primary CNCDs in Ghana include diabetes and hypertension. The prevalence rates of hypertension and diabetes amongst adult Ghanaians in the year 2012 were 48% and 19% respectively. The MOH believes that pragmatic steps need to be taken to address this alarming trend (Ministry of Health, 2012).

According to de Lima *et al.*, (2015), CNCDs are the leading cause of death worldwide and are responsible for 63% of fatalities worldwide. Chronic non communicable diseases which include but not limited to diabetes mellitus and hypertension are diseases that have a longer duration of onset and are not accorded to a particular causative mediator which can be transferred from one

person to another (Daar *et al.*, 2007). Uncontrolled CNCDs are the principal causes of demise and disability worldwide with an incidence rate of about 62% (WHO, 2009). By 2020 projections indicate that CNCDs would account for three-quarters of all deaths worldwide and statistics for developing countries indicate that out of this number 71 % would be due to ischaemic heart disease, 75 % of deaths would be attributed to stroke, and diabetes would take over 70 % of the total mortality record (World Health Organization, 1998). The highest prevalence is seen in developing countries with Africa recording about 76% of the total global statistics (WHO, 2009).

Chronic non-communicable diseases have skyrocketed in developing countries and are projected to become the commonest cause of death in sub-Saharan Africa by the year 2030 (Dalal *et al.*, 2011). Worldwide, about 38 million deaths were recorded in the year 2012 for NCDs alone. Out of this alarming statistics a value slightly higher than 40% was recorded as premature deaths which affected people under 70 years (WHO, 2014).

Over the years, science has proven nutrition to be implicated in the control and prevention of chronic non-communicable diseases. Recommendations regarding the intake of fruits, vegetables, whole grain cereals, lean meats and low-fat dairy products however, appear as the main dietary requirements to promote health, regardless of other lifestyle factors (Office of Disease Prevention and Health Promotion, 2015).

A study conducted in the Plateau State in Nigeria by Tagurum *et al.*,(2015) deduced that the problem of CNCDs and its associated complications face a triple burden, which according to them could be attributed to weak health systems. Results from the study, which was made up of 195 individuals, indicated that the burden of CNCDs was associated with increasing age. However, further study by the researchers found most of these CNCD cases in subjects aged

below 60 years. In the study, sixty two percent had a family history of CNCDs, approximately 74.4% had BMI greater than the normal range and only 40% had a normal waist to hip ratio.

A total mortality rate of 38 million accounting for 68% of total deaths worldwide, was attributable to NCDs in the year 2012. Out of this number a value slightly higher than 40% were under the age 70 years (WHO, 2014). Over a third of premature deaths in this 2016 was as a result of cancer, diabetes, and cardiovascular diseases (WHO, 2016). It is projected that by 2020 chronic NCDs will account for 80% of the global burden of disease, causing seven out of every ten deaths in developing countries (Islam, *et al.*, 2014). The effects of complications of NCDs lead to longer suffering.

2.5.1 Burden of Chronic NCDs in Ghana

Major causes of death in Ghana have shifted from predominantly communicable diseases to a combination of communicable and chronic NCDs over the last few decades. Prevalence of risk factors such as hypertension and obesity also increased. World Health Organisation estimates that Chronic NCDs account for an estimated 34% deaths and 31% of disease burden in Ghana. Chronic NCDs kill an estimated 86,200 persons in Ghana each year with 55.5% of them aged less than 70 years and 58% of males being affected (MOH, 2012). Hypertension and diabetes were among the top ten causes of death in the year 2000 (Agyei-Mensah and de-Graft Aikins, 2010). In Ghana (Kasena- Nankana district) about one-fifth of adults have raised blood pressure (Kunutsor & Powles, 2009).

2.5.2 Hypertension

Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure above 140/90 mmHg which must be confirmed from several readings on separate days (de Boer *et al*., 2017).Blood pressure reading must be carried out by a trained person with the feet of the patient on the floor and in seated position. The cuff size should be appropriate for the upper arm circumference (Pickering *et al*., 2005) Hypertension and its risk factors are gradually becoming a pandemic worldwide (Bromfield & Muntner, 2013) and this could be attributed to the increasing rate of factors such as sedentary lifestyle, unhealthy diet, overweight, and obesity (Oladimeji *et al.*, 2014). The prevalence of hypertension is likely to rise if preventive measures are not timely instituted (U . S . Department Of Health And Human Services, 2004). In a research conducted in Ghana by Bosu (2010) it was reported that hypertension was the second leading cause of death in individuals over age 40 years. These alarming facts point to untimely discovery, monitoring, control and treatment (Schwartz & McManus, 2015).

Hypertension is a life threatening condition in both males and females. It is one of the leading causes of cardiovascular disorders and an important risk factor for coronary artery disease, cerebrovascular diseases and cardiac failure in adult hospitalized (Gupta R. , 2004). Some causes of hypertension are overweight, obesity, high fat intakes, sedentary lifestyle and low fibre intake (Wilborn *et al.*, 2005).

From 1990 to 2010, hypertensive outpatient cases reported for mission hospitals and public and mission hospitals rose from 60,000 **to 70,000** (Ezzati *et al.*, 2005). According to the report, regardless of the increase in the population of Ghana to near double its original numbers, the increase is still significant, and accounted for 3.0% to 5% of all new outpatient diseases and

8.9% of institutional deaths. Between 1973 and 2007, prevalence rate of hypertension, rose from 4.5% to 37.1% with differences in male/female and rural urban population, according to population based studies conducted in Ghana (Mackay & Erikson, 2002).

Lifestyle measures are critical in hypertension management and these include dietary interventions such as salt reduction, potassium increase, avoidance of alcohol, weight reduction and other complex dietary management (Gupta & Guptha, 2010). Other factors to consider in dietary management of hypertension include intake of saturated fats, trans fats, calcium and magnesium (Bawadi *et al.*, 2016).

Sulibursk*a et al.,* (2012) carried out a study on the assessment of dietary intake and state of nutritional in hypertensive patients from rural and urban areas of Greater Poland which was aimed at determining nutritional factors and their link with hypertension. Among their major findings Body Mass Index and total body fat percentages were used to determine the nutritional status of the study participants. The study further highlights on dietary intake assesment which focuses on using a three day 24 hour recall questionnaire. Anthropometric indices measured showed that majority of the participants were obesed. The study offered an explanatory analysis of the literature regarding the consumption of high caloric intakes especially from fat, low fibre intake, lower and higher than the recommended daily intakes were seen for Vitamin C and Vitamin A respectively. The study goes ahead to indicate from the 3 day 24 hour recall that intakes of sodium were in excess with a deficiency in potassium, iron, magnesium and calcium. Copper and zinc intakes among the two groups were higher than the daily recommended intakes. Findings from the research depicted a positive correlation betweeen overweight and obesity and their link with hypertension between the two study groups.

2.5.3 Type 2 Diabetes Mellitus

Diabetes mellitus, commonly called diabetes, is the inability of the body to make or use insulin which converts sugar to energy to ensure efficient metabolism (Canadian Diabetes Association, 2013) . It is a metabolic disorder characterized by elevated sugar levels in the blood as a result of defects in insulin function or uptake (Baynest, 2015). Some symptoms of diabetes are general weakness, blurred vision, loss of consciousness, muscle wasting, and easy susceptibility to certain infections (Ramachandran, 2014). Sometimes these symptoms associated with the elevated blood glucose are linked with ketoacidosis, or non-ketotic hyperosmolar syndrome which could lead to coma and finally death. There are three types of diabetes namely Type 1, Type 2DM and gestational diabetes (Center for Disease Control, 2017).

Type 1 Diabetes is a more genetic form of diabetes and not common among populations as compared to the other forms of diabetes. It often occurs younger persons but can again occur in the elderly. Individuals within this group are normally obese or overweight (Chiang, Sue Kirkman, Laffel, & Peters, 2014) .

Among the three types mentioned T2DM is the most common form of diabetes (Wu, Ding, Tanaka, & Zhang, 2014). It is commonly seen in individuals over the age of 45 who are overweight, sedentary and those with hypercholesterolemia (Olokoba *et al.*, 2012). If one has T2DM the body cannot make enough or correctly use insulin. Some factors which predispose individuals to this form of diabetes are sedentary lifestyle, physical inactivity, higher than normal intakes of carbohydrate foods, overweight and obesity, etc. (Asif, 2014). Mortality rates for the general Ghanaian populace indicate T2DM among the major cause of mortalities (Ofori & Garcia, 2016) and the cost of controlling this condition is expensive thereby rendering the

average Ghanaian incapable of settling medical bills (Quaye, Amporful, Akwengo, & Aikins , 2015).

Gestational diabetes is high blood glucose or glucose intolerance which occurs women who do not have diabetes and usually disappears after pregnancy and happens to be the most common medical complication of pregnancy (Alfadhi, 2015) . If not properly controlled it could lead to the Diabetes in later life (Soumya & Srilatha, 2011).

A random blood sugar level of greater than 200mg/dL (11mmol/L) accompanied with symptoms of diabetes is used to determine diabetes mellitus (Mandal & Hiebert, 2012). A second criterion for determining the presence of diabetes mellitus is a fasting (no food intake for 8 hours) plasma glucose of greater than 126mg/dl (7.0 mmol/l) (American Diabetes Association, 2010). Again, a two hour plasma glucose reading of greater than 11.1 mmol/l during a Glucose Tolerance Test (OGTT) depicts the presence of diabetes mellitus (Doi *et al*., 2008).

Diabetes mellitus is a metabolic defect of several origins due to disturbances of glucose. These defects results in a diminished state of health, survival, and economic stress among people (Olokoba *et al.*, 2012). Several factors, both modifiable and non-modifiable, could predispose an individual to diabetes and a list of the modifiable factors include obesity (Huma *et al.*, 2012), hypertension (Ibekwe, 2015), and dyslipidaemia (Mullugeta *et al.*, 2012). Some of the non-modifiable risk factors include socioeconomic status, sex, age, and genetics (Abdulsalam *et al.*, 2014). Type 2 Diabetes accounts for the high rates of mortalities in health facilities worldwide (World Health Organisation, 2016).

According to studies, diabetes is a disease burden in Ghana. A screening exercise conducted by the Ghana Diabetes Association in selected rural areas estimated the prevalence rate to be 2% (Rudatsikira *et al.,* 2007). Diabetes prevalence rates of 6.4% in two urban areas and twenty rural communities, (Corti, 1982), 8.3% in the Accra Women's Study (US National library of Medicine, 2002), 9.1% among 1,015 civil servants in Accra (Kaplan *et al.,* 1990) and 6% and 8% in studies in Kumasi have been reported (Kaplan, *et al.,* 1990). The results of two studies showed impaired fasting glucose and glucose tolerance rates to be double the rates of diabetes, implying that a high rate of the Ghanaian population are at risk of developing diabetes (Corti, 1982).

