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Assessment of Nutritional Status of the Aged in the West Gonja District In
Northern Region of Ghana

By
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DECLARATION

I hereby declare that, this write-up was made possible out of my own effort, under the supervision of Dr. Anthony Edusei School of Public Health, Kwame Nkrumah University of Science and Technology Kumasi, and to the best of my knowledge, the results of this research is absolutely original and has not been submitted to this university or elsewhere for the award of a master's degree. All references used in this work have been duly acknowledged.

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DEDICATION

I dedicate this research work to my Children Nadra Hadi Tukur and Nusayrah Hadi Tukur

ABSTRACT

World Health Organization (WHO) defines people of age 65 and above as “old age”. Data shows a rapid growing trend of the older persons, especially in developing countries of which Ghana is not an exception, In spite of this increasing trend, little has so far been documented on the nutritional status and associated factors of the aged in Ghana, which can contribute to formulating appropriate policies for this vulnerable group. To help address this, a cross-sectional study was conducted among 384 participants, of them were individuals 65 years or above at the West Gonja District, Ghana to assess their nutritional status and its associated factors. Respondents were selected from twenty-five (25) communities, and a structured questionnaire was used to elicit response on socio-demographic status, dietary habits and food choices, and morbidity. Anthropometric measurements, including height and weight were taken, from which BMIs were calculated. Nutrient analysis template was used extract specific total nutrient values per 100g whilst data entry and analysis was done using statistical package of social sciences (SPSS) version 23 with $p < 0.05$ considered as statistical significant. Pearson chi-square correlation and regression were used to establish the relationship between exposure and outcome variables. Among the 384 respondents, 161(41.9%) were males and 223(58.1%) were females. In total, malnutrition was (43.8%) among the respondents with Underweight (27.9%), 56.2% were of normal BMI while few (15.9%) were either obese or overweight. Majority of the respondent (79.9%) consumed three meals a day, 15.1% consumed two meals a day whilst 2.9% was once a day. A significant association ($p=0.001$) was observed between meal frequency and nutritional status, with overweight/obese participants recording greater meal frequency compared with underweight/normal participants. Equally, a Chi square analysis showed a significant association between protein intake ($p<0.001$), total fat intake ($p<0.012$) and carbohydrate intake ($p=0.216$) with BMI status. A significant association was also observed between weight loss and BMI ($P=0.002$), morbidity ($p=0.012$), having personal food preferences ($p=0.001$) and being on diet ($p=0.002$). Generally, micronutrient intake among the respondents was very poor with 48.4% of the respondents having low iron intake while none of the respondents meeting the RDAs for calcium. In conclusion, the findings shows greater proportion of the participants being malnourished, Significant association between meal frequencies and BMI status, macronutrient and BMI status, and lastly, BMI status, morbidity, food preferences, and being on diet with weight loss. Further study is recommended on how food quality is related to the nutritional status of the elderly.

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ABBREVIATIONS

AIDS- Acquired Immune-deficiency Syndrome

BMI- Body Mass Index

CHD- Coronary Heart Disease

CHRPE- Committee of Human Research Publication and Ethics

CTS- Computer Tomographic Scan

CVD- Cardiovascular Diseases

DASS- Damongo Senior High School

DRIs- Dietary Reference Intake

EPIC- European Prospective Investigation into Cancer and Nutrition

ESA- Economics and Statistics Administration

FAO- Food and Agricultural Organizations

GSS- Ghana Statistical Service

HDL- High Density Lipoprotein

HIV- Human Immune-deficiency virus

JHS- Junior High School

LDL- Low Density Lipoprotein

MTHFR- Methylenetetrahydrofolate Reductase

NPC- National Population Commission

NSI- Nutrition Screening Initiative

RDAs- Recommended Daily Allowances

SHS- Senior High School

SNP- Single-Nucleotide Polymorphisms

SPSS- Statistical Package for Social Sciences

SSA- Sub-Saharan Africa

ULs- Upper Levels

PRB-Population Reference Bureau

UNWPP- United Nation

WCRF- World Cancer Research Fund

WHO- World Health Organization

WGDA-West Gonja District Assembly

DHD-District Health Directorate

CHAPTER ONE

1.0 GENERAL INTRODUCTION

This study was carried out in the West Gonja District in the Northern region, Ghana. The first chapter introduces the study, and also entails the problem statement, research objectives as well as the justifications. The second chapter is made up of the literature review, which gives information related to the research topic. The third chapter elaborates on the methodology deployed in the study comprising of the background of the study area, target population, target sample size, study design, the sampling techniques, data collection, data analysis, and ethical considerations. Chapter four involves analysis of data obtained and discussion of results. The fifth Chapter gives detailed implication of the study findings and its associations to other researches of its kind. Chapter Six concludes the study and goes on to give some recommendations based on the research findings.

1.1 Background

Ageing is the period that starts prior to birth and continues until the end of life. These are inevitable physiological and anatomical change that happens over the course of time. World Health Organization (WHO, 2010) therefore defines people of age 65 and above as “old age” or older persons. Accordingly, the progressive changes among older persons and their body functions are classified as follows; individuals between the age group of 65–74 are classified as “young old”, 75–84 age group as “old” and the group of age 85 and above is categorized as “oldest old” (Aksoydan *et al.*, 2006).

It is believed that growth among individuals aged 65 years and above will rise from 524 million in 2010 to about 1.5 billion in 2050. Although studies have proved that developed countries have the highest older person's population in the world, yet still less developed countries have proven to have the fastest aging population profile with a significant proportion of their population being the aged. Between 2010 and 2050, the proportion of older persons in less developed countries is estimated to increase beyond 250 percent, compared with the 71% rise in the developed countries (World Population Prospect, 2010).

Data has shown a significant rise in aged population. In Ghana, the elderly population has increased from a total 213 thousand (4.5%) of the total national population to 1.6 million (6.7%) between 1960 and 2010 indicating rapid increment of more than seven folds of the total national population (GSS, 2010). However, one of the major challenges battling planners and policy makers is the absence of systematic reliable data on the needs of older Africans (Ramashala *et al.*, 2002). Some data relatively exist for few countries, but the current lack of in depth reliable national-level data about the older populations presents a major limitation to understanding their nutritional wants and associated factors, making policy formulation and interventions difficulty in this aged group (Ramashala *et al.*, 2002).

According to the National Institute on Aging, (2011) the remarkable improvements in life expectancy over the past century were part of the shift in the leading causes of diseases and death. Among developing countries today, a clear cast reflection on the changes of diet, life style and ageing is evidenced with the magical rise of chronic non-communicable diseases such as coronary heart disease, cancers, diabetes among others in the human population.

Liu *et al.*, (2000) indicated that dietary habits have contributed significantly to health-related disease especially among the aged group. It was observed that, atherosclerosis reduced by 30% among individuals who ate 5-10 servings of fruits and vegetables per/day compared with individuals who ate 2-5 servings of fruits and vegetables per/day. Aksoydan *et al.*, (2006) also stated that, proper health promotion, disease prevention and management among the aged populace cannot be achieved without appropriate nutrition.

The basic diseases which afflict older men and women are usually same: cardiovascular diseases, ulcers, cancers, musculoskeletal problems, diabetes, mental illnesses, sensory impairments, incontinence, especially in poorer parts of the world with other infectious diseases which cannot be completely ruled out (WHO, 2002).

The above mentioned illnesses are the notable conditions that are said to accounts for bulk of mortality and morbidity among the old aged stem from early life style behaviours and experiences such as alcoholism, smoking, poor nutrition thus under and over nutrition, lack of physical activity, poor personal and environmental hygiene, violence, poor health care, injuries, and lack of or poor education, these and many same other experiences during early childhood age, adolescent and adult age are the main attributable factors to poor or ill health in later life (WHO, 2002).

By the year 2000, individuals 60 years and above in the world's population were estimated as 10%, which means that a total of 400 million older persons are expected to be living in developed countries whilst over 1.5 billion of same age group will be in the less developed countries. Clearly, the interests of the elderly, including their health concerns are poised to take on greater prominence in coming years (WHO, 2002).

Potentially, the sudden rises in the chronic non-communicable diseases in this age group has been foresight in long term to have a detrimental effect on the economic earnings and societal cost in most African countries (WHO, 2002). A survey on older persons by World Health Organization (WHO) analysed in 23 low- and middle-income countries reveals a huge economic loss of about US\$83 billion between 2006 and 2015 among three non-communicable diseases (heart disease, stroke, and diabetes) (UNWPP, 2010).

Coupled with this, United Nations, (2009) observed a total negligence of aged health care in the sub-Saharan Africa (SSA) in spite of the increasing trend of their aged population (50 years and above) from 2005 to 2030. This in effect is seen among the regions in the world with the highest percentage (108%) thus about 76-157 million aged (Kimokoti *et al.*, 2008). Relatively, this cannot be taught off without considering the economic and health impact of it.

1.2 Problem statement

Data has shown a significant rise in the older individuals. In Ghana, the elderly population has increased from a total of 213 thousand (4.5%) of the total national population to 1.6 million (6.7%) between 1960 and 2010 resulting in rapid increment of more than seven folds of the total national populace (GSS, 2010). However, the major challenge battling planners and policy makers is the lack of in dearth systematic reliable data on the nutritional status of older Africans (Ramashala *et al.*, 2002).

Relatively, some data exist for some few countries, but the current absences of in depth reliable national-level data about the older individuals presents a major limitation to understanding their nutritional problems and associated factors in formulating policy interventions specifically for this age group.

Clearly, the interests of the elderly, including their health concerns, are poised to take on greater prominence in coming years.

1.3 Research Questions

1. What is the current nutritional status of the aged in West Gonja District?
2. What is the usual meal pattern of the aged in West Gonja District?
3. Is the aged dietary intake adequate, how well does that relate to their nutritional status?
4. What influences the dietary intake of the aged in West Gonja District?
5. What is the relationship between body weight and dietary pattern among the aged group in West Gonja district?

1.4 Research Objectives

1.4.1 Principal Objective

To assess the nutritional status of the aged in the West Gonja District in Northern part of Ghana.

1.4.2 Specific Objectives

1. To determine the nutritional status of the aged in the West Gonja District in Northern part of Ghana.
2. To assess the usual dietary pattern of the aged in the West Gonja District in Northern part of Ghana.
3. To determine adequacy of dietary intake of the aged and its effect on their nutritional Status in West Gonja District in Northern part of Ghana.
4. To assess the factors that influences the aged dietary intake in the West Gonja District in Northern part of Ghana
5. To establish the relationship between body weight and dietary pattern among the aged group in west Gonja district

1.5 Justification

Therefore, there is the need for an in depth reliable data on the Nutritional status and associated factors of the Elderly in Ghana, especially in the Northern Part which has the highest number of Older persons Population (65-80+).

This research will also add to literature and will contribute to the knowledge base on Nutritional Status of the Elderly.

CHAPTER TWO

LITERATURE REVIEW

This chapter encompasses review of work done by others which are relevant to the research topic. The chapter will delve into data that support the study.

2.0 Introduction

The World Health Organisation (WHO) in 2010 defined the elderly as persons or individuals aged sixty (60) years upwards and mostly comprises of women than men in the population.

2.1 The Elderly Group

The aged cohort is referred to as elderly persons or adults who are within the category of advanced age.

In accordance to world health organization (WHO, 2010) and other demographic perspectives, the elderly or aged refers to people aged 60 years or 65 years upwards. In Europe and other developed countries, life expectancy is relatively higher, thus about 70 years plus than in most developing continent like Africa. In such places, retirement age from active public economic activities starts at 65 years. Thus, the elderly are people aged 65 years upwards (Population Reference Bureau, 2012).

In the third world continents on the other side, life expectancy within the active working age to retirement still stay at a maximum of sixty (60) years. In Ghana also, just like most developing countries the elderly age still stands at 60 years and same age still remains as the due age limit for retirement from public service (GSS, 2010). By an international level definition, an indication of age 60 years upwards is seen as the cut-off age or age beginning of the aged or elderly population (United Nations Population Fund and Help Age, 2012).

Meaning any cut off of age figure that goes below sixty (60) years as described above does not meet their standard or definition of the aged population and therefore will be seen out of context.

Alternative terms for the elderly are “older people” or the aged or older persons. Ageing is a term associated with the elderly and it is seen as a path of succession through which long life persons or adults attaining sequential advancement in age go into a category of ages classified as old ages. According to Weeks et al. (2012), ageing is the current stage of development at which the older populations constitute the higher proportion of a nation’s population than the period before. That is to say that initial time or period might not constitute a good number of them but for the nation or country to be seen as aged population, its current population then must entails a lot of the aged population than any other age groupings.

Ageing populations have previously being only associated with developed countries and is now being seen or experienced by developing continents or countries (United Nations Population Fund and Help Age, 2010). For population, continent or country, nation, region, town and a community to be termed as older or aged population then that specific population must constitute a total percentage population greater than 10% or 15%. On the contrary, for a population, continent or country, nation, region, town or a community to be seen as a young population structure, the population must have or be made up of high children fraction of not less than 35% of the populace being 15 years and below.

Sub-Saharan countries usually have young populations with children comprising of 40% to 50% of the national age groupings or population census, whilst the older persons constitute about 5 percent or less (PRB, 2012). Examples of countries with a high aged populations (age groups 65 years and above) include, France, Italy and among German population. In these countries, their total aged population census is estimated to be about 25% which is greater than the known

standard of the 10 to 15 percent. This is therefore a clear cast indication that there are good numbers of older persons. Statistics has also proven that Japan has the highest proportion of elderly people with a little over a thirty (32 percent) of her people being aged persons (United Nations Population Fund and Help Age 2012). This in perspectives clearly shows how huge their aged population is compared to the population aged standard of the 10-15 percent.

Unlike the elderly populations, in the younger age population there is a higher likelihood of multiplication over time or increment even with the concept of replacement fertility rate of about 2.1 child/woman thus, at most two children per a woman head attained. Studies are now showing the light of acceptance of this theory among the living population in the world especially in the western worlds, where family planning has gain a very good grounds (WHO, 2010). Similarly, in the developing worlds like Ghana has also shown a progressive trend in family planning acceptance than before (GDHS, 2014) (Ewusie *et al.*, 2014). Therefore by predictive statistics, older populations may experience population decline because they have low fertility rate *ceteris paribus*.

In every continent, the population that encompasses it largely is usually of an issue of a high concerns, because of the several follow-up reasons. Optimally, a high rate of aged population or proportion in a country or a nation is seen as a public health achievement. Implying that, because of the good economic living status, provision good of health interventions and approaches, food security, good social amenities among others is what is contributing to the population's life expectancy and the general well living condition of the people. However, Populations Reference Bureau (2012) also stated that, a high aged population in a country has its own repercussions on the socio demographics, social and economic status of the country which will have a later reflective effect on both the younger and older generations.

Eventhough, some of the aged population might still be strong at retiring age but that cannot be confidently said for all the older population. For a place like Ghana, where individual retirement becomes an issue of a “push and pull” and eventually before the individual so retires, the age is observed to be way beyond seventy or more years. This in perspective will therefore render the aged at the retiring age very weak and cannot make any other survival but to completely relay on the pension scheme. Others may relatively also depend on their relatives and children for their livelihood. Some may have financial resources from other sources. But a higher proportion of them will still be a complete burden. Not withstanding their increasing trend of non-communicable disease which cannot be forgotten, such as cardiovascular diseases, and diabetes among others, that are medically costly to manage and treat (Amoah *et al.*, 2003).

The elderly, among other groups also constitute a significant number or proportion of persons who are disabled. Their health status with their pensioners payment, literally will compound challenges on their personal health and other relatives well-being. Having had a larger populace of the aged, in effect it will eventually aggravate the national economic difficulties of the country as a whole (PRB, 2012). For these and other couple of reasons, it is vital for every country to have sufficient knowledge and information about it aged constituent, even when they do not form a large component of the country’s population, of which Ghana is even in the contrary.

Relatively, there is little concern shown to this group of the human population by many countries of which Ghana, for that matter northern region is of no exception. It is equally same in the area of academia. Therefore perception or other mind-set that the elderly are a health and economic burden to the society must be a thing of the past (Population Reference Bureau, 2012).

