CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Non-communicable diseases (NCDs) refers to non-infectious diseases or illnesses that are caused by something other than pathogens. The term is used to imply a variety of conditions including cancer, cardiovascular diseases, diabetes mellitus, chronic respiratory diseases, musculoskeletal disorders and other conditions. Globally, about 25 million or one half of all deaths are from NCDs, and this proportion keeps rising. Non-communicable diseases (NCDs) are responsible for a high proportion of deaths and disabilities. World Health Organization (WHO) estimated that, in 2000, NCDs and mental disorders caused 59% of deaths and 46% of the global burden of disease (WHO, 2002). Based on available trends, by 2020 NCDs are predicted to account for 73% of deaths and 60% of disease burden world wide (Murray, 1996).

According to the WHO African Regional Consultation Meeting Report on Global Strategy on Diet, Physical Activity and Health (Harare, 2003), "the risk for non communicable diseases is gaining importance in Africa with a prevalence of high blood pressure estimated at 30- 40 % although prevalence data from national surveys are generally inadequate."

The World Health Report 2001 indicates that NCDs, in 1998, accounted for almost 60% of all deaths and 43% of global burden of diseases. Seventy-five percent of total deaths resulting from NCDs occur in the developing countries. The treatment of NCDs is known to be expensive, labour-intensive and needs technological sophistication which most countries are lacking.

Identification of major risk factors, their prevention and control form the basis of the prevention of NCDs. Risk factors of today eventually become the diseases and the public burden in the days after. Population measurements of these risk factors are used to describe the distribution of future disease rather than predicting the health of specific individuals. Knowledge of risk factors can then be applied to shift population distribution of these risk factors. Risk factors are measurable under field conditions and amenable to intervention.

Identification of risk factors and their quantification is of great importance in order to calculate the avoidable burden of disease and framing of cost-effective strategies for prevention.

In the Sekyere West District, NCDs are noted to be among the top-10 diseases prevalent in the area and studies of these diseases to identify the level of risk and associated risk factors are essential. Records indicate that, not less than 20% of all deaths recorded in the District are attributable to NCDs. It is also estimated that NCDs incidence will continue to rise in the District if no urgent research for effective situational diagnosis to yield effective urgent intervention is carried out. (Sekyere West District Health Management Team, 2008)

1.2 PROBLEM STATEMENT.

The problem of non-communicable diseases remains an area of public health focus globally. It is estimated that, globally, 25 million or one half of all deaths and most of the physical disabilities are attributable to NCDs, and this is still on the increase year after year. WHO estimated that in 2000, NCDs and mental disorders caused 59% of deaths and 46% of the global burden of disease (WHO, 2002). Recently, non-communicable diseases has gained popularity in the Sekyere West District due to its overwhelming burden in the district. According to the 2008 Annual Report of the District Health Directorate, '*all the noncommunicable diseases had increased compared to the previous years and is a source of worry for the municipality*'. There is therefore the likelihood of future increase of non communicable disease burden in the district if no intervention is implemented.

The District annual health reports also present that, hypertension and diabetes cases show an increase trend with time. In 2003, 793 cases of hypertension were recorded in the District. This increased to 1,259 cases in 2004, 1,713 in 2005, with a slight decrease to 1,701 in 2006, 1,698 in 2007 with a sharp increase to 1,895 in 2008.

This same hypertension accounted for 2.1 %, 2.8 %, 4 % and 2.1 % of cases of morbidity in 2004, 2005, 2006 and 2007 respectively, as well as 2.9 % of causes of institutional admission in both 2004 and 2005.

Among the top-10 causes of institutional death in the district, Cardio-Vascular Diseases (CVDs) mainly hypertension, diabetes and stroke ranked 1st in 2004 representing 11.3 % of total causes of deaths in that year and 2.9 % in 2005, ranking 7th. In 2006 and 2007, CVA still accounted for 8.94 % and 7.4 % of causes of death respectively.

Similarly, with diabetes mellitus, an increasing trend of cases year after year was observed with 34 and 63 cases of diabetes recorded in 2003 and 2004 respectively. A continuum of increases occurred from 215 cases in 2005 to 258 cases in 2007 and 666 cases in 2008. The picture of non communicable diseases in the district from the previous years to date makes this study so critical for the documentation of the distribution of risk factors among the population.

1.3 RATIONALE OF THE STUDY

Non-communicable diseases remain an area of high public heath concern as well as health services providers. Until recently, non-communicable diseases were not given much attention as the diseases were noted to be confined to the wealthy people. The growing middle class and ever changing lifestyle in developing countries have led to the rapid increase in the burden of NCD; the epidemiological trend has caught up with Ghana.

With the current increase in trend of the diseases among all the different social categories of people, attention has begun to rise about major determinants of the diseases and risk factors for NCDs.

In the Sekyere West District of the Ashanti region, NCDs are among the leading causes of deaths. This and others necessitate this recent study into assessing the level of prevalence, risk and risk factors, and other determinants of the diseases such that tentative interventions can be put in place at a minimum cost before the situation gets out of control.

In order to take effective prevention measures, identification of the risk factors is an essential prerequisite. Little is known about the prevalence of the risk factor coupled with little data available on the dietary habits, physical activity and other life-style associated factors in the District.

It is with these concerns, that an assessment of risk factors is the focus of this study and has been given priority attention in the District. The WHO STEPs Approach on NCDs risk factor surveillance is considered an efficient tool to be used for assessing the risk factor situation in the District.

In view of the burden of NCDs highlighted above, there is the need to have systematic data to determine the magnitude of the problem of NCDs so as to influence policy and resource allocation between prevention and care, this been one of the core relevance of the study.

1.4 RESEARCH QUESTIONS

The study investigated these general research questions:

- Do you have an idea about the risk factors of non-communicable diseases?
- What factors contribute to the risk of non-communicable diseases?
- How is non-communicable disease distributed in the Sekyere West District of Ghana?
- Who is highly affected with NCDs and their risk factors?

1.5 GENERAL OBJECTIVE:

The main objective of the study was to assess the prevalence, levels of risk and the major risk factors for non-communicable diseases in the Sekyere West District

1.5.1 SPECIFIC OBJECTIVES:

Specifically, the study was intended to:

1. Assess the level of awareness/knowledge in the District on NCDs.
2. Identify the individual age groups that are mostly at risk of NCDs
3. Identify the determinants (physical, environmental, socio-economical, biological, behavioural and nutritional factors) of non-communicable disease in the District
4. Assess the trend and distribution of non-communicable diseases as well as their risk factors in the district.
5. Generate a baseline documentation to contribute to the existing literature for further research interventions.

1.6 RESEARCH HYPOTHESIS

The study investigated the following specific hypotheses:

- Sedentary lifestyles such as smoking, drinking, physical inactivity among individuals are strong risk factors for developing NCDs.

- Low consumption of fresh fruits and vegetables and their nutrient biomarkers are associated with increased risk of NCDs.

- Poor dietary/nutritional behaviours contribute to increased risk of NCDs.

- Socio-economic factors are key determinants of non-communicable diseases such as hypertension and diabetes.

- NCDs and their risk factors are equally associated with males and females

- Advanced age is a risk factor for developing NCDs

1.7 PROFILE OF THE STUDY AREA

The research was carried out in the Sekyere West District, which is one of the Administrative Districts in the Ashanti Region of Ghana .It is located on the northern part of the region, and shares boundaries with Atebubu District, Sekyere East, Afigya-Sekyere, and EjuraSekyeredumasi to the north, east, south, and west respectively.

The District has two main rainy seasons and an average annual rainfall of 1270mm. The average temperature in the District is about 27 degrees Celsius with variations in mean monthly temperatures ranging between 22 and 30 degrees Celsius throughout the year.

The Sekyere West district lies within the wet semi-equatorial forest zone. It is generally low lying and gradually rising through rolling hills stretching southwards towards Mampong.

The population of the district is currently 155,755 (2006 projection), as against 143,206 of the 2000 Population and Housing Census figure. According to the 2000 Population and Housing Census, females out-numbered the males in the District. From the census, the females formed 51.3% of the total population whilst males constituted 48.7% with age-dependency ratio of 1:0.7.

The Sekyere West district has a number of health facilities including one (1) Hospital, seven (7) Health Centres, three (3) Maternity Homes, five (5) MCH/FP Points, six (6) Private Clinics and one (1) Midwifery Training Institution. All but two of the health facilities are located in the southern portion of the District. This therefore, means that people in the Afram plains do not have access to most of the health facilities.

The condition of houses in the District reflects the socio-economic status of the people. Given the predominantly rural nature of the District (61%), an observation of the housing conditions

revealed that landcrete block houses account for about 80% of the total housing structures in the District.

The District experiences relatively mild migration mostly from the rural communities to the urban areas. In terms of religion, Christians constitute 87.6% of the population; Moslems constitute 10.9%, Traditionalist 1.1% and others 0.4%

The District has one hundred and eleven (111) Primary Schools, sixty (60) Junior Secondary Schools, four (4) Senior Secondary Schools and one (1) Vocational School. There are also two (2) Teacher-Training Colleges, one (1) Midwifery Training School and one (1) University Campus. Over 80% of the post J.S.S. Educational institutions are all located in Mampong. Despite the numerous educational facilities in the district, the standard of education in the district is relatively not encouraging.

Source: District Statistical Service, 2006.

1.8 SCOPE OF THE STUDY

The study focuses basically on the assessment of the extent of prevalence, levels of risk and the major risk factors for non-communicable diseases among residents in the Sekyere West District in particular and in Ghana in general.

Specifically, the study covers the areas such as the level of awareness and knowledge of the residents in the district on the development of non communicable diseases and their management. It also looked into the individual age groups that are at most risk of developing the diseases. Other determinants such as physical, environmental, socio-economic, biological, behavioural and nutritional factors that are known to correlate with non-communicable diseases occurrence were also measured by the study among the residents. The study is intended to be representative of the extent of non communicable diseases and their major risk factors in the district. However, the actual field study was limited to six randomly selected communities within the district.

1.9 ORGANISATION OF THE STUDY

For the purpose of easy reading, and making references, this work is broken down into five chapters.

The chapter one presents the overview of the general introduction to the study. It focuses on a general background and the statement of the problem of the study. It includes the rational of the study, research questions, general and specific objectives of the study, research hypothesis, profile of the study area, scope of the study as well as the organisation of the work.

The chapter two deals with the review of existing literature on the subject matter of the study mainly on global level of awareness on non-communicable diseases, age specific prevalence rate of non-communicable disease, major risk factors of non-communicable diseases and global epidemiological trend of non-communicable diseases

The chapter three considers the materials and the methodology of the study. It consists of sections such as study type and design, study population, sampling techniques, sample size and pre-testing, study variables, data collection techniques and tools, measurement procedures, data handling and analysis, ethical consideration, study assumptions and limitations of the study

The chapter four presents a detailed outcome of the research results and findings. It is organised around the specific objectives of the study.

The chapter five deals with the discussion and interpretations of the research findings .It offers a comparison to previous research works reviewed and linkages with the research objective.

The chapter six which is the last chapter of the work presents the conclusion and recommendations from the research findings that may be implemented to shift the burden of the risk factors documented among the residents in the district. Next to chapter five is references and the appendix.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1 Global Level of Awareness on Non-Communicable Diseases

Non-communicable diseases (NCDs) and mental health are the leading causes of death worldwide, causing 60% of the global deaths and 46% of the global burden of disease (WHO 2001, Murray, et al., 1996). NCDs include Cardio-Vascular Diseases (CVDs) such as stroke, heart attacks, diabetes, chronic lung diseases, cancer, diseases of bones and joints and mental illness

(Nigel, 2001a).The biggest single killer is coronary heart diseases, followed by other CVDs, cancer and chronic lung disease in that order. Diabetes is a major contributor to deaths from CVDs, but also causes its own unique complications. Common risk factors of these NCDs include smoking, physical inactivity, obesity, and diets high in saturated fats and sodium and low in fruit and vegetables intake (Nigel, 2001a).

Many developing countries are affected by a double burden of disease; the combination of long established infectious diseases with a rapidly growing new epidemic of chronic NCDs (WHO 2000).

Until recently, risk factors such as high blood pressure, cholesterol, tobacco use, excess alcohol consumption, obesity, and the diseases linked to them were associated with developed countries. Studies from some African countries suggest that in predominantly urban settings, the prevalence of diabetes and hypertension increased markedly over the last ten years to the year 2000 (Nigel, 2001b).

2.2 Age Specific Prevalence Rate of Non-Communicable Disease

While malnutrition and infection persist as the major nutritional problems affecting mostly children, chronic diseases are the main cause of premature deaths in adults even in the poorest countries. Immunizations and antibiotics are having a major impact on infectious diseases, but progress is much slower in combating non-communicable chronic diseases (NCDs).

In Britain, death before middle age has been largely avoided, but death in middle age is still common, though it is largely avoidable. 80% of such deaths involve vascular or neoplastic diseases, for many of which better treatment and more effective preventive measures can be foreseen.

In 1980 there were about 50 million deaths in the world, half in people under 35 years of age. Indeed, 15 million were under five. In early childhood, about four million deaths a year were due to diarrhoea, about four million to acute respiratory infections, and about four million to diseases that can largely be prevented by vaccination. (Anon, 2008)

A study involving 4,733 subjects indicated that Diabetes, IGT and combined IFG and IGT increase with age, as the oldest age group (64+ years) has the highest diabetes prevalence (13.6%). The age-adjusted prevalence of diabetes, IFG and IGT, were 6.4, 6.0 and 10.7%, respectively. Diabetes is also known to be common among males than females (7.7% vs. 5.5%) with a probability of [$P<0.05$] in the same study. Worsening glycaemic status is associated with increase in age, body mass index, systolic and diastolic blood pressures. (Amoah, 2003)

2.3 Risk Factors of Non-Communicable Diseases

2.3.1 High Blood Pressure

Blood pressure is considerably lower in children than in adults and increases steadily throughout the first two decades of life. In adults, cross-sectional and longitudinal surveys have shown that systolic and diastolic blood pressure increase progressively with age. For example, in the WHO

MONICA survey, systolic blood pressure increased by about 0.29 to 0.91 mm Hg per year in men and 0.6–1.31 per year in women (Wolf et all., 1997). This increase remains stable and possibly declines after age 50 for diastolic but not for systolic blood pressure, leading to a steep increase in pulse pressure; a key risk factor for cardiovascular outcome (Franklin et all., 1999). These trends have been demonstrated in both genders and most ethnic groups (Hajjar et al., 2003).

Similarly, many studies document an increase in hypertension prevalence with age (Cent 2005). In the United States based on NAHNES 1999–2002, hypertension prevalence increased from 6.7% in persons 20 to 39 years to 65.2% in persons 60 years or older. The greatest increase in hypertension prevalence between 1988–1991 (57.9%) and 1999–2000 (65.4%) occurred in individuals who are 60 years or older (Hajjar et al., 2003).

According to a study in Ghana by Charles and Ellis (2006), on Pre-hypertension in the Ashanti Region, West Africa: An opportunity for early prevention of Clinical Hypertension; documented 40% and 29% as a prevalence of both pre-hypertensive and hypertensive respectively with Pre-hypertension being more in non-hypertensive males than nonhypertensive females particularly people aged around 35 years.

In population-based sample studies of the United States, the mean systolic blood pressure is higher for men than for women during early adulthood, although among older individuals the age-related rate of rise is steeper for women. Consequently, among individuals aged 60 or older, mean systolic blood pressure of women is higher than that of men (Hajjar et al., 2006).

A family history of hypertension is associated with an increase in the prevalence and incidence of hypertension (Galderisi et al., 1993). Both genetic and environmental factors appear to contribute to this association (Fava et al., 2004). In a nationwide screening program, a family history of hypertension was associated with hypertension prevalence double that in persons with a negative family history, independent of BMI, gender, and ethnicity (Stamler et al., 1979). In a population-based ascertainment of families in Utah, a family history of hypertension was associated with a 3.5-fold increased risk of hypertension (Williams et al., 1993). Young children of parents with hypertension are at increased risk of hypertension, and they show higher levels of systolic blood pressure than those of parents with no hypertension. In a study of 745 subjects followed for 10 years (baseline mean age = 12 years), subjects with a family history of hypertension in one or both biological parents were associated with higher systolic blood pressure, and a higher rate of increase of systolic blood pressure over time (Dekkers et al., 2003).

2.3.2 Anthropometric Indexes

Body mass index (BMI) is an important correlate of blood pressure and hypertension prevalence. By the current World Health Organization (WHO,2000) criteria, a BMI <18.5kg/m^2 is considered underweight, 18.5–24.9 kg/m^2 ideal weight and 25–29.9kg/m^2 overweight or pre-obese. The obese category is sub-divided into obese class I (30–34.9kg/m^2), obese class II (35–39.9kg/m^2) and obese class III (≥40kg/m ^{2}). A BMI greater than 28kg/m^2 in adults is associated with a three to four-fold greater risk of morbidity due to T2DM and CVDs than in the general population (Van Itallie, 1985).

The recent increase in overweight and obesity in the United States (Flegal et al., 2002) both in adults and children may explain, in part, the associated increase in hypertension prevalence over the past decade. In the NHANES-III data, obese men and women had a hypertension prevalence ranging from 49% to 64% with increasing degrees of obesity in men and from 39% to 63% with increasing obesity in women versus 27% in normal-weight men and 23% in normal-weight

women (Must et al., 1999). According to Paffenbarger et al., 1983, weight gain is also associated with an increase in hypertension incidence and the age-related rise in systolic blood pressure.

In an analysis of four Chicago epidemiological studies, weight gain was associated with an increase in pulse pressure. In the Framingham Heart Study, a 5% weight gain was associated with a 20% to 30% increase in hypertension incidence (Vasan et al., 2001). A study by Winkvist et al., 1997 in Indonesia indicated 11.6% and 14.3% in their studies in the years 1996 and 1997 respectively as being a rate of overweigh or obese among their study subjects.

Obesity which is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health is impaired (Garrow, 1988) in absolute terms, and its distribution in the body - either around the waist and trunk (abdominal, central or android obesity) or peripherally around the body (gynoid obesity) - has important health implications. A central distribution of body fat is associated with a higher risk of morbidity and mortality than a more peripheral distribution (Kissebah et al., 1994).

Measurement of the waist circumference, measured at the midpoint between the lower border of the rib cage and the iliac crest (Han et al., 1997; Lean et al., 1995), or the waist: hip ratio (WHR) (Han et al., 1997) provide useful indices of abdominal fat accumulation and a better correlation with an increased risk of ill health and mortality than BMI alone (Kissebah et al., 1994).

An abdominal girth in excess of 108 cm (40 inches) for men and 98 cm (35 inches) for women or a WHR > 1.0 and 0.85 in men and women, respectively, are the currently accepted indicators of excessive abdominal fat accumulation which correlate with a substantially increased risk of metabolic complications (WHO, 2000; Han et al., 1997).

There is presently a global epidemic of obesity in all age groups and in both developed and developing countries. In 1995, there were an estimated 200 million obese adults worldwide. As of 2000, the number of obese adults had increased to over 300 million. In developing countries, it is estimated that over 115 million people suffer from obesity-related problems (WHO, 2003).

The study by Berber et al, 2002 on anthropometric indexes in the prediction of type 2 diabetes mellitus, hypertension and dyslipidaemia in a Mexican population indicated an adjusted prevalence of being overweight in men and women (BMI>25) and obesity in men (BMI>30) to be 25.1% in men and 14.9% in women. Similarly, the Mexican National Chronic Conditions Survey disclosed a higher prevalence of DM to be 7.2 % in both gender. In the study, a higher prevalence of being overweight but a lower prevalence of obesity with regard to the presence of chronic conditions was obtained when compared with the Third National Health Examination Survey (overweight 39.4% in men and 24.7% in women; obesity 19.9% in men and 24.9% in women). (Flegal et al., 2002).