In a study carried out by Murad *et al.,* (2014) which sought to align some risk factors associated with T2DM results showed that diabtetic patients who were more likely to be either married or divorced had a history of diabetes in a first degree relative. There were significant differences between BMI indices with most of the cases having a BMI of greater than 25 kg/m^2. The consumption of fatty meals differed among participants as 28 %, 44 %, and 47% of the control group used for the study consumed fatty foods every day, 3-6 times per week, and less than 3 times per week respectively with a total of 8 % who did not consume fried or fatty foods at all. Results obtained for the consumption of starch showed that majority (42.2 %) of the population consumed starch every day, 24.5 % consumed starch 3-6 times per week, and less than 3 times per week; 5.8 % of the participants did not take starchy foods at all. Compared to the control group used for this study 66 %, 31 % and 24 % consumed starch daily, 3-6 times per week, and less than 3 times per week respectively with only 4 % not consuming starchy meals at all. Between the two groups used for the study the consumption of fruits, vegetables, and grains were lower among the control groups. It was deduced from the study that male gender above 40 years with low educational attainment were among the risk factors associated with T2DM. In the

study, diabetics were more likely to be less educated with lower monthly earnings. Body Mass Index was reported to have a positive correlation with the prevalence of diabetes which was associated with insulin resistance due to overweight and obesity.

Medical nutrition therapy (MNT) is an indispensable part of inpatient management of some CNCDs such as diabetes and hypertension. The objectives of MNT in diabetes care are to improve glycemic control, provide sufficient calories to meet metabolic demands, and to consider and factor in individual food preferences, and come up with a discharge plan. Medical nutrition therapy which includes nutritional assessment and individualized meal planning when provided via a consistent carbohydrate meal planning system, may help glycemic control in hospitalized patients (Curll *et al.*, 2010; Clement, Braithwaite, & Magee, 2004).

2.5.4 Study of association between body mass index and hypertension

In a study carried out on 100 patients above 60 years by Gupta, Kumar, & Agrawal, (2016), the relationship between Body Mass Index and Hypertension was studied among an elderly population in a rural health facility. This was a prospective study to evaluate the effect of BMI on systolic and diastolic pressure readings. Result from the study showed a strong link betweeen BMI and systolic blood pressure readings The research emphasised on BMI having a direct correlation on hypertension, diabetes,and high cholesterol. In another study by Kamal *et al.*, (1997) and Xuang *et al.*, (2007) blood pressure readings for systolic and diastolic indices were shown to be affected by the BMIs of patients. Few studies have also shown a stronger correlation among females than males for BMI and blood pressure (Anil, Sudhir, Gita, & Punith, 2008). A strong correlation was observed between specifically systolic pressure readings and BMI in the

study by Gupta *et al.,* (2016). However, there was no significant difference seen between males and females for both the diastolic and systolic pressure readings. The study confirmed that as BMI increases diastolic and systolic pressure indices also rise. Conclusions drawn from the study showed that it may be possible to modify the rates of hypertension by changes in body weight. Looking at Gupta's (2016) findings there is a basis for conducting a study to evaluate the relationship between BMI and its effect on hypertension here in Ghana.

2.5.5 Study of association between Visceral Fat and Blood pressure

It was found in a research that visceral fat was more associated with development of high blood pressure as compared to both body fat and BMI (Walsh, 2014). Conclusions made after the research indicated that only visceral fat was significant for each standard deviation. They again indicated that hypertension had a link with obesity but not all overweight or obese individuals had hypertension. It is therefore important to carry out research here in Ghana to know if obesity has a link with hypertension.

In another study by Nimbalkar *et al.,* 2012 on the effect of visceral fat on cardiovascular disease risk factors using the Omron Body Composition Monitor, visceral fat and visceral fat analysis were determined. Results obtained indicated that no significant differences were seen between the 50 young healthy adults used for this study for diastolic pressure and visceral fat but there was a difference between boys and girls for systolic pressure, pulse pressure and mean arterial pressure. Conclusions made out of the study indicated that visceral obesity correlated with mean arterial pressure in both sexes with a more defined result in males. It summed the research up by stating that fat distribution is an important index in determining overweight and obesity which have an effect on cardiovascular health.

It was reported by the American College of Cardiology in the year 2014 that abdominal fat was more linked with high blood pressure than overall obesity (American College of Cardiology, 2014).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter focuses on the methodological procedures used for gathering and analysing data used for this study. The chapter reveals the sample size calculation, inclusion and exclusion criteria, procedure for data collection, data analysis and presentation.

3.2 Study Design

The research was carried out using a cross sectional study design.

3.3 Study Site

The work was carried out in three hospitals in Accra namely The Accra Regional Hospital, The Trust hospital and The Ghana Police Hospital which record high numbers of in-patient turn out on daily basis. Admission cases involving chronic non communicable diseases like diabetes and hypertension are also recorded on a daily basis in these facilities. Administrative procedures required to carry out research in these facilities are more flexible than the other hospitals. These three facilities were selected for convenient sampling reasons.

3.3.1 The Trust Hospital

With a core vision of becoming a leading player in healthcare delivery service in Ghana and the Sub-region, The Trust Hospital which operates a two shift system i.e. morning (7am- 2pm) and afternoon (2pm-8pm) provides good medical assistance to patients. It is located on the Oxford Street, Osu, Accra. It has two centers namely the Specialist and General Unit which attend to diversified health related conditions (medical, ophthalmology, dental, dietetic, physiotherapy, ENT, Orthopedic, Plastic surgery etc.); this makes it a busy facility. The bed capacity of this hospital is about 40.

3.3.2 The Police Hospital

The Police Hospital established in 1976 has over the years provided medical support for the Ghana Police service and the general populace. It is located on Cantonment road, Accra, Ghana. Currently with a 100 bed capacity, and an on-going infrastructural development, the hospital receives patients from all walks of life on a daily basis.

3.3.3 The Greater Accra regional hospital

With a bed capacity of 620, the Accra regional hospital happens to be one of the ultra-modern health facilities in Ghana which renders services to both Ghanaians and outsiders. Several medical conditions amongst which include diabetes and hypertension are handled here on a daily basis.

3.4 Participants

Participants for this study were inpatients aged 18-60 years with diabetes and hypertension who reported to the three selected hospitals. The type of participants selected were based on WHO's report on the increase in prevalence of diabetes among adults over 18 years globally and the fact that Africa has the highest prevalence of hypertension across WHO regions.

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion criteria

Hospitalised adults (18-60 years) with T2DM and hypertension on admission at the ward and who could consume food orally and were not to be discharged the coming week in order for subsequent data collection to be possible.

3.5.2 Exclusion criteria

1. Hospitalized adults (18-60 years) with T2DM or HPT either on NG tube and EN nutrition support who are immobile/bedridden.
2. Type 1 diabetics and gestational diabetic patients were also excluded from the study.

3.6 Sample Size Determination

Since there is no validated information on the population of hospital patients with NCDs in Ghana who consume hospital foods, a prevalence rate of 50 % was used for this study**.** A total of 96 in-patient with hypertension and diabetes were to be used for this study using the proposed formula by Magnani (2000): $n \geq Z^2 (P) (1-P)/E^2$, where

n= minimum sample size

P= proportion of variable for unknown proportion

Z score= 1.96 at 95% confidence interval and at an allowable error of 10%.

E= Margin of error

$$\mathbf{n = \frac{((1.96^2)\ (0.5)\ (1-0.5))}{(0.1^2)} = 96\ patients}$$

The calculated sample size could not be obtained because of the constraint of time and discharge reasons; only 70 in-patients were obtained and used.

3.7 Sampling Technique

Systematic random sampling technique was employed to select consented hypertensive and type 2 diabetic subjects for the study. A sample frame of the names of all type 2 diabetic and hypertensive subjects (18-60 years) from the various hospitals used for the study was drawn from the register of all diabetic and hypertensive subjects based on the inclusion and exclusion criteria. Numbers were then assigned to the list of subjects who qualified for this research in the sample frame. The total number in the sample frame (total number of patients obtained from all three hospitals) was then divided by the sample size (70) and a sample location which was also used to subsequently identify selected participants determined. Numbers from 1-5 were assigned to all participants until the total number of patients was obtained. With the blindfolded method a number from a list of numbers from one (1) to the sample location number (5) within the sample frame was then randomly selected. This randomly selected number was then set aside as the first selected and qualified number and the subsequent numbers identified from each step by adding the sample location till all the 70 selected subjects were drawn.

A semi-structured questionnaire was then administered to patients who needed no assistance and the various anthropometric indices were taken by trained personnel. The protocol for collecting the samples lasted a month and two weeks. Data collection for each patient involved two weekdays and a weekend.

3.8 Procedure for Data Collection

3.8.1 Pretesting of the questionnaire

Pretesting of the questionnaire was carried out at Legon Hospital with ten participants. A pre-tested semi-structured questionnaire (Appendix IV) was used to obtain participants' socio-demographic characteristics (age, gender, marital status, religion, occupation and ethnic group) and eating habits information. Some modifications made to questionnaire included restructuring of questions to narrow the aims and objectives to eating habits during hospitalization and before admission. Again, no space was made available for disease condition so it was later corrected. It was observed that clients normally spoke about taste of hospital meal so it was deemed fit to capture a question under that.

Some dietary intake information before admission was obtained by the administration of a food frequency questionnaire (FFQ) (Appendix VI) validated from the Dana-Farber Cancer Institute and a three day 24-hour recall was also used strictly for assessing regular intakes while on admission. With the help of a stature metre and a digital scale, anthropometric indices (height, weight,) were measured for each participant. Nutritional status was assessed using Body mass index (BMI), albumin results, and with the help of a BIA analyzer body fat and visceral fat were obtained which all together help in determining the nutritional status of individuals.

3.8.2 Eating habits on admission

Eating habits of participants was assessed using a modified form of the eating habits questionnaire originally designed by Dana-Farber Institute, USA (Dana- Farber Cancer Institute, 2003) (Appendix VI).