2.2 Nutrition

Nutrition involves all the processes from the start of crop production, harvesting, preparing into the raw state, cooking, ingesting, digestion (breaking down), thus anabolism and catabolism, absorption and usage of food to bring to an individual optimal health. It is equally seen or considered as a demand led process or demand and supply approaches, where the human domain or body or the immune system asked for and it is being supplied thorough ingestion. In one way or the other, it is believed to be dependent on an individual age, height, weight and in some cases bodily size. This in perspective will help tell or know the amount, an individual can consume. Coupled with this, the type , nature and amount of work or energy usage one expends must be dependent on the nutrient intake to ensure a proper balance or else a condition called malnutrition sets in and in some cases come with additional adverse outcomes such chronic non-communicable diseases or morbidity.

For an effective and efficient nutritional anthropometric measurement is needed to ascertain the weight, height and other key parameters together will give accurate caloric estimate to be able to prescribe appropriately on how much one should eat or reduce or avoid. This cannot be left out especially in the venerable age group such as the age or elderly (Roth *et al.*, 2010).

2.3 Nutrition and Old Age

Various studies have underscored the importance of good nutrition to growth and development of the elderly and by so doing tend to highlight diversify effects of malnutrition among this age group. (Haveman *et al.*, 2002) establish relationship between food intake and socio-economic status. They identify elderly people as being more prone to malnutrition. They observed that, elderly people do not eat adequately and attribute this to the following reasons: Insufficient

income, insufficient skills to select and prepare a well-nourished diet, dental problem, limited mobility, feeling of rejection and isolation among others as factors that endears them to be very susceptible to malnutrition.

As observed, physiological, psychological, social and economic as major changes of life are the same changes that causes malnutrition among the elderly. A substantive research evidence also shows that elderly that have less educational background are likely to have low income status than those whose who had better education. Old persons who had limited reading ability are also likely to have lesser opportunity of nutrition information which also possesses them to greater danger of malnutrition.

Chronic disorder among the elderly is influenced either directly or indirectly by earlier food selection. Encouraging the intake of appropriate amount and type of food at the appropriate time will help in prevention of malnutrition in the aged (Nkansah *et al.*, 2002).

2.4 Nutritional Status of the Aged

Nutritional status as believed by global thinkers entails a number of reasonable factors or traits. This therefore includes nutritional examination or screening, nutritional check-up or assessment, nutritional management protocol or procedure and lastly specialized nutrition aid processes. Therefore for better understanding, nutritional status can be seen to involve nutritional check-up, basic anthropometrics, biomedical indicators, history and physical or bodily assessment among others (Guigoz *et al.*, 2006). This in perspective is usually carried out among individuals across all age groups such as the infant, adolescent, adulthood and the aged population. It also stands as a tool or indicator that give a very unique reasonable sense of meaning especially after evaluation of an individual into its category as underweight (thus BMI below 18.5), normal (BMI 18.5-24.5), overweight (BMI 25-29.5) and finally obesity (BMI 30 and above).

This gives every individual weight a better sense of meaning and to be easily identified and understood without any special knowledge or technical know-how.

A follow-up studies, also suggested that the basic need or importance of nutritional status is to help identify the most vulnerable group among the assessment cohort or in the mist of other healthy groups as underweight or normal or overweight or obese with the knowledge that each individual must be mutually exclusive and exhaustive, that is to say each life subject must belong to at least one of the category with no other category were an individual can exist apart from those stated already. Coupled with the above, the main brain or backbone of this assessment is to be able to identify the vulnerable ones that are malnourished and those that are safe from malnutrition so as to be able to develop or put in place remedies. This include treatment or management plans in the event of malnutrition which is common among the elderly or public health interventions such as nutrition intervention activities e.g. food demonstration, durbars, home visits to give nutritional and other keen counselling's (Gibson et al., 2005). This mentioned approaches has to be done with the elderly nutrition in focus.

Equally, nutritional assessment process is seen as a key component especially at the IPC level or when dealing with patients at the pediatric wards or in the examination of elderly weight status where key notes about the individual's growth and development processes are very vital in taking suggestive decisions in the treatment or management of the individual. Nutrition status is therefore important in these and other ill situations where patients weight measurement or assessment are inevitable to the diagnosis, management or treatment protocol (Maka *et al.*, 2000).

World Health Organisation observed that among the most vulnerable groups of malnutrition it appears that aged group still emerged as the topmost priority than even children and other younger age groupings. This is as a result of ignorance on appropriate food choices, their loneliness and social isolation which often times lead to depression, apathy, lack of appetite, physical disabilities, cardiovascular problems, poverty among others, resulting in poor food eating habit among the elderly than the youth age group, fundamentally they are even left on themselves to get food, to eat whether they can or not. This means to survive on their own without family concert (World Health Organisation, 2010). More or less this elderly are left to live a life of “survival of the fittest” (Herbert Spencer, 1964).

In most recent decades, studies have proven that elderly population have the most rapid increasing trend of developing world’s population especially Africa (Seong *et al.*, 2012). The elderly populace who are mostly seen as the gemstones of any society or country are burdened, with their healthcare and other wellbeing factors relatively left to their wards with little or no government support (Govender *et al.*, 2011).

Coupled with this negativity, the continues rising trend of cost of living also have severe detrimental effect on the aged who are already neglected in the their homes or communities as they have to face the same economic impact on cost of living just like other populace without any favour or consideration. Without any taught to their age and incapability’s in life to some extent (Govender *et al.*, 2011).

Several studies (Fadupin, 2012; Sanya *et al.*, 2014) have recorded poor nutritional assessment status among the elderly persons. Similarly, earlier studies (Govender *et al.*, 2011) also identified poor nutrient and energy consumption among this same age group were lower compared to the RDAs of international standards. A well evidenced scientific study has proven beyond doubt, an indisputable strong association of unhealthy diets and chronic non-communicable disease in the elderly population (Darmon *et al.*, 2010).

Added to that, the study also established fundamentally that, the aged persons in developing worlds will be more vulnerable to health-related predicaments (Undernutrition, heart diseases, cancers, diabetes e.t.c) with very low income, inadequate food intakes, poor diet patterns than in the other part of the world (WHO, 2009; Govender *et al.*, 2011).

2.5 Dietary Pattern of the Aged

In 2013, an estimated number of 55 million thus about 70% older persons worldwide died thorough chronic non-communicable diseases; (GBD, 2015). Among the death that occurred, One-third of it was basically as a result of cardiovascular disease (CVD) (24%), Next among the list was cancer at 15% (GDB, 2015). For the time being, liberal or atherogenic diet comprising of sufficient amount of whole grains, fruits, legumes, vegetables, nuts, and fish have been found to be very effective in preventing early death and disability worldwide (Lim *et al.*, 2013). During the past 50 years, lifestyle behaviours or factors have been noticed as modifiable factors related to mortality. Eventhough, they are unclear direct biological mechanisms due to the many potential underlying diseases. Epidemiologic risk factors that can change the probability of death are important public health indicators. Studies have equally indicated the translational risk reduction into measures of life expectancy and calculated the population among the lower risk profile (no smoking, physically active, healthy dietary pattern) persons with healthy profiles

usually enjoy some life extension of about 10–15 years than those with a high-risk profile (O'Doherty *et al.*, 2016). An earlier meta-analysis study shows that whole grains, fruits and vegetables, nuts, and fish were closely related to lower risk of all the causes of morbidity and mortality (Wang *et al.*, 2014; Aune *et al.*, 2016; Mayhew *et al.*, 2016; Zhao *et al.*, 2016), whilst red meat and other factory sources of meats were directly related to chronic non-communicable diseases (Wang *et al.*, 2016). In addition to that, another recent meta-analysis has shown a high adherence to diet quality indexes such as the Healthy Eating Index and Dietary Approaches to Stop non-communicable diseases such as Hypertension were associated with a 22% decrease in the risk of all-causes of mortality (Schwingshackl & Hoffmann *et al.*, 2015).

However, evidence to support the similar associations in older people is not enough. Existing evidence highlights that adherence to recommended dietary guidelines may positively influence quality of life and functional ability in older adults (Gaskill *et al.*, 2008). Moreover, in this perspective, chronic non-communicable diseases have been suggested to dietary inconsistencies by a recommendations from local dietary guidelines may adversely influence risk in persons aged over 65 years (Darmon *et al.*, 2010; Baulderstone *et al.*, 2012).

2.5.1 Dietary and nutrient Intake Estimation

In assessing an individual's food intake, the methods used are usually two: the retrospective reporting of food intakes and the prospective recording of foods consumed. Diet History, Food Frequency and 24-hour recall make up the retrospective approach to dietary assessment while diet records and chemical analysis make up the current intakes (FAO, 2003). The 24-hourly dietary recall has been used extensively in many research works due to its dynamic importance, One of which is, it is easy and speedy to administer to a respondent, i.e it has less respondent burden.

The interviewer simply administers and fills the questionnaire for the respondent by posing the questions and eliciting responses (Seidu *et al.*, 2017). That makes it simple to be used in a densely populated area with much ease. Equally it doesn't alter the eating pattern or behaviour of the respondent because foods are usually eaten before recall period (Seidu *et al.*, 2017).

2.5.2 The Mediterranean Diet

The Mediterranean diet may play a key role in health and longevity (Trichopoulou *et al.*, 2004). Its key components have been operationalized as a dietary pattern using a 9-point score (Lagiou *et al.*, 2006). The Mediterranean dietary pattern has been associated with a decrease in overall mortality in several small studies, (Lagiou *et al.*, 2006) and in most recent times the European Prospective Investigation into Cancer and Nutrition (EPIC), a cohort study of over half a million people from 10 countries across Europe equally reveal same (Trichopoulou *et al.*, 2005).

2.5.3 Growth and Morbidity in Old People

Increasing life expectancy will see the proportion of the world's population aged over 60 years increased from 11% to 22% by 2050, whilst those aged over 80 years will increase fourfold (WHO, 2013). Increasing age corresponds with increasing prevalence of chronic disease, including cancer and cardiovascular disease (CVD), thus posing critical challenges to health systems and policies (WHO, 2013). With the increase in life expectancy, the leading causes of death have shifted from infectious diseases to non-communicable diseases and from younger to older individuals. In industrialized countries, about 75% of deaths among older persons thus 65 years and above, have been found to be attributed to cardiovascular diseases and cancers (WHO, 2002), and diet and lifestyle also influence morbidity and mortality during the course of life regardless of predisposing factors (WHO, 2002).

Because of the cumulative effect of adverse factors throughout life, it is very important for older persons to adopt a particular diet and lifestyle practices that minimize their risk of death and morbidity and maximize their prospects for healthful aging (WHO, 2002).

Dietary patterns and other modifiable lifestyle factors are associated with mortality from all causes, coronary heart disease (CHD), cardiovascular diseases (CVD), and cancer (Trichopoulou *et al.*, 2003), yet few studies have investigated the combined effect of diet and other lifestyle factors (Haveman-Nies *et al.*, 2002). Different dietary components have been suggested as important modifiable risk factors for chronic diseases, specifically for cardiovascular diseases (CVD), that are the leading causes of death in the United States and other westernized countries (WHO, 2008). Meanwhile, traditional nutritional research has primarily focused on single nutrients or food; there is currently a growing interest in dietary patterns that consider the complexity of overall diet (Zarraga *et al.*, 2006).

Two major approaches have been applied to derive dietary patterns (Hu *et al.*, 2002). The hypothesis-oriented approach based on scientific evidence or prevailing dietary recommendations, which typically use dietary indices or scores to reflect on the quality of the diet or the degree of adherence to a particular predefined diet. In a broader view, the exploratory approach using factor or cluster analysis empirically, identifies patterns that represent actual eating behaviours of the study population; typically these are 2-6 extracted patterns that reflect different dietary composition (Newby & Tucker, 2004). Recently, a number of studies have examined the impact of dietary indices on the risk of cardiovascular or total mortality. These indices were defined on the basis of general dietary recommendations or characteristics of the Mediterranean diet (Kant *et al.*, 2004; Trichopoulou *et al.*, 2004).

To some extent, studies have investigated the relation of dietary patterns that reflect existing eating habits to mortality from CVD and other major chronic diseases (Cai *et al.*, 2007), or all-causes (Bamia *et al.*, 2007; Cai *et al.*, 2007; Masala *et al.*, 2007). But majority of these studies were small and inadequately powered.

2.5.4 The role of Nutrition in preventing CVD's and other non-communicable diseases related to Ageing.

In most times, studies have shown the great impact of nutritional sciences especially in prevention of chronic non-communicable diseases such as heart diseases, stroke, and high blood pressure among other morbidities. This awareness creation was not than in isolation it includes social media platforms like televisions, radio stations, facebook, instergrams among others, organizations e.g. Ghana Health Service, Ministry of Health, Agriculture and Environmental departments and the like, industries like natural fruit juice companies, governmental agencies (Food and Drugs Authority and Ghana Standard board) were also involved (WHO,2003).

In this regards, food industries in their response to this challenge have started producing new and modified food staff and fruits juice to help in curtailing this menace (chronic non-communicable diseases).All the above mentioned cannot be said without considering the individuals genotypic nature. This is a new science of health that is emerging in the area of genotype-based nutrition. This in context try to elaborate on the relationship between food or some type of nutrient with the genetic make-up of an individual together as resultant to chronic non-communicable diseases. That is to say that only the idea of good nutrition might not hold very well in controlling, curtailing or reducing chronic non-communicable diseases without considering the individual genetic make-up (Davis & Milner *et al.*, 2004; Kaput & Rodriguez *et al.*, 2004).

This cannot be overstated without mentioning new thoughtful emerging companies that have taken upon themselves to give genotypic-nutrition based counselling on some key commonly known genotypes such as MTHFR, CYP3A4 and PPAR α . Even though they still face a test of debate by some of the public domain who still do not believe in their theories.

Follow up studies, have tried to support the genotypic based nutrition and so called it as personalised nutrition. In this defence, the theories try to give instances, by restating the fact that nutrition in infant, adolescent, adult, pregnant women and aged have always been different in terms of nutrient intake and calories. Similarly, nutrition have also been specific or different in a healthy population and in an unhealthy population (patients), where patients are being counselled and given what is known as special diet to follow for the time being. Therefore in this same perspective different individuals who are known to have different genetic make-up will have different nutrient and caloric intake (Hesketh *et al.*, 2006).

In another school of thought, even though the concept of genotypic-based nutrition was not completely disputed, a new theory was emerged called phenotypic gene expression, where interaction between genes expression and environmental factors were considered as the bases to consuming good nutrition in relation to morbidity reduction. This theory tries to add that only individuals genetic make-up is so not enough in determination of once nutrient intake and calories in relation to morbidity reduction especially among the older population. Also the added value of environmental factors are very necessary and important in achieving that goal (Kaput & Rodriguez, 2004). This in effect establishes the fact older persons or individuals dietary intake or nutrition should be prescribed or formulated based on the individuals phenotypic gene expression. All this cannot be stated without considering the senior citizens or the aged in

context since they are even seen as the most vulnerable and neglected groups in the human society as sited above.

2.5.5.1 Genotype-Dependent Effects of Nutrients in Monogenic Conditions.

Among the several examples of monogenic conditions the most known common one is the lactose intolerance. In most animals especially mammals, loss of ability to hydrolyse lactose in adulthood is common and in this age group. In many developing countries such as Northern Europe, a variant allele of the lactase gene, which results in a continue expression of lactase in adulthood, originated or came into known since 9,000 years ago (Enattah *et al.*, 2002).

Within a sampled new-borns or deliveries, specific genotype (homozygous) is expected to tally with their biological make up through a phenylalanine-reduced diet intake, this in effect will prevent the immune system from converting the available amino acids into ketone bodies leading to a process known as ketone acidosis which relatively results in brains retardation or impairs once mental development and bodily sensitivity. This as a resultant will generate many adverse outcome to the human system e.g. renal diseases thus nephritis and nephrotic syndrome, brain confusion, low body sensitivity, atherosclerosis, hypertension, diabetes, stroke and many related others (Ordovas *et al.*, 2004). This in context is a clear prove of the ideology of genotypic based nutrition. Moreover, effective management of aged chronic non-communicable disease cannot be done appropriately without adequate knowledge on the genotypic, phenotypic nutrition base sciences as a tool in curtailing and mitigating morbidity rate among the elderly.

2.5.5.2 The Pathophysiology of Nutrition- Related Diseases

In view of this subject, moving back in perspective from complex and specific causative factors of nutritional related diseases, a well-established response to morbidity through dietary interventions have been developed (Cusack *et al.*, 2003). A simple example would be the higher risk of those carrying the T allele of MTHFR for elevated levels of plasma homocysteine when intakes of folic acid are very low (Strain *et al.*, 2004). Another instance is the High Density Lipoprotein (HDL) cholesterol and the intake of PUFA in women carrying the 275A allele of APOA1 (Ordovas *et al.*, 2002).