Obesity among Ghanaian adults is common, particularly among the elderly, females and urban dwellers. A recent survey involving two urban and one rural community in the Greater Accra region showed an overall crude prevalence of obesity (BMI ≥ 30 kg/m^2) of 20.2% and 4.6% for females and males respectively. The age-standardized prevalence of adult obesity was 13.6%. Obesity increased with age, peaking in the 55 to 64-year age group (Amoah, 2003).

From a large body of evidence, the global epidemic of obesity has resulted mainly from societal factors that promote sedentary lifestyles and the consumption of high-fat, energy-dense diets (WHO, 2000). The increasing prevalence of obesity places a large burden on health care use and costs. A few studies show that 2–7 % of total health care expenditure in a country may be directly attributable to obesity, with the costs of hypertension representing 53 – 60% of the total

direct costs of obesity. On the other hand, weight loss in obese individuals is associated with both clinical and economic benefits (WHO, 2000).

The Ghana Demographic and Health Survey 2003 (GDHS) demonstrate that prevalence of obesity or overweight among adult (non-pregnant) women across the country increased 2.5 fold in ten years from 10% in 1993 to 25.3% in 2003 (GSS/NMIMR/ORC Macro, 2004). Crucially, the 2003 GDHS data shows that there are more obese women (25.3%) than malnourished women (9%).

The GDHS data is supported by a 2003 WHO sponsored national obesity survey which showed higher obesity rates in southern compared to northern regions, among women compared to men, among married individuals compared to unmarried and among older compared to young individuals (Biritwum et al., 2005). In both national studies, Greater Accra Region had the highest overweight and obesity rates and women constituted a high-risk group.

2.3.3 Nutritional/Dietary Behaviour Measures

Results of observational studies and clinical trials document an association between sodium chloride (NaCl) intake and blood pressure (Kotchen et al., 1994). The effect of NaCl on blood pressure increases with age, with the height of the blood pressure, and in persons with a family history of hypertension. Among population groups, age-related increments of blood pressure and the prevalence of hypertension are related to NaCl intake (Elliott et al., 1996).

In societies with high potassium intakes, both mean blood pressure levels and the prevalence of hypertension tend to be lower than in societies with low potassium intakes (Khaw et al., 1988). Meta-analyses of clinical trials have concluded that oral potassium supplements significantly lower both systolic and diastolic blood pressures (Cappuccio et al., 1991).

Within and among populations, as with potassium, there is an inverse association between dietary calcium intake and blood pressure, and low calcium intake is associated with an increased prevalence of hypertension (Cutler et al., 1990).

A study by Maham et al in India indicates that majority (93.2%) of the subjects (190) incorporated into a study of Risk factor profile of non communicable diseases in an industrial productive had low daily intake of vegetables and fruits.

Excess blood glucose levels predispose in a way to the development of diabetes, which is basically influence by lifestyle. A study by Baridalyne et al., 2003 into Profile of Biochemical Risk Factors for non communicable diseases in Urban, Rural and Peri-urban Haryana, India documented 11.4% of men in urban areas having fasting blood glucose above the cut off.

2.3.4 Sedentary lifestyle

Sedentary life style and low educational attainment have each been linked to the rise in blood pressure with age, low socio-economic status, low occupational class, psycho-social factors such as hostility and time urgency/impatience, job strain, depression (Davidson et al., 2000).

2.3.5 Tobacco Smoking

Smoking, which is believed to be the number one major single known cause of noncommunicable diseases (Toustad et al., 2006), is widespread around the world. Estimate of the World Health Organization (WHO) indicates that roughly about 30% of the global adult male populations are smokers.

It is estimated that tobacco-related deaths exceed 4 million annually. It has been estimated that by 2030, diarrhoeal diseases and lower respiratory infections will have been surpassed by chronic obstructive airways diseases as causes of mortality (Murray and Lopez 1990; Lopez et al, 2006).While the prevalence of tobacco use in many industrialized nations is reducing, there is a

growing epidemic of smoking in the developing world. In many African countries, there is paucity of data on the epidemiology of tobacco and smoking. Based on the available data however, in African countries, it appears smoking among adults is more common among males and the poor (Pampel, 2002).

An estimated 4.8 million deaths cases worldwide in 2000 was believed to have occurred due tobacco smoking, particularly occurring in developing countries (Ezzat and Lopez; 2000).

Globally, an estimate of 250 million of today's children is expected to die from tobacco-related diseases (Peto and Lopez, 2004).

Hublet et al, 2006 have studied and reported on daily cigarette smoking among adolescents in Europe. Daily cigarette smoking was 5.5% and 20.0% among boys in Sweden and Latvia respectively. Among girls, daily smoking was 8.9% and 24.7% in Poland and Austria respectively.

In sub-Sahara Africa, data on national smoking prevalence ranges from 20% to 60% among men. Rate of smoking among certain sub-Saharan African youth has been documented. A prevalence rate of 1.4% in Zimbabwe, 1.5% in Nigeria, 34.4% in Cape Town, South Africa which exhibit a steadily increase and that must need an attended (Townsend et al, 2006). In Kenya, a study into a Global Youth Tobacco Survey document a rate of 7.2% cigarette smoking among school-going children and 8.5% of other tobacco related products (Global Youth Tobacco Survey, 2001).

A similar study on modifiable risk factors for coronary heart disease among young people in Ethiopian (15–25 years of age) residing in Addis-Ababa was 11.8% for males and 1.1% for females in 1995 (Betre et al; 1997). Prevalence of tobacco smoking in Kampala and Lilongwe among adolescents was 5.6% and 6.2% respectively. (Adamson et al, 2007). In Tanzanai, a

population based study into smoking prevalence demonstrated smoking to be more common in men than women. A prevalence of 27% tobacco smoking among males and 5% in females was reported (Kirstie et al, 2001).

Studies have shown that an estimated 50% adolescents who start smoking become regular smokers (WHO, 2000). About 50% of those who continue to smoke during adulthood die from diseases associated with smoking (MacKey and Ericksen, 2002).

Various categories of smoking exist which must be considered in estimating an extent of smoking related infections. A study into Prevalence and determinants of adolescent tobacco smoking in Addis Ababa, Ethiopia indicate an overall prevalence of 2.9% of which 4.5% males and 1% females were current smokers. The same study also reports an estimated 15.1% males and 5.7% females ex-smoking status among the population (Emmanuel et al; 2007).

On comparative assessment, several studies document a higher prevalence of smoking among males than females (Global Youth Tobacco Survey, 2003).

In Ghana specific, little is known about prevalence of smoking. Before the year 2003, no National data was available on prevalence of smoking among adults. The 2003 Ghana Demographic Health Survey estimated smoking prevalence in men aged 15 to 19 to be only 0.7% (Anon, 2003). Global Youth Tobacco Survey (GYTS) also documented smoking prevalence rate of 4.8% among 1,917 Ghanaian school children between the ages of 11-16 years in 2000. Males smoker were more than females (5.3% verses 3.8 %) (Wellington 2002).

A study by Juliet A. et al, (2006) *on Smoking Patterns in Ghanaian Civil Servants: Changes Over Three Decades:* revealed a smoking prevalence rate of 6.1% and 0.3% in men and women respectively. The age-standardised prevalence of cigarette smoking among the 1,015 participants was 3.9%. Among the participants, men with age-standardised prevalence of 7.3% and 0.5% for women were considered to be ex-smokers. The study also obtained an average

number of cigarettes smoked per day among the proportion of respondent being current male smokers to be 4.3 sticks. About 82% of men reported smoking 5 or less cigarettes in a day while 18% reported smoking 6 to 10 sticks of cigarettes per day. None of the participants smoked more than 10 cigarettes in a day.

2.3.6 Physical Inactivity

Physical inactivity is known to be a major public health problem of concern in 2000 as physical activity levels of people of all ages tended to decrease (CDC 2001). The Centres for Disease and Control (CDC 2001) reported that, among the youth in America aged 12 and 13 years, 69% were regularly active. However, the number dropped to 38% for young people between the ages of 18-21 years. A physically inactive child is more likely to become a physically inactive adult, which could lead to chronic diseases of lifestyle (Frantz et al., 2003).

Patterns of inactivity, also known as sedentism, begin early in life, making the promotion of physical activity among children imperative (Summerfield 1998). The prevalence of physical inactivity among youth worldwide has increased.

In the international level, 67% of young children in Canada did not meet the average physical activity guidelines to achieve optimal growth and development (Canadian Fitness and Lifestyle Research Institute 1998).

In the United States of America, Guo et al (1994) reported that nearly 50% of American young people aged between 12 and 21 years did not engage in vigorous physically active lifestyles on a daily basis.

Among the United Kingdom, London Health Observatory reported that both adults and children in Britain are less active and less fit than previously. The Allied Dunbar National Fitness Survey (1992) identified UK adult population groups who were sedentary as women aged 16-24 years, middle-aged men and people aged 50 years and over. In the Health Survey in England 1997, 22% boys and 30% girls were reported as being physically inactive between age

10 and 15. In the 16-24 year age group, 39% of the males were reported as inactive and 62% of the females were reported as inactive.

In some Sub-Saharan countries, prevalence of physical inactivity has been recorded. A study in South Africa report from Birth to Twenty (BTT) 2002, indicates that more than 40% of young people do not participate in regular physical activity. The BTT study found that physical activity was less common among girls than boys and among those with lower income and less education.

2.3.7 Environmental Factors

Urbanization is an important factor in the aetiology of obesity, and a major risk factor for NCDs. It accelerates the changes in diet, physical inactivity and increases access to tobacco products and high fat foods which are all risk factors of NCDs (Vorster 2000). Diet and physical inactivity are modifiable risk factors associated with changes in lifestyle.

Diets of the African population tend to differ between rural and urban dwellers. Studies have shown that rural dwellers diets are low in fat and sugar but high in carbohydrates and fibre (Steyn et al., 2001), while their urban counterparts show high fat and low fibre and carbohydrate intake (Bourne et al., 2002) which is typical of a Western diet. Popkin (1999) suggests that the shift from an agricultural economy to industrialization is one of the major economic changes that are associated with nutrition transition.

2.4 Epidemiological Trend of Non-Communicable Diseases

In United States, Estimates of hypertension (generally defined as systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg, or taking antihypertensive medications) prevalence in the United States varies somehow. A study conducted with a total population of 15,739, aged between 45–64 years, revealed a prevalence rate of 35% (Nieto et al., 1995) in the years 1987–1989. A similar study by the Woman's Health Initiative in U.S in the years between

1993 and 1997 of a total population of 90,755 women aged 50–79 years also revealed a prevalence rate of hypertension of 37.8% (Wassertheil et al., 2000).

In the Behavioural Risk Factor Surveillance System (BRFSS) in U.S, self-reported hypertension prevalence increased from 21.2% in 1991 to 25.7% in 2001 (Ahluwalia et. al., 2001).

In developing countries, the trend is for a rapid increase in hypertension prevalence, and in developed countries, the previous trend of a decrease in hypertension prevalence is actually reversing (Cent., 2005; Gupta, 2004; Hajjar et al., 2003).

Generally, the worldwide burden of hypertension in 2000 was estimated to be 972 million persons or 26.4% of the adult world population, with 333 million in developed and 639 million in developing countries (Kearney et al., 2005). It has been estimated that by 2025 1.56 billion individuals will have hypertension, an increase of 60% from 2000 (Kearney et al., 2005).
Chronic diseases have a longer history in Ghana than is usually thought especially stroke (Addae et al., 1996).

Between the 1920s and the 1960s, data gathered from Korle-Bu hospital showed a steady increase of stroke and cardiovascular diseases (Pobee, 2006). Hospital-based and communitybased studies conducted since the 1950s provide important information on prevalence and morbidity trends for hypertension, diabetes and other chronic non communicable disease such as cancers and sickle cell disease.

Data on the prevalence of diabetes in Ghana is scanty and unreliable. A study conducted in Greater Accra area to ascertain the prevalence of diabetes, impaired fasting glycaemia (IFG) and impaired glucose tolerance (IGT) in a random cluster sample of 4,733 Ghanaians aged 25 years and above indicated a crude prevalence of diabetes at 6.3%. (Amoah, 2003).

Diabetes prevalence studies in southern Ghana have recorded a steady increase. The earliest studies in the 1960s recorded 0.2% prevalence in a population of men in Ho (Dodu and Heer,

1964). Diabetes screening conducted by the Ghana Diabetes Association in the early 1990s suggested 2-3% prevalence in urban areas in southern Ghana; in the late 1990s a prevalence rate of 6.4% for diabetes and 10.7% for impaired glucose tolerance (IGT) was recorded in a community in Accra (Amoah et al., 2002).

At Korle-Bu hospital, the percentage of medical admissions due to diabetes increased almost two-fold from 3.5 in the mid-1970s to 6.4% in the mid-1980s (Adubofuor et al., 1993; 1997).

In the 1970s, the World Health Organisation (WHO) sponsored research in Mamprobi on Cardiovascular Disease (CVD) recorded hypertension prevalence of 13% in the community (Pobee, 2006). A non-communicable disease survey conducted in 1998 recorded a national prevalence of 27.8% for hypertension (Bosu, 2007). Studies conducted after the national survey show higher prevalence rates across different groups in different regions: 28.7% in Kumasi in the Ashanti Region; 32% prevalence in Bawku/Zebilla in the Upper East Region; 36.9% in Keta-Dzelukope in the Volta Region; and 47.8% among a cohort of women in Accra (Pobee, 2006; Cappuccio et al., 2004; Hill et al., 2005). Reported facility cases of hypertension increased by 67 per cent, from 58,677 in 1989 to 97,980 in 1998 (Amoah et al.,2002). In 2005, national out-patient hypertension cases totalled 250,000 (Bosu, 2007). During the same period (1950s to present) major causes of death have shifted from solely communicable diseases to a combination of communicable and chronic non-communicable diseases.

CHAPTER THREE 3.0 MATERIALS AND METHODS

3.1 STUDY TYPE AND DESIGN

A cross-sectional study design was adapted to assess the prevalence, levels of risk and the major risk factors for developing non communicable disease (Hypertension and Diabetes) among a representative sample in the Sekyere West District of Ashanti Region of Ghana with the use of structured questionnaire on formal interview basis as well as direct physical measurements and biochemical analysis.

3.2 STUDY POPULATION:

The study population comprised of individuals with or without indications of risk for NCDs within the District. The target population for the study was selected among individuals of not less than 18 years of age in both sexes as at the time of the study and who had been resident in the district for a period of more than three months. It was assumed that people aged 18 or above stood a chance of risk of contacting NCDs if not genetically acquired. Exclusion criteria included physical disability, mental disability and the presence of communication barriers, those who agreed to participate only in Step 1 and those who refused to participate in the study.

3.3 SAMPLING TECHNIQUES, SAMPLE SIZE AND PRE-TESTING

A systematic simple random technique was adopted to obtain the target respondents for the study. A total of 300 respondents with 150 each for both males and females were selected within an age cluster of three as young (18-24 years), adult and elderly (25-65 years) and aged (>65 years). Each group had 50 males and 50 females. The participants were enrolled from six randomly selected communities within the district.

Based on the previous prevalence estimate rate of non-communicable diseases (hypertension, diabetes) in the District, a total of 300 respondents were selected for this study with the use of suitable sample size estimation formula.

A pilot test of the survey questionnaire for STEP1 and STEP2 was carried out on a sample of 20 respondents outside the district of the study with similar characteristics to establish adherence, control, skills and rate of questionnaire administering for effective correspondence

and to help in restructuring of the questionnaire. Little amendments were undertaken after pretesting of the questionnaire.

3.4 STUDY VARIABLES

Table 3.1: Study Variables

VARIABLES	OPERATIONAL DEFINITION	SCALE OF MEASUREMENT
INDEPENDENT VARIABLES		
Sex	Sex of respondents in term sex organ	Binary
Age	Age at last birthday	Numeric
Education	Highest educational establishment	Ordinal
Occupation	Main work of respondents	Nominal

Religion	As reported by respondents	Nominal
Smoking pattern	Frequency of smoking by respondents	Ordinal
Smoking intensity	Number of times of smoking per day	Nominal
Alcohol intake pattern	Frequency of drinking daily	Ordinal
Vegetable and fruit intake	Fruit and vegetable intake per daily	Ordinal
Fat intake	Meat taken containing fat	Nominal
Physical activity	Type of physical activities perform	Ordinal
Salt intake	Level of quantity of salt taken per meal	Ordinal
DEPENDENT VARIABLES		
Blood pressure	Systolic and Diastolic blood pressure on resting	Numeric
Weight	Weight of respondents in Kilograms	Numeric
Height	Physical measure of height in cm	Numeric
Waist	Physical measure of waist in cm	Numeric
Hip	Physical measure of hip in cm	Numeric
Heart Rate	A measure of heart beat per minute	Numeric
Blood glucose	Volume of excess glucose in blood	Numeric

Source: Field Study, 2008

3.5 DATA COLLECTION TECHNIQUES AND TOOLS.

Primary data was collected with reference to WHO STEPS approach for non-communicable diseases risk factor assessment with particular emphasis on steps 1 and 2.

STEP 1 was used to capture information related to nutritional habit, sedentary lifestyle, sociodemographic characteristics and many others with the use of questionnaire

STEP 2 was also used to capture information on weight, height, blood pressure level and BMI. This was carried out with the use of materials such as digital weighing scale, tape measurement and digital blood pressure monitor

STEP 3 which is taking blood samples for biochemical assessment was not considered in its full package as being adopted by WHO. The content of the step 3 package was altered somewhat, though information obtained was in close relation with that adopted by World Health Organisation Instead of drawing a whole blood sample for laboratory chemical analysis for presence of parameters such as cholesterol, lipids, triglycerol and others, digital diabetes monitor was used to measure the presence of only blood glucose level in the blood of the sample respondents for detection of diabetes in general. This was as a result of limited resources to carry out the full content of the step 3 as part of the research.

Secondary data was also collected and manipulated to yield an interpretable outcome. Such data include records on various reported NCDs attendants in the hospitals in the District and death records on NCDs and other relevant literature. Data collection was assisted by trained enumerators and physicians who help to facilitate the progress of the research.

3.5.1 MEASUREMENT PROCEDURES

Pulse Rate and Blood Pressure Measurements

The pulse rate and resting blood pressure were recorded using a calibrated, digital blood pressure monitor.

Procedure:

- The subject was made to sit for at least five minutes prior to testing.
- His/her right arm was bare and resting at an angle of 45 degrees on a table with palm up.
- A cuff of appropriate size was wrapped firmly around the wrist.
- The start button was then pressed and the cuff inflated.
- Once maximum inflation was reached the cuff automatically deflated and both the resting blood pressure and the resting pulse rate was recorded.

- Both pulse readings and resting blood pressure was taken three times within about 5 minutes.

Weight

Weight was measured using a scale (Electronic weighing scale).

Procedure:

- The subject was asked to remove all excess clothing and made to stand upright on the scale on bare footed
- The weight of the subject was recorded in kilograms to the nearest whole number.

Height

A tape measure was used to measure the overall height of subjects.

Procedure:

- Tape measure was taped against a wall with tape measure 20 cm above ground level. The subject was also made to remove his/her shoes, stand feet together and arms at the sides and made to stand with heels, buttocks and upper back against the wall in a complete upright position.
- The measurement from the 20th cm level to highest point on head was measured.
- The overall height was recorder/obtained by adding 20 cm to the remaining height obtained above the bench mark level, all in centimetres.
- The height was then expressed in metres.
- The height in metres was then squared. BMI was then calculated from this expression using the following formula: Body weight (kg)/height (m)2.

Waist-to-Hip Ratio (WHR)

With abdomen relaxed, a horizontal measurement was taken at the level of the narrowest part of the torso just below the twelfth rib using a tape measure. The subject was made to stand upright while taking the measurement of the waist

While the subject stood erect and in upright position, a horizontal measurement was taken at the level of maximum circumference of the hips/buttocks.

Procedure:

- The subject was made to stand with feet together and the arms at the sides.
- The waist and hip circumference was measured, all in centimetres
- The tape was wrapped horizontally around the entire circumference of the waist and on hip at different times
- Measurement was repeated for three times in each case for consistency.
- Scores were recorded to the nearest centimetres ⬥ The waist-hip ratio was determined.