3.8.3 Dietary Intake Assessment

Assessment of food consumed over one past week while on admission was carried out using a three day 24-hour dietary intake recall. The recall was obtained with the aid of household measurements such as spoons and cups to estimate the portion sizes and quantities of foods consumed. The estimated amounts consumed were then converted into grams using a micro diet software tool. A food frequency checklist developed by Dana- Farber cancer institute was also used to assess the frequency of consumption of various foods before they were admitted to the hospital. Frequency responses were listed in columns indicated as 'daily', '2-3x/week', 'weekly', 'monthly', occasionally', and 'never'.

3.8.4 Anthropometric Measurements

Anthropometry is the measure of the human body in terms of the dimensions of adipose tissue, skeletal muscle and bone. Subcutaneous adipose tissue measurements are important because they give an indication of possible disease states and risk for conditions such as diabetes mellitus, hypertension, cardiovascular diseases and other non-communicable diseases. Commonly used adult anthropometric measurements include weight, height, BMI, Waist circumference, Hip circumference, WHR, visceral fat, body fat and skeletal muscle mass. These measurements are compared to universally accepted reference standards to assess risk for various diseases. The

BMI which examines body weight relative to height is a good indicator of total body composition. It is calculated by dividing the body weight (kilograms) by the square of the height (meters). A simple range of BMI values used in this study were based on the World Health Organization criteria (WHO, 2012) for adults which define underweight as a BMI ($\leq$18.5kg/m^2), healthy weight (18.5 – 24.99 kg/m^2), overweight (25 – 29.99 kg.m^2) and obese ($\geq$30kg/m^2).

3.8.4.1 *Weight*

Weight was measured using an Omron bio-electric impedance analyzer (Omron BF-511, 2011) to the nearest 0.1kg with participants in light clothing and standing upright. Participants were asked to remove shoes, jackets and other heavy objects before standing on the scale.

3.8.4.2 *Height*

Height was taken to the nearest 0.1cm using a portable stadiometer (SECA - model 213, Germany). Participants were asked to stand upright on the base plate of the stadiometer without shoes with their feet together and their heels touching the back of the plate. Each participant's head was positioned at a right angle to their body, while the horizontal headpiece was lowered gently to touch the top of the head and height recorded.

3.8.4.3 *Body Fat and Visceral Fat mass measurements*

The BIA analyzer, BF-511, (Omron Matsusaka Co. Ltd, Matsusaka, Japan) was used in determining the body fat and visceral fat of the participants (OMRON BF-511, 2011). This method is easily performed, portable, non-invasive, and more affordable than other methods.

In determining readings from the BIA machine the height, weight, and gender of the patients were taken separately and fed into the machine to determine BMI, visceral fat, and body fat. With the help of a clean gauze or cotton the plates on both the base and handle of the BIA were well cleaned before and after each measurement till the total number of patients were obtained. Measurements on the BIA machine were carried out with participants standing upright on the machine which was on a leveled ground with arm stretched while holding the handle at 90 degrees to the body.

3.8.5 Measurement of Blood Pressure and Fasting blood Sugar

Initial preparation for blood pressure readings had patients rest for at least 10 minutes before this exercise. It was ensured that patients were not under stress before the reading was taken. Two readings were taken at least 1 minute apart on two occasions and on two separate days and the average readings were calculated. Most of the blood pressure readings were carried out in the mornings. Blood pressure for the patients was taken with a blood pressure apparatus (Omron Digital Automatic Blood Pressure Monitor, Model M3). Patients were made to sit in a chair with their backs supported. They were instructed not to cross their legs and had their feet on the floor. With their arms supported at heart level the blood pressure cuff was placed around their upper arms. The power button on the pressure was pressed and both systolic and diastolic pressure readings were obtained by trained personnel employed for this study.

Initial preparation for blood sugar tests had patients fasting for at least 8 hours. Blood sugar levels were taken with a glucometer (ACCU- check Performa). It was ensured that the tip of the finger to be used for the test was properly cleaned with a disinfectant before the lancing device was used to prick patients for their blood to be taken. A test strip was then inserted into the

glucometer and a piece of the blood drop was collected. The glucose level of the patients appeared on the screen of the glucometer and were recorded by the trained personnel.

3.8.6 Measurement of Serum albumin

Serum albumin levels were obtained from patient folders with their consent three days after admission. This result was from one lab reading.

3.9 Data Analysis

Data collected was analysed using the Statistical Package for Social Sciences (SPSS) software version 20. Means, standards deviation, ranges and percentages of continuous variables were determined. Statistical significance and or association between categorical data were analysed using Chi-square test. P-value ≤ 0.05 were considered significant. The dietary assessments of the participants were analysed using micro diet nutrient analysis software (version 3). Results obtained from the 3 day 24 hour recall were entered into this software. The database used had estimated weights of most of the Ghanaian foods consumed and this made it easier for references to be made. Graphical representations of data were generated where appropriate.

3.10 Ethical Approval

Permission was sought from the Ethics and Protocol Review Committee of the School of Biomedical and Allied Health Sciences, College of Health Sciences, Korle-Bu. Permission was also obtained from the administrative authorities of the two hospitals prior to data collection. The rationale and the procedures of the study were explained to participants (Research Participants Information Sheets (Appendix II) and a written consent form (Appendix III) was obtained before

inclusion in the study to guarantee voluntary participation. Confidentiality of all information received from study participants was ensured during collection, storage and publication.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-Demographic Characteristics of Participants

The demographic characteristics of the study participants are shown in table 4.1. The age range for the study was between 18 and 60 years with a cumulative mean age of 41 years. Out of the 70 patients (48 (68.57%) hypertensives and 22 (31.43%) Type 2 diabetics) who were involved in the study 21.4 % were obtained from The Police Hospital with 54.3 % and 24.3 % of the total number of patients being from The Greater Accra Regional hospital and The Trust hospital respectively. Hypertension was most prevalent among the age category of between 45 and 52 years with the least prevalence observed between the ages of 18 and 25 years.

A greater percentage (61.4 %) of the patients were females with males forming a minority percentage of 38.6 %. Majority of the patients (51.4 %) were single followed by those married (20 %) with an even proportion for those who were separated and divorced (14.3 % each).

A total of 80 % out of the total population used for the study were employed with 18.6 % and 1.4 % being unemployed and retired respectively. Religious segmentation showed that 92 % of the total population were Christians and 7.1 % out of the total were Muslims. Educational qualification depicted a 7.1 % having no formal education, 17.1 % being JHS dropouts. Less than ten percent (7.1 %) completed middle/SHS and 30 % were HND / Diploma holders and the greatest percentage (38.6 %) had a Degree / Post degree. Monthly income earnings for the patients were from below 100 Ghana cedis to greater than three thousand Ghana cedis. From table 4.1, co- morbidity data obtained from the patients indicated that 22.9 % of the patients suffered from coronary heart disease aside their main condition, 12.9 % suffered from

myocardiac infarction, 20 % had stroke as a secondary diagnosis, 10 % with congestive heart failure, 5.7 % from peripheral vascular disease and 28.6 % suffered no co- morbidities. The research probed more to find a family history of the two conditions under study. A 44.3 % of the patients reported having a family history of HPT, 15.7 % of T2DM and 40 % of the patients reported having no family history of hypertension and diabetes. The mean length of stay on admission was a week and four days with. Diabetics had a longer period of hospital stay (1 week and 5 days) than hypertensives (1 week and 4 days). These distributions are shown in the tables (4.1, 4.2, 4.3, and 4.4) and figures (4.1, 4.2, 4.3, and 4) below:

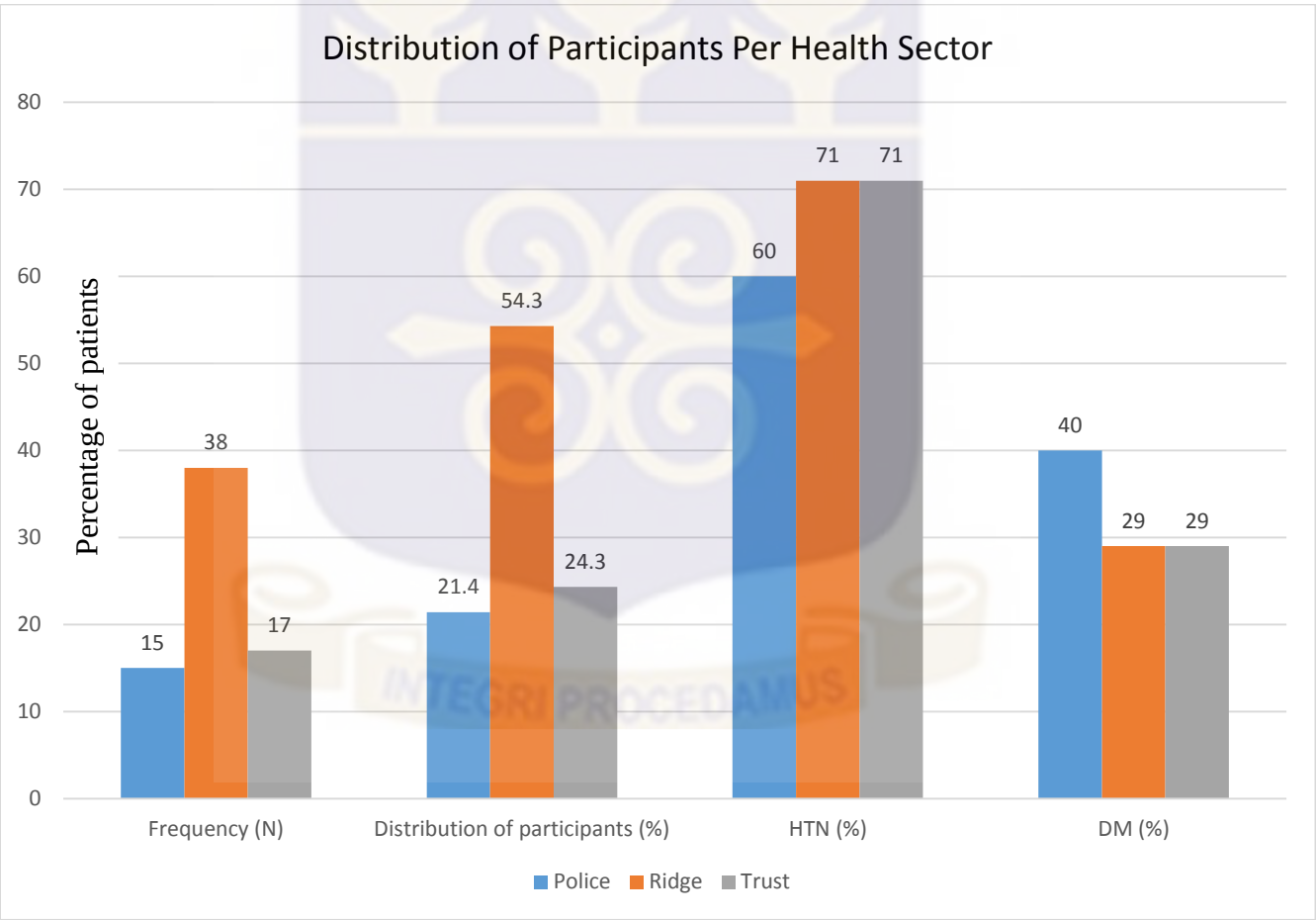


Figure 4. 1: Distribution of patients and their disease condition in the three health sectors