The theory of gene expression and morbidity or diseases has proven the existence of a number of gene variants. A practical investigation using mouse strains as subjects shows that not just one a susceptible loci may be present within a particular disease condition but a reasonable number of loci (about sixty or more), this equally in a number of strains might determine body weight and adiposity. As many as ten (10) to twenty (20) might be present or available in a single or one inbred strains or type (Wuschke *et al.*, 2006).

In the worst scenario, one should possibly expect about a hundred of gene variants being direct responsible of a particular disease condition. This is to say that in relation to genetic gene variants, they should equally be anticipated as they are usually unpredictable especially in the number to expect as per a particular disease condition.

In the light of this, it usually appears that only few genotypic traits are expected to influence a disease risk. Coupled with other relevant studies, this taught have been disabused. In today study's, findings are been established on the proper link and association between dietary intake, contributory factors of chronic non-communicable diseases and genetics with major focus on genotype and phenotypic gene expression (Kaput *et al.*, 2005).

For that matter, what future research directions are needed? Future research will have to provide solid evidence on the associations between genotype, diet and disease or risk factor. Having a reasonable amount of the science population being in doubt or uncertain, further research or studies in area of genotype, phenotypic gene expressions, diet or dietary intake, chronic non-communicable diseases and their risk associated factors have to be determined using a strong type of studies or research base approach such as randomized control trial type of research where enough and ample time will be given to follow and study both the intervention group and the control group. This in effect will help to clear the existing doubts and confusion among the learned and unlearned group. Similar studies have to be conducted among the aged group just like other groups (Hinds *et al.*, 2005).

2.6 Diet Adequacy

Data are limited on the nutrient requirements of older persons that could be used as a basis for health policy.

Current studies have shown insufficient data on the nutritional requirements of the elderly population that could be used as a baseline making for policy intervention strategies. Partly, the inadequacy of reliable in-depth data may be due to the inherent difficulty of collecting dietary data. Another factor may be the presence of various cohort of older persons living in the community, homebound or institutionalized healthy frail (Johnson and Begum, 2008).

Moreover, nutritional status assessment does not really account directly for energy expenditure. Testing hypothesis in regards to adequacy of energy and nutrient intakes in the young- and oldest-old compared to the young-old emphasizes on the variation of nutrient requirements and minimal decreasing energy expenditure through ageing (Lesser *et al.*, 2008).

2.7 Unplanned Weight Loss

Unplanned Weight loss determination is something seen as a tedious thing. But yet still accurate evaluation is necessary; however since this problems are associated with increased morbidity and mortality. Patients having many medical conditions and being on many different types of drugs, various diagnoses to the unplanned weight loss can be extensive. If the patient also has cognitive impairment, the evaluation of further complications is needed. To successfully address this type of challenges, the medical expert must understand the normal physiologic happenings in body composition that occur with aging, as such, the adverse effect of Weight loss among the elderly.

2.7.1 Weight Loss with Morbidity and Mortality

Over time, Unplanned Weight Loss has showed a clear relationship with disease severity, diseases such as heart disease, lung diseases and the like. Many studies have established a significant association between 4-5 percent Weight loss in a year and 10 percent or more Weight loss within 5-10 years range or more with high rate of morbidity and mortality or both (Somes *et al.*, 2002). Similarly, Somes *et al.*, (2002) equally proves similar association between Weight loss disability, smoking, and alcohol among others more likely to result in death within a few years than expected.

Intentional and unintentional Weight loss among the aged population showed a strong association with hip fracture among others and mortality (Ensrud *et al.*, 2003). This in effect highlights the essence of weight maintains in the older persons for a better sustainable health care and long life.

2.7.2 How common is Weight Loss among the Elderly?

A number of studies have aided in estimating the prevalence of weight loss among the elderly population, unveiling a great insightful information concerning the elderly weight management; a reasonable weight maintains usually within this period among the elderly is seen so far to be between the period of five (5) to ten (10) years (Shatenstein *et al.*, 2007). Among number of studies, weight loss as defined by Ensrud *et al.*, (2003) was, 15-20 percent of a person's weight loss or weight loss of Five (5) kilograms of body weight or more or 5 percent weight loss of usual weight over a five (5) to ten (10) years period in both males and females. Weight loss was also seen among both the young and the old with medical illnesses, at In-patients Care Services (IPC), low educational level, alcohol intake, and smoking among others was common among weight loss people. This clearly proves the healthy association between chronic-non communicable diseases and weight loss among the aged Ensrud *et al.*, 2003).

In addition, other clinical studies have also estimated a percentage of 1.3-8 as incidence of Weight loss especially among individuals or adults seeking health care, this and many others in context should be considered dependent on the individual's socio-demographic location or settings (Bilbao *et al.*, 2002).

2.7.3 Causes and Mechanisms of Weight Loss

Generally, the major causes of weight loss among the elderly and the youth or the middle age group persons relatively lays within the same domain, these entails of a number of factors such as organic factors, socio-economic factors (non-medical conditions) and psychological factors. Among the organic factors are non-neoplastic, neoplastic and aged-related changes, the socio-economic factors or non-medical conditions or factors also include income, family thus the impact of once relatives, living status such as living alone or with other family, accessibility to

food, water, living condition of the environment and many others, lastly, the Psychological factors also consist of depression, dementia and anxiety disorder among others (Hernandez *et al.*, 2003). Beyond this causes, older persons with known causes of their weight loss have better prognosis than those with unknown cause.

The significance of medication to weight loss in the elderly population cannot be overstated, since most of the aged population cannot live without any medication or stimulates for personal preferences or for their chronic conditions whether prescribed by a qualified physician or not. Various schools of thought have therefore elaborated on the strength of association between weight loss and the adverse outcomes of these unprescribed medications or stimulates. Therefore the loss of fat free mass (sarcopenia) in the aged cannot be stated without considering the unprescribed drugs and other stimulates the aged consume (Payett *et al.*, 2003).

Furthermore, ageing that usually comes with chronic non-communicable diseases is coupled with conditions such as cachexia, impaired immunity among others as a resultant to morbidity in the elderly and subsequently death (Roubenoff *et al.*, 2003).

2.7.4 Maximum Clinical approach to Weight Loss

With weight loss management, the first and foremost thing to do by an individual is once willingness to identify and acknowledged its presence (weight loss). Evidence has shown that most elderly are likely to deny the fact that they have lost weight unless it is proven by measurement and proper documentation. But even if they do, it should be expected (Hernandez *et al.*, 2003). Similar studies have suggested possible options on how to still predict weight loss in the aged, if denial persists by the older person. This will therefore call for close observation of the person's clothing size, or finding out from close relatives or friends of the individual if really he or she has lost weight or not.

Any further positive answer from the close relatives, friends, or numerical estimate of the clothing size, should be enough to suggest on the true Weight lost (Hernandez *et al.*, 2003).

Another suggested approach to confirmation of Weight loss among the elderly is cautious history taking which indicates localized symptoms such as gastrointestinal tract infection with frequent defecation. These are elements that can equally prone for further investigation to confirm the possibility of weight loss (Bilbao *et al.*, 2002; Hernandez *et al.*, 2003).

Coupled with the above, for a proper weight loss management in the elderly, the following suggested approaches are advised, screening for dementia, depression and other possible causative factors that will be suggestive to individual's weight loss (Huffman *et al.*, 2002). Weight loss can also possibly be as a result tumours, muscle tissue wasting and lymphadenopathy (Bilbao *et al.*, 2002). However, diagnostic approaches such as medical history and physical assessment in Weight loss identification are yet to be evaluated properly.

Eventhough, studies have suggested the use of screening processes in Weight loss diagnosis but yet still the most appropriate non-invasive approach in determination of Weight loss is through full blood count and other keenly radiographic approaches (Hernandez *et al.*, 2003).

Equally, other symptomatic patients with intestinal tract infections, aneamia, and liver disease should be made to go through proper assessment procedures such as physical examination and ultrasound for proper diagnosis of Weight loss (Hernandez *et al.*, 2003). This would aid in arriving at an informed decision and to help clinicians identify which patient with weight loss is likely to be physical seen or observed (Bilbao *et al.*, 2002). Though different methods are being used, none of them have been validated independently in populations presenting weight loss (Bilbao *et al.*, 2002). As a baseline approach, apparent Weight loss among the elderly is evidenced by organic factors, primary malnutrition or socio-economic factor (non-medical

factor) these must be considered as possible contributory factors (Hernandez *et al.*, 2003). Clearly, older persons among all age groupings stand a higher chance of being faced with nutrient deficiency (insufficient food intake and inappropriate food selection).

2.7.5 History in determination of Weight Loss

In history taking, information about weight loss i.e. ascertaining the presence of weight loss in the client and its' intensity is to be sought first. For this will inform the care taker of the next thing to do. There should be the possibility to determine if really the patient is not hungry or feeling nausea or possibly wants to vomit after meals, if seen or observed that the patient is experiencing eating or swallowing difficulty, or possibly the patient is suffering from emotional or other social problems that are interfering with the eating behaviour or the ability to enjoy food. A number of possible factors should be considered (Bilbao *et al.*, 2002; Hernandez *et al.*, 2003). A very close relative or the caregiver is needed to help the patient understands the current nutritional status (Weight loss or underweight) and accept to work towards recovering and not to pose any difficulty or denial. If the patient's weight measurement can't be obtain over time, the caregiver may be able to suggest carefully on the possible amount of Weight the patient would have lost, based on changes of the patients clothing size.

Nutritional assessment including dietary taking should be performed to examine patient's nutritional status (underweight, overweight, normal and obese) (Amaral *et al.*, 2009).

The dietary history should entail information on food availability, the patient's use of nutritional/herbal supplements, and lastly, the adequacy of the patient's diet (amount of food consumed, frequency, type and balance of nutrients) and the total daily caloric intake (Huffman *et al.*, 2002).

The patient's nutritional assessment should include his medical and other surgical history. Patient's functional and mental status should be reviewed with the patient and family members or other caregivers. Advisedly, on the review of patients sound mental capabilities, close relatives or family members must be present. Equally, with patient's medical and surgical histories, maximum focus should be attached to the following: previous gastrointestinal conditions or stomach infections and surgeries with the interest of identifying the possibility of nutrient malabsorption, hepatic, renal diseases, and other organ failure leading to the individual Weight loss.

2.7.6 Physical Examination as determinate of Weight Loss

A physical assessment of elderly patients with unplanned weight loss is usually suggested by the information obtained during clinical history taking. Additionally, the dental health, respiration and gastrointestinal system of the patient should be examined.

Comparative effect of minimum and maximum adults or aged Weight cannot be done without key anthropometric measurements such as weight and height. Basic patient body mass index (BMI) can be determined by dividing patient's weight in kilogram by height in meters square. Higher nutritional status or BMI status thus mostly in the overweight and obese category has been associated with high risk of mortality and other chronic non- communicable diseases (hypertension, diabetes, renal disease, coronary heart disease, stroke e.t.c.) in older people (Chapman *et al.*, 2010; Miller *et al.*, 2012). Suggested possible remedies like the intake of a healthy diet (liberal diet) or atherogenic diet thus diet low saturated fat and cholesterol but high in unsaturated fat, will reduce if not eliminate totally the risk of chronic non- communicable disease that will lead to morbidity and mortality (Darmon *et al.*, 2010; Baulderstone *et al.*, 2012).

Compared weight measurement to standards is usually used than Body mass index (BMI) due to the difficulty in determine the height of some the elderly patients, especially those that are bedridden or bounded on a wheelchair.

2.7.7 Nutritional status among the Elderly in Nursing Homes

Follow-up studies on socio-economic and health factors among individuals residents at home care facilities or nursing home has disclosed a high level of nutritional problems among the residents especially those who have been resident for two years and above (Seong *et al.*, 2012). Coupled with that, the studies have shown a very high rate of malnutrition among the elderly who were resident than those outside the nursing home or at their personal homes. It was also observed that interaction with the caregivers and the dietary staffs of the facility are crucial to understanding the patient's problems (Seong *et al.*, 2012).

The fact still remains that, since most of this nursing homes or facility usually have low staffing rate or inconsistent staffing levels, it is obvious that patient's meal time may be affected, as staff working at this places uses time. The eating time of the patients are regulated by way of specific set meal time. The serving staffs are sometimes pressured to meet this timelines making it difficult to have ample time in feeding the patients. This therefore means that, the amount of calories a patient is supposed to consume per meal time will be compromised; therefore Creative strategies are often required when weight loss is due to environmental conditions. One of the advised strategies is for the patient to be put in a quiet room to be well taken care - off by extending his or her meal timing. Again, family members can also be called to render assistance to their clients, as studies shows that, many relatives or caretakers are sometimes more successful than nursing assistants in encouraging a patient to eat (Seong *et al.*, 2012).

2.7.8 Approaches to Unplanned Weight Loss management

By weight management protocol, the first line of treatment is to sequentially identify and treat root causes of the unplanned Weight loss. As part of the treatment protocols the usage of non-pharmacological approaches such as nutrition (food intake) is necessary to the quick recovery of the unplanned Weight loss. Contributory factors such as poverty, poor oral dentition, vision or hearing loss, difficulty in chewing or swallowing, arthritis, and stress are associated with poor diet quality. Another co-existing factor such as Isolation and other unjoyful moments have also been found to trigger poor diet eating quality or lack of appetite and this together with other relevant ones should therefore be on a watch out. It is therefore very important to bring other experts on board such as dietician/nutritionist and keen social support facilities or workers to assist in curtailing and management of the situation especially in cases where organic causes have been diagnosed. On the part of the patient's mobility and physical activities a physiotherapist may assist in that direction so as to prevent other occurring adverse situations. This in a way will also help in the appetite stimulation of the patient (Borst *et al.*, 2004).

Studies have also found Oral nutrition supplements such as high energy drinks, medical supplements among others to be effective in Weight loss recovering alongside adequate food intake (Payette et al, 2002)

Therefore counselling Weight lost patients to take oral nutrient supplements (ONS) should be done carefully, they must be made to understand that (ONS) is an added supplements to their normal or usual food intake instead of ONS as a complete replacement for their food nutrient intake, this is vital for a quick Weight loss recovering as a means of gaining reasonable weight as confirmed by studies (Payette *et al.*, 2002; Amaral *et al.*, 2007).

Usually consumption of oral nutrient supplements (ONS) in between meals times has shown to be helpful among older patients than taking the same (ONS) after eating once normal meal or before the meal time (Wilson *et al.*, 2002). Eventhough, added supplements have shown a strong relationship with short-period weight gain with an improved anthropometrics, biochemical, quality life and health, other key life enhancement parameters, and extended life span. Other thoughts like the ability to function and survival in undernourished elderly people are yet to be consistently established. A recent review has indicated a lower risk of morbidity and mortality among the aged who consumed extra protein energy supplements than those who did not. (Milne *et al.*, 2002).Among such studies, were those who were seen consuming little food while expecting to meet their daily nutrient requirements, of which failure and poor nutritional status was recorded among those subjects (Wendland *et al.*, 2003).

2.9.9 Feeding Tubes among Weight Lost elderly

Rarely, will one see a case of weight lost among the elderly where losing weight have become very severe to the extent that the patient has not been able to eat, until the usage of gastronomic feeding tubes is deployed. This in effect must be done with patient consent to help in the feeding processes.

Different studies on the area of dietary pattern and mortality of the aged have been carried out because of the vulnerability of this group of people. In addition to that, because of the rising trend of morbidity and mortality among this groups the studies tries to establish the relationship between their cumulative dietary intake over an extended period with their morbidity and death (Knoops *et al.*, 2004).

A number of studies and trials have proven an association between individual's dietary intake and mortality. A continues Prolonged usual dietary intake meal times though have not shown a stronger association with death but a little association was still seen, which clearly suggest the negative impact of usual prolonged meal dietary timing. This shows that, the aggregative effect of prolonged food intake time over an extended period of time, the higher the chance of death. (Knoops *et al.*, 2004).

CHAPTER THREE

MATERIALS AND METHODS

This chapter highlights on materials and methods used, these include; the study design, study area, population, setting, method of data collection and procedures, Statistical analysis of data and ethical considerations.