Blood glucose

Blood glucose level of subject was taken between the hours of 6 am to 9am. An exceptional case existed beyond this time only if a subject had not taken anything during the time of the exercise except water. Subjects were pre-informed of the test a day after and made to fast until the exercise. Consent was sought with well explanation given to subject on the need to fast for the exercise. The test was carried out with the use of digital blood sugar level monitor.

Procedure:

- The researcher was fully protected from infection by means of wearing gloves
- The tip of the thumb of subject was washed and cleaned with napkin
- The tip of the thumb of subject was then pricked with the special needle(lancet) of the machine to induce blood flow
- Drop of blood was poured unto the test slide of the glucose monitor
- The tip of the thumb was then dressed with cotton to cease excess flow of blood

- A minute was allowed to pass to read the glucose level of subjects from the screen of the digital glucose monitor
- Each lancet used was kept in a poly-bag after usage and disposed appropriately afterwards.

3.6 DATA HANDLING AND ANALYSIS.

Data was collected and edited to exclude errors, re-organized, coded and manipulated with appropriate software for efficient analysis. Access to the data was limited to the researcher and the supervisor at the initial stage of the research till completion.

Data was analyzed with computerized software such as SPSS Version 15 and Microsoft Excel 2007 compatible with Microsoft windows Vista version 2007. Data was analysed for frequency of distribution, proportion and percentages for qualitative variables, mean ± SD, correlations and rates, for quantitative variables. Results were calculated based on 95% Confidence Interval (alpha=0.005) and tested using inferential statistical tools such independent sample t-test distribution and correlation. Results were presented in tables, graphs and interpretations of findings made as possible.

3.7 ETHICAL CONSIDERATION

Ethical approval for conduct of the study was obtained from the District Assembly as well as the District Health Directorate Unit and all necessary authorities concerned. The research was approved for implementation with few amendments. Informed consent was also obtained from community heads and chiefs, household heads, community opinion leaders and the participants of the study.

The aims and the processes of the research were fully explained to the participants and their informed consent obtained for participation in each of the three components of the STEPS survey – STEP 1, STEP 2, and STEP 3.

Participants was informed about the content of the interviews to enable them understand the procedures and give their full approval. The importance of the study was made known to the participants as well as any possible risk that may be involved.

Participation was made voluntarily rather than imposition, thus, individuals were given the right to or not to take part in the study.

Only consenting individuals were chosen to be interviewed and other measurements taken. Although the data was handled by the researcher and supervisor, confidentiality was guaranteed as respondents were dealt with individually.

All information provided to the interviewers by participants was strictly confidential. Records were securely stored and did not include any names that might be used to identify the individuals as well as families or groups. Findings from Blood Glucose measurement and blood pressure were communicated to individual respondents on field during the time of measurement and necessary advice rendered based on individual status. .

3.8 STUDY ASSUMPTIONS

On the basis of this research, the following assumptions were made:

- With the use of WHO STEPWISE Approach for non-communicable diseases surveillance on risk factor assessment will serve to provide sufficient evidence on the magnitude of the effect under study in the District.
- The population selected for the study is quite representative to give an accurate findings to draw conclusion about the general trend of NCDs in the District.
- The dependent variable -Non-Communicable Diseases (hypertension, diabetes) is caused by the independent variables which are the risk factors. ♠ The risk status of the study population is not known
- Adults and aged are included in the study because behaviour patterns of adults and old aged are associated with NCDs.

3.9 LIMITATIONS OF STUDY:

For the purpose of this research, the STEP THREE of the WHO STEPWISE Approach for Non-communicable diseases surveillance on risk factor assessment serving as the basis for data collection was not carried out as a in full package adopted by WHO as result of the technical complexities involved, unavailable technical staff coupled with high cost of expenditure to execute such an aspect of the project. Nonetheless, the STEPS 1 and 2 provide sufficient evidence to validate any findings and conclusions of the study. Limited sample size of the study, as the study intended to cover the vast majority in the District and Transportation difficulties during questionnaire administration posed a great challenge on the part of the researcher.

CHAPTER FOUR

4.0 RESULTS

4.1 Background Information of Respondents.

An equal number of 150 (50%) each of males and females were enrolled in the study with most of the respondents classified as married (72.0%). Majority of them were also Christians (53%) followed by Muslim (40%) with the remaining being traditionalist (7%).

In terms of highest level of education, majority were Junior Secondary School leaver (62.3%) with the least being tertiary (7.0%). Most of the respondents on the status of employment were involved in informal services (49.7%) as against formal services (40.7%). The remaining proportion were classified as unemployed (1%), students (7.3%) and retired (3%)

Majority of the respondents (56.7%) received an average income of GH ¢ 50 per month.

Table 4.1 Background Information of Respondents.

Variable	Frequency	Percentage
Sex of Respondents		
Males	150	50
Females	150	50
Marital Status		
Single	65	21.7
Married	216	72.0
Divorced	16	5.3
Widowed	3	1.0
Religious affiliation		
Christian	159	53
Muslim	120	40
Traditionalist	21	7

Highest Level of education		
No Education	46	15.3
J.S.S	187	62.3
S.S.S	46	15.3
Tertiary	21	7.0
Employment Status		
Informal Services	149	49.7
Formal services	122	40.7
Unemployed	3	1
Students	22	7.3
Retired personnel	4	1.3
Income Status		
Minimum(GH ¢30)	75	25
Average (GH ¢ 50)	170	56.7
Maximum(GH¢500)	55	18.3

Source: Field Survey, 2008

4.2 Socio-Economic and Behaviour Risk Factor Profiles

4.2.1 Smoking Status of Respondents.

The table 4.2 below shows is a cross tabulation analysis presenting information on various smoking statuses of respondents by sex at different age levels. Majority of the respondents (82.33%) are described as never smoked followed by 9.66% and 8.0% which are described ex-smoker and current smoker respectively.

Table 4.2: Smoking Status of Respondents.

Age of respondents	Sex of Respondents	Smoking status					
		Never Smoked	%	Current smoker	%	Ex-smoker	%
	Males (N=50)	44	88	3	6	3	6

18-34	Females(N=50)	47	94	3	6	0	0
	TOTAL	91	91	6	6	3	6
35-51	Males (N=50)	38	76	8	16	4	8
	Females(N=50)	48	96	0	0	2	4
	TOTAL	86	86	8	8	6	6
52-68>	Males (N=50)	28	56	5	10	17	34
	Females(N=50)	42	84	5	10	3	6
	TOTAL	70	70	10	10	20	20
Over all Total		**247**	**82.33**	**24**	**8**	**29**	**9.66**

Source: Field Survey, 2008

4.2.2. Age of Smoking Initiation among Respondents.

Respondents were asked of the first time they smoked. Majority (19.1%) of them started smoking as early at the age of 22-27. This was more common among respondents within the age group of 52-68> and was high among males than females.

Table 4.3: Age of Smoking Initiation among Respondents

Age of respondents	Age smoking initiation	Sex of respondents N=47				To al	
		Male	%	Female	%	Both sexes	%
	10-15	2	4.2	0	0	2	4.2

18-34	16-21	4	8.5	2	4.2	6	12.7
35-51	16-21	3	6.3	0	0	3	6.3
	22-27	3	6.3	1	2.1	4	8.5
	28-33	4	8.5	0	0	4	8.5
	33-39 >	2	4.2	0	0	2	4.2
52-68>	10-15	1	2.1	0	0	1	2.1
	16-21	5	10.6	1	2.1	6	12.7
	22-27	9	19.1	0	0	9	19.1
	28-33	2	4.2	2	4.2	4	8.5
	33-39 >	2	4.2	4	8.5	6	12.7

Source: Field Survey, 2008

4.2.3. Quantity of Cigarette Smoked Per Daily.

Respondents were asked of the average quantity of cigarette smoked on daily basis. It was observed that they smoked between 1 and 13 pieces of cigarettes per day. Most of the respondents (26.9%) smoked between 4 and 6 pieces of cigarettes per day and was found most among respondents within age group of 52-68>. This was higher among males (17.3%) than females (9.6%).

Table 4.4: Quantity of Cigarette Smoked Per Daily

Age of respondents	Quantity of cigarettes smoked per day	Sex of respondents N=52				Total	
		Male	Prop	Female	Prop	Both sexes	Proportion

18-34	1-3	1	1.9	0	0	1	1.9
	4-6	1	1.9	2	3.8	3	5.7
	7-9	3	5.7	1	1.9	4	7.6
	10-13	1	1.9	0	0	1	1.9
35-51	1-3	1	1.9	1	1.9	2	3.8
	4-6	7	13.4	0	0	7	13.4
	7-9	3	5.7	0	0	3	5.7
	10-13	1	1.9	0	0	1	1.9
52-68>	1-3	1	1.9	0	0	1	1.9
	4-6	9	17.3	5	9.6	14	26.9
	7-9	2	3.8	1	1.9	3	5.7
	10-13	10	19.2	1	1.9	11	21.1
	12	0	0	1	1.9	1	1.9

Source: Field Survey, 2008

4.2.4 Intake of Other Tobacco Products

Among the proportion of respondents who either smoke or had smoked before (47/300), 25/47(53.2%) were identified to have taken any other tobacco products.

4.2.5. Daily Intensity of Smoking among Respondents

Daily intensity of smoking among respondents was observed to be on the average of thrice per day. Most of the respondents being males smoked three times per day and was more common among respondents within the age group of 52-68>.

Table 4.5: Daily Intensity of Smoking among Respondents

Age of respondents	Number of times of smoking per day	Sex of respondents				Total	
		Male N=150 n=50	%	Female N=150 n=50	%	Both sexes N=300 n=100	%
18-34	Once	3	6	1	2	4	4
	Twice	1	2	1	2	2	2
	> Thrice	2	4	0	0	2	2
	Total	**6**	**12**	**2**	**4**	**8**	**8**
35-51	Once	1	2	1	2	2	2
	Twice	2	4	0	0	2	2
	Thrice	8	16	0	0	8	8
	> Thrice	1	2	0	0	1	1
	Total	**12**	**24**	**1**	**2**	**13**	**13**
52-68>	Once	4	8	0	0	4	4
	Twice	4	8	1	2	5	1
	Thrice	7	14	4	8	11	11
	> Thrice	3	6	1	2	4	4
	Total	**18**	**36**	**6**	**12**	**24**	**24**

Source: Field Survey, 2008 t=-7.136 p-value=0.000

4.2.6. Perception of Respondents towards Smoking

The responses obtained from the sampled respondents of the study indicated that all 300(100%) of the respondents either smoked or not smoked before express a negative perception about smoking, hence they indicated that smoking is considered not good but rather harmful.

4.2.7. Smokeless Tobacco Use among Respondents.

Most of the respondents (36.6%) were identified to be involved in smokeless tobacco use. This was observed among respondents within the age group of 52-68>, being more common among males (21.9%) than females (14.6%).

Table 4. 6: Smokeless Tobacco Use among Respondents.

Age of Respondents	Ever use smokeless materials	Sex of respondents N=41				Total	
		males	Proportion	females	Proportion	Both sexes	Proportion
18-34	Yes	4	9.7	1	2.4	5	12.1
	No	1	2.4	3	7.3	4	9.7
35-51	Yes	1	2.4	0	0	1	2.4
	No	7	17.0	1	2.4	8	19.5
52-68>	Yes	9	21.9	6	14.6	15	36.6
	No	7	17.0	1	2.4	8	19.5

t= -1.748 p-value=0.088

Source: Field Survey, 2008

4.2.8. Passive Smoking Behaviours among Respondents.

Passive smoking behaviour was also observed among respondents. Most of them (40.4%) spend between 27-37 minutes in direct contact with active smokers. This is followed by 23.8% of the respondents who also spend between 5 -15 minutes in direct contact with active smokers. This behaviour was observed among males (21.4%) than females (19.0%).

Table 4.7: Passive Smoking Behaviours among Respondents.

Duration of Contact with Smokers(Minutes)	Sex of Respondents N=300 n=42				Total	
	Males	%	Females	%	Both sexes	%
5-15	4	9.5	6	14.2	10	23.8
16-26	4	9.5	2	4.7	6	14.2
27-37	9	21.4	8	19.0	17	40.4
38-48	---	0	---	0	0	0
49-59	---	0	---	0	0	0
60+ and above	6	14.2	3	7.1	9	21.4
TOTAL	23	54.7	19	45.2	42	100

Source: Field Survey, 2008

4.2.9. Drinking Status

Various forms of drinking status among respondents were observed by the study. Among respondents within age group of 18-34, 6.3% were current drinkers as against 2.6% exdrinkers and 23.3% had not drunk before. Current drinking status was higher among males (9.3%) than females (6.3%).

Among respondents ages between 35 and 51, 4.6% were current drinkers, 4.0% were exdrinkers and 24.6% had also not drunk before.

Among this group, current drinking status was equal among males and females.

With regard to respondents aged 52-68 and above, 7.3% were current drinker, 2.6% were exdrinkers and 23.3% had not drunk before. Current drinking status was higher among males (9.3%) than females (5.3%) among this age group.

Table 4. 8: Drinking Status of Respondents

Age of respondents	Drinking status	Sex of respondents				T otal	
		Male n=150	Prop	Femal e	Prop	Both sexes	Prop
				n=150		N=300	
18-34	Never drink	32	21.3	38	25.3	70	23.3
	Current drinker	14	9.3	5	3.3	19	6.3
	Ex-drinker	4	2.6	7	4.6	11	3.6
35-51	Never drink	36	24	38	25.3	74	24.6
	Current drinker	8	5.3	6	4	14	4.6
	Ex-drinker	6	4	6	4	12	4
52-68>	Never drink	34	22.6	36	24	70	23.3
	Current drinker	14	9.3	8	5.3	22	7.3
	Ex-drinker	2	1.3	6	4	8	2.6

Source: Field Survey, 2008

4.2.10. Frequency of Drinking

Majority of the respondents (22.0%) drink once per pay. Most of them were within the age group of 18-34 and was much higher among males (12.7%) than females (9.3%). Intake of alcohol twice per par was higher among respondents aged between 38 and 68 (11.6%) than among 18-34 (6.9%). In both cases, males drinks more than females. Trice drinking per day was lower among all age groups compared to once and twice drinking per day.

Table 4.9: Frequency of Drinking

Age of respondents	Times you drink per day	Sex of respondents. N=86				Total	
		Males	Prop	Females	Prop	Both sexes	Prop
	Once	11	12.7	8	9.3	19	22.0

18-34	Twice	6	6.9	0	0	6	6.9
	Thrice	1	1.1	4	4.6	5	5.8
35-51	Once	6	6.9	8	9.3	14	16.2
	Twice	6	6.9	4	4.6	10	11.6
	Thrice	2	2.3	0	0	2	2.3
	Once	8		3	3.4	11	12.7
52-68>			9.3				
	Twice	3	12.7	7	8.1	10	11.6
	Thrice	5	5.8	4	4.6	9	10.4

Source: Field Survey, 2008

4.2.11. Intake of Alcoholic Beverage

Most of the respondents (29.0%) engaged in intake of alcoholic beverages in addition to alcohol intake. This was observed to be higher among males (15.1%5) than females (13.9%) and was associated with respondents aged between 52-68 and above. This was followed by respondents ages between 18-34 who also take in alcoholic beverage in addition to alcohol (23.2%).

Table 4.10: Intake of Alcoholic Beverage

Age of respondents	Alcoholic Beverage Intake	Sex of respondents N=86				Total	
		Males	Prop	Females	Prop	Both sexes	Prop
18-34	Yes	11	12.7	9	10.4	20	23.2
	No	7	8.1	3	3.4	10	11.6
35-51	Yes	10	11.6	7	8.1	17	19.7
	No	4	4.6	5	5.8	9	10.4
52-68>	Yes	13	15.1	12	13.9	25	29
	No	3	3.4	2	2.3	5	5.8

4.2.12. Drinking Pattern

Majority of the respondents were daily drinkers (19.7%) and occasional drinkers (17.4%). These were among respondents aged between 52-68> and 18-34 respectively and in both cases were higher among males than females. A trend of increasing daily drinking was observed with increasing age among respondents.

Table 4.11: Drinking Pattern

Age of respondents	Drinking pattern	Sex of respondents N=86				Total	
		males	Prop	females	Prop	males	Prop
18-34	Daily	4	4.6	5	5.8	9	10.4
	Weekly	3	3.4	2	2.3	5	5.8
	Monthly	1	1.1	0	0	1	1.1
	Occasionally	10	11.6	5	5.8	15	17.4
35-51	Daily	6	6.9	7	8.1	13	15.1
	Weekly	4	4.6	0	0	4	4.6
	Occasionally	4	4.6	5	5.8	9	10.4
52-68>	Daily	10	11.6	7	8.1	17	19.7
	Weekly	2	2.3	4	4.6	6	6.9
	Occasionally	4	4.6	3	3.4	7	8.1

Source: Field Survey, 2008

4.2.13. Mean Number of Days of Fruits and Vegetable Consumption Per Week.

People on average consumed fruits and vegetables on 3.0 day and 2.7days in a week respectively. Males alone consume on the average of 3.1 days and 2.6 days of fruits and vegetables as against females of 2.9 days and 2.7 days respectively.

Table 4.12: Mean Number of Days of Fruits and Vegetable Consumption per Week.

Age	Mean days of fruits consumption			Mean days of vegetable consumption		
	Male	Females	Both Sexes	Male	Females	Both Sexes
18-34	3.3	3.3	3.33	2.36	2.78	2.57
35-51	2.54	3.0	2.77	2.64	2.76	2.70
52-68>	3.46	2.5	2.98	3.04	2.7	2.87

t=0.688 p-value=0.492 t=-0.461 pvalue=0.645

Source: Field Survey, 2008

4.2.14. Mean Number of Times of Fruits and Vegetable Servings Per Day

On the average, people serve fruits and vegetables with their diet on 1.2 and 1.7 times per daily respectively. Men and Women in general serve fruits on the average of 1.2 times each per day and 1.66 and 1.74 times of vegetables daily respectively. None of the respondents on the average serve more than two times of fruits and vegetables per daily.

Table 4.13: Mean Number of Fruits and Vegetable Servings Per Day

Age	Mean times of fruits serving/day			Mean times of vegetable servings/day		
	Male	Females	Both Sexes	Male	Females	Both Sexes
18-34	1.38	1.30	1.34	1.50	1.74	1.62
35-51	1.12	1.16	1.14	1.54	1.64	1.59
52-68>	1.18	1.20	1.19	1.94	1.84	1.89

t=1.171 p-value=0.243 t=-0.981 p-value=0.327

Source: Field Survey, 2008

4.2.15. Salt Intake Pattern/Ability

In order to estimate the level of risk of subjects with regards to daily salt intake, they were interviewed on the average quantity of salt intake per meal per day which was ranked as low, moderate and high.

Table 4.14: Salt Intake Pattern/Ability

Age of respondents	Salt intake ability	Sex of respondents				Total	
		Males n=150	Prop	Female n=150	Prop	Both sexes	Prop
18-34	Low	3	2	4	2.6	7	2.3
	Moderate	42	28	32	21.3	74	24.6
	High	5	3.3	14	9.3	19	6.3
35-51	Low	6	4	13	8.6	19	6.3
	Moderate	30	20	22	14.6	52	17.3
	High	14	9.3	15	10	29	9.6
52-68>	Low	9	6	17	11.3	26	8.6
	Moderate	20	13.3	28	18.6	48	16
	High	21	14	5	3.3	26	8.6

Source: Field Survey, 2008

4.2.16 Physical Activity

Physical activity was assessed by asking the subjects about the time spent in doing various types of physical activities. The intensity of physical activity is categorized into:

1 Vigorous-intensity activity: defined as the activity, which causes large increases in breathing or heart rate, and sweating for at least 10 minutes continuously.

2 Moderate-intensity activity: defined as the activity, which causes small increase in breathing or heart rate for at least 10 minutes continuously.

3 Low-intensity physical activity: the remaining subjects who were not captured in both vigorous and moderate intensity activity were thus considered to belong to this group of classification.