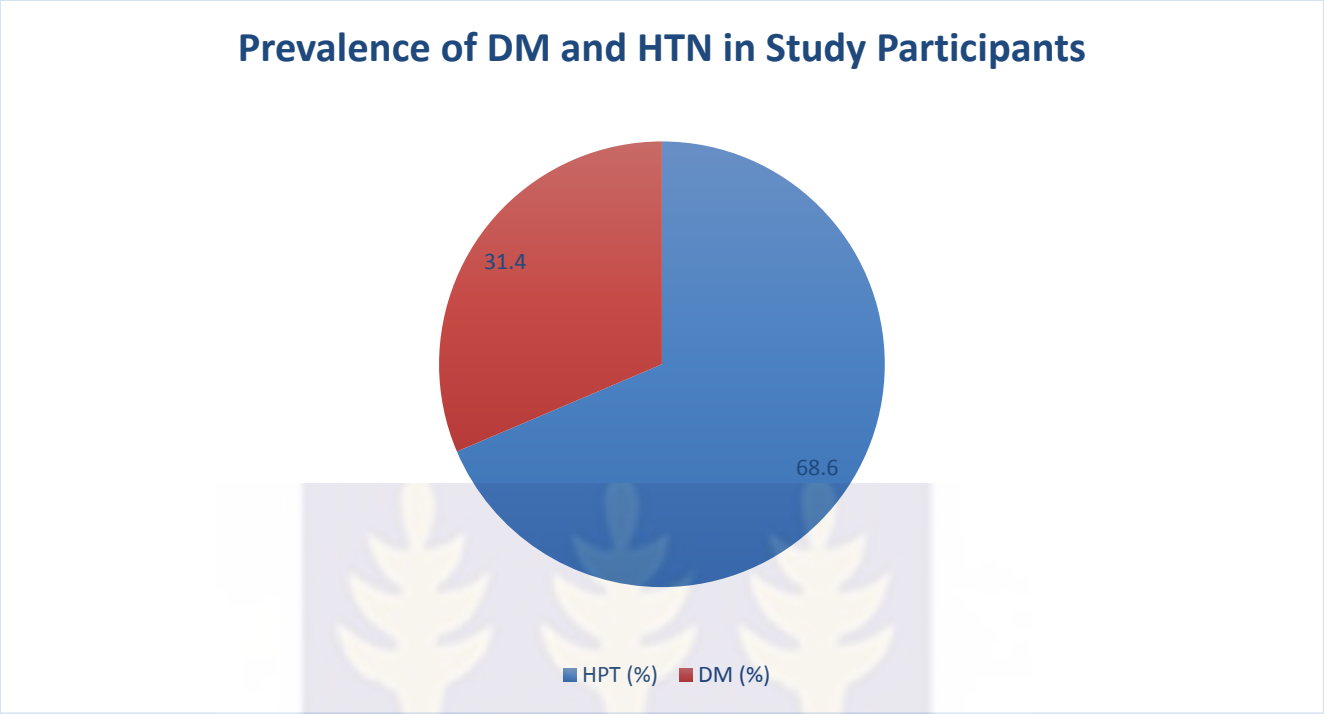
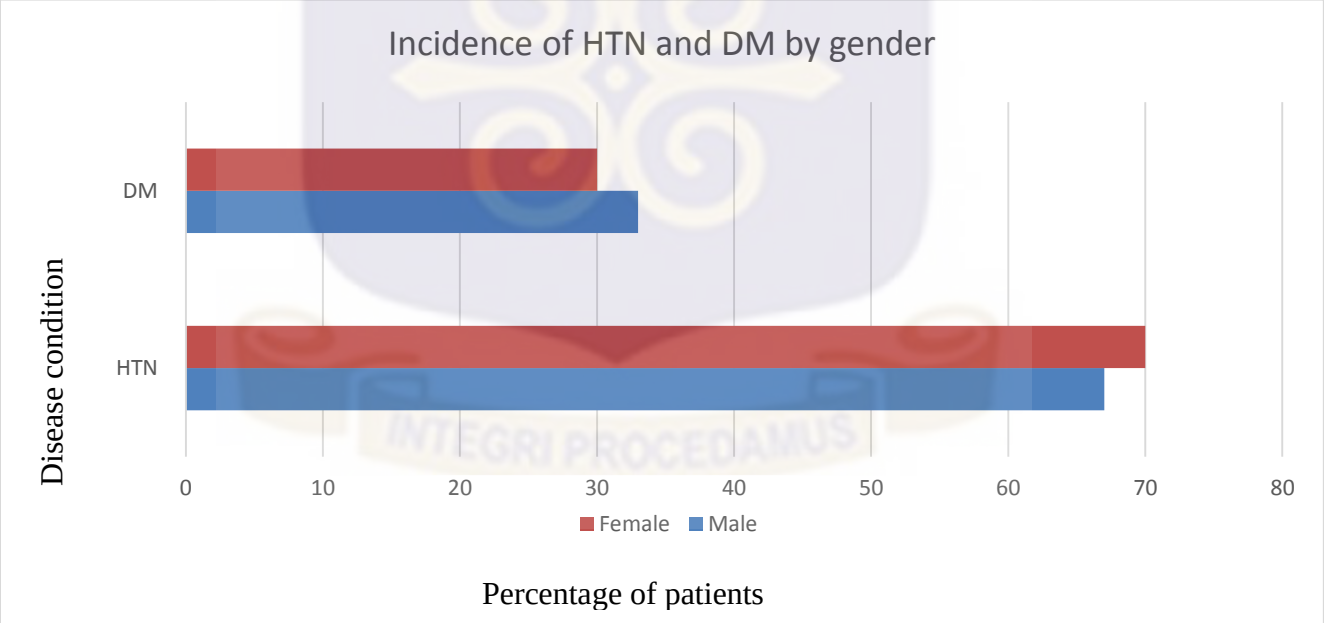
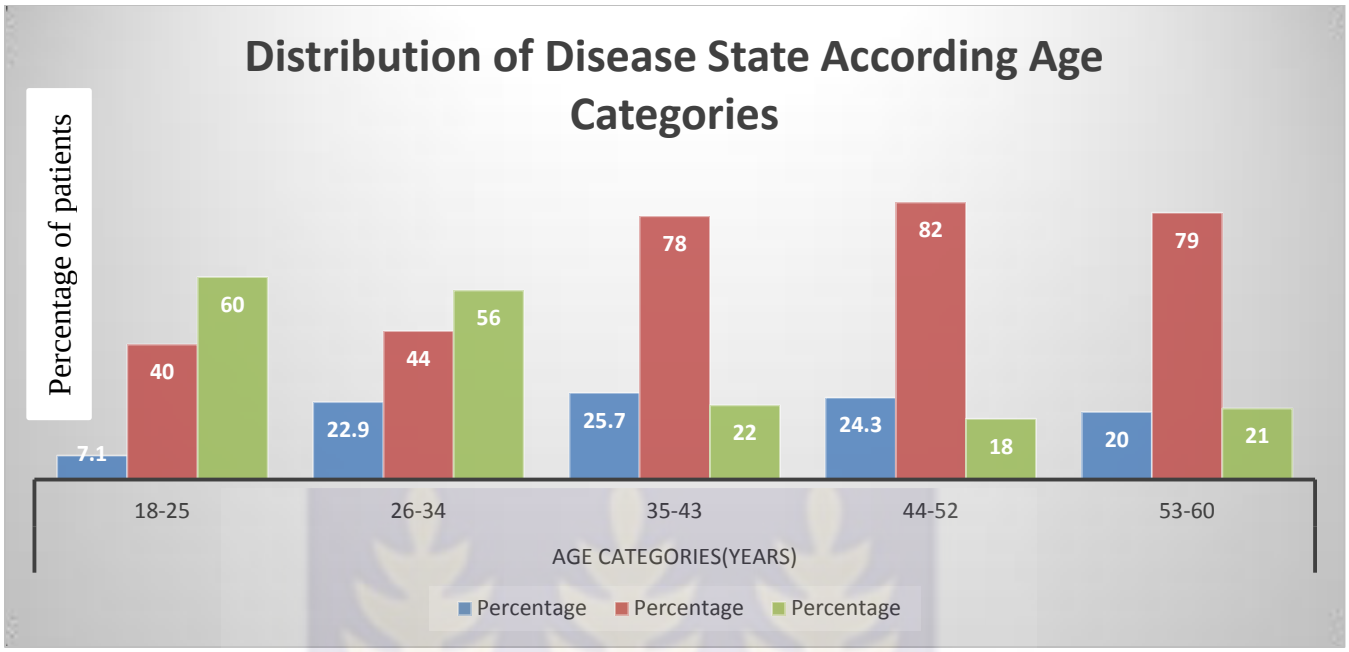


Figure 4. 2: Overall prevalence of DM and HTN among study participants



HTN Hypertension; DM: Diabetes Mellitus

Figure 4. 3: Prevalence of hypertension and diabetes among male and female patients from all hospitals



HTN Hypertension; DM: Diabetes Mellitus

Figure 4. 4: Incidence of hypertension and diabetes among participants according to age

Table 4. 1: Prevalence of hypertension and diabetes within the different demographic group

Socio demographic distribution		Frequency (N)	Prevalence (%)	HTN (N)	HTN (%)	DM (N)	DM (%)	p-value
Marital Status	Single	36	12	51.4	67	24	33	
	Married	14	4	20	71	10	29	
	Separated	10	5	14.3	50	5	50	**0.279**
	Divorced	10	1	14.3	90	9	10	
Occupation	Employed	56	17	80	70	39	30	
	Unemployed	13	5	18.6	61	8	39	
	Retired	1	0	1.4	100	1	0	**0.675**
Religion	Christian	65	19	92.9	71	46	29	
	Muslim	5	3	7.1	40	2	60	**0.153**
Ethnic Group	Akan	33	11	47.1	67	22	33	
	Dagomba	3	1	4.3	67	2	33	
	Ewe	11	1	15.7	91	10	9	
	Fante	11	5	15.7	54	6	46	**0.127**
	Ga	10	2	14.3	80	8	20	
	Gonja	2	2	2.9	0	0	100	