3.1 Study Design

The design adopted for this study was descriptive cross-sectional study

3.2 Study Area

This study was conducted in Damongo the district capital of the West Gonja District in Northern part of Ghana. West Gonja District is one oldest district capital of the 26 districts in the Northern Region, North Gonja district board the district to the North. Further south, the District shares boundaries with Central Gonja and to the West by Bole and Sawla Tuna Kalba Districts. A greater part of the land area is occupied by the game reserve (Mole National Park) with few communities and camps. West Gonja also has a number of mineral deposits yet to be exploited. Chief among them is barite deposits. The District capital, Damongo, is approximately 129 km west of Tamale (WGDA, 2015).

3.2.1 Population

For the year 2016, the estimated population of the district was 48,886, according to projections from the 2010 population and housing census. The district populaces usually settle in few accessible areas which make those areas densely populated/concentrated or clustered; the age structure is similar to that of a developing country with 50% plus between 15-60 years.

Coupled with this the district has the age–sex structure like that of the National/Regional patterns. (Ghana Statistical Service, 2010).

3.2.2 Administrative Areas

There are three (3) Area/Town councils and 12 electoral areas which correspond to CHPS zones. The three area/town councils are; Busunu Area Council, Damongo Town Council and Larabanga Area Council

3.2.3 Health Facilities

The district has twenty six healthcare facilities including one district hospital. Apart from West Gonja Hospital and SAGISS Health Centre which are managed by CHAG, all the remaining 24 health care facility are managed by Ghana Health Service.

3.2.4 Ethnicity

The district is made up of 22 ethnic groups. Majority among them include Gonja, Hanga, Dagomba, Camara, Mamprusi and Dagarbas group. The kokombas who used to be the majority ethnic group in the district left since 1994 and never return. The lack/inadequate ethnic homogeneity tend to hinder socio-cultural organizations and developmental issues. However, inter-tribal marriages, peaceful co-existence and harmony still exist among the district populace in diverse ways.

3.2.5 Economy

Farming (agriculture) is the major occupation in the West Gonja District, accounting for over 60% of the district labor force. Except for retailing and trading services, males are the dominate gender in most of the occupations in the district, as custom and tradition preserve most jobs as male type of jobs but not females.

The main agriculture crops cultivated are maize, sorghum, groundnuts, cassava, yam, beans and soya beans. Gari and sheabutter processing are major commercial activities for the women. Cattle, sheep, goat, pig and guinea fowl rearing is also carried out in the district. There are three (3) main markets in the district located at Busunu, Damongo and Kotito No. 2. Fridays are the market days for Busunu and Kotito No. 2. Damongo has a daily market but the main market day for the district is every Saturday.

3.3 Sample Size

In determining the sample size, the Snedecor and Cochran, (1989) formula was used;

$$N = \frac{z^2 (pq)}{e^2}$$

Where; N = required sample size

Z = coefficient of reliability associated with 95% level of significance (1.96)

P = the proportion of people with the condition of interest (50% or 0.5)

q = the proportion of the population without the condition of interest (1-p = 0.5)

e = margin of error or degree of precision (5% or 0.05)

Therefore; $N = \frac{1.96^2 (0.5 \times 0.5)}{0.05^2}$

$$0.05^2$$

$$N = 384$$

Hence Sample size of 384 respondents (65 years and above) were considered and served as the target population.

3.4 Instrument and data collection

Trained interviewers were deployed and administered semi-structured questionnaires to respondents. These were used to collect information on socio demography, physical and social activities, anthropometry including previous weight in the last 3-6 months and the current weight as at the time of the interview were taken, dietary habits or history, food security, medical history and other health concerns.

Anthropometry measurements were taken at the participant's home and it was done simultaneously with questionnaire administration.

Tools such as weighing scale, pencils, erasers, stadiometer, and non-extensible tape measure were deployed in assessing and collecting the information

3.4.1 Data collection Procedures

Data collection was undertaken by trained staff of Ghana Health Service. Intra-researcher reliability was achieved through prior training on all data collection tools including repeated assessments of measurements to ensure consistency. Face to face interview using structured questionnaire was deployed to collect data. The questionnaire was administered by the trained health staff that completed it on behalf of participants. Questions were asked in the local dialect.

3.4.2 Pre-Testing of Questionnaire

Pre-testing of questionnaire was done prior to the actual data collecting exercise in Hangaline community of the district to ensure clarity, uniformity and common understanding of the questions by field staff and to avoid errors and ambiguity.

3.5 Sampling Techniques

3.5.1 Cluster sampling technique:

The West Gonja Sub-districts were put into five clusters as Damongo sub-district, Canteen sub-district, Busunu sub-district, Larabanga sub-district and DASS sub-district.

3.5.2 Random sampling technique:

Five (5) communities each were randomly selected from the five (5) main sub-districts giving a total of Twenty Five (25) different areas or communities.

3.5.3 Questionnaire per each sub-district

The sample size (384) was proportionately distributed among the five sub-districts based on the total population of each sub-district using the formula;

$$n = \frac{Spop.}{Tpop.} \times N$$

Where n= number of questionnaires for each sub-district

Spop. = each sub-district's total population

Tpop. = the total population for the five (5) sub-districts (49,348) as the 2017 West Gonja District Population.

N= the sample size (384)

- Damongo respondents = $8,102/49,348 \times 384 = 63$ questionnaires
- Busunu respondents = $11,547/49,348 \times 384 = 90$ questionnaires
- DASS respondents = $11,591/49,348 \times 384 = 90$ questionnaires
- Larabanga respondents = $7,877/49,348 \times 384 = 61$ questionnaires
- Canteen respondents = $10,231/49,348 \times 384 = 80$ questionnaires

3.5.4 Purposive sampling technique:

Based on facility level EPI registers on households, households in the district/sub-district that have older persons were considered, key informants were identified (community health volunteers). The key informants assisted in the selection of the houses that have the older persons by way of random sampling.

3.5.5 Snow ball sampling technique:

The key informants helped to identify the respondents and those respondents also assisted in getting other respondents. This continued until the sample size of 384 respondents was realized.

3.6 Questionnaire Administration:

Open and close ended questions type were the questionnaire that was administered to the 384 respondents which gave information on the nutritional status and other variables of the aged.

3.7 Anthropometry

In this study just like other related studies, anthropometric measurements was used to establish the difference between proper growth and failure among the respondents as healthy or malnourished, measurements such as weight, height, and mid upper arm circumferences in relation to the respondents age and sex were determined and considered (UNICEF, 2012).

Field officers took respondents measurements with them wearing lightweight clothing after the interview. Measurement of height was taken with stadiometer with participants standing upright, and the figures were recorded to the nearest 0.1cm. Weight among the respondents were equally measured on a separate calibrated digital scale, and was recorded to the nearest 0.1kg. Waist and Hip circumferences were measured using a non-extensible tape measure with participants wearing light clothing's. Coupled with the above, Waist circumference (WC) was measured at the navel region and recorded to the nearest 0.1cm while in the case of Hip circumference (HC),

measurement was done at the trochanter level and recorded to the nearest 0.1cm. Waist to hip ratio (WHR) was then calculated by dividing Waist circumference (WC) over Height Circumference (HC) thus WC/HC.

Data collected on the respondents were also compared and defined using the WHO cut-off for WHR and HC as > 0.85 and $> 88\text{cm}$ respectively for Females and > 0.90 and 102cm

3.8 Dietary Record

Dietary and nutrient intakes were also assessed using 24-hourly recall tables. Foods eaten in the last 24-hours to the time of the interview were recalled and quantities estimated in portion sizes. The estimated portion sizes or amounts were later converted into actual nutrients consumed with the aid of the nutrient analysis template, while further analysis was carried out with SPSS. Institute of Medicine and National Institute of Health Recommended Daily Allowance (RDA) of each nutrient was determined and used to compare with the respondents intake to make deductions.

3.8.1 Multiple 24-hour recalls or multiple days of diet records:

A three (3) day dietary recall of the respondents was collected and recorded; this was then used in the estimation of the respondent's usual intake.

Thus, if enough days are collected on each individual, this could be an appropriate measure to use for research in which the individual's usual intake is the unit of interest.

All interviews were conducted in-person and by trained personnel.

Older persons selected were also in accordance with the WHO definition of "older person" (WHO, 2001),

3.9a Inclusion

Older persons aged 65 years and above that have consented to participate in the research were considered.

3.9b Exclusion

Excluded in this study were:

1. Older people below 65 years.
2. Older persons whose family refuse to give consent
3. Older people with physical deformities because of the difficulty in assessing their anthropometric measurements
4. Other older people with other health complications (Those with mental impairment because of their inability to understand and answer questions)
5. Older persons at the In-patients care

3.9 Statistical Analysis

Nutrients analysis software template was first used to aggregate and extract specific/actual amounts of nutrients consumed by the respondents, while Statistical Package for Social Sciences (SPSS) computer software version 23 was used to analyse the data. Quantitative and qualitative data were described using frequencies, percentages, and graphs generated by the SPSS software. A p-value <0.05 was used to test for significance and association in the data, chi-square was used to establish relationship between categorical variables while means were compared in the case of continuous variables.

3.9.1 Assessing the BMI of aged

The weights and heights of the aged in the various selected sub-districts were measured and recorded. The BMI= weight (kg)/height (m²) of each respondent was calculated using the BMI computer calculator software formula, this was done by inputting age, height and weight variables of respondents into the software. The World Health Organizations BMI for Age chart was then used to classify respondents into underweight, normal, overweight and obese.

3.9.2 Determining the Mineral Intakes of Respondents

Microsoft Excel (Nutrients analysis template) and SPSS computer software version 23 were used to compute for the amount of nutrient in the meal(s) of respondents. Daily nutrient intake was then categorized based on the average of the three (3) different daily intakes as low intake, recommended daily allowance (RDA's), tolerable upper level (ULs) and higher intake (A. Catharine et al,2011).

3.10 Ethical Considerations

An introductory letter was sent to District Assembly and Districts Health Directorate for permission to be granted to carry out the study. An informed consent was done and agreement was by both respondents and the investigators conducting the interview. The study was reviewed and approved by Dr. Anthony Edusei (Supervisor) and the Committee of Human Research Publication and Ethics (CHRPE) of the School of Medical Science dated 10th April,2016 for a period of one year (Ref: CHRPE/RC/156/16).

CHAPTER FOUR

RESULTS

This chapter presents the results obtained from the statistical analysis of data collected from field, displayed in charts and tables, Chi-square test was also used to compare all categorical variables and means were compared for continuous variables.

4.1 Distribution of Socio-demographic Characteristics of respondents

The study was conducted in West Gonja District of Northern Region among 384 aged with 161(41.9%) being males and 223(58.1%) as females. Of that, 63 respondents come from Damongo sub-District. 29 (7.6%) and 34 (8.9%) were males and females respectively. The 90 respondents from Busunu comprised of 40(10.4%) males and 50 (13%) for females, whilst from DASS the respondents were made up of 38(9.9%) males and 52(13.5%) females. From Larabanga, 21(5.5%) males and 40(10.4%) females were studied, whilst from Canteen, 33(8.6%) males and 47(12.2%) females were studied respectively (Table 4.1).

Majority (72.4%) of the respondents were Gonjas, followed by Camara (18.8%), Hanga (5.2%), and Dagari (0.3%). The rest (3.4%) belonged to the other different ethnic groups (Table 4.1).

The ages of the respondents were grouped as 65-74 (Young Old), 75-84 (Old), 85-99 (Oldest Old) and 100+ (Centenarians). With Damongo having 9.4% respondents within 65-74years 5.2% within 75-84years 1.6% within 85-99years and 0.3% 100years and above. Busunu had 8.9% within 65-69years, 11.2% within 75-84 years, and 3.4% within 85-99years. From DASS, (13.0%) respondents were within 65-74years, 8.1% within 75-84 age groups, 1.8% within 85-99 age group and 0.5% were within 100+ age group and above. Larabanga had 9.1% of it respondents within 65-74 age group, 4.4% within 75-84 age group, 1.6% for 85-99 age group

whilst 100+ were 0.8%. In Canteen 13.5% respondents were within 65-74 age group, 4.9% in 75-84 age group, 1.8% in 85-99 age group whilst 0.5% within 100+ age group (Table 4.1).

Damongo recorded 52(13.5%) of its respondents not having any formal education, 6(1.6%) had only primary level education, 1(0.3%) JHS, 4 (1.0%) tertiary level. Busunu recorded 82(21.4%) no formal education, 6(1.6%) primary education, 1(0.3%) JHS education and 1(0.3%) tertiary level education, DASS recorded 75(19.5%) as none educated, 9(2.3%) primary education, 2(0.5%) JHS and 4 (1.0%) tertiary level education. Canteen recorded 69(18.0%) none formal education, 8(2.1%) primary level, 1(0.3%) JHS, whilst 2(0.50) attained tertiary level education (Table 4.1).

The occupations of the respondents were grouped as farming, teaching, trading, no work and others. From Damongo 20(5.2%) were farmers, 4(1.0%) teachers, 17(4.4%) traders and 22(5.7%) as not working at all. Busunu recorded 56(14.6%) farmers, 1(0.3%) teachers, 22(5.7%) traders and 11(2.9%) not doing any work. DASS recorded 34(8.9%) farmers, 6(1.6%) teachers, 22(5.7%) traders and 28(7.3%) not working. Larabanga recorded 25(6.5%) farmers, 5(1.3%) teachers, 13(3.4%) traders, 18(4.7%) not doing any form of work and 3(3.8%) as those involved in other forms of work whilst Canteen recorded 35(9.1%) farmers, 1(0.3%) teachers, 15(3.9%) traders, 26(6.8%) not working and 3(0.8%) involved in other works (Table 4.1)

Table 4.1 Distribution of the Socio-demographic Characteristics of Respondent

Variable	Damongo (n=63)	Busunu (n=90)	DASS (n=90)	Larabanga (n=61)	Canteen (n=80)	Totals
<u>Sex;</u>						
Males	29(7.6%)	40(10.4%)	38(9.9%)	21(5.5%)	33(8.6%)	161(41.9%)
Females	34(8.9%)	50(13.0%)	52(13.5%)	40(10.4%)	47(12.2%)	223(58.1%)
<u>Age;</u>						
65-74	36(57.1%)	34(37.8%)	50(55.6%)	35(57.4%)	52(65.0%)	207(53.9%)
75-84	20(31.7%)	43(47.8%)	31(34.5%)	17(27.9%)	19(23.8%)	130(33.9%)
85-99	6(9.5%)	13(14.5%)	7(7.8%)	6(9.8%)	7(8.8%)	39(10.2%)
100+	1(1.6%)	0(0.0%)	2(2.2%)	3(4.9%)	2(2.5%)	8(2.1%)
<u>Education;</u>						
None	52(82.5%)	82(91.1%)	75(83.3%)	45(73.8%)	69(86.3%)	323(84.1%)
Primary	6(9.5%)	6(6.7%)	9(10.0%)	6(9.8%)	8(10.0%)	35(9.1%)
JHS	1(1.6%)	1(1.1%)	2(2.2%)	4(6.6%)	1(1.3%)	9(2.3%)
SHS	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Tertiary	4(6.3%)	1(1.1%)	4(4.5%)	6(9.8%)	2(2.5%)	17(4.4%)
<u>Ethnicity;</u>						
Gonja	55(87.3%)	89(98.9%)	81(90.0%)	8(13.1%)	45(56.3%)	278(72.4%)
Hanga	8(12.7%)	1(1.1%)	8(8.9%)	1(1.6%)	2(2.5%)	20(5.2%)
Camara	0(0.0%)	0(0.0%)	0(0.0%)	49(80.3%)	23(28.8%)	72(18.8%)
Dagar	0(0.0%)	1(1.1%)	1(1.1%)	0(0.0%)	0(0.0%)	1(0.3%)
Others	0(0.0%)	0(0.0%)	0(0.0%)	3(4.9%)	10(12.5%)	13(3.4%)
<u>Occupation;</u>						
Farmer	20(31.7%)	56(62.2%)	34(37.8%)	25(41.0%)	35(43.8%)	170(44.3%)
Teacher	4(6.3%)	1(1.1%)	6(6.7%)	5(8.2%)	1(1.3%)	17(4.4%)
Trader	17(27.0%)	22(24.5%)	22(24.5%)	13(21.3%)	15(18.8%)	89(23.2%)
No work	22(34.9%)	11(12.2%)	28(31.1%)	18(29.5%)	26(32.5%)	105(27.3%)
Others	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	3(3.8%)	3(0.8%)

4.1.1 Living Condition

Respondents were asked whether they live alone or with their family and as shown in (Figure 4.1), majority live with family members across board.