Table 4.15: Physical Activity

Age Group	Males N=150			Females N=150			Both sexes 300		
	L	M	V %	L %	M %	V %	L %	M %	V %
18-34	54.1	29.3	16.6	62.1	27.3	10.6	58.1	28.3	13.6
35-51	63.4	26.6	10.0	66.7	27.3	06.0	65.0	27.0	08.0
52-68>	66.7	22.0	11.3	54.7	30.0	15.3	61.4	25.3	13.3
Total	61.4	26.0	12.6	61.2	28.2	10.6	61.5	26.9	11.6

L=Low physical activity M=Moderate physical activity V=Vigorous physical activity Source: Field Survey, 2008

4.2.17. Number of Days of Moderate Activity

The overall mean number of days of performing moderate activities among respondents was 2.1 days per week. Males and females as part of the entire subject perform on an average of 2.2 and 2.1 days of moderate activities per week respectively. Majority of the respondents 88.3% (265/300) performed at least between 1 to 3 days moderate activities per week.

Table 4.16: Number of Day of Moderate Activity

Age	Mean number of day of moderate activity among respondents		
	Males	Female	Both sexes
18-34	2.28	2.30	2.29
35-51	1.70	2.02	1.86
52-68>	2.68	2.10	2.39

t= 0.0576 p-value= 0.565 Source: Field Survey, 2008

4.2.18. Total Time for Moderate and Vigorous Activities.

On the average the respondents spent 59.90 minute and 2.05 hours in performing whatever kind of moderate and vigorous activity in the course of the daily works respectively. Males and females spend on an average of 60.29 minutes and 59.50 minutes per day respectively for moderate activity and 3.89 hours and 3.27 hours respectively in performing vigorous activity. Majority of the respondents 55.7 % (167/300) and 68.2 %(71/104) spent between 15 to 30 minute and 1 to 3 hours per day in performing any form of moderate and vigorous physical activity respectively.

Table 4. 17: Total Time for Moderate and Vigorous Activities.

Age	Mean total time for moderate activity among respondents per day(min)			Mean total time for vigorous activity among respondents per day(Hrs)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	50.50	43.40	46.95	3.06	4.21	3.50
35-51	52.08	25.90	38.99	3.65	2.04	2.91
52-68>	78.30	109.20	93.75	4.96	3.57	4.05

t= 0.088 p-value= 0.930 t= 0.661 p-value= 0.512
Source: Field Survey, 2008

4.2.19. Moderate Activity and Mean Number of Days Involving Bicycling or Walking

In totality, 97% (292/300) of the respondents actively indulged in walking and bicycling to and from places as part of their daily activities as against 2.7 %(8/300) who do not involved in such walking or bicycling to and from places.

With regard to the mean number of days of bicycling and walking, the mean number of days for the entire study population is 6.0 days. Males and females as an individual subject on the average spent 6.1 and 5.8 number of days walking and bicycling as part of daily moderate physical activity.

Majority of the respondents 90% (263/292) in a week basis spent between 5-7days walking and bicycling.

Table 4.18: Moderate Activity and Mean Number of Days Involving Bicycling or Walking

Age	Percentage of respondents indulging in walking and bicycling as part of moderate physical activity. N=300		Mean number of days of walking and bicycling		
	Male %	Females %	Male	Females	Both sexes
18-34	16.3	16.3	5.9	6.3	6.1
35-51	15.6	15.6	6.3	5.6	5.9
52-68>	16.6	16.6	6.24	5.68	5.9
			t= 1.663	p-value= 0.097	

Source: Field Survey, 2008

4.2.20. Sedentary Time of Respondents

The average sedentary time of the respondents was 98 minutes. Males and females spent on an average of 104 and 92 minute per day as a sedentary time respectively. Majority of the respondents 39.7% (119/300) spent 120 minutes per day as a sedentary time.

Table 4.19: Sedentary Time of Respondents

	Mean total sedentary time of respondents per day(min)		
Age	**Males**	**Females**	**Both sexes**
18-34	91.1	76.3	83.7
35-51	110.3	69.6	89.95
52-68>	112.38	132.6	122.49

Source: Field Survey, 2008

4.2.21. Awareness on Hypertension and Diabetes

To identify public awareness about their health status, the prevalence of hypertension and diabetes were estimated based on self reporting. The respondents were asked whether they have been told by health professional that they had hypertension or diabetes, and were also asked about their compliance to medical treatment and the advice they received at health settings for promotion of healthy life style.

4.2.22. Self-Reported Hypertension

Forty-nine percent (49%) of the respondents had their blood pressure measured within a period of less than12 month at time of the study. A trend observed was that females seemed to measure their blood pressure more than males even at all age level except age range 35-51 where males percentage was a bit higher than females (48% verses 46%).

Table 4.20: Blood Pressure Check-Up

Age	**Males N=150**	**Females N=150**	**Both sexes N=300**

	< 1 yr %	1-5 yrs %	Never %	< 1 yr %	1-5 yrs %	Never %	< 1 yr %	1-5 yrs %	Never %
18-34	48	30	22	56	16	28	52	23	25
35-51	48	34	18	46	22	32	47	28	25
52-68>	44	38	18	52	30	18	48	34	18

Source: Field Survey, 2008

The table 4.21 below shows the self reported hypertension status of respondents and the drug use. In all, 49/300 (16.3%) out of the entire respondents were identified to have been reported hypertensive by either a doctor or any health care personnel as against the majority 252/300(83.7%) who do not have any records of hypertension. Prevalence of reported hypertension was higher among females than males (17.3% verses15.3%). An increase trend of hypertension was observed with increasing age among both males and females.

Out of the total 16.3% reported hypertensive prevalence among respondents, only 14.6% out of this percentage is currently on medication. The remaining 2% are neither seeking medication nor going for hypertensive medical review or check up. Males (15.3%: 13.3%) are a bit responsive to hypertensive medication than females (17.3%: 14.6%) with reference to percentage prevalence in both cases respectively.

Table 4.21: Self-Reported Hypertension

Age	N=300						N=49		
	Reported of Hypertension %			Not Reported Hypertension %			% reported hypertensive respondents on drugs		
	Males	Females	Both sexes	Males	Females	Both sexes	Males	Females	Both sexes
18-34	6	4	5	94	96	95	0	2	2
35-51	16	24	20	84	76	80	16	20	18
52-68>	24	24	24	76	76	76	24	24	24
TOTAL	**15.3**	**17.3**	**16.3**	**84.7**	**82.7**	**83.7**	**13.3**	**14.6**	**14.3**

Source: Field Survey, 2008

4.2.23. Advice on Hypertension

The table 4.22 below shows the self reported hypertensive respondents and percentage of respondents receiving various behavioural lifestyle forms of advice on hypertension reduction or control.

Table4.22: Advice on Hypertension

Form of advice	Age	Males	Females	Both sexes
	18-34	0	2	2
Advice on salt reduction	35-51	14	14	14
	52-68>	22	24	23
	TOTAL	**12**	**13.3**	**12.6**
Advice on weight loss	18-34	0	2	2
	35-51	8	2	5

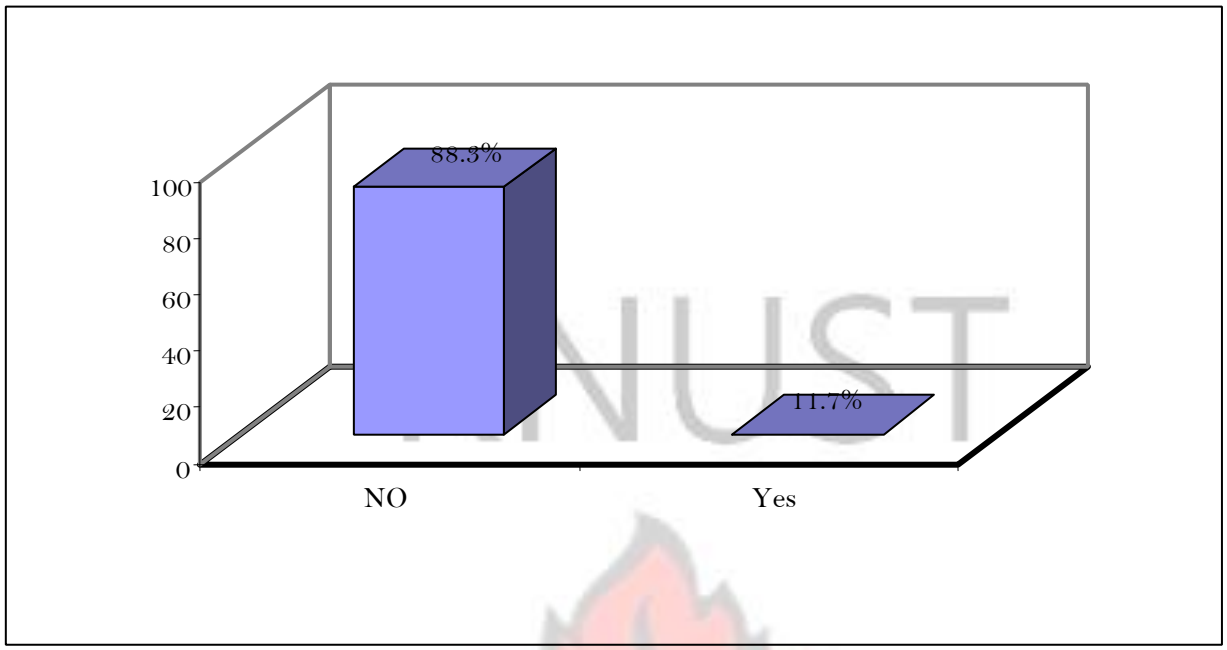
	52-68>	22	12	17
	TOTAL	**10**	**5.3**	**7.6**
Advice on smoking cessation	18-34	0	4	4
	35-51	6	4	5
	52-68>	12	10	11
	TOTAL	**6**	**6**	**6**
Advice of Exercise	18-34	0	6	6
	35-51	12	22	17
	52-68>	12	22	17
	TOTAL	**8**	**16.4**	**9.8**

Source: Field Survey, 2008

2.2.24. Intake of Herbal Remedies for Treatment of Hypertension.

The figure 4.1 below shows the number and percentage of respondents especially self reported hypertensive respondents who basically depend on traditional healers for the management and treatment of hypertension. In general females resort to herbal medication for hypertension treatment than males respectively {68.6 %(24/35) 31.4 %(11/35)} [P=0.019].

Figure 4.1: Responses on Intake of Herbal Medicine for Hypertension



Source: Field Survey, 2008

2.2.25. Self Reported Diabetes

The table 4.23 below shows the proportion of the respondents under the various age category who measured their blood glucose within a period of 12 month as at time of the study to those who never measured their blood glucose. The overall prevalence of Blood Glucose measurement among the entire respondents was 17.0%.Females in totality check their BG level regularly than males {19.3 % (22/150) verses 14.6 % (22/150} [P=0.284].

Table 4.23: Blood Glucose Check-Up

Age	N=300 %					
	Diabetes checked			N› diabetes check		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	16	4	10	84	96	90
35-51	12	30	21	88	70	79
52-68>	16	24	20	84	76	80
TOTAL	**14.6**	**19.3**	**17.0**	**85.4**	**80.7**	**83.0**

Source: Field Survey, 2008

Out of the total proportion who cheeked their BG levels (51/300), the table below also presents information on the percentage of respondents detected diabetes by either a doctor or a medical officer. The prevalence of self reported diabetes among the entire respondents is 7.7%. Most of these victims are particularly females compared to males (12.0% verses 3.3%) [P=0.005].

Among the proportion detected diabetes upon check-up (23/51), 78 %(18/23) were identified being on insulin injection. The prevalence of insulin injection among the population is 6.0% [P=0.052] All 100 % (23/23) of the respondents reported of diabetes are on oral drugs [P=0.051].

Proportion of detected diabetes patients (23/51) who were identified for being on a special diet for diabetes management was 85 % (20/23), therefore the overall prevalence of diet use for diabetes management among population was 6.7%.

Table 4.24: Self Reported Diabetes

Age	N=300					
	Detected diabetes %			Not detected diabetes %		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	10.0	10.0	10.0	90.0	90.0	90.0
35-51	0	18.0	17.6	100	82.0	91.0
52-68>	0	8.0	8.0	100	92.0	82.0

TOTAL	**3.3**	**12.0**	**7.7**	**96.7**	**88.0**	**92.3**

Source: Field Survey, 2008

4.2.26 Family History of Hypertension and Diabetes

To obtained information on hypertension and diabetes presence among family set up, respondents were asked if any known family member is either hypertensive or diabetic. Respondents were expected to indicate 'Yes' or 'No' for presence and non-presence of NCD (hypertension and diabetes) in a family setting respectively. Sixty three (63%) [190/300] against 36.7% (110/300) indicated existence and non-existence of NCD's in a family setting respectively.

4.3 Physical/Anthropometric Risk Factor Profiles Measurement

4.3.1. Height and Weight Measurement.

The mean height and weight of the total population of the study was 164.65cm and 65.28Kg respectively. Males alone measured on average 164.9cm and 65.52Kg whilst females measured 164.3cm and 65.5 kg respectively.

Table 4.25 Mean Height (cm) and Mean Weight (Kg)

Age	Mean Height (cm)			Mean weight(Kg)		
	Male	Females	Both Sexes	Male	Females	Both Sexes
18-34	167.00	164.54	165.77	65.2	61.92	63.56
35-51	168.42	163.36	165.89	65.96	68.5	67.23
52-68>	159.36	165.22	162.29	65.4	64.74	65.07
t=0.427		p-value=0.670		t=0.354		p-value=0.724

Source: Field Survey, 2008

4.3.2. Body Mass Index (BMI)

This is a measure of nutritional status whereby the body weight in Kilogram is divided to the square meters for height.

It is expressed mathematically as:

$$BMI = \frac{\text{Body weight (Kg)}}{\text{Height } (m^2)}$$

Mean BMI of the study population was 24. 2Kg/m². Of this, males and females recorded an average of 24.2 Kg/ m²and 24.1 Kg/ m² respectively. Males on the average recoded a higher BMI than female, though no clear difference exist between their means (p= 0.779).

Table 4.26: Body Mass Index (BMI)

Age	Mean BMI(Kg/ m²)		
	Male	Females	Both Sexes
18-34	23.74	22.79	23.269
35-51	23.34	25.81	24.58
52-68>	25.778	23.78	24.77

t= 0.281 p-value= 0.779 Source: Field Survey, 2008

Table 4.27: Rate of Under Weight and Normal Weight among Respondents

Age						
	Under Weight (<18.5Kg/ m²)			Normal Weight(18.5-24.95Kg/ m²)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	12	4	8	54	76	65

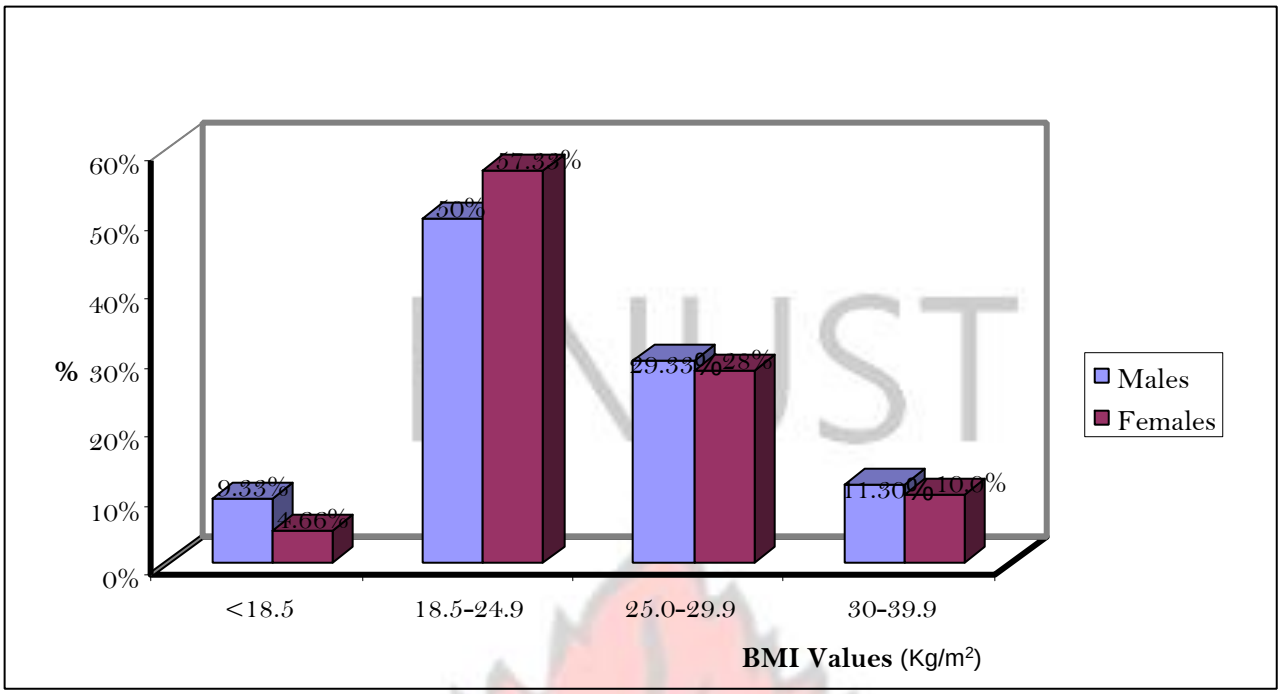
35-51	14	2	8	52	38	45
52-68>	2	8	5	44	58	51
TOTAL	**9.33**	**4.66**	**7.00**	**50.00**	**57.33**	**53.66**

Table 4.28: Rate of Over Weight and Obese among Respondents

Age						
	Over Weight (25-29.9Kg/ m^2)			Obese (>/=30Kg/ m^2)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	18	12	15	16	8	12
35-51	34	48	41	0	12	12
52-68>	36	24	30	18	10	14
TOTAL	**29.33**	**28.00**	**28.66**	**11.33**	**10.00**	**10.66**

Source: Field Survey, 2008

Figure 4.2: Rates of BMI among Males and Females



Source: Field Survey, 2008

4.3.3. Waist and Hip Circumference

The mean waist and hip circumference of the study subjects was 87.38cm and 96.9cm respectively. Males and females measured on the average of 86.17cm and 88.59 cm as waist circumference and 94.68 cm and 99.19cm as hip circumference respectively.

Table 4.29: Waist and Hip Circumference

Age	Mean Waist (cm)			Mean Hip(cm)		
	Male	Females	Both Sexes	Male	Females	Both Sexes
18-34	84.04	82.34	83.19	89.96	95.96	92.96
35-51	87.46	93.56	90.51	97.94	103.34	100.64
52-68>	87.02	89.92	88.45	96.16	99.92	98.02

t=-1.758 p-value=0.080 t=-3.789 p-value=0.000

Source: Field Survey, 2008

4.3.4. Waist-To-Hip Ratio (WHR)

The overall mean WHR of the study subjects was 0.85cm. Of this, males and females on the average recoded 0.85cm and 0.84cm respectively.

Table 4.30: Mean Waist-To-Hip Ratio (WHR) [cm]

Age			
	Male	Females	Both Sexes
18-34	0.89	0.82	0.85
35-51	0.85	0.86	0.85
52-68>	0.85	0.85	0.85

t= 1.761 p= 0.079 Source: Field Survey, 2008

4.3.5. Rate of Waist-Hip Ratio (WHR)

With reference to World Health Organisation (WHO) standards, the cut off points used to categories waist/ hip ratio as an indicator for excess abdominal fat was adopted. The cut off points are 1cm and 0.85cm for males and females respectively. The table 4.31 below presents the details of the finding from the study.

Table 4.31: Rate of Waist-Hip Ratio (WHR)

Age				
	Males		Females	
	WHR (</=1.0cm)	WHR (>1.0cm)	WHR (<0.85cm)	WHR (>0.85)
18-34	88	12	56	44
35-51	100	0	36	64
52-68>	96	4	42	56
TOTAL	**94.66**	**5.33**	**44.96**	**55.03**

Source: Field Survey, 2008

4.3.6. Heart Rate/Pulse

On the average, the overall pulse rate among the entire subject was 81.54 beats per minutes. Males and Females measured on the average of 79.20 and 83.87 beat per minute respectively.