HTN: Hypertension; DM: Diabetes Mellitus

Table 4. 2: Prevalence of hypertension and diabetes within the different demographic group continued

Characteristics	Frequency (N)	Prevalence (%)	HTN (N)	HTN (%)	DM (N)	DM (%)	p-value
Educational Background							
No Formal Education	5	7.1	5	100	0	0	
Basic Education (JHS)	12	17.1	8	67	4	33	
Basic Education (Middle/SHS)	5	7.1	5	100	0	0	0.221
HND/Diploma	21	30	14	67	7	33	
Degree/post degree	27	38.6	16	59	11	41	
Income (GHS)							
<100	7	10	4	57	3	43	
100-499	8	11.4	6	75	2	25	
500-599	13	18.6	10	76	3	23	
1000-1499	18	25.7	14	78	4	22	0.564
1500-1999	11	15.7	5	45	6	55	
2000-2499	11	15.7	8	73	3	27	
2500-2999	2	2.9	1	50	1	50	

**P significant at HTN: Hypertension; DM: Diabetes Mellitus*

Table 4. 3: Prevalence of co-morbidities among study participants in relation to their disease state

Co- morbidities	Frequency (N)	Co-morbidities (%)	HTN (%)	HTN (N)	DM (%)	DM (N)	p-value
Coronary Heart Disease	16	22.9	94	15	6	1	
Myocardial Infarction	9	12.9	44	4	55	5	
Stroke	14	20	71	10	28	4	0.090
Congestive Heart Failure	7	10	43	3	57	4	
Peripheral Vascular Disease	4	5.7	75	3	25	1	
None	20	28.6	65	13	35	7	

HTN Hypertension; DM: Diabetes Mellitus

Table 4. 4: Family history and incidence of hypertension among study participants

Family History of Disease	Frequency (N)	Prevalence (%)	HTN (%)	HTN (N)	DM (%)	DM (N)	p-value
HTN	31	44.3	93.50	29	6.50	2	
DM	11	15.7	18.20	2	81.80	9	<0.001
None	28	40	60.70	17	39.30	11	

HTN Hypertension; DM: Diabetes Mellitus

Table 4. 5: Mean length of stay in relation to disease condition

Disease condition	Frequency (N)	Mean length of stay in hospital (weeks)	Standard deviation
HPT	48	1.4	0.61
DM	22	1.5	0.67

HTN Hypertension; DM: Diabetes Mellitus

Table 4. 6: Mean age for males and females from the three hospitals

Gender	Frequency (N)	Mean (age)	Standard deviation
Males	27	40	10.37
Females	43	41	11.43

4.2 Description of Anthropometric and Biochemical Indices

The distribution of weights for the patients indicated an average body weight of 72.9 kg with males having a higher recorded average weight of 78.1kg and females recording an average weight of 69.6 kg. Height readings obtained for both genders showed an average height value of 166.1cm. The BMI category had an average BMI of 27.1 kg/m^2 and out of this there was a close difference between males (27.1 kg/m^2) and females (27.0 kg/m^2). Mean values obtained for visceral fat, body fat, and albumin were 11, 30.7 %, and 3.5 respectively. Most of the patients were classified as obese by BMI (both on admission for both gender). Few patients (18.52 %) were classified as well-nourished with a small percentage (14.82 %) classified as

undernourished. Weight changes were observed among patients during the study. Although there were no changes recorded between BMI ranges, changes were recorded within BMI ranges with a higher percentage (91.43%) of patients losing weight during hospital stay. Weight loss ranged from 0.2 kg to 1.0 kg in a period of 1 week. The rest of the patients 5.71 % and 2.86 % either maintained or gained weight respectively.

Table 4. 7: Mean anthropometric and biochemical results

Variable	Mean (±SD)		
	Total (N)	**Male**	**Female**
Weight (Kg)	72.9 (18.5)	78.1 (17.3)	69.6 (18.7)
Height (cm)	166.1 (9.4)	170.1 (8.9)	163.6 (9.0)
BMI	27.1 (6.8)	27.1 (5.8)	27.0 (7.4)
Visceral fat	11 (6.10)	12.3 (6.2)	10.14 (5.95)
Body Fat (%)	30.7	33.3 (5.6)	29.02 (6.90)
Albumin (g/dL)	3.5	3.6 (0.66)	3.3 (0.73)

N=number out of the total number of participants; BMI=body mass index; p<0.05 is significant

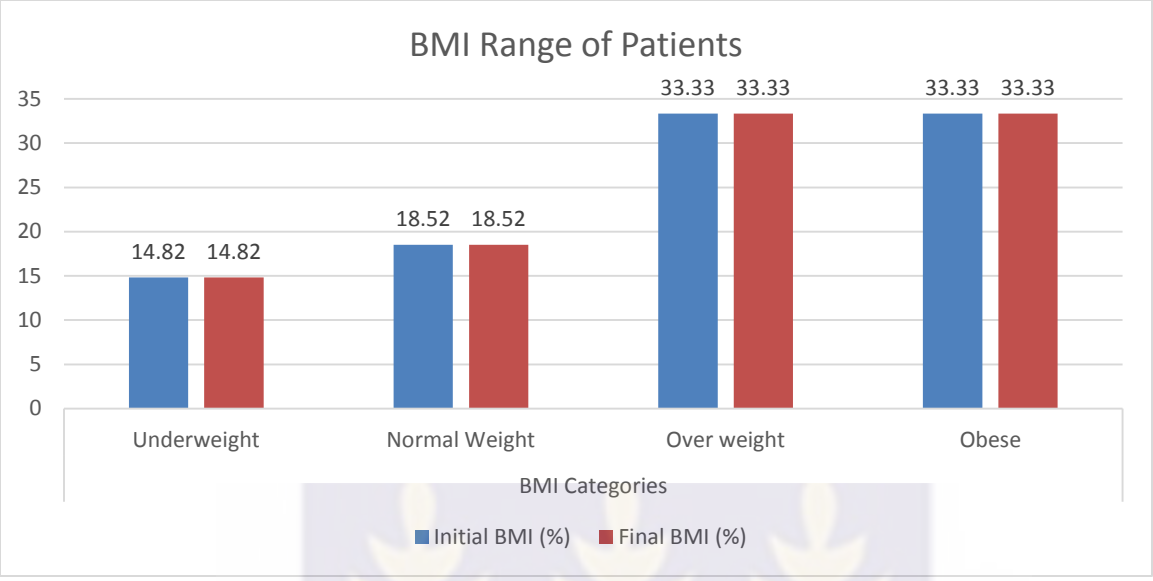


Figure 4.5: BMI range for patients from the three hospitals

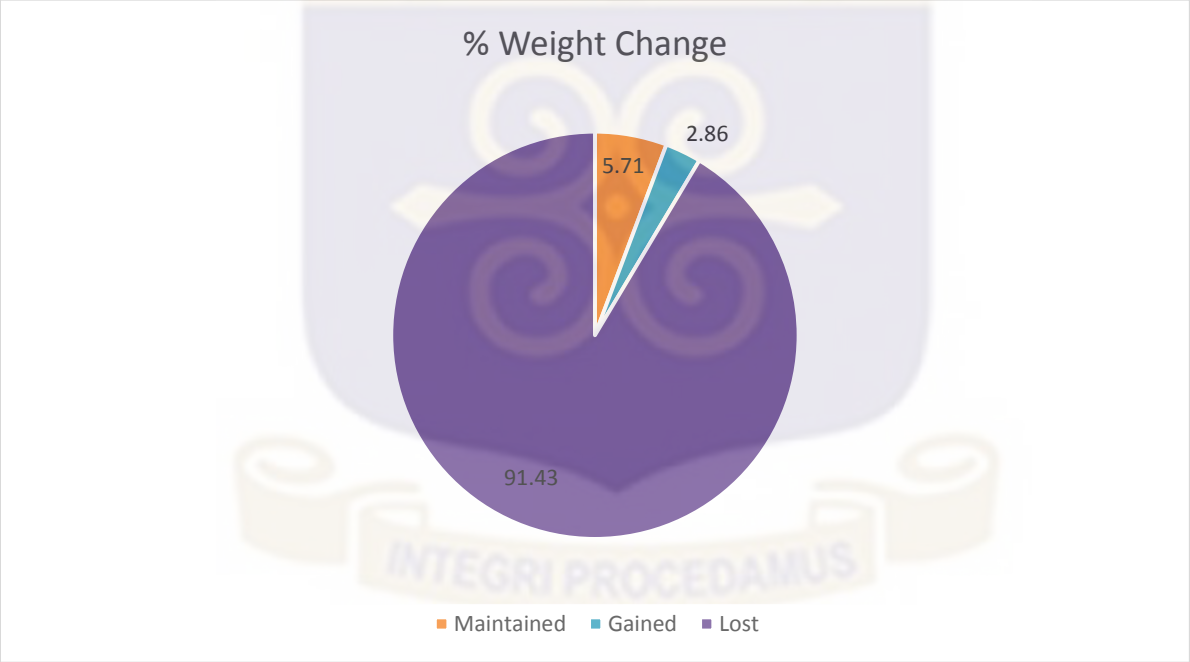


Figure 4.6: Weight change observed during admission period

4.3 Meal Patterns of Study Participants

The FFQ was used to ascertain usual food intakes of patients before admission. The consumption of animal products (meat, fish, eggs, snails, and poultry) indicated that 24.3 % of the total number of patients ate these foods on a daily basis, 32.9 % ate this 2-3x/week, with the greatest number of patients (41.1 %) consuming these products on a weekly basis. Monthly consumption for the animal and animal products was recorded by only 1.4 % of the total number of patients used for this study. It was recorded that the daily consumption of cereals and cereal products (rice, maize, wheat, millet) was recorded among a higher percentage (71.4 %) of the population since these foods are normally staple foods in Ghana and other African countries. A total of 21.4% of the patients reported eating 2-3x/week from this group with the least percentage (7.1 %) consuming foods from this group on monthly basis before admission. Fats and oils consumption among the patients reflected a 60 % value for patients who consumed fats and oils on daily basis. From the study 22.9 % and 17.1 % out of the total sample size consumed fats and oils 2-3x/week and weekly respectively. From the legume group (Cowpea, groundnut, bambara, agushie, neri) 71.4 % of the patients consumed this on a daily basis, 18.6 % and 10 % consumed 2-3x/week and weekly respectively. Consumption of roots and tubers (cassava, yam, plantain, cocoyam, sweet potato) among the patients showed a high value of 90 % for patients who consumed foods from this group on a daily basis with the remaining 10 % recording a consumption frequency of 2-3x/week. The last group in this section focused on the consumption of fruits from which deductions obtained reflected that only 7.1 % of the patients consumed fruits on a daily basis, with 24.3 % and 58 % consuming food from this group 2-3x/week and weekly respectively (figure 4.5). Number of meals eaten in a day showed that 65.7 % of the total

population ate 2 meals in a day, 30 % ate three main meals in a day and 4.3 % ate four meals in a day (Table 4.6).