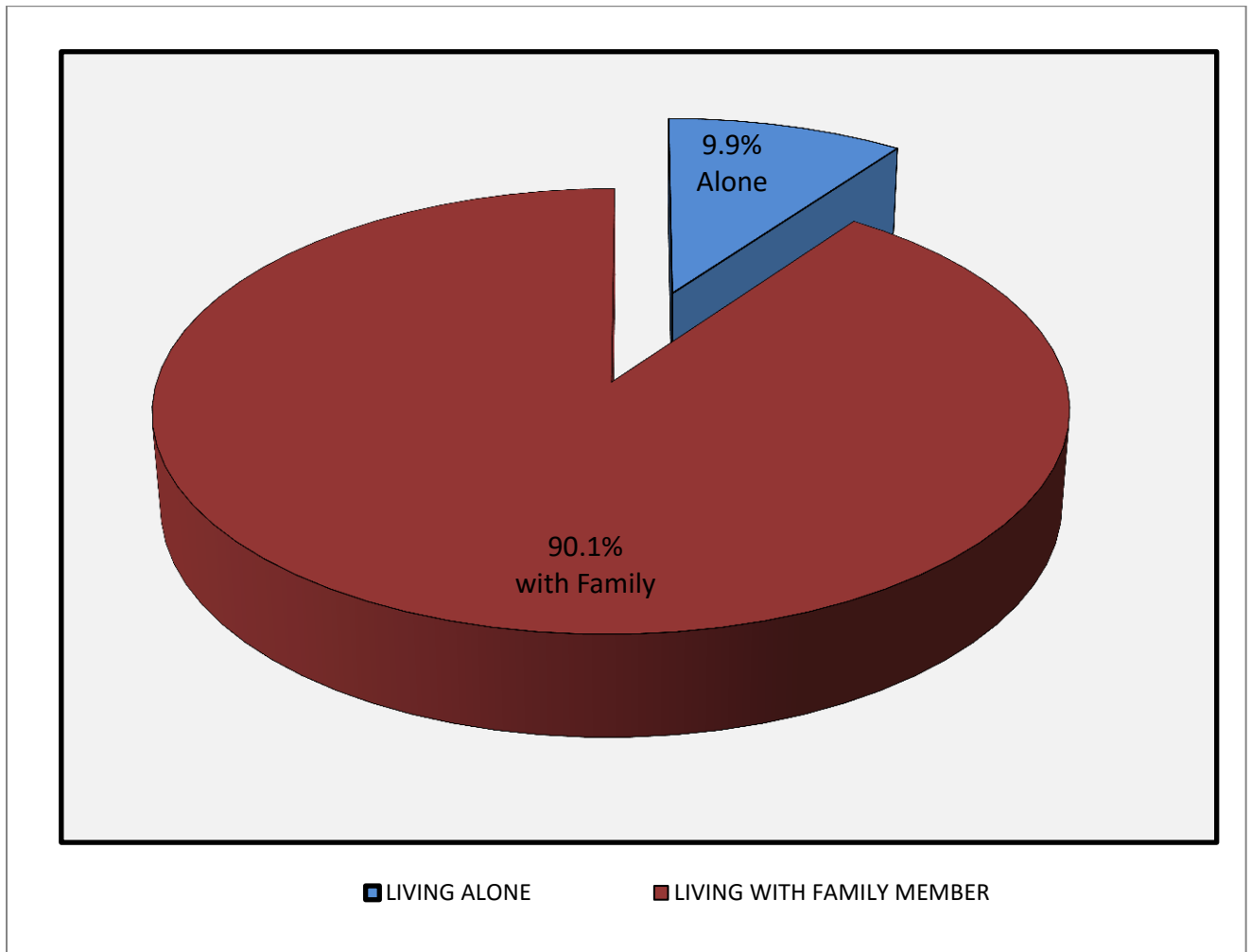


Figure 4.1 Living conditions of Participants

4.1.2 Morbidity

Twenty (20.6%) of the respondents had high blood pressure while 15.1% had coronary heart disease, Diabetes (6.3%), Depression (8.9%), Vision difficulty (8.3%), and lastly was Stroke (10.6%) were observed and recorded. Majority (25.0%) had other medical conditions whilst five (5.2%) of the respondents had none of above (Figure 4.2).

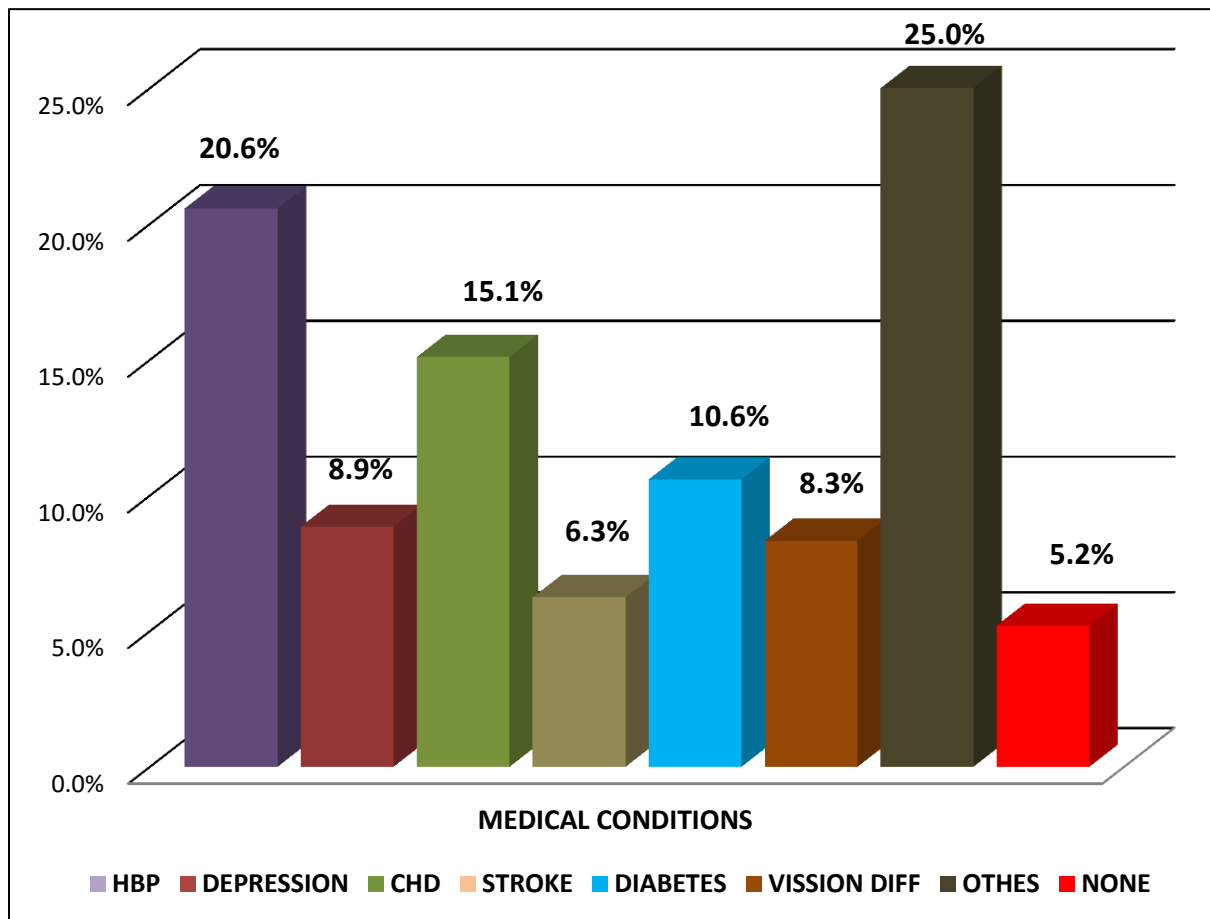


Figure 4.2.Morbidity among Participants

4.3 Nutritional Status of Respondents

Majority 56.3% were within the normal weight, greater proportion (43.8%) were malnourished. Among those who were malnourished, 27.9% were underweight, 8.6% were overweight and 7.3% were Obese. This therefore makes the population of participant's among overweight and obese as 15.9%. (Figure 4.3)

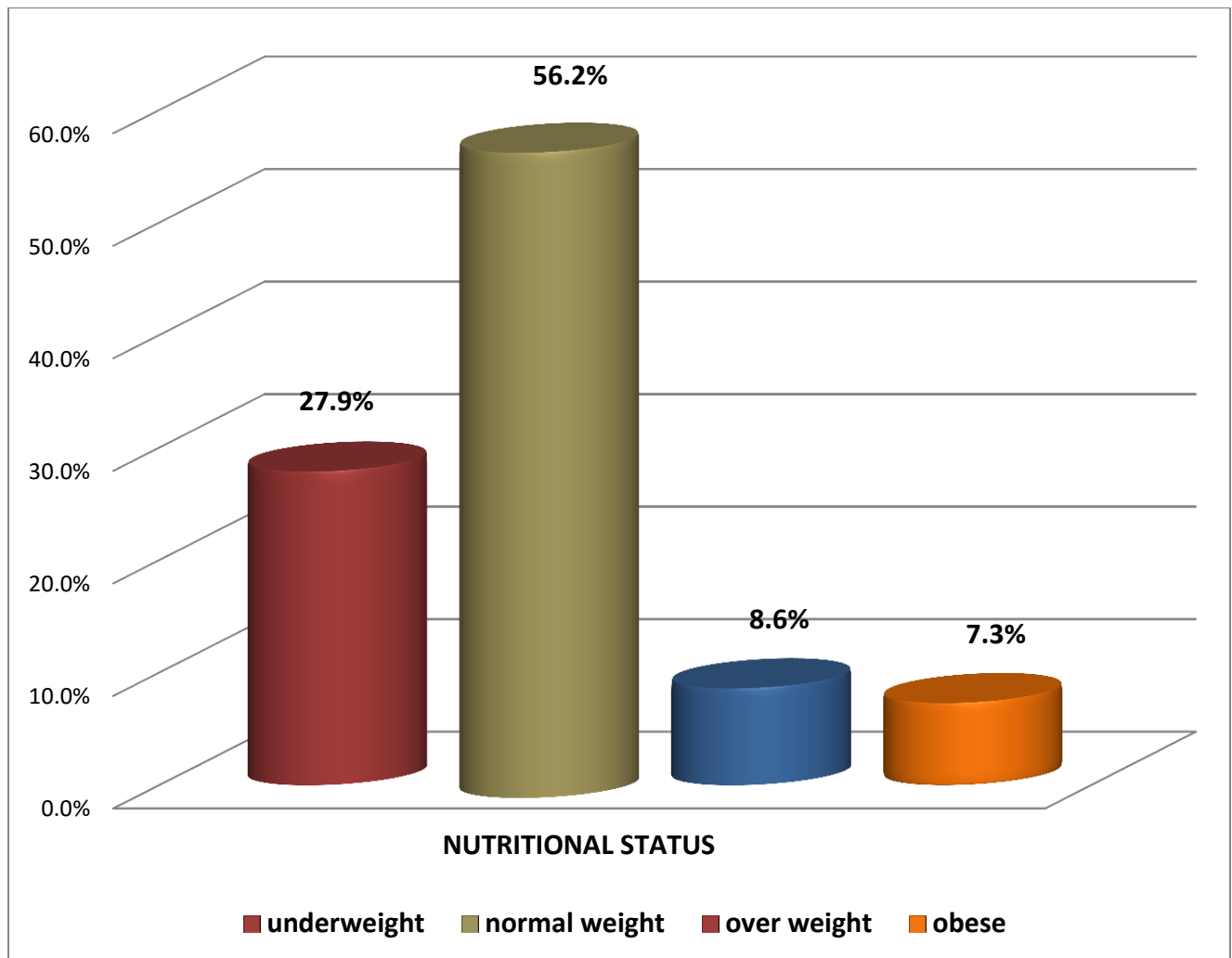


Figure 4.3 Nutritional Status among Participants

4.4 Assessment of Dietary Pattern and Nutrient Adequacy

4.4.1 Dietary Pattern

The dietary pattern of respondents was classified as the number of times/day participants had meals (once, 2 times, 3 times and 4 times) and snacks (once, 2 times and 3 times) per day. Majority (79.9%) of respondents ate at least three meals in a day, 15% consumed at least two meals per day whilst only 2.9% ate just a meal per day. With regards to snack, 68.5% consumed a snack per day, 23.7% two snacks per day whilst only 7.8% ate three snacks per day (Table 4.2).

Table 4.2 Dietary Pattern and Nutrient Adequacy

	Damongo	Busunu	DASS	Larabanga	Canteen	Total
Variable	(n=63)	(n=90)	(n=90)	(n=61)	(n=80)	(n=384)
<u>Meals</u>						
Once	1(1.6%)	2(2.2%)	3(3.3%)	4(6.6%)	1(1.3%)	11(2.9%)
2 times	7(11.1%)	16(18.0%)	10(11.1%)	13(21.3%)	12(15.0%)	58(15.1%)
3 times	53(84.1%)	71(79.0%)	75(83.3%)	43(70.5%)	65(81.2%)	307(79.9%)
4 times	2(3.1%)	1(1.0%)	2(2.2%)	1(1.6%)	2(2.5%)	8(2.1%)
<u>Snack</u>						
Once	47(74.6%)	57(63.3%)	67(74.4%)	34(55.7%)	58(72.5%)	263(68.5%)
2 times	13(20.6%)	21(23.3%)	18(20.0%)	20(32.7%)	19(23.8%)	91(23.7%)
3 times	3(4.8%)	12(13.3%)	5(5.6%)	7(11.6%)	3(3.8%)	30(7.8%)

4.4.2 Association between Meal Frequency and BMI Status

All (100%) overweight participants consumed three (3) meals per day whereas 92% of the obese participants consumed three (3) meals per day. Less proportion of underweight and normal participants consumed three (3) meals a day. A quarter (25%) and 14% of underweight and normal participants consumed three (3) meals a day. A quarter (25%) and 14% of underweight and normal participants respectively ate twice a day.

A chi-square test showed a significant association between meals frequency and BMI status (Table 4.3).

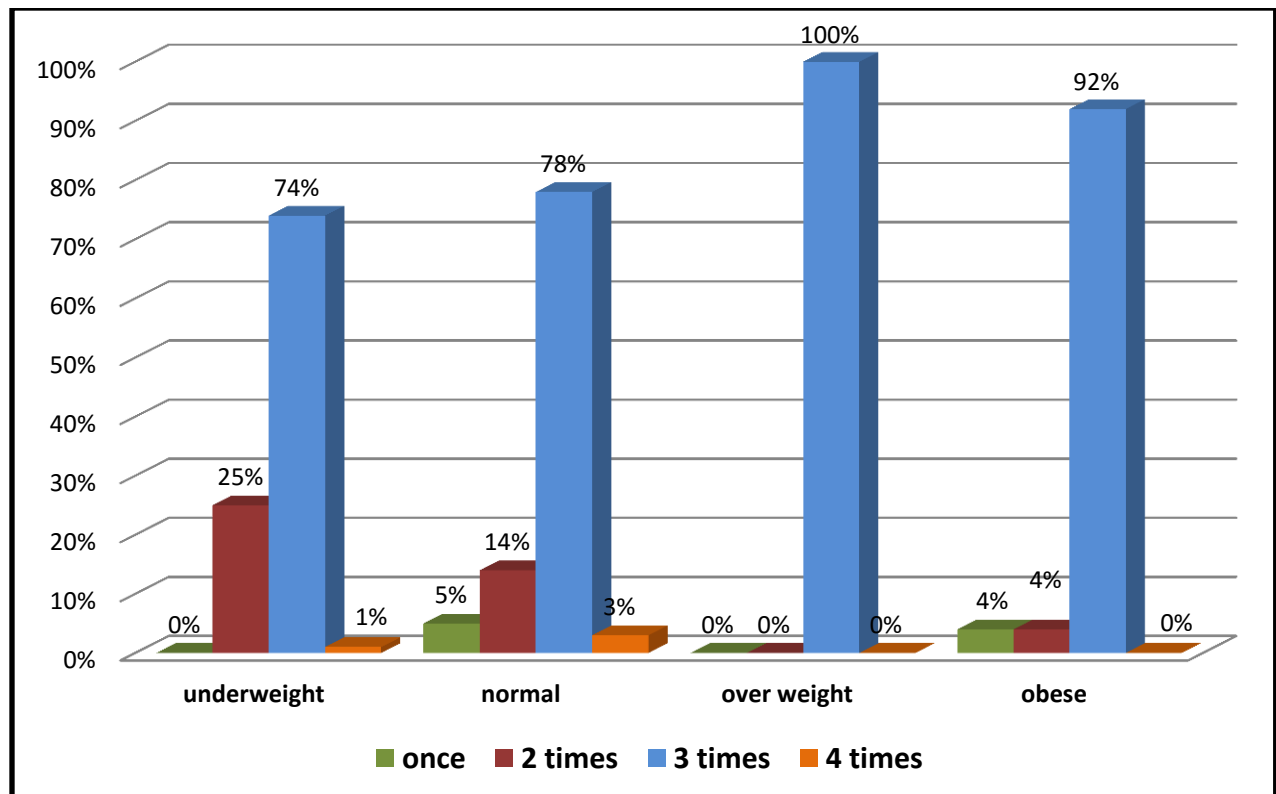


Figure 4.4 Meal Frequencies and BMI Status

Table 4.3 Chi-Square Tests for Meal Frequency and BMI Status

	χ^2	df	p-value
Pearson Chi-Square	27.499 ^a	9	.001
Likelihood Ratio	37.105	9	.000
Linear-by-Linear Association	4.368	1	.037
N of Valid Cases	384		

4.5 Nutrient Intake

4.5.1 Macro and Micro Nutrient Intake among Participants

Table 4.5 shows proportion of participants who met the RDA for various nutrients and those below or above RDAs. With regards to sodium intake, majority (34.9%) of respondents were within the ULs, followed by low intake (30%), 19% consume in higher quantity whilst only 8.1% meets the RDAs. With regards to iron intake, only 2.9% meets the RDAs, 29.7% were within ULs, 19% within the higher intake whilst majority (48.4%) fall within the low intake for iron. Surprisingly with regards to calcium intake, all respondents (100%) fall within the low intakes (Table 4.5). For carbohydrates, majority (78.4%) consumed amounts above the RDAs. For total fat, low intake was recorded among the greater proportion (80.5%) of respondents, followed by high intake (11.7%) while 7.8% met their RDAs for total fat, With regards to protein intake majority (78.1%) were within the low intake whilst only 3.9% were within the RDAs and 18% within the high intake.