Females recorded a higher heart rate/pulse value than males [p=0.001]. **Table 4.32: Heart Rate/Pulse**

Age			
	Males	Females	Both sexes
18-34	75.13	86.23	80.68
35-51	81.62	84.52	83.07
52-68>	80.86	80.87	80.87
TOTAL	**79.20**	**83.87**	**81.54**

t=-3.436 **p=0.001**

Source: Field Survey, 2008

4.3.7. Blood Pressure

Table 4.33: Mean Systolic and Diastolic Blood Pressure (mmHg)

Age						
	Systolic Blood Pressure(SBP)			Diastolic Blood Pressure(DBP)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	130.78	129.31	130.05	97.10	84.24	90.67
35-51	135.61	126.70	131.15	92.34	87.89	90.11
52-68>	150.22	142.82	146.52	98.52	90.03	94.28
TOTAL	**138.87**	**132.94**	**135.91**	**95.98**	**87.38**	**91.68**

t= 2.250 **p=0.025** **t=3.169** **p=0.002 Source: Field Survey, 2008**

4.3.8. Prevalence of Hypertension.

The World Health Organization (WHO) criteria for classifying blood pressure measurement were adopted to determine the rate of the various categories of hypertension both systolic and diastolic among respondents. The definition of the categories of hypertension adopted by WHO are as follows:

Category Systolic Blood Pressure Diastolic Blood Pressure

Optimal	<120	<80
Pre-hypertension	120- <140	80 - <90
Hypertension stage I	140 - <160	90 - <100
Hypertension stage II	≥ 160	≥ 100

Table 4. 34: Rate of Systolic and Diastolic Blood Pressure (mmHg)

Age						
	Systolic Blood Pressure <120 mmHg			Diastolic Blood Pressure <80 mmHg		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	8	26	17	26	38	32
35-51	16	36	26	20	20	20
52-68>	14	16	15	10	24	17
TOTAL	**12.68**	**26.00**	**19.35**	**18.68**	**27.34**	**23.01**

Table 4.35: Rate of Systolic and Diastolic Blood Pressure (mmHg)

Age						
	Systolic Blood Pressure ≥ 120 mmHg			Diastolic Blood Pressure ≥ 80 mmHg		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	70	52	61	30	20	25
35-51	56	50	53	12	46	29
52-68>	28	42	35	32	28	30
TOTAL	**51.33**	**48.00**	**49.66**	**24.66**	**31.33**	**28.00**

Table 4.36: Rate of Systolic and Diastolic Blood Pressure (mmHg)

Age						
	Systolic Blood Pressure ≥ 140 mmHg			Diastolic Blood Pressure ≥ 90 mmHg		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	18	14	16	20	26	23
35-51	20	6	13	32	16	24
52-68>	26	22	24	18	16	17
TOTAL	**21.33**	**14.00**	**17.66**	**23.33**	**19.33**	**21.33**

Table 4.37: Rate of Systolic and Diastolic Blood Pressure (mmHg)

Age	Systolic Blood pressure ≥ 160 mmHg			Diastolic Blood pressure ≥ 100 mmHg		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	4	8	6	24	16	20
35-51	8	8	8	36	18	27
52-68>	32	20	26	40	32	36
TOTAL	**14.66**	**12**	**13.33**	**33.33**	**22.00**	**27.66**

Source: Field Survey, 2008

4.4. Biochemical Risk Factor profiles Measurements

4.4.1. Time of Blood Glucose Measurement and Mean BG Values

It was observed that 34(11.3%) and 266(88.7%) of the subject Blood Glucose (BG) were measured in the afternoon (random blood sugar) and morning (fasting blood sugar) respectively. The mean BG value of the subjects whose BG level ware taken in the afternoon and morning was 5.42 and 5.09 respectively. Also the overall mean BG values of the subjects irrespective of time measurements were taken was 5.1. The minimum as well as the maximum values obtained during measurement of subject BG was 3.4 and 7.3 respectively.

Table 4.38: Time of Blood Glucose Measurement and Mean BG Values

Time of BG measurement	Frequency	Proportion	Mean BG values
Afternoon	34	11.3	5.42
Morning	266	88.7	5.09
TOTAL	300	100.0	10.51

t= 2.604 p-value= 0.010 Source: Field Survey, 2008

4.4.2. Fasting Blood Glucose at Age Levels.

Table 4.39: Fasting Blood Glucose Levels.

Age	Mean Fasting Blood Glucose (FBG)(mmol/L)		
	Male	Females	Both Sexes
18-34	**5.00**	**5.06**	**5.03**
35-51	**5.26**	**4.92**	**5.09**
52-68>	**5.28**	**5.26**	**5.27**

t= - 0.598 p-value= 0.551 Source: Field Survey, 2008

4.4.3. Rate of Blood Glucose Measurement.

With reference to WHO standardized criteria for classifying blood Glucose measures, subjects of the study were categorized according to their fasting blood glucose based on the WHO classification as follows.

Category	Fasting Blood Glucose (FBG) [mmol/L]
Normal	< 5.5
Impaired FBG	5.5-7
Hyperglycaemia	≥ 7

Table 4.40: Rate of Normal and Impaired FBG Measurements among Respondents

Age						
	Normal FBG(<5.5mmol/L)			Impaired FBG(5.5-<7mmol/L)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	68	60	64	32	40	36
35-51	54	67	61	46	32	39

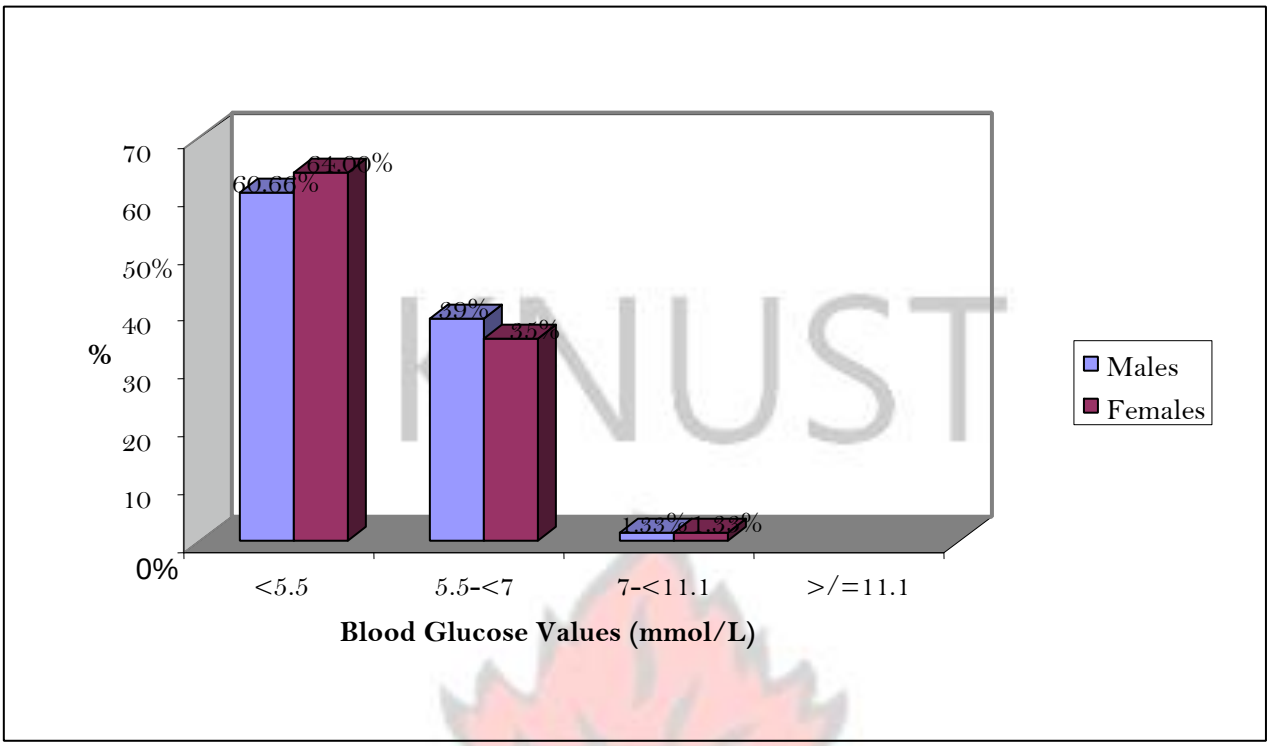
52-68>	60	64	62	38	34	36
TOTAL	**60.66**	**64.00**	**62.33**	**38.66**	**35.33**	**37.00**

Table 4.41: Rate of Hyperglycaemic FBG Measurements among Respondents

Age						
	Mild Hyperglycaemia (7-<11.1)			Severe Hyperglycaemia (≥11.1)		
	Males	Females	Both sexes	Males	Females	Both sexes
18-34	0	0	0	0	0	0
35-51	0	0	0	0	0	0
52-68>	2	2	2	0	0	0
TOTAL	**1.33**	**1.33**	**0.66**	**0.00**	**0.00**	**0.00**

Source: Field Survey, 2008

Figure 4.3: Rates of Blood Glucose Levels



Source: Field Survey, 2008

CHAPTER FIVE 5.0 DISCUSSION

5.1 Background Information of Respondents

This study enrolled equal number of males to females within the age classes between 18 to 68 years and above. The study revealed that most of the respondents (72.0%) were married while the remaining were considered single (21.7%), divorce (5.3%) and widowed (1.0%).

The high proportion of married people among the respondents could have a significant impact on non communicable diseases occurrence especially high blood pressure since some marital issues such as social, financial and nutritional obligations on the part of married couples has an

associated effect on blood pressure. This assertion supports the research hypothesis stated that socioeconomic factors are key determinants of non-communicable diseases.

Education also plays a very significant role in the development, management and control of non communicable diseases. Existing literatures support the fact that in an environment where illiteracy is high, NCD is said to be high as compared to high literacy environment. This study documented 90% literacy rate among the subjects. High literacy rate among the respondents means that the rate of most risk factors for NCDs and others having an association with educational status is likely to be low among the entire communities. This will manifest in the adoption of healthy lifestyle that promote good health and prevention of NCD's. In contrast, as indicated by Davidson et al., (2000), low educational attainment has been linked to the rise in blood pressure with age.

At least majority (90.4%) of the respondents has something to do with work ranging from informal business activities to formal business activities.

On the average terms, most respondents received on monthly income basis an amount of 50 cedi with the minimum and maximum being 30 and 500 Ghana cedi per monthly respectively.

This implies that at least every individual has an opportunity of being able to afford basic needs, though their economic status is considered average. This is emphasised by Davidson et al., 2000 that low socio-economic status and low occupational class have been associated with increased hypertension incidence.

This study also documented 53% and 40% of the population being Christian and Muslims respectively as against 7% Traditionalist in the sample population of the study. This implies that at least every individual in the community belongs to certain religious or traditional groups.

Christian organisation as well as Muslim and traditionalist has certain customs and doctrine that has an association either positive or negative with NCDs. Typically, among the Muslim dominated communities, eaten of pork which is known to contribute significantly to build up of fat leading to diabetes and hypertension is prevented. Also smoking is known to be prohibited among Christians and others and with high percentage of the respondents being Christians, the effect of smoking in the population is less likely to be prominent.

5.2 Socio-Economic and Behavioural Risk Factors Profile

Among the behavioural risk factors for non communicable diseases, this study documented a prevalence rate of current smoking among the study population to be 8% as against 9.6% for ex-smoking. Out of this, males against females constituted 5.3 % and 2.7 % respectively for current smoking. This finding is approximately three times lower than that reported by the previous study in which 40% prevalence rate of current smoking was documented (Sugathan et al.,2006).With regards to ex-smoking prevalence, males constituted 8% as against 1.6% for females.

The prevalent rate of current daily smoking documented by this current study (8%) is in close relation to that documented by Hublet et al, 2006, in his study in Europe on smoking among adolescent. A rate of 5.3% among males documented by this current study is almost equal to that documented by Hublet et al, 2006 among males in Sweden (5.5%). Quite a larger difference was observed for rate among males in Latvia (20%) on the same study compared to this current study.

Among females, the current study documented a prevalence rate significantly lower than that observed by the same study of Hublet et al, 2006. A prevalence rate of 2.7% was observed among females by this current study compared to 8.9% and 24.7% in Poland and Austria respectively. This suggests that females of European origin smoke more than that of African origin particularly Ghana and specifically resident in Sekyere West District and is contrary to the

finding of this study that males smokes more than females. Prevalence of smoking in AddisAbaba as 11.8% for males and 1.1% for females in 1995(Betre et al; 1997), Tanzania as 27% among males and 5% in females (Kirstie et al, 2001) are also in supports of the general finding of this present study that males smokes more than females.(Wellington 2002, Juliet A. et al, (2006) This also means that among the African countries particularly Sub-Saharan region, males smokes more than females as reported by this current study. The overall smoking prevalence obtained by this study (8%) is higher than that of Zimbabwe (1.4%), Nigeria (1.5%) and highly lower than that of Cape Town (34.4%) (Townsend et al, 2006). This also means that among the Sub-Saharan African countries, there is a variation in prevalence of Smoking which may be attributable to the extent of advocacy on effects of tobacco smoking.

Findings from this current study on prevalence of smoking (8%) is consistent with that of Kenya (7.2%) on a study into Global Youth Tobacco Survey (GYTS, 2001), Kampala (5.6%) and Lilongwe (6.2%)(Adamson et al, 2007) and that of Addis Ababa, Ethiopia of which 4.5% prevalence rate among males and 1% among females were observed compared to the current study (5.3 % for males and 2.7% for females) (Emmanuel et al; 2007)

With the prevalence of ex-smoking, the current study reported 9.6% of which males constituted 8% as against 1.6% for females. This finding is lower than that observed by Emmanuel et al; 2007 in a study into Prevalence and determinants of adolescent tobacco smoking in Addis Ababa, Ethiopia which documented 15.1% males and 5.7% females as being ex-smoker. A general trend of increasing prevalence on both current and ex-smoking status among Sub Saharan countries is higher among males than females as supported by various author and the current study.

In Ghana, a prevalence rate of 4.8% was observed among school children between the ages of 11-16 years (Global Youth Tobacco Survey 2000).

This is approximately half of that obtained by the present study (8%). This therefore implies that at all levels of age among Ghanaians, smoking prevalence is likely to fall within and a little outside the finding of this recent study. The ex-smoking prevalence rate documented by the present study among males (8%) and among females (1.6%) is close to that of the previous study in which 7.3% for males and 0.5% for females were recorded. (Global Youth Tobacco Survey 2000).

Among age groups for both male and females, there is an increasing trend of both current and ex-smoking status among the respondent with increasing in age. 2 %, 2.7% and 3.3% prevalence rate of current smoking was observed among the age groups 18-34, 35-51 and 5268> respectively.

Similar trend is also observed among respondents within the same age group for ex-smoking. This implies that, one is severely at risk of non-communicable diseases with regard to smoking with increasing age. This finding is consistent with that reported by Owusu-Dabo et al (2009) in their study into smoking uptake and prevalence in Ghana in which smoking was more in elderly people, those of traditional belief, those of low education, the unemployed and the less affluent.

Concerning the age of smoking initiation in general, males initiated themselves into smoking earlier than females (10-15 years, 20 years respectively) with majority [19.1% (9/47)] of the respondents being males enter into smoking between the ages of 22-27. This was observed among the age group of respondents between 52 -68 and above. This generally means that, on the average most of the respondents being males and is within the age group of 52-68 and above has had at least 25-50 years experience of smoking as at the time of the research.

The quantity of cigarette smoked per day among the respondents in this present study ranges between 3 and 15 sticks and is consistent with that obtained in the previous study on the average of 4.3 sticks (Juliet et al, 2006).

In general, males on the average smoked cigarette more than females on daily basis. This was observed mostly among males within the age group of 52-68> who smoked at least between 10-13 sticks of cigarette daily (19.2%) followed by those who smoked between 4-6 sticks of cigarette daily (17.3%) within the same age group as against 9.6% of the total proportion of the respondents being females who smoked between 4-6 stick of cigarette within the same age group. This implies that, on the average people within age group of 52-68> are at most risk of NCDs than any other age group since most of the respondents (57.6%) among both sexes recorded the highest percentage of increasing in quantity of cigarette smoked on daily basis followed by people within the age group of 35-51(24.8%) and lastly 18-34(17.1%). This result means that, quantity of cigarette smoked increases with increasing age among the people in the environment.

This makes the aged class of the population to be more at risk of complications associated with smoking such as lung cancer, hypertension and others.

Intake of other tobacco products such as tar, cigar and many others were also reported by this study to be 8.3% prevalent among the entire population. This represents the proportion of the population whom are at double risk with regard to cigarette smoking and its products (8.3%). With increasing in multiple risk status of respondents, the incidence of the NCDs among the population gets higher than normal. This population at risk of smoking cigarette and other tobacco products, on the average, smoke more than one times per day. Among the sexes, males smoked at a higher intensity being of once, twice or thrice daily compared to females. This makes the overall males in the entire population being at risk of increasing intensity of smoking complications than the female population.

Within the males population, 16% out of the total smoked three times daily. This was observed among the age range of 35-51 years thus recoded the highest intensity level of smoking among the males population. This makes the males population within age 35-51 to be more at risk of NCDs with regard to smoking intensity than any other age group.

At least every individual within the sampled population of the study being either smoker, exsmoker or non- smoker expressed a negative perception about smoking of cigarette and other tobacco products. This means that ignorance is the driven force for smoking among the population.

Smokeless tobacco use among respondents in general was more prevalent in males than females, with majority (21.9% and 14.6%) of the cases be within the age range of 52-68> for both males and females respectively. This implies that smokeless tobacco use is positively correlated with age irrespective of sex.

Passive smoking behaviour which is also known to contribute partly to development of NCDs such as lung cancer and many others was identified to be a behavioural practice among 54.8% and 45.2 %of the males and female of the study population respectively. On the average people spend between 20-40 minutes in close proximity with people who actively smokes tobacco products.

This higher incidence of passive smoking behaviour among the population implies that, significant number of the population will have associated complications which are all indicators to development of NDSs.

Drinking of alcohol as one of the behavioural risk factors for NCDs was also documented by this present study to be 18.3% for current drinking status and 10.3% for ex-drinking status. This

finding greatly contradict with that reported by the previous studies on the similar subject in which current alcohol usage among the study subjects was 41 % (Sugathan et. al., 2006) , 50% and 34% among women of two different comparative study (Bela and Prashant2005).

Among this, the proportion of males who were noted to be current smokers was 12% as against 6.3% of females of current smoking status. On the part of ex-smoking status, the prevalence rate of 4% for males and 6.3% for females were documented. This means that the percentage current active smoking status among males is higher than females.

Males generally being active smokers than females will mean a greater risk of developing NCDs and its complication than females. This level of risk among males is almost twice than among females {18.3% verses 10.3%}.

Additionally, there is also a trend in active smoking status within the various age groups category of the study. Respondents within the age group 18-34 in general accounted for 6.3% of the total active smoking.

This proportion decrease to 4.6% among the respondents within the age group of 35-51 with a corresponding sharp increase among respondents within age group 52-68 and above to 7.3%.

This shows an undulating increasing level of risk of NCDs with regard to smoking among the population, with people within age group 52-68 and above been at most risk.

Initiations of alcohol intake among the respondents start on the average at the age 15 years among both males and female. Among the different age levels of drinking by the respondents, males accounted for 16% against 12.3% in females. This means that males drink more than females and at all age levels, thus increasing their risk of developing NCDs attributable to drinking of alcohol.

Alcohol intake among respondent exhibit different pattern as observed from this study. The study recorded a prevalent rate of 13%, 5%, 0.3% and 10.3% for daily, weekly, monthly and occasional drinking pattern among respondents respectively. This means that majority of the entire population are daily drinkers, thus increasing their level of risk for contracting NCDs and its associated complications.