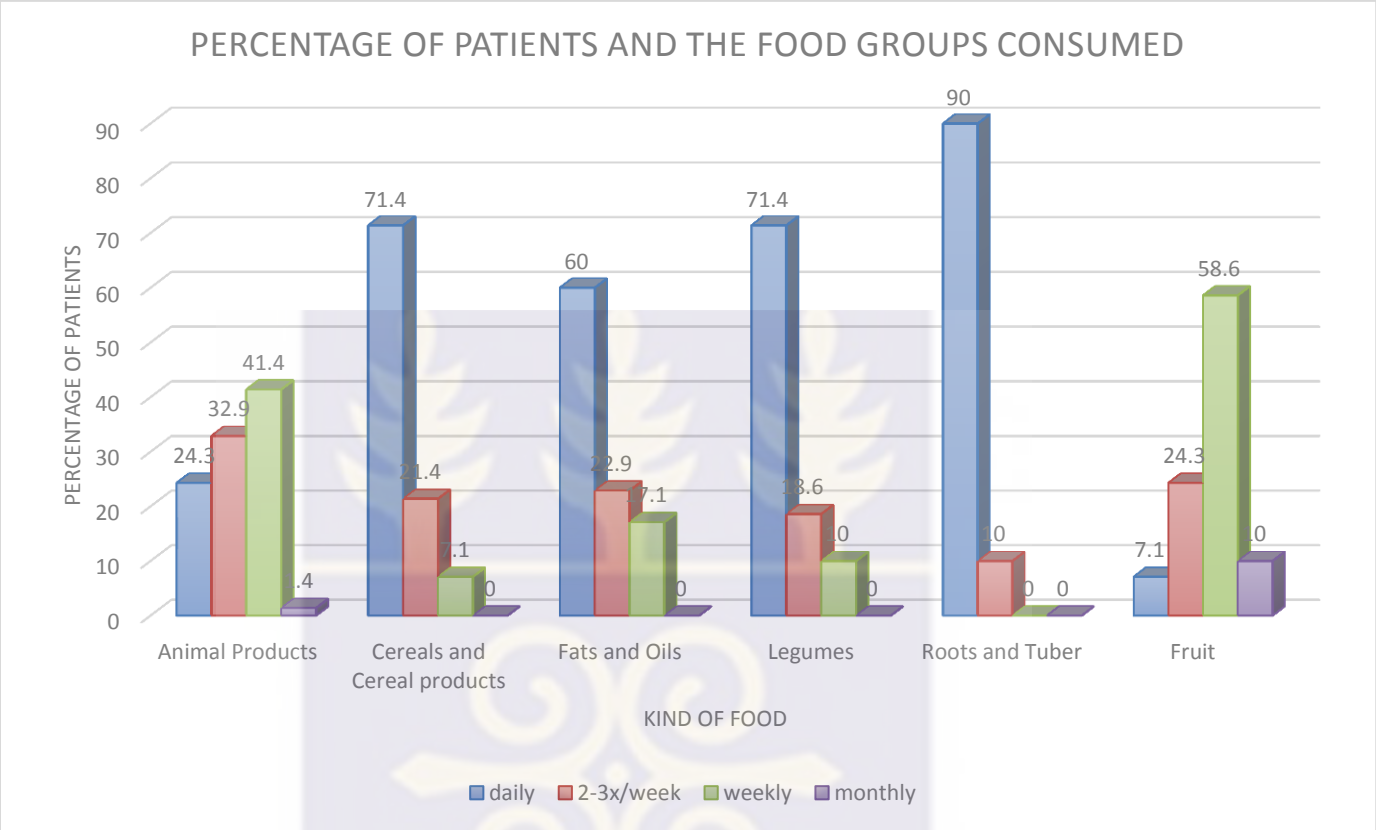


Figure 4.7: Consumption of food according to the food groups

Table 4. 8: Number of meals consumed in a day

Number of meals eaten/day	Frequency (N)	Valid percentage
1	0	0
2	46	65.7
3	21	30
≥4	3	4.3

4.4 Mean Energy and Nutrient Intakes of Participants whiles on Admission

The hospital meal plan had three major meals provided (breakfast, lunch, supper) on a daily basis. The mean energy intakes for the patients based on daily intakes indicated a below DRI for both male and female patients. Macronutrient analysis carried out on the foods showed that consumption of protein for both gender was higher than the DRIs recommended by WHO. Both genders consumed more fat which represented 30% energy above the DRI (20-25 g/day) in reference to WHO statistics. The consumption of carbohydrate on daily basis depicted an above normal value for both males and females. Sodium and potassium intakes among the patients were lower than the accepted values as compared to values endorsed by WHO. Dietary recommended intakes for iron were higher than the accepted ranges by WHO. Vitamin C and Folate obtained from foods served by the hospital showed a far lower value in comparison with DRIs.

Table 4. 9: Mean energy and nutrient intakes of patients

Nutrients	Total N ± SD	Male N ± SD	DRI (WHO)	Female N ± SD	DRI (WHO)	P -Value
Energy (kcal/day)	1612 (707.80)	1611 (800.44)	2200-2600	1614 (653.00)	1600-2000	0.38
Macronutrients						
Protein (g/day)	68.53 (27.65)	71.54 (27.2)	56	66.63 (28.06)	46	0.44
Fat (g/day)	55.06 (30.20)	56.63 (29.5)	20-35	54.08 (30.88)	20-35	0.35
Carbohydrate (g/day)	243.48 (158.35)	264.15 (215.01)	130	230.50 (110.13)	130	0.31
Minerals						
Sodium (mg/day)	905.35 (962.36)	920.96 (1323.14)	1500	895.55 (661.44)	1300-1500	0.35
Potassium (mg/day)	846.91 (664.04)	724.84 (514.77)	4700	923.55 (738.11)	4700	0.35
Calcium (mg/day)	816.09 (717.58)	1043.72 (937.02)	1000-1200	673.16 (498.20)	1000-1200	0.38
Iron (mg/day)	23.07 (15.22)	27.52 (20.20)	6	20.28 (10.35)	5-8.1	0.41
Vitamins						
Vitamin c (mg)	36.30(43.15)	33.75 (31.93)	90	37.91 (49.21)	75	0.23
Folate (ug)	62.09 (81.80)	50.09 (49.32)	400	69.63 (96.62)	400	0.34

DRI=Daily recommended intakes; WHO= World Health Organization

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

In hospitalized patients with CNCDs, it is necessary to assess their eating habits and nutritional status in order to come out with effective and efficient nutrition intervention and policies. During this period of hospitalization a knowledge of the food intake and nutritional status helps in the individualized care required for recovery or control of condition. This study was conducted among 70 hospitalized patients with 15 from The Police hospital, 17 from The Trust hospital, and 38 from The Accra Regional Hospital. The link between dietary habits, nutritional status and their effects on NCDs were also looked at.

5.2 Socio-Demographic Characteristics of Respondents

In relation to the socio-demographic characteristics of the patients, the result of the study showed that the mean age for the patients was 41 years with majority (61.4 %) of them being females. This confirmed with findings from de Lima *et al.*,(2015) in which most of the participants were also females. Majority (38.6 %) of the patients used for this study had either a degree or post degree qualification and only 7.1 % had no form of formal education at all and an equal percentage (7.1 %) completing middle/SHS. In a previous study by Quadri *et al.*, (2012) this was not seen as most (44 %) of the study participants were illiterates and only 4 % had attained a degree status. Some literature has it that educational qualification has an effect on the food choices, satisfaction, and general health status of individuals (The National Bureau of Economic

Research, 2011). Thus, education plays a vital role in the food choices of individuals. Wrong nutritional choices on the other hand may lead to a state of malnutrition (Barker *et al*., 2011).

Also, co morbidity results gathered from the current study indicated most of the participants suffered from other conditions and this falls in line with a study carried out by Grossman and Masserli, (2008) which explained that this was due to the diseased condition having common target organs. Coronary heart disease was highest co-morbidity factor recorded and this is evident in another study which lists coronary heart disease as a common co-morbid index (Mensah & Brown, 2007).

The family history of a disease helps in planning interventions according to Hood (2015) and it was observed from this study that a greater percentage of the patients recorded a family history of either hypertension or diabetes. This could be attributed to lifestyle trends passed on from first generational family members and a change in the eating pattern of individuals could control this problem (Shahtahmasebi, 2015). It has also been reported by other sources that a shorter length of stay in a health facility can be more beneficial to patients than longer stays (Kupersmith, 2012). To add up to the earlier point, a negative contributor to a patient's health is a long period of hospital stay which leads to decreased nutritional status as stated earlier by Stanga *et al*., 2003. Stanga *et al.*, (2003) in their study revealed that the longer a patient stayed in hospital, the greater his/her dissatisfaction with the food provided which may be due to a higher tendency for these patients to lose their appetite and eat less food. This according to the researchers, may consequently have an effect on their nutritional status.

5.3 Anthropometric and Biochemical Characteristics

Anthropometric indices carried out under this study were BMI, body fat (%), visceral fat, weight, and height. Fasting blood sugar and pressure readings were obtained from the patients but much emphasis was not laid on it because other confounding factors like medication and disease state could have altered the readings. Serum albumin, which has been shown to be an indicator of nutritional assessment (Mehrotra *et al.,* 2011) was therefore used for this research.

BMI ranges in this study stayed the same at admission and at a week into admission (18.52 % normal with normal BMI, 14.82 % being underweight, and the remaining being in the overweight and obese zone), however, reductions were seen in a majority of participant's individual BMI. It was observed in the current study that hospital meal consumption was lower than the recommended DRI in terms of energy and nutrients which might also have contributed to weight loss seen in the majority of participants (91.43%). Malnutrition is responsible for poor clinical responses to treatment, increased complications, longer hospital stay and costs of hospitalization what adversely affects clinical outcomes (Ordoñez et al., 2013).