Table 4.4 Nutrient Intake of the Respondents

Variable(n=384)	Low intake	RDA's	ULs	High intake
Sodium				
Damongo	31(8.1%)	5(1.3%)	21(5.5%)	6(1.6%)
Busunu	27(7.0%)	5(1.3%)	42(10.9%)	16(4.2%)
DAAS	35(9.1%)	7(1.8%)	34(8.9%)	14(3.6%)
Larabanga	24(6.3%)	9(2.3%)	15(3.9%)	13(3.4%)
Canteen	29(7.6%)	5(1.3%)	22(5.7%)	24(6.3%)
General	146(30.0%)	31(8.1%)	134(34.9%)	73(19.0%)
Iron				
Damongo	43(11.2%)	*	16(4.2%)	4(1.0%)
Busunu	10(2.6%)	9(2.3%)	30(7.8%)	41(10.7%)
DAAS	49(12.8%)	2(0.5%)	24(6.3%)	15(3.9%)
Larabanga	41(10.7%)	*	16(4.2%)	4(1.0%)
Canteen	43(11.2%)	*	28(7.3%)	9(2.3%)
General	186(48.4%)	11(2.9%)	114(29.7%)	73(19.0%)
Calcium				
Damongo	63(16.4%)	*	*	*
Busunu	90(23.4%)	*	*	*
DAAS	90(23.4%)	*	*	*
Larabanga	61(15.9%)	*	*	*
Canteen	80(20.8%)	*	*	*
General	382(99.5%)	*	*	*
Protein				
Damongo	55(14.3%)	2(0.5%)	*	6(1.6%)
Busunu	71(18.5%)	1(0.3%)	*	18(4.7%)
DAAS	73(19.0%)	3(0.8%)	*	14(3.6%)
Larabanga	48(12.5%)	3(0.8%)	*	10(2.6%)
Canteen	53(13.8%)	6(1.6%)	*	21(5.5%)
General	300(78.1)	15(3.9%)	*	69(18.0%)
Carbohydrate				
Damongo	9(2.3%)	1(0.3%)	*	53(13.8%)
Busunu	24(6.3%)	11(2.9%)	*	55(14.3%)
DAAS	13(3.4%)	5(1.3%)	*	72(18.8%)
Larabanga	8(2.1%)	4(1.0%)	*	49(12.8%)
Canteen	7(1.8%)	1(0.3%)	*	72(18.8%)
General	61(15.9%)	22(5.7%)	*	301(78.4%)
Total fat				
Damongo	52(13.5%)	5(1.3%)	*	6(1.6%)
Busunu	75(19.5%)	5(1.3%)	*	8(2.1%)
DAAS	75(19.5%)	7(1.8%)	*	8(2.1%)
Larabanga	46(12.0%)	6(1.6%)	*	9(2.3%)
Canteen	61(15.9%)	7(1.8%)	*	12(3.1%)
General	309(80.5%)	30(7.8%)	*	45(11.7%)
Water intake				
Damongo	*	*	*	63(16.4%)
Busunu	*	*	*	90(23.4%)
DAAS	*	*	*	90(23.4%)
Larabanga	*	*	*	61(15.9%)
Canteen	*	*	*	80(20.8%)
General	*	*	*	384(100%)

4.5.2 Association between Nutrient Intake and BMI

With regards to protein intake, 75% of the underweight were within the low intake, 85% low intake among the normal weight, 52% among the overweight were within the low intake and 71% among the obese were within the low intake for protein whilst very few in all categories meets the RDAs for protein, implying that those with low protein intake were more likely to be underweight (Figure 4.5).

Carbohydrate intake in all categories recorded a high intake. With the highest intake (85%) being among the Overweight (Figure 4.6).

Even though total fat intake reordered was low across all the categories but was still a bit high among the overweight and obese than the normal and underweight group (Figure 4.7). A significant association was also observed between nutritional status and all the macronutrients. Protein ($p=0.000$), Carbohydrate ($p=0.024$) and Total Fat ($p=0.000$) (Table 4.4).

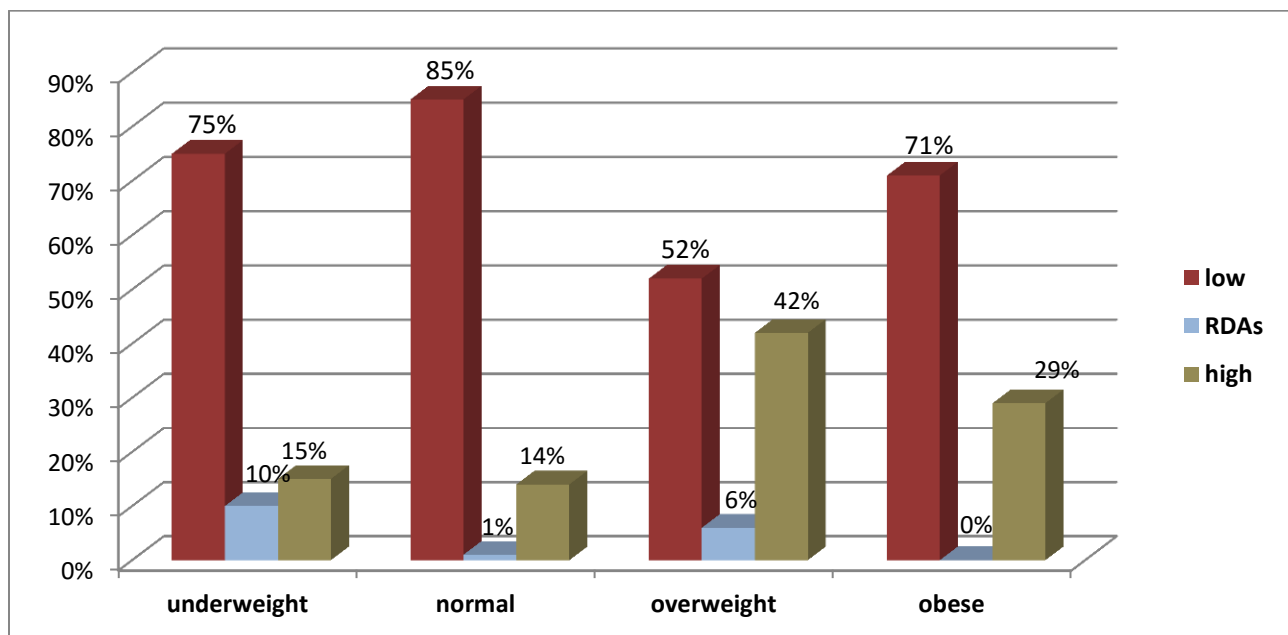


Figure 4.5 Protein Intakes and Nutritional Status

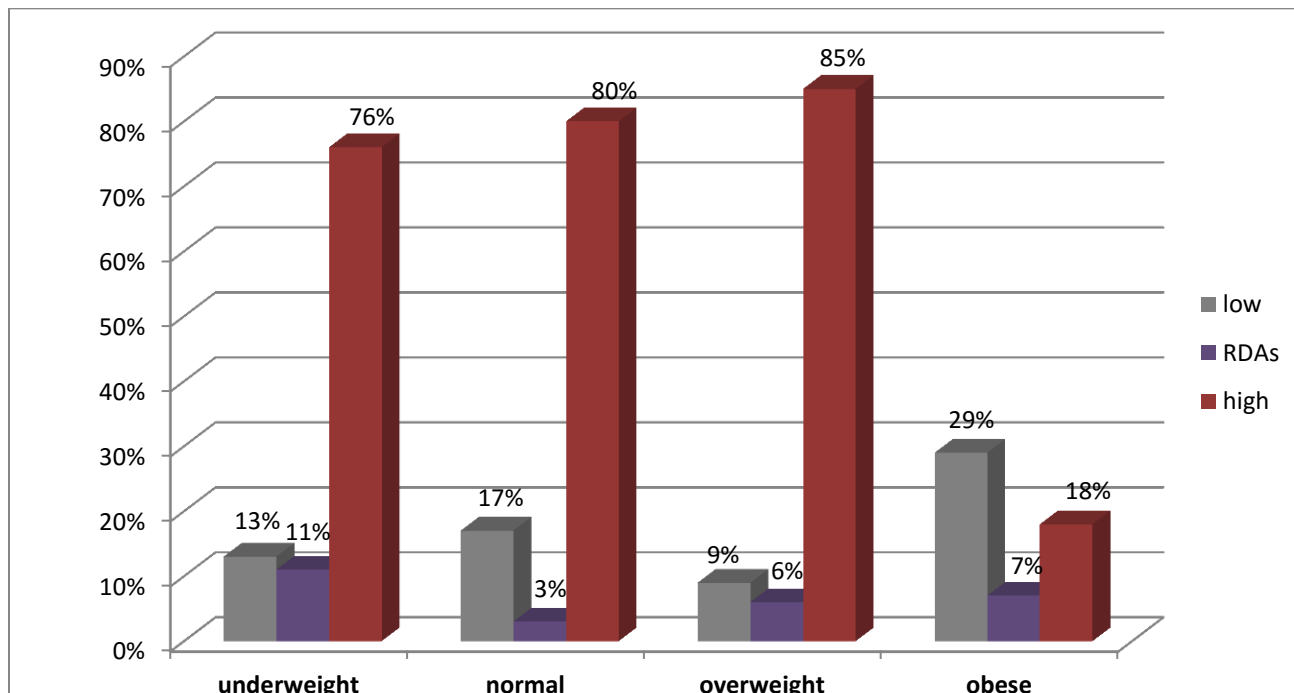


Figure 4.6 Carbohydrate Intakes and Nutritional Status

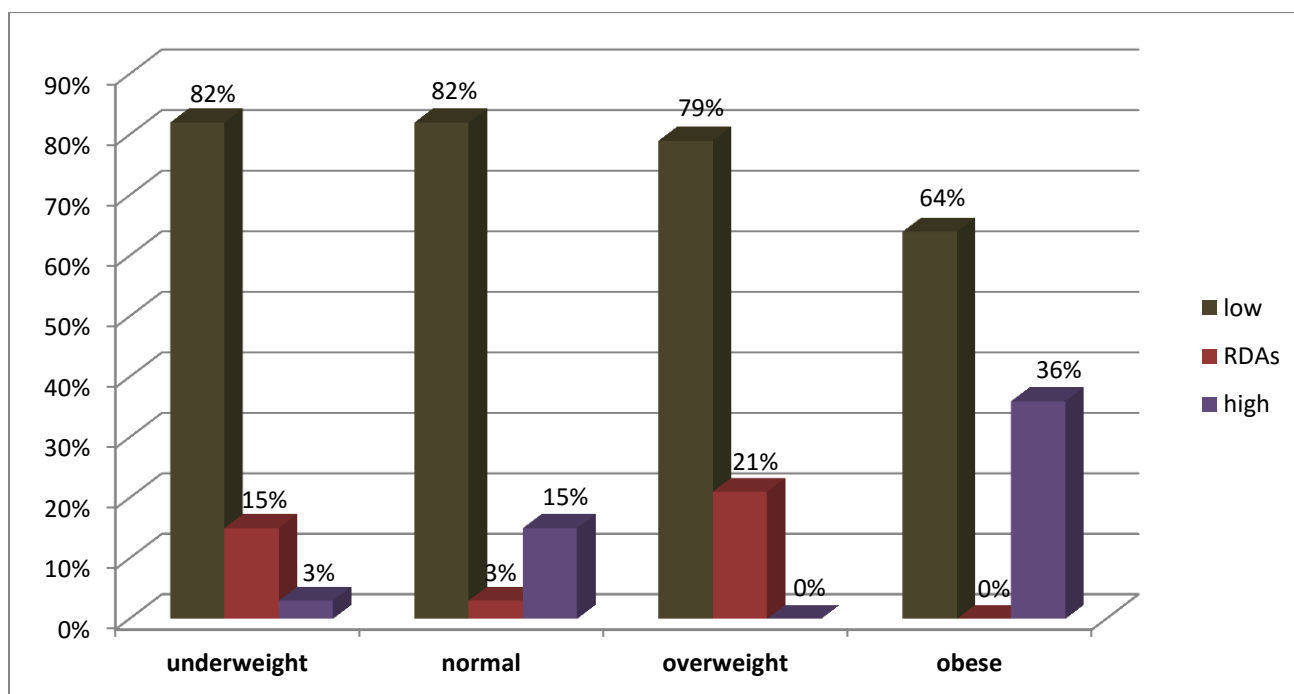


Figure 4.7 Total Fat Intakes and Nutritional Status

Table 4.5 Chi-Square Tests for Nutritional status and Diet Content

Variable	χ^2	df	p-value
Carbohydrate and nut. status	14.530	6	0.024
Protein and nut. status	36.886	6	0.000
Total fat and nut. status	50.206	6	0.000

Comparison of mean intake for carbohydrates (Table 4.6), protein (Table 4.7) and total fat (Table 4.8) all shows that intakes were lower in underweight and normal weight participants compared with the overweight or obese respondents, even though association between BMI status with carbohydrate and protein intake was not significant, significant association was observed for total fat intake and BMI status.

Table 4.6 Mean of Total Carbohydrate Intake and BMI Status

BMI CATEGORY	Mean	N	Std. Deviation	F	Sig.
UNDER WEIGHT	195.6654	106	74.91053	2.044	0.216
NORMAL WEIGHT	189.8718	214	83.75840		
OVER WEIGHT	227.7677	33	88.81209		
OBESE	206.5432	27	121.43132		
Total	195.9634	380	85.39296		

Table 4.7 Mean of Total Protein Intake and BMI Status

BMI CATEGORY	Mean	N	Std. Deviation	F	Sig.
UNDER WEIGHT	37.6160	106	53.69285	9.332	0.27
NORMAL WEIGHT	26.5164	216	26.27546		
OVER WEIGHT	74.7505	33	121.46019		
OBESE	48.8753	27	51.90556		
Total	35.3435	382	52.91607		

Table 4.8 Mean of Total Fat Intake and BM Status

BMI CATEGORY	Mean	N	Std. Deviation	F	Sig.
UNDER WEIGHT	19.2575	105	20.19885	2.431	0.012
NORMAL WEIGHT	21.5554	213	29.10729		
OVER WEIGHT	26.2424	33	16.97532		
OBESE	34.7880	25	45.26298		
Total	22.2049	376	27.61324		

Post hoc analysis of the mean intakes between different BMI categories with carbohydrate, protein and total fat were done to determine where significant differences exist, and these are presented in Table 4.9. For proteins, differences were observed between underweight and overweight respondents, normal and overweight respondents and normal and obese respondents. For total carbohydrate, differences were observed between normal and underweight respondents only, while for total fat, no differences were observed.