Daily drinking pattern was more prevalent among respondent within the age group of 52-68 and above since most (5.7%) of the respondents contributed largely to the overall prevalence (13%) of daily drinking pattern among the study population. This is followed by the respondents within the age group of 35-51(4.3%), and 18-34 (3%). This shows an increasing trend of daily alcohol intake with age, thus the aged has a double risk of NCDs with regard to alcohol intake compared to the adults.

Respondents, mostly daily drinkers on average drink at least once per day. The study documented 14.7% and 14% for respondents who drink once and more than once per day respectively. This implies that there is a double burden and risk of developing NCDs attributable to drinking in the population.

Among the sexes, the prevalence of multiple drinking among males (7.7%) was higher than females (6.3%). This makes the males be at a greater chance of developing NCDs and its complication than females.

Within the age groups, an increasing trend of multiple drinking was observed with age: 18-34 (3.6%), 35-51(4%) and 52-6 (6.3%). This finding reveals that increasing age has an association with multiple drinking behaviour.

In addition, consumption of other alcoholic drinks was observed among the population. Prevalence rate of 20.6% was documented as proportion of respondents who take additional drinks others than alcohol. . With this overall prevalence (20.6%) of alcoholic beverage intake respondents, males contributed 11.3% against 9.3% among females. This means that males are at greater risk compared to females in this perspective. With this, respondent within the age group of 52-68 and above contributed most (8.3%) to the overall alcoholic beverage intake prevalence(20.6%) followed by 18-34 (6.7%) and 35-51(5.6%).

On the part of fruit and vegetable consumption, this study documented an average of 3.0 day for fruit and 2.7days for vegetables intake per week . This finding by the present study corresponds to that reported by the previous study in which mean number of days per week of fruit intake was 3 days (Bela and Prashant, 2005) though a contrast with regard to vegetable intake per week was observed as compared to the previous study which documented an average of 4.7 days per week of vegetable intake (Bela and Prashant,2005).

No statistically significant difference was observed for fruit and vegetable consumption respectively among respondents [p=0.461and p=0.645], males contributed a little bit on average basis more than the overall average number of days of fruit consumption than the females per weekly basis [3.1day verses 2.9day]. A reverse trend was also observed among males and females with regards to vegetable consumption.

Females on the average consume exactly equal number of days of vegetable as with the mean of the overall sampled population per week [2.7days] whereas males contributed a little less than the average number of days of vegetable consumption among the study population per week.
[2.6 days verses 2.7 days].

Additionally, a decreasing trend of number of days of fruit consumption per week was also observed with increasing age. People within the age group of 18-34 consumed fruits of an average of 3.3 days per week. A slight reduction occur among age group of 35-51 and 52-68 and above to 3.0 and 2.5

days respectively. This implies that number of days of fruit intake ability per week decreases with increasing age. On the contrary, an increasing trend of number of days of vegetable consumption per week was observed with age. People within the age group of 18-34 years consumed less than the overall number of days of vegetable per week [2.57 verses 2.7]. An increase in terms of days per week of vegetable consumption was observed among age 35-51 and 52-68+ as 2.7days and 2.9 days respectively.

On the average, people serve fruits and vegetables with their diet on 1.2 and 1.7 times per daily respectively. Males and females in general served fruits on the average of 1.2 times each for both sexes and 1.66 and 1.74 times of vegetable daily respectively. No statistically significant difference was observed for times of fruit and vegetable servings per day among the respondents respectively [p=0.243, p =0.327]. It is clearly indicated that none of the respondents on the average served more than two times of fruits and vegetables per daily.

This means that on the average, none of the respondents meet the basic minimum requirement as recommended by WHO, that ideally one should serve fruit and vegetables for at least 4-5 times daily, for which a standard serving of fruit or vegetable constitute about 80gm. A 100% prevalent rate of low fruit and vegetable intake (<500 g/day) was observed by the study. A total of about 400-500g/day of fruits or vegetable is required as recommended by WHO. This finding from the present study correspond to that documented by Maham et al in their similar study in which 93.2% of the subjects had low daily intake of vegetables and fruits.

This study documented an average of 96g and 136g of fruits and vegetables intake among the samples population per daily basis respectively. This implies that none of the respondents meet approximately 30% of the requirement of daily allowable calories of fruits and vegetables intake as recommended by WHO. This can result in increasing the risk levels of respondents in respect

to development of NCDs, as increase or recommended caloric intake of fruits and vegetable are know to increase the body resistance to NCDs.

In order to calculate or estimate the level of risk of subjects with regards to daily salt intake, respondents were asked of the average quantity of salt taken per meal per day which was ranked as low, moderate and high. Excessive consumption of salt beyond recommended as a risk factor for developing NCD can not be under estimated. Literature document that daily intake of salt beyond 500g is considered a risk for developing cardiovascular affections particularly hypertension and stroke. For this study, respondents were classed as low salt intake (<500g), moderate salt intake (=500g) and high salt intake (>500g) on daily basis. The study, by this criterion, documented a prevalence rate of 17.3% for low, 58% for moderate and 24.7% for high salt intake. This clearly indicates that about one quarter of the entire study population consumed more than the recommended grams of salt daily, thus increasing their risk levels of complications associated with high salt intake.

This was emphasized in the previous study that there exist an association between sodium chloride (NaCl)-salt intake and blood pressure (Kotchen et al., 1994) with age-related increments of blood pressure and the prevalence of hypertension closely related to NaCl-salt intake (Elliott et al., 1996).

Among sexes, males have higher salt intake ability than females. [13.3% verses 11.3%]. This makes the males to be generally at higher risk compared to the females' population in terms of higher salt intake. Across ages and among both sexes, an undulating trend of high salt intake ability was observed with age. Respondents within age category 35-51 constituted the highest percentage (9.6%) to the overall prevalence of high salt intake among the study population.(24.7%). Nearly half of these people are at a grater risk than any other age group,

followed by this 52-68+ (8.6%) and 18-34 (6.3%) On the average, increasing higher salt intake with age will mean greater risk of NCDs infections with age.

Various categories of physical activity were measured among respondents. The study documented an overall prevalence rate of low (61.5%), moderate (26.9%) and vigorous (11.6%) physical activity among the study subjects. This means that more than half of the respondent are considered physically inactivate be either at their work place or on their normal leisure. Finding from the present study on prevalence of physical inactivity (61.5%) does not support that reported by the previous study in which a rate of 23% and 22% among males and females respectively was documented (Sugathan et al., 2006). With the increasing level of physically inactivity among the population, there is more likelihood of risk of contracting NCDs and lesser control over already exiting cases of NCDs among the population. Less than half of the study population are considered involving in physically moderate activity, thus the chance of NCDs development will as matter of fact be on the increase since majority of the population are physically inactive.

Extreme vigorous physical activity that over task ones ability and increase in heart beat beyond normal predisposes to a greater risk of CVDs disorders particularly hypertension and others. The overall prevalence rate of 11.6% vigorous physical activity documented by the study will in addition to the low physical activity exert a greater influence in the development of NCDs among the population. Physical inactivity was observed to be almost the same among makes and females (61.4% verses 61.2%) and increases with age across all age levels in both sexes except among respondent within age52-68 and above for females where a decrease was observed. This finding is consistent with that documented by the previous study in which physical inactiveness among males and females were 23% and 22% (Sugathan et al., 2006).
Males in general were more involving in physically vigorous activities than females (12.6% verses 10.6%) and a decrease trend was observed across all age groups among both sexes with

increasing age except age 52-68 and above for both sexes where an increase trend was observed. Females being less into vigorous physical activities may as a result be due to the continuous sitting for a long period of time which particularly characterised most of the activities especially in the work places. Most activities of males require bodily expenditure of energy which thus makes them more prone into vigorous activates than females. An overwhelming finding that vigorous physical activity decrease with age across all age groups among both sexes with increasing age except age 52-68 and above for both sexes may as a result be attributed to most of the aged group into farming activities which all constitute a form of vigorous physical activity.

Moderate physical activity as the recommended form of physical activity among population was also documented by the study to be undertaken on an average basis of 2.1 days per week. Males were found to undertook moderate physical activities on more number of day per week on average basis than females (2.2 days verses 2.1 day) though no statistically significant difference was observed between their means [p=0.565].

The study documented that most (88.3%) of the respondents involved themselves in at least between 1 to 3 days moderate activities per week.

A decreasing trend of average number of days of moderate physical activity was observed among both sexes across all age categories with increasing age except age 52-68 and above.

The study also documented an average daily total time for performing moderate and vigorous physical activity to be 59.90 minute and 2.05 hours respectively among the respondents.

Males on the average spent more time performing moderate physical activities than females (60.29 min verses 59.50min) [p=0.930] and vigorous physical activity (3.89 hours verses 3.27 hours) [p=0.510].

A decreeing trend was observed for both moderate and vigorous physical activities among both sexes across all age groups with increasing age except age 52-68 and above for both sexes where each variables increases. The overall increase in involvement of males into moderate physical activities per daily and weekly basis than women may as a result be due to majority of the men into business activities that require movement to and from places either by mean of walking or exercise which predominantly characterised one of the means of transport in the District. In contract, males stand a greater risk of NCD with regard to vigorous physical activities since daily hours for vigorous physical activities is higher among males than females. The study in addition to moderate and vigorous physical time per daily and weekly basis also documented a mean sedentary time of 98 minutes per daily among the entire subjects. Males and females spent on an average of 104 and 92 minute per day as a sedentary time and it increases across all age groups among both with increasing age. [p=0.158]. Increased sedentary time per daily basis increases the risk of infections. The average sedentary time per daily basis among the subject (98minute/day) is considered an ideal sedentary time so as to provide sufficient rest to the body. Rest after a hard days work also contribute to increased body resistance to diseases infections and vice versa.

Self awareness on hypertensive status of individual is a requisite tool for personal behavioural lifestyle modification to aid in controlling of complications associated with hypertension.

The study revealed that majority of the respondents (49%) had their blood pressure measured within a period of less than12 month as at time of the study. This mean that most of the respondents are conscious on their health status on hypertension related issues.

A trend observed was that females seemed to measure their blood pressure more than males and increases with age across all age levels except age range 35-51 where males percentage was a bit higher than females (48verses 46). This implies that respondents within age category 35-51 may be predisposed to hypertension without their awareness since they do not regularly check their hypertensive status. . This can further increase their level of risk complication.

Among the issues related to hypertension, the study documented self reported hypertension prevalence rate of 16.3% among the study subject. This finding is close to that documented by Mehan et al., 2007 (19.5%) and higher than that documented by WHO, 2004 (10.5%). Higher prevalence of self reported hypertension was observed among females than males (17.3% verses 15.3%) which increase among both sexes and across all age groups with increasing age. This corresponds to that of similar study by WHO, 2004 in which self reported hypertension was more prevalent among females that males (11.5% verses 9.5%) and increases with increasing age among both sexes. This implies that increasing age has an associated effect with development of hypertension. Of the proportion who reported hypertensive (16.3%), 14.6% are on medication. The remaining 2% are neither seeking medication nor taking hypertensive drugs. Failure to seek medical attention or take drugs when reported hypertensive increases one's risk of developing complication and possibly resulting in sudden death. On the average males reported hypertensive (15.3%: 13.3%) seek medical care than females (17.3%: 14.6%). This make the male's population to be rehabilitated of hypertension thus increasing their chance of living longer than the female population all things being equal.

Various forms of behavioural lifestyle modification advice were received by the proportion of respondents who reported hypertensive. Among both sexes, 12.6% received advice to reduce salt intake, 7.6% on weight reduction/loss, 6% on smoking cessation and 9.8% on increase moderate exercise. Except smoking cessation and weight loss regulation, females received advice on most of the behavioural indicators for NCDs control than males. This generally means that females have high salt intake ability as well as excess body weight compared to males. Males receiving higher advice on smoking cessation might be due to high involvement of males into smoking than females.

Some respondents also depended on traditional healers for traditional medicine for the management and treatment of hypertension. The study observed that 11.7 % of the proportion of the entire respondents depended on herbal remedies. This makes the overall usage of herbal medicine to be 71.4% prevalent among the entire self reported hypertensive respondents being recipient of herbal remedies for hypertension control. This implies that traditional medicine has a great deal over the treatment and management of hypertension among the subject. Females resort to herbal medication for hypertension treatment than males (68.6 % verses 31.4 %) [P=0.019].

Among the other risk factors for NCDs and diabetes in particular, 17.0% of the respondents measured their BG within a period of less than 12 month before the study. This implies that majority of the study population are likely to be at risk of diabetes since they do not have an adequate knowledge about their diabetes status. Knowledge about ones health status aids in effective behavioural lifestyle modification that promote good health, thus reducing the incidence and risk levels of complication. It was revealed by the study that females measured their BG level across all age categories than males except age range 18-34 where males out way females in terms of BG measurement (19.3 % verses 14.6 %) [P=0.284].

Out of the total proportion (17%) who cheeked their Blood glucose, prevalence of self reported diabetes of 7.7% was observed among the entire subjects, most of which are females rather than males (12.0% verses3.3%) [P=0.005]. This finding is about half less than that documented by Mehan et al., 2007 (15.3%). This implies that female on the average contributed more than the average value of self reported diabetes among the overall.

Among the self reported diabetes subject, prevalence of 78 % insulin injection therapy was observed, most of which are females than males (13% verses 5%). [P=0.052]. This brings the prevalence of insulin injection among the entire sample population to be 6.0%. At least 1% of

the reported diabetes subjects are likely to develop further complication due to withdrawal from insulin injection.

Additionally, the study observed that all the self reported diabetes subjects were on oral diabetes drug use. This means that oral drug use may be an efficient and convenient way of managing diabetes among the subject. Additionally, 6.7% of the total subjects reported diabetes basically used dietary regimen as a tool for diabetes management and control. This implies that a combination of oral drug use, insulin injection and dietary modification is an appropriate tool for diabetes management and control.

Information on family history of hypertension and diabetes is an indicator for estimating future probable burden of incidences of NCDs. The study documented 63 % prevalence of family history of NCDs (hypertension and diabetes) among the entire study subjects. This means that there is more likelihood of increasing the burden and development of NCDs incidences in the study boundaries. This is also emphaseed by previous studies (Galderisi et al., 1993, Williams et al., 1993 Dekkers et al., 2003), that a family history of hypertension is associated with an increase in the prevalence and incidence of hypertension which further substantiated by Fava et al., 2004 that both genetic and environmental factors appear to contribute to an association between family history and hypertension.

This will mean suppressing genetic factors that code for NCDs among the study population through behavioural lifestyle modification and adjustments such as smoking ceasation, ceasation of alcohol intake, reduction in intake of high cholesterol based-foods and others as recommended by WHO, 2003. Excess consumption of these increases the expresitivity and repeatability gene index that favours NCDs among individual with a trait of family history of

NCDs.

5.3. Physical /Anthropometric Risk Factors Profile

The study documented a mean height and weight of the entire respondents of the study to be 164.65cm and 65.28Kg respectively. No significant differences was observed between males and females in terms of height and weight respectively (164.9cm and 65.52Kg verse 164.3cm and 65.5 kg [p=0.724]. Increased weight is associated with increased risk of NCD particularly hypertension and diabetes. This is stressed by previous studies that weight gain is associated with an increase pulse, hypertension incidence and the age-related rise in systolic blood pressure (Paffenbarger et al., 1983, Vasan et al., 2001).

Using the weight and the high measure, the overall average BMI of the entire study subject was 24. 2 Kg/ $m^{2.}$ This finding is close to that reported by the previous study in which the mean BMI of the study subject was 28.4 ±7.4 (Roberts et al., 2007). This means that the average BMI of the subjects of the present study is considered within a normal range as a measure of normal BMI recommended by WHO (18.5-24.95Kg/ m^2). As emphasised by Van Itallie , 1985, that a BMI greater than 28kg/m^2 in adults is associated with a three to four-fold greater risk of morbidity due to T2DM and CVDs than in the general population. The study observed no significant difference between males and females in terms of BMI values respectively (24.2 Kg/ m^2 verses 24.1 Kg/ m^2), though males were having higher BMI values than females.

This was attributable to almost equal weight to height among both sexes. This finding contrast that documented by Anand et al., 2007 in which BMI was lover in men than among women (20.9 kg/m2 21.9 kg/m2).

The study though recorded overall average BMI values of the subject to be within normal weight range (18.5-24.95Kg/ m^2), there is a considerable variation among individual and across all age groups. Prevalence rate of underweight (7%), normal weight (53.66%), over weight (28.66%) and obese (10.66%) were recorded by this study. This finding is inconsistent with that documented by the previous studies that recorded a prevalence of 11.6% in 1996 and 14.3% in

1997 being overweigh or obese among females of the study participants (Winkvist et al., 2007; Nawi et al., 2006).

With the present study, males were more underweight than females (9.33% verses 4.66). There is an evident indication that male contributed 2.33% higher than the overall prevalence rate of underweight among the entire subjects. This may a have a significant overall effect on the general wellbeing of the male population, though not necessarily a risk factor for NCDs. A reverse trend on normal weigh was observed among males to female as against that occurred in underweight. Males recorded low prevalence rate of normal weight than females (50.00% verses 57.33%) which mean that females contributed to the majority of the entire population within normal weight range. This implies that majority of the respondents being females are at lesser risk of developing NCDs with reference to BMI. A measure of overweight and obese in a population based study as a NCDs risk factor survey provides a reasonable estimate for quantifying the proportion of individual who are at risk of NCDs in relation to nutritional and behavioral linked undesirable practices. Garrow, 1988 stressed that obesity which is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health is impaired have important health implications.

This study documented that males were both over weight and obese than females respectively.(29.33% verses 28.00 and 11.33% verses 10.00%) with overweight increases among males and across age group with increasing age. This finding is consistent with that of Flegal et al, 2002 who reported a higher prevalence of obesity among males than females (39.4% verses 24.7%) and a reverse trend as reported by this study on obesity (19.9% : 24.9%). Additionally, similar finding was documented by a previous study on chronic non-communicable diseases risk factor survey in Iraq in which males reported of higher overweight than females (37.4% verses 31.4%) and a conflicting finding with obesity in which females were

more obese than males as against that documented by the present study. Additionally, findings from this present study on the issue that obesity is more prevalent among males than females doest not support that of Biritwum et al., 2005; Sugathan et. al., 2006 who also reported a higher prevalence of obesity among females than males, though a consistent relation with increasing obesity level with age was documented as also reported by previous studies (Biritwum et al., 2005, Flegal et al, 2002). The disparities in the finding may be due to geographical and economic effects on the respondents. Obesity among females increases with increasing age whilst an unclear pattern is observed among males. This implies that aging among female is associated with grater risk of NCDs. No prevalence rate of obese was recoded for the males' population of this study within the age group of 35-51. This might be due to increasing moderate exercising ability of the males within that age category.

The increase obesity rates documented by the study may in part be attributed to undesirable nutritional habit among the study subject. This is further emphasized by WHO, 2000 that the global epidemic of obesity has resulted mainly from societal factors that promote sedentary lifestyles and the consumption of high-fat, energy-dense diets.

Waist and hip circumference measurements provide knowledge on an abdominal fat deposit which is an indicator for estimating central obesity and WHR as a risk factor for NCD.

This study documented and average of 87.38cm and 96.9cm as wait and hip circumference of the entire subjects respectively. Females on the average recorded higher wait circumference value than males (88.59 verses 86.17cm) [p=0.080] as well as a higher hip circumference (99.19cm verses 94.68 cm) [p=0.000].

The overall mean WHR of the study population was 0.85cm of which males and females alone on the average recoded 0.85cm and 0.84cm respectively [p=0.079]. Previous studies emphasized that WHR > 1.0 and 0.85 in men and women, respectively, are the currently accepted indicators of excessive abdominal fat accumulation which correlate with a substantially

increased risk of metabolic complications (WHO, 2000; Han et al., 1997). This study by adopting WHO standards criteria as a cut off point to categories waist/ hip ratio as an indicator of excess abdominal fat, documented a prevalence rate among males with WHR </=1.0cm (94.66%) and WHR >1.0cm (5.33%). Findings from the present study on WHR >1 among males is higher than that recorded by previous study [5.33% verses 3.5%] (Anand et al., 2007). This implies that approximately 5% of the males population is at risk of excess abdominal fatness which predisposes to various NCDs such as hypertension and diabetes.