Contrary to this study, a study conducted by Ordonez *et al.*, (2013) to investigate the relationship between the nutritional status and clinical outcome and length of stay among hospitalized hypertensive and diabetic patients classified majority of patients as well nourished by the BMI and MAC (50% and 64.9%, respectively). Few patients were diagnosed of overweight/obesity, 8.3% and 4.8%, respectively. The average length of stay in their study was 13 days was similar to that of this study (14 days). The result seen in this study may be due to confounding factors such as co-morbidities and stress which were not considered in this study.

To determine nutritional status using albumin as a key indicator, it was seen that individuals who were underweight had reduced albumin levels. Conclusions drawn indicated that low values which were still in the recommended range could also signal a poor state of health. Albumin reading obtained from this work was at border line low and this is a true reflection of the possibility of patients becoming nutritionally deficient.

These findings call for more attention to be paid to assessing BMI, visceral fat, body fat, and albumin regularly for hospitalized patients in Ghana in order to identify patients at high risks of malnutrition and to improve upon the nutritional status on time.

5.4 Eating Habits

Many research works have proven that eating three times a day has a correlation with nutritional status and vice-versa (Burkert *et al.,* 2014). Skipping of meals can lead to abnormal metabolism which consequently leads to overweight and obesity (Dovey, 2017). A healthy eating habit protects hospitalized patients against all forms of malnutrition (World Health Organization, 2010).

In a study on hypertensives by Nalepa *et al.,* (2014) to show the healthy and non- healthy eating habits of hypertensives, results indicated high salt intakes, white bread, and moderate intake of meat. However, the intakes of fruits, grain products, and vegetables were below the DRIs;. Conclusions drawn from the work showed that majority of the patients had moderate eating habits.

Analysis of eating habits revealed that majority (65.7 %) the participants ate twice in a day. This means they rarely ate three main meals in a day which in effect could have made them overeat to compensate for the meal missed according to a research by Skerett and Walter (2010). Healthy eating habits such as eating three meals in a day and consumption of enough fluids lead to improved health outcomes. A 30 % result was obtained for patients who ate 3 times a day which corresponds to recommended intakes. It was concluded again in a study that regular intakes of meals have positive effects on fasting lipid, postprandial insulin profiles, and thermogenesis (Farshchi *et al.,* 2005). None of the patients in this current study ate once a day.

The normal healthy eating habit encourages the consumption of foods from the food groups in their right proportions. Grains should form at least half of a healthy plate, 3-4 servings of vegetables per day, 4 -5 fruit servings per day, 2-3 fat-free or low fat dairy products, and 2-3 servings of fats and oils.

It was seen from a study that frequent consumption of meat and meat products could lead to overweight and obesity which have been linked with CNCDs. Carbohydrate and protein intakes were found to have an association with overweight and obesity in a study (Jitnarin *et al.,* 2010). These findings were not in agreement with other studies which disproved the earlier comments on carbohydrate intake and BMI (Scali, 2003). With data obtained from the food frequency questionnaire it was seen that consumption of foods from this group was on weekly basis which could limit further complications in the near future.

Cereals and whole grains are a rich source of fibre and the benefits of these foods have been highlighted in most research on hypertension and diabetes (Dauchet *et al.,* 2006).

Overconsumption of these products on the other hand poses risks of overweight and obesity to patients which further predisposes them to CNCDs (Asif, 2014).

High consumption of fats and oils lead to atherosclerosis which could further lead to insulin resistance, diabetes, and finally hypertension. With respect to the data obtained, the consumption of fat was high (60 %) which could lead to more complications associated with CNCDs. In the typical Ghanaian home setting men are served better than women. Oils in foods as a whole are perceived as contributing rich nutrients to consumers in most parts of Ghana. A general explanation men consuming more fat than women could be that in Ghana the men spend most of their hours working outside so end up buying most of the meals they consume from outside and at home are served with more oily meals.

5.5 Nutritional status

The nutritional status of a patient is frequently the result of many inter-related dynamics. It is influenced by food intake, amount and value, and somatic healthiness. Nutritional status ranges from obesity to severe malnutrition and is influenced by the diet; the level of nutrients in the human system and the capability of those levels to sustain standard metabolic integrity (Siobal & Baltz, 2013).

5.5.1 Energy and Nutrient Intake

The amount of energy in the form of calories consumed by an individual must be proportional to the amount of energy expended in order to ensure one continues to remain within the normal nutritional status. The mean requirement obtained for energy was lower than the recommended

values set by WHO (2010) and this poses a greater risk of NCD complications on patients as evidenced by the study carried out in Scotland (Schindler *et al.,* 2010; Deutz *et al.*, 2014). Dietary recommended intakes for energy although there was no significant difference between males and females were lower for both gender and this could lead to negative side effects like weight loss, fatigue, cachexia, and a general state of malnutrition (Chron, 2017).

Macronutrient intakes among the patients showed that carbohydrate and fat consumption was within the DRI ranges for both gender. Comparing this to other works which sought to find out the effects of these two variables on diabetes it was observed that both carbohydrate and fat had effects on HbA_{1C} concentrations (Shadman *et al.,* 2013) and as a result, high intake could lead to obesity which predisposes one to hypertension (Jitnarin et al., 2010). Attention must be paid to this area to help in planning interventions for both hypertension and diabetes patients. The value obtained for proteins for males was higher than the DRIs which places them at a more greater risk of diabetes, hypertension , and other co- morbidities (WHO/FAO Expert Consultation, 2003). Sodium, potassium, and calcium intakes among the two groups fell lower than the DRI range which represented a state of malnutrition. In a research by Waitzberg *et al.,* 2001 to ascertain the nutritional status and prevalence of malnutrition in hospitalized patients similar findings were obtained. The effect of these micronutrient deficiencies could be detrimental to the health status of hypertensive and diabetic patients. Sodium in the body helps in the regulation of major bodily functions. Although a high sodium diet could elevate blood pressure a reduction in sodium levels might result in years of heart complications (Livestrong Foundation, 2013). According to the study by Gupta & Guptha (2010), a lifestyle change like high potassium intake leads to improved cardiovascular disease state but in the current study the low value obtained for potassium could pose a life threat to patients.

A study has shown that iron helps with the circulation of red blood cells in the body, DNA synthesis and general metabolism (Gupta, 2014). In the study by Gupta (2014), iron was seen to have the ability to form a free radical which could damage body cells if its levels were exceeded. It was clear from the current research that iron intakes were far above the DRIs and that could result in altering cellular activities among patients.

Vitamin C and folate aid in collagen synthesis and protein metabolism according to a study (Li & Schellhorn, 2007; Bellow & Moore, 2012). Dietary recommended intakes for vitamin C and folate were higher than values obtained in this study and according to the study very low levels of these vitamins could lead to malnutrition.

Poor nutritional status (which encompasses micro and macronutrient deficiencies) could make the patients be at increased of morbidity and mortality, increased length of hospitalisation, more frequent re-admission, and increased healthcare costs (Ljungqvist *et al.*, 2010).

5.6 Conclusion

The study revealed that the eating habits of the hospitalized patients were inappropriate in relation to World Health Organisation's standards which could have led to the high prevalence of malnutrition among them. The consumption of animal and animal products was more than the daily recommended intakes which could also contribute to the high levels of fat (both body and visceral) which have been proven to increase the prevalence of malnutrition and chronic non communicable diseases. The consumption of fruits and vegetables was insufficient. The eating habits of patients used for this study could have a negative effect on their nutritional status and this calls for pragmatic steps to be taken by hospital administration to position enough healthcare

professionals especially dietitians on the ward to correct the problems associated with nutritional management.

5.7 Recommendations

It is recommended that the study be carried out in other health facilities to see if results would differ or concur to this study. A larger sample size could be looked at to give more power to the study. Future studies could take a look at some of the eating habits not covered thoroughly in this work – calorie control, intake of supplements and physical activity.

Inclusion of more objective methods for assessing both personality traits and dietary habits could add more explanation to this study. Again, further work could be carried out to include other chronic conditions and eating habits of hospitalized patients.

5.8 Limitations of Study

1. Under reporting and over reporting of dietary intakes and habits on the part of patients and caregivers could possibly be done to impress the researcher.

2. There was constraint of time which made it difficult to obtain the expected total number of patients.

3. The micro diet analyzer used for the micro and macro nutrient determination omitted certain local foods which forced the researcher to substitute with other foods on the list.

4. Other nutritional assessment tools like subjective global assessment, triceps skin fold, and other equally nutritional predictive tools could have been used.

5. It was difficult running analysis on hospital menu and this could have added up to body of knowledge.

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APPENDIX I

INFORMATION SHEET

Dear Respondent,

My name is Afful Borto Chris, an MSc student of the School of Biomedical and Allied Health Sciences, University of Ghana undertaking a research on the topic "Eating habit and nutritional status of hospitalized individuals with chronic non communicable conditions".

The main aim of this research is to assess the eating habit and nutritional status of hospitalized individuals (18-60 years) with diabetes and hypertension. As part of the study, weight and height/length will be determined. Also, you will be asked specific questions about your eating habits before admission and while on admission. Kindly respond carefully and sincerely to the best of your knowledge. All information given will be kept confidential and used for the research purpose only.

The research will not pose any risk to you the individual. The only discomfort is the time you take to respond to questions and assessment of your weight, height, and other indices. Added to these indices your serum albumin level would be obtained from your folder.

Your participation is voluntary and you may decide to opt out at any point in time without it affecting your ward treatment. Please be assured that all information you give will be handled confidentially. Your withdrawal and refusal to participate will not affect subsequent care that will be given.

Should you have any questions, concerns or any matter relating to this study please contact the research personnel.

RESEARCHER'S CONTACT

Mobile number: 0246858587 Email: chrisafful@ymail.com

SUPERVISOR'S CONTACT

Name: Dr. Gladys Peprah Boateng Email: nitramharpep@yahoo.com

Mobile number: 0244265436

Name: Dr. Joana Ainuson-Quampah.

Mobile number: 0576096699 Email: quampah73@gmail.com

APPENDIX II

CONSENT FORM

UNIVERSITY OF GHANA

SCHOOL OF ALLIED HEALTH SCIENCES

This study is investigating eating habit and nutritional status in hospitalized patients with specific chronic non communicable disease conditions (diabetes and hypertension). Questions about my eating behavior and nutritional status would be asked if I agree to partake in this study of which I would be expected to answer to the best of my knowledge.