Table 4.9 Multiple comparisons between Total Protein, Total Carbohydrate, Total Fat and BMI Status

Total Protein and BMI Categories						
(I) BMI CATEGORY	(J) BMI CATEGORY	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
UNDER WEIGHT	NORMAL WEIGHT	11.09968	11.09968	.069	-.8533	23.0527
	OVER WEIGHT	-37.13447*	-37.13447*	.000	-57.2266	-17.0423
	OBESE	-11.25927	-11.25927	.309	-32.9873	10.4688
NORMAL WEIGHT	OVER WEIGHT	-48.23415*	9.58086	.000	-67.0726	-29.3957
	OBESE	-22.35895*	10.46365	.033	-42.9332	-1.7847
OVER WEIGHT	OBESE	25.87520	13.30226	.052	-.2805	52.0309

Total Carbohydrate and BMI Categories						
UNDER WEIGHT	NORMAL WEIGHT	142.44465*	54.95419	.010	34.3923	250.4970
	OVER WEIGHT	132.30460	92.56216	.154	-49.6936	314.3028
	OBESE	130.13180	98.67663	.188	-63.8888	324.1524
NORMAL WEIGHT	OVER WEIGHT	-10.14005	86.88287	.907	-180.9715	160.6913
	OBESE	-12.31285	93.37000	.895	-195.8994	171.2737
OVER WEIGHT	OBESE	-2.17280	119.43931	.985	-237.0175	232.6719
Total Fat and BMI Categories						
UNDER WEIGHT	NORMAL WEIGHT	-7.44431	20.93163	.722	-48.6006	33.7120
	OVER WEIGHT	9.88873	35.25621	.779	-59.4330	79.2104
	OBESE	-13.04861	37.58516	.729	-86.9496	60.8523
NORMAL WEIGHT	OVER WEIGHT	17.33304	33.09301	.601	-47.7353	82.4014
	OBESE	-5.60430	35.56391	.875	-75.5310	64.3224
OVER WEIGHT	OBESE	-22.93734	45.49351	.614	-112.3879	66.5132

4.5.3 Dietary Habits and factors associated with food choice

The study also shows that 61(15.9%) of respondents were on special diet while 322 (83.9%) were not on any special diet. One hundred and fifty eight respondents (41.1%) said their dietary intake was influenced by personal preference and/or ate foods they usually like to eat, while the rest did not have such preferences and did not practice any food avoidance. Only 5.2% of respondents took dietary/nutrient supplements.

Table 4.10 Diet Intake and Habit

Variable	Yes	No	Missing value
Being on diet	61(15.9%)	322(83.9%)	1(0.3%)
Food like or dislike	158(41.1%)	226(58.9%)	*
Taken supplement	20(5.2%)	364(94.8%)	*

4.5.4 Association between dietary habit and BMI status

As observed from Table 4.11, more overweight participants were on diet than normal or underweight participants. A similar observation can be seen for those who had personal preferences to food intake, with over 50% overweight and obese respondents having such preferences compared with lower underweight and normal weight respondents. For supplement use, more normal weight respondents were on supplements (7.9%), compared with underweight (0%), overweight (6.15) and obese respondents (3.6%).

Table 4.11 Dietary habit and nutritional status

<u>variable</u>	<u>Underweight</u> <u>(N=107)</u>	<u>Normal</u> <u>(N=216)</u>	<u>Overweight</u> <u>(N=33)</u>	<u>Obese</u> <u>(N=28)</u>
On diet	17(15.9%)	34(15.7%)	7(21.2%)	3(10.7%)
Food choices	46(43.0%)	81(37.5%)	17(51.5%)	14(50.0%)
Supplementation	0(0.0%)	17(7.9%)	2(6.1%)	1(3.6%)

4.6 Factors that influence the aged dietary intake

With regards to food choices, majority (35.0%) of the respondents make choice to food without any reason, whilst few as a result of either food allergy, the smell, as their favourite foods among others (Figure 4.8).

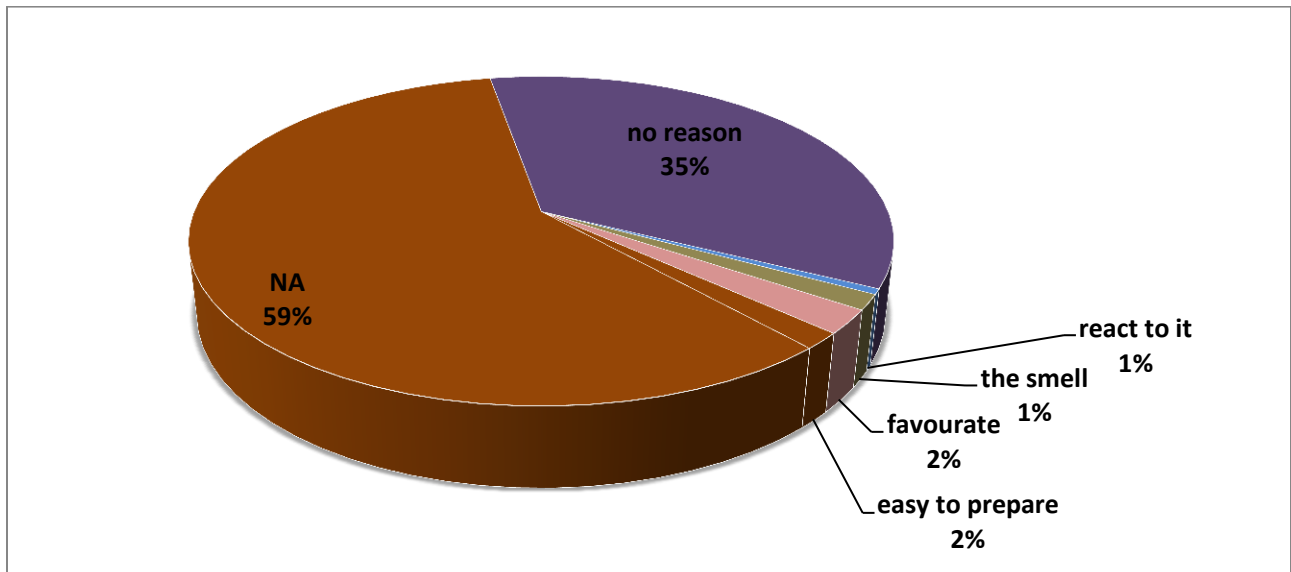


Figure 4.8 Reasons for Food Choice

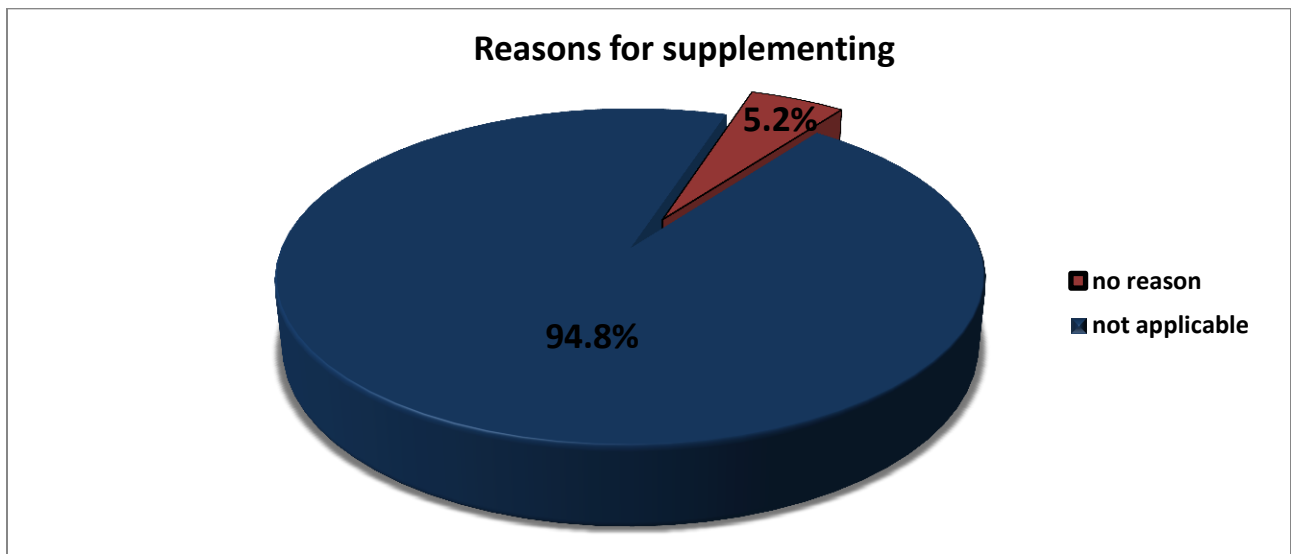


Figure 4.9 Reasons for Supplement Intake

4.7 Weight loss and associated factors

4.7.1 Association between Weight Loss and Meal Frequency

The weights of respondents were taken and compared with their previous weights. Similar proportions (46.6%) gained or lost (44.5%) weight, with only 9.4% maintained their weight (Figure 4.10).

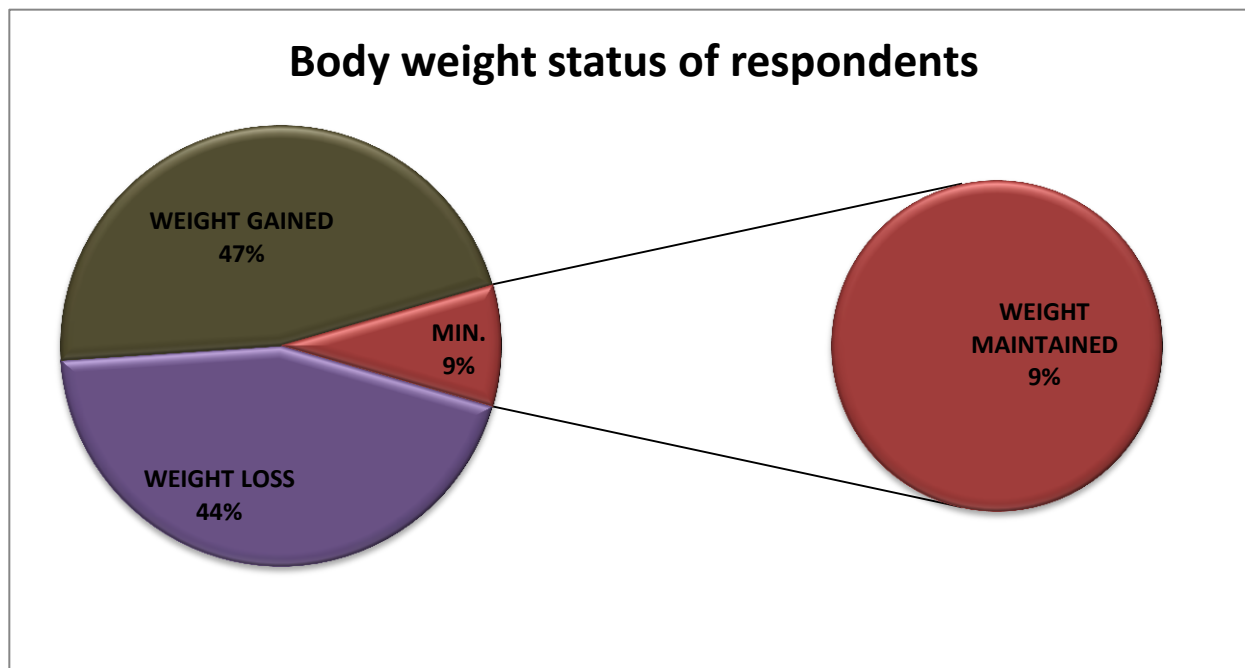


Figure 4.10 Body Weight status of respondents

Weight loss was compared with the number of meals taken per day. Among the respondents who have lost weight, 0.8% ate once, 7.6% ate twice, 34.9% ate three times whilst 1.3% ate four 4 times per day (figure 4.11). The relationship between weight loss and number of meals consumed per day was weak association ($p=0.557$) but weight loss established a strong association with the food preference ($p=0.001$), being on diet ($p=0.002$), morbidity ($p=0.012$) and BMI status of respondents ($p=0.002$) (Table 4.7).

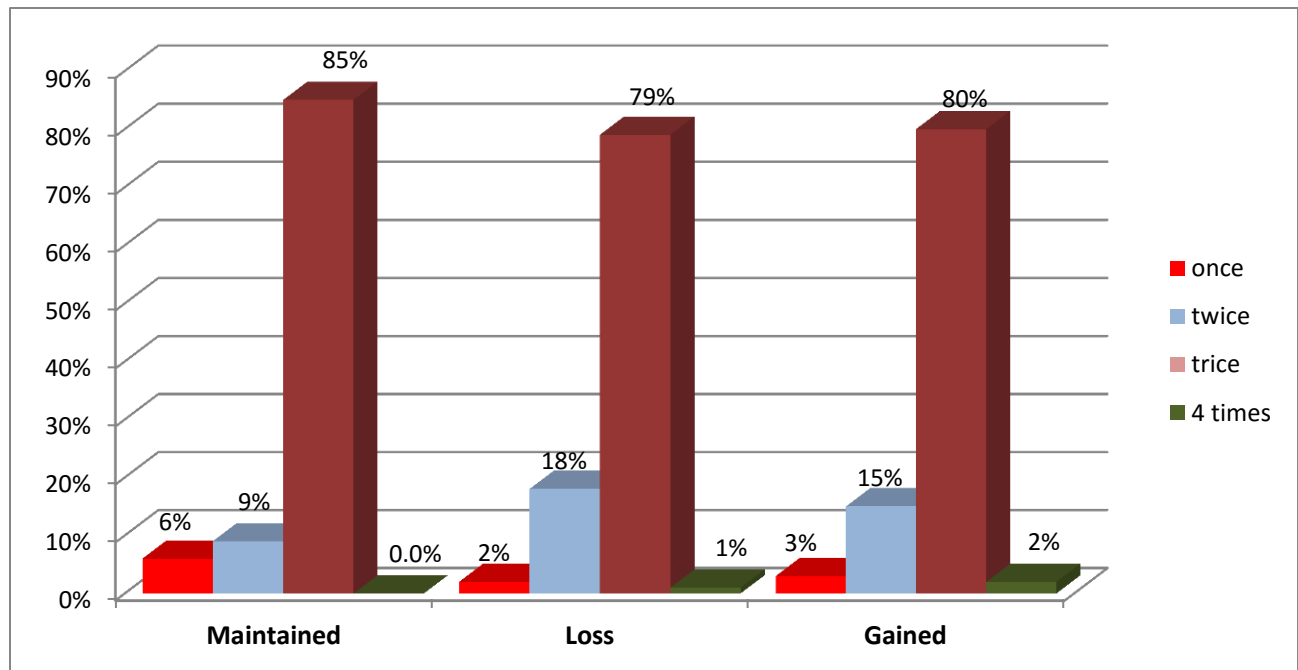


Figure 4.11 Body Weight and Meal Frequency

4.7.2 Association between Weight Loss and Morbidity and Socio-demographic

Table 4.12 Chi-Square Test between Weight Loss and other Variables

Weight loss vrs:	χ^2	df	p-value
BMI	20.870	6	0.002
Morbidity	28.607	14	0.012
Number of meals	4.894	6	0.557
Living status	4.941	2	0.085
Occupation	6.780	8	0.561
Being on diet	16.650	4	0.002
Personal food preference	14.711	2	0.001

4.7.3 Weight loss with morbidity and living condition

The weight status of respondents was compared with their medical and living condition; 22.2% of those had lost weight had high blood pressure compared with 16.8% who gained weight. With regards to DM, 11.1% who lost weight were diabetics compared with 11.2% who gained weight. Stroke (2.9%) was recorded among the weight loss and 8.9% among the weight gained.

With regards to living condition, 9.4% of those who lost weight were living alone whilst 87.7% of weight gained live with their family (table 4.10).