Among females, prevalence rate of WHR <0.85cm (44.96%) and WHR >0.85cm (55.03%) was recorded. This finding far exceeds that documented by Anand et al., 2007 in their study on similar subject in which prevalence rate of WHR > 0.85 among females was 20.6%. This clearly indicates that more than half of the females population from the present study is at risk of excess abdominal fatness, thus increasing their chance of developing NCDs. More importantly, female subjects within age range of 35-51 alone contributed largely in extra of 8.89% to the overall prevalence rate of excess abdominal fatness among the entire female population than any other age group.

Comparatively, prevalence of females at risk of excess abdominal fatness is higher than males when WHO a cut-of-point criteria is used (55.03% verses 5.33%).

This means that female are at a greater risk of developing complications associated with excess abdominal fatness than males, hence increasing their risk levels of NCDs development. This is due to increased sedentary lifestyle pattern among females couple with increased intake of energy-dense fatty based foods that increases levels of adipose formation.

With regards to heart rate, the study recoded 81.54 beats per minute as an average pulse of the entire subjects. Females on the average recorded a higher pulse rate than males (83.87 verses 79.20 beats /min) [p=0.001]. This is believed to have been attributable to the aggressiveness which predominantly characterised females particularly among adults which has an effect on pulse rate.

A decreasing trend of pulse rate with increasing age among females was observed whilst a slight increase in pulse rate with increasing age was also observed among the males subjects of the study. This might be contributed by decrease activity factor among females with increasing age and with corresponding increase activity factor among males that accounted for variation in pause rate.

On the average, the pulse rate of the entire subjects is considered within the range of adult recommended by WHO.

Among the other anthropometric risk factors for NCDs, the study documented an average systolic and diastolic resting blood pressure of 135mmHg and 93mmHg respectively.

This finding is higher than that recorded by the previous studies (120/75mmHg) (Anand et al., 2007;) and (130/82 mmHg) Anon, 2006) as mean systolic and diastolic resting blood pressure respectively.

Males recorded a higher resting systolic blood pressure than females among the entire study population (138.87 mmHg verses 132.94mmHg) [p=0.025] as well as diastolic blood pressure (95.98mmHg 87.38mmHg) [p=0.002]. This corresponds to that obtained by the previous studies in which males recorded a higher resting systolic and diastolic blood pressure values than females (Anand et al., 2007; Anon, 2006; Hajjar et al, 2006). This means that males are at a higher risk of developing both systolic and diastolic hypertension than females. On the average, the resting systolic blood pressure of the male subjects according to WHO standards with this present study in general is considered pre-hypertension as well as hypertension stage

1 for resting diastolic blood pressure. The entire study population is considered within both pre-hypertension category on SBP and DBP. With resting systolic blood pressure, an increased trend was observed among both sexes across all age groups with increasing age. Similar trend was also observed with resting diastolic blood pressure. This finding is in line with that documented by the previous studies in which both systolic and diastolic resting blood pressure increases with increasing age (Hajjar et al., 2003; Cent, 2005, Anon, 2006) thus leading to an increase in pulse pressure; a key risk factor for cardiovascular outcome (Franklin et al., 1999).

Prevalence of various categories of both systolic and diastolic hypertension was documented with reference to WHO criteria. A prevalence rate of 19.35% and 23.01% optimal SBP and DBP, 49.66% and 28.00% pre-hypertension SBP and DBP, 17.66% and 21.33% hypertension stage I SBP and DBP and 13.33% and 27.66% hypertension stage II SBP and DBP respectively was documented by the study. An evident deference is observed on this present study compared to a similar study on chronic non-communicable disease risk factor survey in Iraq in which 30.9% and 31.0% prevalence rate of hypertension stage I systolic and diastolic and 10.3% each for prevalence rate of both systolic and diastolic hypertension stage II respectively was documented(Anon.2006) and 8.1% stage II hypertension (Mehan et al., 2007), 35% and 37.8% for overall hypertension (Nieto et al., 1995; Wassertheil et al., 2000) respectively.

This implies that the present study recorded a lower prevalence rate for stage I and a higher prevalence for stage II hypertension compared to the previous study (Anon.2006). Additionally, by comparing present finding to previous findings on prevalence of hypertension on studies in Ghana, a great deal of increase differences exist in favour of the previous studies documented as 28.7% for Kumasi in the Ashanti Region; 32% prevalence in Bawku/Zebilla in the Upper East Region; 36.9% in Keta-Dzelukope in the Volta Region; and 47.8% among a cohort of women in Accra (Pobee, 2006; Cappuccio et al., 2004; Hill et al., 2005).

Additionally, the study documented a similar consistent finding with a previous study in which prevalence rate of stage I hypertension on SBP was observed compared to the present study.

[18.0% verses 17.66%] (Anand et al., 2007) and 18.8% stage I hypertension (Mehan et al., 2007).

Prevalence of systolic pre-hypertension alone documented by the present study (49.66%) is slightly higher than that reported by the previous study (40%) as an overall prevalence of prehypertension in Ghana, though prevalence of diastolic hypertension from the present study (21.3%) is lower than the overall prevalence of hypertension (29%) (Ellis and Charles, 2006).The disparities with present study compared to the previous study may be attributable to the advocacy on preventable risk factors for non communicable diseases which until recently is gaining attention in Ghana health sector. Nonetheless, the educational programs on preventable risk factors for non communicable disease may be limited to few communities, thus an increasing prevalence of pre-hypertension from the present study compared to the previous study.

The findings above from this study indicate that majority of the subjects are considered prehypertensive. Males were more pre-hypertensive than females on SBP (51% verses 48%) and less pre-hypertensive than females on DBP (24.44% verses 31.33%).

A decreasing trend of pre-hypertension on SBP among both sexes with increasing age was observed. An undulating patter was also observed with age on DBP among both sexes.

Severity of hypertension increases with increasing systolic and diastolic blood pressure. Approximately, 30% of the entire subjects are at risk of a combined effect of hypertension stage I and II on SBP and 49% on DBP. In general, prevalence of complicated resting DBP is more than resting SBP among the entire subjects. Hypertension stage I on systolic blood pressure is higher among males than females (21.33% verses 14.00%) as well as diastolic blood pressure

(23.33% verses 19.33%) and increases with increasing age. More prominently, hypertension stage II on both systolic and diastolic blood pressure highly increases with increasing age among both sexes. This implies that ageing has an effect on the severelity of hypertension with increasing.

5.4. Biochemical Risk factor Profile

A Blood glucose level measurement was particularly taken in the morning among subjects who have not taken any substance apart from water. An extreme cases occurred in which a few subjects BG was carried out in the afternoon. The study recoded an overall mean BG of subjects whose BG level was taken in the afternoon (random) and morning (fasting) to be 5.42mm/L and 5.09mm/L respectively. A statistically significant difference was observed among subjects on time of BG measurement. [p=0.010]. This finding is in line with that obtained by the previous study in which 5.3 mmol/L was documented as the mean BG of the sample studied (WHO, 2006).

A minimum of 3.4mmol/L as well as a maximum of 7.3mmol/L BG was documented by the present study. Males recoded a slightly higher FBG values than females, though no statistically significant difference was observed between their means (5.28mmol/L verses 5.26mmol/L) [p=0.215]. This was emphasised by Amoah, 2003 in his study that males are more diabetic than females. This contradict with the finding documented by a previous study in which males recorded a lesser FBG values than females compared to the present study [5.28 and 5.33; 5.25 and 5.26 respectively, though values obtained in both previous and present study were closely related in terms of increasing FBG with age (WHO, 2006). A trend of increased FBG with age as observed by the study means that ageing has an effect on the FBG level, thus increasing risk of diabetes with increasing age among subject.

By adopting WHO standardized criteria for classifying blood Glucose measures, prevalence rate of various categories of FBG was documented. A prevalence rate of 62.33% normal FBG (<5.5mmol/L), 37.00% impaired FBG (5.5-<7mmol/L) and 0.66% mild hyperglycaemia (7-<11.1mmol/L) was documented by the study.

This study recorded a prevalence rate value of impaired FBG values more than that obtained in the previous study (37% verses 15.7 %) (WHO, 2006) and low mild hyperglycaemic FBG values prevalence than the previous studies [0.66% verses 10.4% and 3.6%] (WHO, 2006; Roberts et al., 2007), though a similar trend of increasing severity of blood glucose levels with age was observed by both studies. These may reflect in the lack of screening for detection of asymptomatic conditions at the younger stages of growth as emphasized by Roberts et al., 2007 .None of the subjects was identified severely hypoglycaemic ((≥11.1mmol/L) as in contrast to the previous study in which prevalence rate of severely hyperglycaemic among the study subject was 3.5% (WHO, 2006). Males were found to be more impaired FBG than females (38.66% verses 35.33%). Subject within age range of 52-68 and above only contributed to the 0.66% rate

of mild hyperglycaemic condition among the entire subjects. This shows that increasing risk of hyperglycaemic status is profoundly associated with ageing.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion:

This study attempts to assess the prevalence, levels of risk and major risk factors for developing non communicable diseases in the Sekyere west district of Ghana.

The study answered specific research questions and hypotheses on issues relating to sedentary lifestyles, nutritional behaviours, knowledge on NCDs risk factors, and distribution of risk factors of non communicable diseases among the population.

Among the socio-economic and behavioural risk profile study variables, the study documented a high prevalence of active smoking, low fruit and vegetable intake, physical inactivity, self reported history of diabetes and hypertension, family history of hypertension and current active alcohol usage.

A trend of increasing levels of risk among variables studied with increasing age was observed. This provides substantial evidence in support of the research hypothesis that 'age has an effect on development of NCDs'.

Males were found to be at high risk on most of the study variables measured compared to females. This empirical evidence has clearly justified the basis of the study objective by the falsification of one of the key research hypotheses that 'NCDs and their risk factors are equally associated with males and females'.

On the physical/anthropometric risk profile variables measured, prevalence rate of 28.66% of overweight and 10.66% obesity was recorded, with more males accounting for the high prevalence than females.

The study recorded a Waist-to hip ratio among males and females greater than that recommended by World Health Organisation (WHO) with increasing prevalence with age and higher among females than males (5.33% verses 55.0%).

The study also recorded a prevalence rate of 49.66% and 28.00% pre-hypertension on SBP and on DBP, 17.66% and 21.33% hypertension stage I on SBP and on DBP and 13.33% and 27.66% hypertension stage II on SBP and DBP respectively.

These findings at least present an indication of the prevalence of all categories of hypertension in the communities which calls for immediate attention and intervention.

With regard to the biochemical risk factor profile, the study recorded a prevalence rate of 37 % of impaired FBG (5.5-<7mmol/L) and 0.66% for mild hyperglycaemia (7-<11.1mmol/L). No record on severely hyperglycaemic status among the respondents was observed.

The prevalence rate of the behavioural risk factors documented by the study reflect the interplay of the underlying social, economic and cultural driving forces such as low education, unemployment and low incomes. Poor consumption of fruits and vegetables, high consumption of fat, low level of moderate physical activity and others may have also contributed to high obesity, hypertension and hyper-glycaemia prevalent in the community.

The depth of knowledge and information provided on the magnitude of risk factors for NCDs in the community, which to a very large extent is representative of the entire district, should be relevant for policy formulation and intervention in areas which share similar socio- economic and geophysical characteristics, if not across the entire county as a whole.

6.2 Recommendations:

Drawing from key findings of the study, the following recommendations are made for consideration and implementation by Health Policy-makers, institutions and all stakeholders.

Government:

- Strengthening integration of chronic NCD care into Public Health Care services
- Establishment of a health facility-based screening programs in the District and SubDistrict Hospitals and clinics for early detection of asymptomatic hypertension and diabetic conditions.
- Improvement of the existing facilities for chronic NCD detection and management at local levels.

- Integration of NCD prevention programs into the school curriculum to ensure reduction of risk behaviours among school going adults.
- Formulation and strengthening of policies to control the incidence of tobacco use in schools, workplaces and other public places to minimise the effects of smoking on passive smokers or the general public as a whole.

District Health Management Team (DHMT)

- Embarking on community based health education programs on the risk factors for NCDs and its preventive strategies
- Strengthening action to promote healthy diet and physical activity in schools.
- Strengthening the initiation of home-based programs on healthy diet and indoor and outdoor physical exercises with the female and the elderly as specific targets.
- Routine public education on awareness through educational campaigns for promoting healthy life styles.
- Establishment and strengthening of a stepwise surveillance system for NCDs to monitor the trend of the diseases over time.
- Formation of keep-fit clubs should be encouraged within the communities.

District Assembly

- Provision of funds for research into NCDs in the district
- Assisting the DHMT to establish community clinics for NCDs screening programs.
- Multi-cultural activities to tackle chronic non-communicable diseases in the district.

REFERENCES

Adamson, S., Muula, L. M. (2007).Cigarette Smoking Prevalence among School-going Adolescents in Two African Capital Cities: Kampala Uganda and Lilongwe Malawi, 2007

Addae, S. (1996). *History of Western Medicine in Ghana, 1880 – 1960.* 1996. Durham: Durham Academic Press.

Adubofuor, K.O.M., Ofei, F., Mensah-Adubofour, J., Owusu, S.K. (1993). Diabetes in Ghana: A Morbidity and Mortality Analysis. *International Diabetes Digest* 1993; 4(3), 90-92.

Adubofour, K.O.M., Ofei, F., Mensah-Adubufour J, Owusu SK. (1997) Diabetes in Ghana. In Gill G, Mbanya J-C, Alberti G (Eds), *Diabetes in Africa.* 1997; FSG Communications Ltd, Reach, Cambridge, UK. (Pp. 83-88)

Agyemang, C. and Owusu-Dabo E. (2006). Prehypertension in the Ashanti Region of Ghana, West Africa: An Opportunity For Early Prevention Of Clinical Hypertension

Ahluwalia, I.B., Mack K.A., Murphy, W., Mokdad A.H., Bales, V.S. (2003). State-Specific Prevalence of Selected Chronic Disease-Related Characteristics—Behavioral Risk Factor Surveillance System, 2001. *MMWR (Surreal. Summ.)* 52:1–80

Allied Dunbar National Fitness Survey (1992). Health Education Authority and Sports Council, London.

Amoah, A.G.B., Owusu, K.O. And Adjei, S. (2002).Diabetes in Ghana: A Community Prevalence Study in Greater Accra. *Diabetes Research and Clinical Practice*, 2002; 56: 197-205.

Amoah, A.G. B. (2003). Obesity in Adult Residents of Accra, Ghana. Ethn Dis. 2003 13(2 Supp 12):S97–S101.Summer; [Pubmed]

Anand, K., Bela S., Kapil Y., Ritesh S., Prashant M., Eldho P. and Kapoor, S. K (2007). A Survey of Risk Factors for Non-Communicable Diseases in Urban Slums of Faridabad

Anon, Ghana. (2003). Results from the Demographic and Health Survey Studies in Family Planning 2005 Jun; 36(2):158-62.

Baridalyne, N., Anita A., Lakshmy R., Ritvik, K. A. And Bela S.(2003). Profile of Biochemical Risk Factors for Non Communicable Diseases in Urban, Rural and Periurban Haryana, India

Bela S., Prashant M., (2005): Risk Factor Surveillance for Non-Communicable Diseases (NCDs): The Multi-Site ICMR-WHO Collaborative Initiative

Betre, M., Kebede D. And Kassaye, M (1997). Modifiable Risk Factors for Coronary Heart Disease among Young People in Addis Ababa. *East Afr Med J* 1997, 74(6):376-81. Abstract

Berber, A., Gómez-S.R., Fanghänel, G.And Sánchez,-R.L.(2002) Anthropometric indexes in the Prediction of Type 2 Diabetes Mellitus, Hypertension and Dyslipidaemia in a Mexican Population

Biritwum, R. B., Gyapong, J. And Mensah, G. (2005).The Epidemiology of Obesity in Ghana. *Ghana Medical Journal*, 2005; 39(3): 82-85.

Birth to Twenty Study (2002). Physical Activity and South African Children –Some Shocking Findings. March 2002. Study Updates.

Bosu, W.K. (2007). *Ghana's National NCD Programme: History, Prospects And Challenges.* Paper Resented At The 1st Annual Workshop, British Academy UK-Africa Academic Partnership On Chronic Disease In Africa, Noguchi Memorial Institute For Medical Research. (12th April 2007)

Bourne, L., Lambert, E.V. And Steyn, K. (2002). Where Does the Black Population of South Africa Stand on the Nutrition Transition? *Public Health Nutrition*, 5(1A): 157-162.

Canadian Fitness And Lifestyle Research Institute (1998). Physical Inactivity Crisis Of Children And Youth Continues to Worsen. February 2, 1998.

Cappuccio, F.P., Micah, F.B., Emmett, L., Kerry, S.M., Antwi, S., Martin-Peprah, R., Phillips, R.O., Plange-Rhule, J. And Eastwood, J.B. (2004). Prevalence, Detection, Management, and Control of Hypertension In Ashanti, West Africa. *Hypertension.* 43(5):1017-22.

Cappuccio, F.P., Macgregor, G.A. (1991). Does Potassium Supplementation Lower Blood Pressure? A Meta-Analysis of Published Trials. Journal of Hypertension: 466, Vol 9 No 5

Cent. D. (2005). Control Prev. 2005. Racial/Ethnic Disparities In Prevalence, Treatment, and Control of Hypertension—United States, 1999–2002. *MMWR.* 54:7–9

Center for Disease Control and Prevention (2001). Increasing Physical Activity: A Report on Recommendations of the Task Force on Community Preventive Services. *Morbidity And Mortality Weekly Report* 50:1-16.

Cutler, J., Macmahon, S., Peto, R., Collins, R., Sorlie, P. (1990). Blood Pressure, Stroke and Coronary Heart Disease. I, Prolonged Differences in Blood Pressure. Lancet (British Edition)

Dekkers, J.C., Treiber, F.A., Kapuku, G., Snieder, H. (2003). Differential Influence of Family History of Hypertension and Premature Myocardial Infarction on Systolic Blood Pressure and Left Ventricular Mass Trajectories In Youth. *Pediatrics* 111:1387–93

Dodu, S.R.A. And De Heer, N. (1964).*Ghana Medical Journal*, 1964; 3:75.

Emmanuel, R., Abdurahman A., Adamson, S. M. (2007). Prevalence And Determinants of Adolescent Tobacco Smoking In Addis Ababa, Ethiopia, *BMC Public Health* 2007, 7:176doi

Elliott, R.B., Pilcher, C.C., Fergusson, D.M., Stewart, A.W. (1996). A Population based strategy to prevent Insulin-Dependent Diabetes Using Nicotinamide. *J. Pediatr. Endocrinol. Metab.* 9 (5): 501–9. 8961125.

Ezzati, M., and Lopez, A.D. (2000). Measuring The Accumulated Hazards of Smoking: Global and Regional Estimates For 2000 460. Tob Control 2003 Mar;12(1):79-85.

Fava, C., Burri, P., Almgren, P., Groop, L., Hulthen. U.L. And Melander, O. (2004). Heritability of Ambulatory and Office Blood Pressure Phenotypes in Swedish Families. *J. Hypertens.* 22:1717–21

Franklin, M., Jagoe, K., Edwards, R., Whiting, D., Unwin, N. (1990). Tobacco Smoking in Tanzania, East Africa: Population Based Smoking Prevalence Using Expired Alveolar Carbon Monoxide as a Validation Tool

Flegal, K.M., Carroll, M.D., Ogden, C.L., Johnson, C.L. (2002) - Prevalence And Trends In Obesity Among US Adults, 1999-2000.American Medical Assoc.

Frantz, J., Phillips, J. And Amosun, S. (2003). Promotion Of Physical Activity In South African Youth - Is It The Answer to the Public Health Burden Of Chronic Disease? *African Journal for Physical, Health Education, Recreation And Dance* 9(2): 200-207.