STUDY TOPIC: EATING HABIT AND NUTRITIONAL STATUS OF HOSPITALIZED ADULT PATIENTS WITH SPECIFIC CHRONIC CONDITIONS

I, ……., agree to partake in this study conducted by CHRIS BORTO AFFUL from the Nutrition and Dietetics Department, School of Allied Health Sciences, college of Health Sciences, University of Ghana under the supervision of Dr. Gladys Peprah Boateng and Dr. Joana Quampa Ainuson of the University of Ghana, Legon- Accra. I am aware my participation is voluntary. I can decide to opt out of the study as and when I wish during the course of this study.

As part of the study questions I would be asked about my usual food intakes prior to hospital admission. Also questions would be asked about my intake while on admission. A high level of document confidentiality would be kept. Permission would be asked for to access personal information in my folder for necessary medical information of which no details would be given out to a third party without my consent.

I hereby append my thumbprint/ signature to agree to the above consent form.

Researcher

……..

CHRIS BORTO AFFUL (0246858587)

Name of Participant …….

Signature/ thumbprint …… Date……

Mobile Number ……

Additional questions or problems concerning your rights as a research participant should be addressed to: The Chairman, Ethics and Protocol review Committee, School of Biomedical and Allied Health Sciences, Korle-Bu, Accra, Ghana.

APPENDIX III

SOCIO DEMOGRAPHIC INFORMATIONAND ANTHROPOMETRY

Please tick and circle where appropriate

Date……. Code……. Age ….....

1. Gender: 1. Male 2. Female

2. Marital Status……. 1. Married 2. Divorced 3. Single 4.widowed

3. **Occupation**…….. 1. Employed 2. Unemployed 3. Retired

4. Religion… 1. Christian 2. Muslim 3. Traditionalist 4. Rastafarian 5. Buddhist

6. Atheist 7.Other (please indicate) ……..

5. Ethnic group: 1. Akan 2. Dagomba 3. Ewe 4. Fante 5. Ga 6.Gonja 7.Other (please indicate) …….

6. **Educational background:** 1. No formal education 2. Basic education (JHS) 3.Basic education (middle/SHS) 4. HND/ Diploma 5. Degree/ post degree

8. Income in Ghanaian cedis per month: 1. <100 [ ] 2. 100-499 [ ] 3. 500-999 [ ]

4. 1000-1499 [ ] 5. 1500-1999 [ ] 6. 2000-2499 [ ]

7. 2500-2999 [ ] 8. ≥3000 [ ]

MEDICAL HISTORY

9. History of medical condition: 1. HPT 2.DM (Type 2)

10. Co- morbidities: 1. Coronary artery disease 2. Myocardial infarction

3. Stroke 4.congestive heart failure 5. Peripheral vascular disease 6. None

11. Family history of 1. HPT 2.DM 3.None

Other Anthropometric Indices

Measure	1st reading	2nd reading	Average	Difference in reading
	On admission			
Weight (kg)				
Height (cm)				
BMI (kg/m^2)				
MUAC				

Length of stay……..

Measure	**Result 1**	**Result 2**	**Result 3**
Serum albumin(g/dL)			
Blood pressure (mmHg)			
Fasting blood sugar(mmol/L)			

LABORATORY INDICES

BODY COMPOSITION MEASUREMENTS

INDICES	1ST READING	2ND READING	AVERAGE
Visceral fat			
Total body fat (%)			

APPENDIX IV

3-DAY 24 HOUR RECALL

Please complete this as accurately as possible with times of day, estimated or weighed portions, applicable brands, cooking methods and indication of appetite (hunger and fullness where appropriate).

DAY 1	**DAY 2**	**DAY 3**
Meal **Weight/Estimated portion**	**Meal** **Weight/ Estimated portion**	**Meal** **Weight/ Estimated portion**
Breakfast 1. 2 3		
Mid- morning Snack		
Lunch 1. 2. 3.		
Mid-afternoon Snack		
Supper 1. 2. 3. 4.		

APPENDIX V

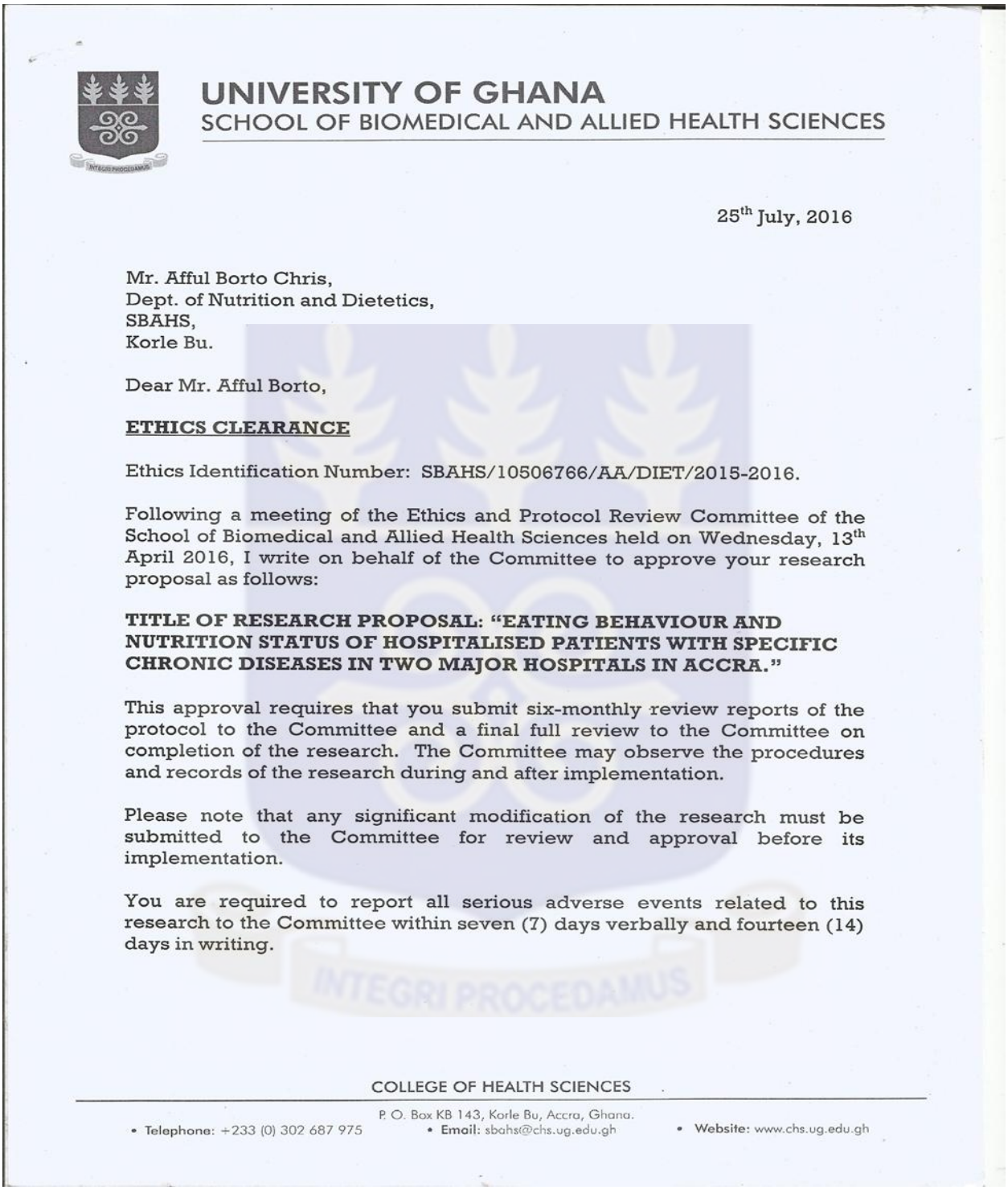
FOOD FREQUENCY QUESTIONNAIRE

KINDS OF FOOD	DAILY	2-3X/ WEEK	WEEKLY	MONTHLY	OCCASSIONALLY	NEVER
ANIMAL PRODUCTS Meat Fish Eggs Snails Poultry Other						
CEREALS AND CEREAL PRODUCTS Rice Maize Wheat Millet Other						

Fats and oils *Vegetable* oil Red palm oil Coconut oil Margarine Others						
LEGUMES Cowpea Groundnut Bambara Agushie Neri						
ROOTS AND TUBERS Cassava Yam Plantain Cocoyam Sweet						

potato						
FRUITS Orange Pineapple Watermelon Banana Apple Other						

ETHICAL CLEARANCE



UNIVERSITY OF GHANA
SCHOOL OF BIOMEDICAL AND ALLIED HEALTH SCIENCES

25th July, 2016

Mr. Afful Borto Chris,
Dept. of Nutrition and Dietetics,
SBAHS,
Korle Bu.

Dear Mr. Afful Borto,

ETHICS CLEARANCE

Ethics Identification Number: SBAHS/10506766/AA/DIET/2015-2016.

Following a meeting of the Ethics and Protocol Review Committee of the School of Biomedical and Allied Health Sciences held on Wednesday, 13th April 2016, I write on behalf of the Committee to approve your research proposal as follows:

TITLE OF RESEARCH PROPOSAL: "EATING BEHAVIOUR AND NUTRITION STATUS OF HOSPITALISED PATIENTS WITH SPECIFIC CHRONIC DISEASES IN TWO MAJOR HOSPITALS IN ACCRA."

This approval requires that you submit six-monthly review reports of the protocol to the Committee and a final full review to the Committee on completion of the research. The Committee may observe the procedures and records of the research during and after implementation.

Please note that any significant modification of the research must be submitted to the Committee for review and approval before its implementation.

You are required to report all serious adverse events related to this research to the Committee within seven (7) days verbally and fourteen (14) days in writing.

COLLEGE OF HEALTH SCIENCES
P. O. Box KB 143, Korle Bu, Accra, Ghana.
• Telephone: +233 (0) 302 687 975 • Email: sbahs@chs.ug.edu.gh • Website: www.chs.ug.edu.gh

As part of the review process, it is the Committee's duty to review the ethical aspects of any manuscript that may be produced from this research. You will therefore, be required to furnish the Committee with any manuscript for publication.

Please always quote the ethical identification number in all future correspondence in relation to this protocol.

Thank you.

Yours sincerely,

Dr. E. Olayemi.
(Chairman, Ethics and Protocol Review Committee)

Cc: Dean
Head, Dept. of Nutrition and Dietetics
School Officer