Table 4.13 weight loss with morbidity and living condition

Variable(n=384)	Weight lost	Weight gained	Weight maintained
Hypertensive	38(22.2%)	30(16.8%)	11(32.4%)
Non. Hypertensive	133(77.7%)	149(83.2)	23(67.6%)
TOTAL	171(100%)	179(100%)	34(100%)
DM	19(11.1%)	20(11.2%)	2(5.9%)
NON DM	152(88.9%)	159(88.8%)	32(94.1%)
TOTAL	171(100%)	179(100%)	34(100%)
STROKE	5(2.9%)	16(8.9%)	3(8.8%)
NON STROKE	166(97.1%)	163(91.1%)	31(91.2%)
TOTAL	171(100%)	179(100%)	34(100%)
Living alone	16(9.4%)	22(12.3%)	0(0.0%)
With family	155(90.6%)	157(87.7%)	34(100%)
TOTAL	171(100%)	179(100%)	34(100%)

CHAPTER FIVE

DISCUSSION

This chapter gives detailed implication of the study findings and its associations to other researches of its kind.

5.1 Socio-Demographic Distributions

The study was conducted in West Gonja with 41.9% of the respondents being males and 58.1% females. The largest ethnic group among the respondents was Gonja (72.4%), followed by Camara (18.8%). West Gonja is predominated by Gonjas which leaves no doubt for recording the highest number of respondents coming from that ethnic group. The reason for recording more females than males could also be the fact that they are the care takers of the house and are mostly found at home.

Majority (53.9%) of the respondents were within 65-74 years whilst only 2.1% were 100 years and above. It was also noted that, 84.1% of the respondents have not attained any formal education. However, 4.4% among the literates have attained education to the tertiary level.

The study also reported 44.3% farmers and as the largest occupation among the respondents. Northern region is noted to have a vast and fertile land for farming which usually triggers the occupants of the region to go into farming activities. Since West Gonja is equally found in the northern region of Ghana, this could have accounted for the reason of having farming as the largest occupation in the district. Quite a number (23.2%) of the respondents involve in petty trading and 4.4% were also teachers. The high illiteracy rate could also be the reason for having majority of the respondents into farming and other petty trades. Greater portion (27.3%) respondents do not do any form of work. This could lead to a sedentary lifestyle and predisposes

them to the risk of getting chronic disease such as diabetes and hypertension. As established fact that the elderly in developing countries will be vulnerable to health related predicaments associated with very low income, inadequate food intakes, poor diet patterns, under-nutrition, over-nutrition, chronic illness and diseases (WHO, 2009; Govender, 2011).

5.2 Nutritional Status

Malnutrition is a serious public health problem of which the aged groups appear to be the most vulnerable than the young population. This is due to problems relating to ignorance on appropriate food choices, loneliness, and social isolation which often times lead to depression, apathy, lack of appetite, physical disabilities, cardiovascular problems and poverty among others (WHO, 2010).

As depicted in this study majority of the respondents had other medical conditions rather than high blood pressure, coronary heart disease, diabetes among others. This probably is due to nature (ageing) of the study population and the sedentary lifestyle predicted in the study.

Several studies (Fadupin, 2012; Sanya et al, 2014) have documented on poor nutritional status and morbidity among the aged. Similarly, previous studies (Govender, 2011) also noted that the poor nutrient intakes of the elderly were low compared to recommended dietary allowances, which has contributed to their general health status. This is in line with the findings of this study where a greater number of the respondents were underweight and very few within the obese and overweight categories. This could be as a result of the fact that majority of the aged lives with other family members and probably depend solely on them for survival. And as a result, feeding might not be done adequately (on appropriate timing, frequency, quality and amount) especially when they are not closely related which may result in poor nutritional status.

5.3 Dietary Pattern

To some extent, studies and other trials have investigated the association between dietary patterns and food habits or behaviours attributing to chronic non-communicable diseases subsequently leading to mortality (Cai et al, 2007). With regards to dietary pattern, majority of the respondents from all the sub-districts met the three square meals whilst few eat between 1-2 meals daily. The study also noted that, majority of respondents consumed one snack per day in addition to their main meal. The study unearth majority of the respondents being farmers with regards to their occupation, this therefore indicate a high chance of the respondents having food in abundance, this could have also contributed to the reason why on the average most of the respondents ate at least two-three times a day. They are also exposed to fruits to some extent, and that might have been taken as snacks, which explains the fact that they take at least a snack daily. Very few respondents were on diet and about 41% of respondents either disliked or were allergic to a particular food item. Food supplement was not common among the respondents. This could be dangerous to their health as majority of the respondents have either one or more chronic diseases and proper attention must be given to their dietary intake or choices they make to foods. As a high-quality diet comprising of abundant amounts of whole grains, fruits, vegetables, nuts, and fish is one of the most important factors in preventing early death and disability worldwide (Lim et al, 2013).

5.4 Diet Adequacy and Its Effect on Nutritional Status

Data on the nutrient requirements of older persons is limited, thus insufficient to be used as a basis for health policy. Partly, the lack of in-depth data may be due to the inherent difficulty of collecting dietary data. Another factor may be the presence of different groups of older persons

with different cultural beliefs and food habits (Johnson and Begum, 2008). In this study, among the underweight respondent's 25% ate twice per day, among the normal weight 14% ate twice in a day, 0% ate twice among the overweight group whilst 4% ate twice in the obese category. This means that the lower the frequency of meals being consumed the higher the likelihood of underweight to set in. This could have accounted for the 43.8% malnutrition rate among the respondents. Diet frequency (number of meals) established a significant ($p=0.001$) association with nutritional status. Nutritional status again established significant associations with protein intake ($p=0.000$), total fat intake ($p=0.000$) and carbohydrate intake ($p<0.024$). Even though greater proportions (43.8%) of the respondents were malnourished but yet still majority (56.2%) of respondents were within the normal weight. It could also be from the fact that majority produce their own foods which makes food readily available in their households. In addition, a recent meta-analysis shows that high adherence to diet quality indexes such as the Healthy Eating Index and Dietary Approaches to Stop Hypertension were associated with a 22% decrease in the risk of all-causes of mortality (Schwingshackl & Hoffmann, 2015).

5.5 Factors Influencing Dietary Intakes

With regards to food choices, majority (35.2%) respondents did not make choice to food without any reason, whilst few as a result of either food allergy, the smell, as their favourite foods among others. This could be as a result of respondents being aged where their food intake is being influenced by the aging process or being prepared by other family members regardless of what the aged would have like to eat for a meal. Energy and nutrient intakes in the young, old and oldest-old compared, had emphasizes on the dietary changing requirements through age in the context of decreasing energy expenditure (Lesser et al, 2008)

5.5.1 Micronutrient

A greater proportion of the respondents are within the ULs and high intakes for sodium which is very alarming as higher intake predisposes one to cardio vascular diseases. This could be as a result of majority of the respondent living with family members where food choices or preferences of the aged are mostly not considered. It could also be the reason why hypertension rate (20.6%) among the respondents was highest. Similarly, it is an established fact that the elderly in developing countries will be vulnerable to health-related predicaments associated with very low income, inadequate food intakes, poor diet patterns, under-nutrition, over-nutrition, chronic illness and diseases (WHO, 2009; Govender, 2011). Surprisingly, the study noted a great concern where none of the respondents meet the DRAs for calcium. Again food choices in this part of the country are usually done by the head of the family and the preferences of the aged are mostly not considered and could be the reason for the low calcium intake. This calls for an intervention as low calcium intake especially among the aged is coupled with osteoporosis and other diseases. The study also reported low intake for iron among respondents in all the sub-districts. This again calls for an immediate intervention as low iron intake can lead to high anaemia rate and other economic burdens in the populace.

5.5.2 Macronutrient

Govender, (2011) noted that the energy and nutrient intakes of the elderly were low compared to recommended dietary allowances. On the contrary, the findings of this study has revealed higher intake (ie, above the DRAs) for carbohydrate and fat. The study also noted a greater proportion of respondent had low protein intake below the RDAs for protein. This could be as a result of the usual dietary habit in the northern part of Ghana as having greater part of food we eat, mainly being carbohydrate based with very few households including protein base food to their meals.

Measures should be taken to educate the populace on the components of nutritious diet, also it should be learnt that as high intake of fat and carbohydrate could lead to weight gain and eventually expose one to the risk of a chronic disease.

5.6 Weights Loss

Majority of respondents who lost weight from their previous weights did so unintentionally. This can therefore be curtailed and treated through non-drugs usage approaches such as appropriate nutrient intake. Strong association has been established between Poor dietary intake and health challenges in the elderly populace (Marshall et al, 2002). This therefore calls for the involvement of dietary management experts like the dieticians and nutritionist in assessing, curtailing and treating of these nutritional related problems in the older persons, particularly in cases where an obvious organic cause has not been identified. Key support staff such as the physiotherapist can also aid in the patients mobility. (Borst, 2004). Nutritional counselling of patients on the intake of oral nutritional supplements is also advised, since weight gain has been confirmed among those who practice that (Payette et al, 2002).

The study equally tried to establish the relationship between unplanned weight lost and dietary intake; thus number/frequency of meals respondent consumed in a day ($p=0.557$). From the study the number of meals one may eat was not the main reason for weight loss among the study population. But could be attributed to the quality of the food instead. However, unplanned weight loss established a strong association with the following; food choices ($p=0.001$), being on diet ($p=0.002$), morbidity ($p=0.012$) and nutritional status of respondent ($p=0.002$). This implies that, among the study population, being on diet or the choices one makes to food together with once medical conditions have a greater influence on the individuals weight loss.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

This chapter sums up all the findings of the research as they relate to the stated specific objectives. As a final chapter, it entails of a brief conclusion based on the analysed data and also provides recommendations for other researchers, government and non-government agencies.

6.1 Conclusions

- Among the study participants, greater proportions (56.3%) of the respondents were within normal weight range. High percentage (43.8%) of them were malnourished, among them (27.9%) were underweight whilst (15.9%) were overweight and obese.
- Majority (79.9%) of the respondents from all the sub-districts met three square meals whilst few eat between 1-2 meals daily. The study also noted majority (68.5%) of the respondents taking at least one snack in addition to the main meals.
- With very few of the participants meeting their nutrient intake requirements, the study established a strong association ($p < 0.05$) between diet frequency, nutrient adequacy and nutritional status of respondents.
- Though most of the respondents did not address what really influenced their food choices, a significant number (35%) alluded to no reason but depend on what is given or available to them.
- Lager proportion of the participants had lost weight as at the time of the interview.
- Significant association was observed between weight loss and BMI ($P = 0.002$), morbidity ($p = 0.012$), having personal food preferences ($p = 0.001$) and being on diet ($p = 0.002$).

6.2 Recommendations

- Since there is absence of reliable data on these area of study in West Gonja District. The study therefore recommends more research of its kind to compiled adequate data on the nutritional status and associated factors of the aged.
- There is the need to prioritize the aged population especially in the area of nutrition intervention activities by donor partners and government since data is showing a rapid growing trend of the aged population with high probability of chronic non-communicable diseases.
- Nutritionists, dieticians and other health staff should also make the aged nutrition education/counselling a priority just as it is being done for pregnant women and under five children especially during routine outreach services.
- Facility, mass media and community level sensitization exercises on aged nutrition and its related concerns should be considered.
- Continuous counselling and support on aged feeding practices by informed care givers should be encouraged.
- Mass nutrition screening for older persons on identification of nutrition related diseases should be encouraged at least routinely.

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APPENDICES 1-CONSENT FORM

Statement of person obtaining informed consent:

I have fully explained this research to _____ and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant make an informed decision to or not to participate.

DATE: _____ NAME: _____

Statement of person giving consent:

I have read the information on this study/research or have had it translated into a language I understand. I have also talked it over with the interviewer to my satisfaction.

I understand that my participation is voluntary (not compulsory).

I know enough about the purpose, methods, risks and benefits of the research study to decide that I want to take part in it.

I understand that I may freely stop being part of this study at any time without having to explain myself.

I have received a copy of this information leaflet and consent form to keep for myself.

NAME: _____

DATE: _____ SIGNATURE/THUMB PRINT: _____

Statement of person witnessing consent (Process for Non-Literate Participants):

I _____ (Name of Witness) certify that information given to _____ (Name of Participant), in the local language, is a true reflection of what I have read from the study Participant Information Leaflet, attached.

WITNESS' SIGNATURE (maintain if participant is non-literate): _____

MOTHER'S SIGNATURE (maintain if participant is under 18 years): _____

MOTHER'S NAME: _____

FATHER'S SIGNATURE (maintain if participant is under 18 years): _____

FATHER'S NAME: _____

APPENDICES 2-STUDY QUESTIONNAIRE

QUESTIONNAIRE ON THE ASSESSMENT OF THE NUTRITIONAL STATUS OF THE AGED IN WEST GONJA DISTRICT IN NORTHERN REGION OF GHANA

Dear Respondent, Am a students of Kwame Nkrumah University of Science and Technology (KNUST) conducting this research for the purpose of assessing the nutritional status of the aged. For this purpose, we will appreciate if you can fill these questionnaires and we assure you that any information given would be used solely for academic purpose and would be treated with confidentiality. Thank You.

Background, demographic and socioeconomic characteristics

ID:

Date

Ethnicity

(Please thick ✓ only one)

Gender: ☐ Male ☐ Female

1. Age Group ☐ Between 65-74 years ☐ Between 75-84 years ☐ Between 85-99

☐ 100years and above Specify

2. What is the height of the person either by standing/Ulna length/Knee heightcm

3. What is the current weight of the personKg

4. What is the previous Weight of the Person in the last 3-6 monthsKg

5. What is your level of education

☐ None ☐ Primary ☐ Junior High School ☐ Senior High School

☐ College/ University

6. Is the elderly staying ☐ alone or ☐ with the family

Nutritional History

7. Have you in the past or are you currently following any special diet ☐ Yes ☐ No
8. How many meals do you eat a day.....?
9. How many snacks do you eat a day
10. Are there any food group you dislike, like, avoid or allergic to ☐ Yes ☐ NO
If Yes specify And Why
.....
11. Are you taking any vitamin/mineral or dietary supplement ☐ Yes ☐ NO
If Yes specify And Why
.....
- 12.

MEAL TYPE

ABBREVIATION

- 1= Morning
- 2=mid-Morning
- 3=Noon
- 4=Afternoon
- 5=Evening
- 6=Late Evening

SERVING

- Tablespoon =TBSP
- Cup =C
- Teaspoon =tsp
- Grams =g
- Ounce =oz
- Slice =sl

Foods and Beverages Consumed. Describe in details and List one food per Line

24 Hour Diet Recall

Please be as specific and honest as possible for review with the Registered Dietitian. Thank you.

Day 1

<u>Food Item</u>	<u>Serving Size</u>	<u>Time Consumed</u>	<u>Where</u>

Day 2 24 Hour Diet Recall

<u>Food Item</u>	<u>Serving Size</u>	<u>Time Consumed</u>	<u>Where</u>

Day 3 24 Hour Diet Recall

<u>Food Item</u>	<u>Serving Size</u>	<u>Time Consumed</u>	<u>Where</u>

APPENDICES 3-MEAN NUTREINT INTAKE AND THEIR RDAs

	RDAs FOR ADULTS		
NUTREINT	MALES	FEMALES	KEY REMARKS
Kcal	2,900	2,200	2,300 51+ (M) ,1,900 for 51+ (F)
Protein (g)	56	46	
Total Fat g	65	65	
Carbohydrate (g)	130	130	
Dietary Fiber (g)	38	35	30 f0r 51+ (M), 21 for 51+ (F)
Sugar g total			
Calcium (mg)	1000	1000	1,200 for 71+ (M), 1,200 51+(F)
Iron mg	8	18	
Magnesium (mg)	400	310	430 for 31+ (M) ,320 for31+ (F)
Phosphorous (mg)	700	700	
Potassium (mg)	4,700	4,700	
Sodium (mg)	1,500	1,500	1,300 for 51+ M&F
Zinc (mg)	11	8	
sCopper (mg)	0.9	0.9	
Manganese (mg)	2.3	1.8	
Vitamin C (mg)	90	75	
Thiamine (mg)	1.2	1.1	
Riboflavin (mg)	1.3	1.1	
Niacin (mg)	16	14	
Vit .B-6 (mcg)	1.3	1.3	1.7 for 50+ (M), 1.3 for 50+ (F)
Folate (mcg) Total	400	400	
Vit. B-12 (mcg)	2.4	2.4	
Vit. A (mcg) RAE	900	900	
Vit. E (mg)	15	15	

Source of RDAs: National Institute of Health (NIH) and Institute of Medicine.