Garrow, J.S. (1988). Obesity And Related Diseases. London: Churchill Livingstone; 1988. Pp. 1–16.

Galderisi, M., Benjamin, E.J., Evans, J.C., D'Agostino, R.B. (1993). Impact of Heart Rate and PR Interval On Doppler Indexes Of Left Ventricular Diastolic Filling. The American Journal of Cardiology, Ncbi.Nlm.Nih.Gov

Ghana Statistical Service (GSS).(2004). Noguchi Memorial Institute For Medical Research (NMIMR)And ORC Macro. 2004. *Ghana Demographic and Health Survey, 2003*. Ghana Statistical Service: Accra, Ghana, 2004.

Global Youth Tobacco Survey Collaborating Group (2003). Differences in Worldwide Tobacco Use By Gender: Findings From The Global Youth Tobacco Survey. *J Sch Health* 2003, 73:207-15. Abstract

Global Youth Tobacco Survey (GYTS)(2001). Report On The Results Of Global Youth Tobacco Survey In Kenya-2001.
[://Www.Cdc.Gov/Tobacco/Global/GYTS/Reports/Afro/2001/Kenya-Report.Htm]

Guo, S., Roche, A., Chumlea, W., Gardner, J. And Siervogel, R. (1994). The Predictive Value of Childhood Body Mass Index Values For Overweight At Age 35. *American Journal of Clinical Nutrition* 59: 810-819.

Gupta, R. (2004). Trends In Hypertension Epidemiology In India. *J Hum Hypertens* 2004;18: 73–8.

Guo, S., Roche, A., Chumlea, W., Gardner, J. and Siervogel, R. (1994). The Predictive Value of Childhood Body Mass Index Values for Overweight at Age 35. *American Journal Of Clinical Nutrition* 59: 810-819.

Hajjar, I., Kotchen, T.A. (2003). Trends In Prevalence, Awareness, Treatment, And Control Of Hypertension In The United States, 1988–2000. *JAMA* 290:199–206

Hajjar, I., Jane, M. K., Theodore A. K. (2006). Hypertension: Trends in Prevalence, Incidence, and Control .Annual Review Of Public Health. Vol. 27: 465-490

Han, T.S., Seidell, J.C., Currall, J.E., Morrison, C.E., Deurenberg, P. (1997). Lean ME. The Influences of Height and Age on Waist Circumferences as an Index of Adiposity in Adults. Int J Obes Relat Metab Disord. 1997;21:83–89. [–]

Health Survey England (1997): Health Survey of England

Hill, A.G., Anarfi, J., Darko, R. And Duda, B. (2005). *Selfreported And Independently Assessed Measures Of Population Health Compared: Results From the Accra Women's Health Survey*. 2005. Paper Presented at the IUSSP General Conference, France, 21st July 2005

Hublet, A., De Bacquer, D., Valimaa, R., Godeau, E., Schmid, H., Rehav, G. (2006) Smoking Trends Among Adolescents from 1990 to 2002 In Ten European Countries And Canada. *BMC Public Health*. 2006;6:280. [–]

Juliet, A., Liam, S. and David, A. L. (2006): Smoking Patterns In Ghanaian Civil Servants: Changes Over Three Decades

Kaur, J. And Bains, K.(2006). A Study Of The Risk Factor Profile Of Cardiovascular Diseases In Rural Punjabi Male Patients. *Indian J Public Health* 2006, 50(2):97-100. Abstract

Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K., He, J. (2005). Global Burden of Hypertension: Analysis Of Worldwide Data. *Lancet* 365:217–23

Khaw, K.T., Barrett-Connor, E. (1988). Endogenous Sex Hormones and Cardiovascular Disease in Men. A Prospective Population-Based Study. American Heart Assoc.

Kirstie, J., Edwards, R., Mugusi, F., Whiting, D., Unwin, N.(2001). Tobacco Smoking In Tanzania, East Africa: Population Based Smoking Prevalence Using Expired Alveolar Carbon Monoxide As A Validation Tool.

Kissebah, A.H., Krakower, G.R.(1994). Regional Adiposity and Morbidity. Physiol Rev. 1994;74:761–811. [_]

Lean, M.E.J., Han, T.S., Morrison, C.E. (1995). Waist Circumference as A Measure For Indicating Need For Weight Management. Bri Med J. 1995;311:158–161.

Lopez, A.D., Matters, C.D.(2006). Measuring The Global Burden Of Disease And Epidemiological Transitions: 2002–2030. *Ann Trop Med Parasitol.* 2006;100:481–499. [_]

Mackey. J., Ericksen, M.(2002). Tobacco Atlas. *World Health Organization (WHO)* 2002.

Mehan, M.B., Kantharia, N.B., Surabhi, S.(2007). Risk Factor Profile of Non-Communicable Diseases In An Industrial Productive (25-59 Years) Population Of Baroda. Int J Diab Dev Ctries 2007;27:116-21

Must, A., Spadano, J., Coakley, E.H., Field, A.E., Colditz, G., Dietz, W.H.(1999) The Disease Burden Associated With Overweight And Obesity. *JAMA* 1999; 282: 1523-1529, _

Murray, C.J.L., Lopez, A.D., (1996). Eds. *Global Burden of Disease.* Harvard, MA: Harvard School of Public Health, 1996. (Vol 1 Of Global Burden Of Disease And Injury Series.)

Nawi, N., Hans, St., Ruth, B., Mohammad, H., Stig, W., Lars, W. (2006): Preventable Risk Factors For Non Communicable Diseases In Rural Indonesia:

Nieto, F.J., Alonso, J., Chambless, L.E., Zhong, M., Ceraso, M. (1995). Population Awareness and Control Of Hypertension And Hypercholesterolemia. The Atherosclerosis Risk in Communities Study. *Arch. Intern. Med.* 155:677–84

Nigel, U.(2001a). Taking Poverty To Heart Non Communicable Diseases And The Poor. University Of Newcastle, Department Of Diabetes and Epidemiology & Public Health. March 2001a Insight Health Issue Number 1.

Nigel, U. (2001b).Theme Papers. On-Communicable Diseases In Sub-Saharan Africa: Where Do They Feature In Health Research Agenda? Policy And Practice. Bulletin of The World Health Organization. Volume 79. Number 10. Geneva 2001b.

Owusu-Dabo, E., Lewis, S., McNeill, A., Gilmore, A., Bril, J.(2009). Smoking Uptake and Prevalence in Ghana.

Pampel, F.C.(2002). Patterns Of Tobacco Use In The Early Epidemic Stages: Malawi And

Zambia, 2000–2002. *Am J Pub Health.* 2002;95:1009–1015. [ ]

Paffenbarger, R. S., Wing, A. L., Hyde, R. T. And Jung, D. L.(1983). Physical Activity And Incidence Of Hypertension In College Alumni. Am J Epidemiol 1983; 117: 245–57.

Pesut, D.And Basara, H.Z.(2006).Cigarette Smoking And Lung Cancer Trends In Serbia – A Ten Year Analysis. *Med Pregl* 2006, 59(5–6):225-9. Pubmed Abstract

Peto, R. And Lopez, A.D. (2004). The Future Worldwide Health Effects of Current Smoking Patterns. In *Tobacco: Science, Policy And Public Health.* New York: Oxford University Press; 2004.

Pobee, J.O.M. (2006). *The Heart Of The Matter. Community Profile of Cardiovascular Diseases Of A Sub- Saharan African Country.* 2006. Accra: Commercial Associates Ltd

Popkin, B.M. (1999). Urbanization, Lifestyle Changes and the Nutrition Transition. *World Development*, 27(11): 1905-1999.

Roberts, D. E., Meakem, T. D., Dalton, C. E., Haverstick, D. M and Lynch, C. (2007). Prevalence of Hyperglycemia in a Pre-Surgical Population . The Internet Journal of Anesthesiology. 2007

Steyn, N., Burger, S., Monyeki, K.D., Alberts, M. And Nthangeni,G. (2001). Seasonal Variation In Dietary Intake Of The Adult Population Of Dikgale. *South African Journal of Clinical Nutrition*, 14(4): 140-145.

Sugathan, T.N., Soman , C.R., Sankaranarayanann, K. (2006). Behavioural Risk Factors for Non Communicable Diseases Amongadults In Kerala, India

Summerfield, L. (1998). Promoting Physical Activity and Exercise Among Children. Http:// Www. Kidssource.Com/

Toustad, S., Andrew-Johnston J. (2006). Cardiovascular Risks Associated With Smoking: A Review For Clinicians. *Eur J Cardiovasc Prev Rehabil* 2006, 13(4):507-14. Pubmed Abstract

Townsend, L., Flisher, A.J., Gilreath, T., King G.(2006). A Systematic Review of Tobacco Use Among Sub-Saharan Africa Youth. *Journal of Substance Use* 2006, 11(4):245-269.

Van, I.T. (1985). Health Implications of Overweight and Obesity In The United States. Ann Intern Med. 1985;103:983–988. [ ]

Vorster, H.H. (2000). An Epidemiological Study of Hypertension and Its Determinants in a Population in Transition: The THUSA Study. *Journal of Human Hypertension*, 14: 779-787.

Vasan, R.S., Larson, M.G., Leip, E.P., Evans, J.C. (2001). Impact Of High-Normal Blood Pressure On The Risk Of Cardiovascular Disease. New England Journal Of Medicine. Content.Nejm.Org

Wassertheil-Smoller, S., Anderson, G., Psaty, B.M., Black, H.R., Manson, J. (2000).

Hypertension And Its Treatment In Postmenopausal Women: Baseline Data From The Women's Health Initiative. *Hypertension* 36:780–89

Wellington, E.(2002). Global Youth Tobacco Survey Fact Sheet, Ghana. Global Youth Tobacco Survey Collaborative Group 2002 Mar 6.

Winkvist, A., Barcos, A., Berglund, G., Mulligan, A. (2007). -Public Health Nutrition, Cambridge Univ Press Page 1. Diversity Of Dietary Patterns Observed In The European Prospective

Wolf, H.K., Tuomilehto, J., Kuulasmaa, K., Domarkiene, S., Cepaitis, Z., Molarius, A., Sans, S., Dobson, A., Keil, U. Rywik, S.,(1997) . WHO MONICA Project. Blood Pressure Levels in The 41 Populations of the WHO MONICA Project. J Hum Hypertens 1997; 11:733-42. [Pubmed]

World Health Organization (2006). The WHO Stepwise Approach To Chronic Diseases Risk Factor Surveillance. Chronic Non-Communicable Diseases Risk Factors Survey in Iraq2006

World Health Organization. (2004). A Strategy to Prevent Chronic Disease in Europe A Focus on Public Health Action: The CINDI Vision. [Online], Available Http://Www.Phac-Aspc.Gc.Ca/Ccdpc-Cpcmc/Cindi/Pdf/Cindi_Vision_En.Pdf.

World Health Organization (2002). Innovative Care for Chronic Conditions: Building Blocks for Action. Global Report. Non Communicable Diseases and Mental Health.
Geneva:. WHO/MNC/CCH/02.01, P. 15

World Health Organisation, (2002). Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation, Geneva. 2000. WHO Technical Report Series 894.

World Health Organisation (2001). Physical Activity. Department of Non-Communicable Disease Prevention And Health Promotion. World Health Organisation: Geneva.

World Health Report (2001). Mental Health: New Understanding New Hope. World Health Organisation, Geneva.

WHO/FAO. (2003). Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation. 2003. Geneva: WHO.

STEP 1: SELF REPORTED. Demographic Characteristics		
1. Sex of Respondent	1.Male 2. Female ☐	
2. Age of Respondents	3. What is your marital status	1.Single 2. Married 3.Divorced 4.Widow 5. Separation 6. Cohabiting ☐
4. Highest level of education	1. Never 2. JSS ☐ 3. SSS 4. Tertiary	

APPENDIX

Sample Questionnaire.

QUESTIONNAIRE ON ASSESSSMENT OF NON-COMMUNICABLE DISEASES PREVALENCE, LEVELS OF RISK AND RISK FACTORS.

Community……. **Paper**
Code……

5. What is your main occupation
1. Informal
2. Formal skilled
3. Housewife
4. Not employed
5. Student
6. Other (Specify)……..

☐

---

6. What is your monthly Income?..... 7. Additional/Other sources of income ……

---

8. Religious affiliation
1. Christian
2. Muslim
3. Traditional

☐

BEHAVIOURAL MEASUREMENTS:

Tobacco Use

9. Which of the following best describes your smoking status (Go to 18 if Never smoke)	1. Never smoke 2. Current smoker 3. Ex-smoker ☐
10. At what age did you started smoking ☐	11. Average number of cigarettes Smoked per day ☐
12. Do you smoke any of the tobacco products? such as pipes or cigarettes daily?	1. Yes 2. No ☐
13. How many time in a day do you smoke? ☐	14. Age at the initial onset of Smoking (ex-smoker only) ☐
15. Age at which smoking was quit (Ex-smoker only).	16. To you, is smoking good 1. Yes 2. No ☐

17. Average number smoking per day at time of regular Smoking (Ex-smoker only).	☐
18 Do/have you ever use any smokeless materials 1. Yes 2. No	☐
19. Hours spent per day in closed environments where people smoke	☐

(Never smoke only/Second hand smokers)

20. What is your general attitude towards smoking?	1. Wish to stop 2. Good for my use 3. Like to smoke ☐
21. Do you belief that smoking is harmful 1. Yes 2. No 22.Have you contracted any diseases since smoking period. ☐	1. Yes 2 No ☐

Alcohol Consumption

23. Which of the following best describes your drinking status?	1. Never drink 2. Current drinker 3. Ex -drinker ☐
24. At what age did you started drinking ☐☐	26. How many times in a day do you ☐
25. When did you quit drinking? drink ☐☐ (Ex- drinker only)	1. Once 2. Twice 3 Thrice

27. Apart from alcohol, have you ever consumed a drink that contains alcohol such as beer, wine, spirit, fermented cider, etc?	1. Yes 2. No ☐
28. On average how may litres of alcohol have you been taken per day	1. One litre 2. Two litres 3. Three litres ☐
29. Have you consumed alcohol (such as beer, wine, spirits or fermented cider) within the past 12 months?	1. Yes 2. No ☐
30. In the past 12 months, how frequently have you had at least one drink?	1. Daily 2. 5-6 days per week 3. 1-4 days per week 4. 1-3 days per month 5. Other (Specify)…… ☐
31. Have you consumed alcohol (such as beer, wine, spirits or fermented cider within the past 30 days?	1. Yes 2. No ☐
32. Which of the following describes your drinking pattern?	1. Daily 2. Weekly 3. Monthly 4. Occasionally ☐

Dietary Behaviour

33. In a typical week, how per many days do you eat fruit	1. One Day 2. Two days 3. Three days 4. Four days ☐	34. How often do you eat fruit day 1. Morning only 2. Afternoon only ☐

3. Evening Only
4. Both Morn. & Aftern.

35. In a typical week, on how many days do you eat Vegetables?	1. One day 2. Two days 3. Three days 4. Four days ☐
36. How many servings of vegetables do you eat on one of number of servings those days?	1. Once 2. Twice 3. Thrice ☐
37. What type of oils or fat is most often used for meal preparation in your household?	1. Vegetable oil 2. Lard 3. Butter 4. Margarine 5. Peanut butter 6. Other Specify ☐☐☐ ☐
38. Which of the following best describes your salt intake ability.	1. Low 2. Moderate 3. High ☐
39. On average, how many spoonful of salt is taken per meal/day	1. One 2. Two 3. Three 4. Four ☐
40. Which of the following is frequently taken in a week? 1. Egg 2. Beef 3. Cheese 4. Low fat milk 5. Peak milk 6. Cow milk ☐	41. At what quantity or amount of 40 is taken per week. ☐
42. a. On the average, how many kilos of sugar is consumed per week	1. One 2. Two 3. Three 4. Four 5. Five ☐
42. b.Tick all the diseases that apply to you or your known family member. Asthma Cancer ☐ Diabetes ☐ HBP Stoke COD CVD	

Physical activity

43. Does your work involve mostly sitting or standing, with walking for not more than 10 minutes at a time?	1. Yes 2. No ☐
44. Does your work involve vigorous-intensity activity that causes large increase in breathing or heart rate for at least 10 minutes continuously	1. Yes 2. No ☐

45. In a typical week, on how many days do you do moderate intensity activities as part of your work? 1. One day 2. Two days 3. Three days 4. Four days 5. All days

46. How much time do you spend doing vigorous-intensity activities at work on a typical day? (Hours/minutes)

49. Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places? 1.Yes 2. No	☐
50. In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places? Number of days	☐
51. How much time do you spend walking or bicycling for travel on a typical day?(Hours/minute) Number of H/M	
52. Do you do any vigorous-intensity sports, fitness or recreational activities that cause large increases in breathing or heart rate like running or football for at least 10 minutes continuously? 1. Yes (leisure) 2. No	☐
53. In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities Number of days	
54. How much time do you spend doing vigorous-intensity sports, Fitness or recreational activities on a typical day? Number of H/M	
55. Do you do any moderate-intensity sports, fitness or recreational activities that causes a small increase in breathing or heart rate. 1. Yes for at least10 minutes continuously? 2. No	☐
56. How much time do you spend doing moderate-intensity on a typical day? Number of H/M activities	
57. How much time do you usually spend sitting or reclining on a typical day? Number of H/M	☐
History of Raised Blood Pressure	

58. When was your blood pressure last measured by a health professional?	1. Within past 12 month 2. 1-5 years ago 3. Never had my

47. How much time do you spend doing moderate-intensity activities at work on a typical day?

48. How long is your typical working day? (Hours/minutes)

	BP checked before 4. Other (Specify)	
59. During the past 12 months have you been told by a health worker that you have raised blood hypertension?	1. Yes doctor or other 2. No pressure or	☐
60. Have you been taking any drugs in past 2 weeks	1. Yes 2. No	☐
		☐
		☐

63. Were you given advice to stop smoking?	1. Yes 2. No	☐
64. Were you given advice to start or do more exercise?	1.Yes 2. No	☐
65. During the past 12 months have you consulted traditional elevated blood pressure or hypertension remedies	1. Yes healer for 2. No	☐
66. Are you currently taking any herbal or traditional remedy for your high blood pressure?	1. Yes 2. No	☐
History of Diabetes		
67. Have you had your blood sugar measured in the past 12 months?	1. Yes 2. No	☐
68. Have you ever been diagnosed by a doctor or other health worker that you have diabetes? (If No, Go to Q 72)	1. Yes 2. No	☐
69. Are you on Insulin injections?	1. Yes 2. No	☐
70. Are you on any oral drugs that you have taken in the last 2-weeks?	1. Yes 2. No	☐
71. Are you on any special prescribed diet	1. Yes 2. No	☐
72. Is any member of your family having HBP or Diabetes?	1. Yes 2. No	☐
STEP 2: PHYSICAL MEASUREMENTS		

Height and Weight	
73. Height measurement:	Centimeters (cm)
74. Weight measurement	Kilogram ☐

61. Have you been on any special prescribed diet including Salt reduction? (If No, Go to Q 67)
1. Yes
2. No

62. Were you given advice or treatment to lose weight?
1. Yes
2. No

75. Are you pregnant? (For women only)	1. Yes (Don't measure waist and HIP circumference)	
	2. No	☐

Waist and Hip

76. Waist circumference (to nearest 0.1 cm)	☐
77. Hip circumference (to nearest 0.1 cm)	☐

Heart Rate (Pulse)		
78. a. Reading 1	Beats per minute	☐
b. Reading 2	Beats per minute	☐
c. Reading 3	Beats per minute	☐
Blood Pressure		
79. a. Reading 1	Systolic (mmHg)	☐
	Diastolic (mmHg)	☐
b. Reading 2	Systolic (mmHg)	☐
	Diastolic (mmHg)	☐
c. Reading 3	Systolic (mmHg)	☐
	Diastolic (mmHg)	☐
80. Average reading	Systolic (mmHg	☐
	Diastolic (mmHg)	☐
STEP 3: BIOCHEMICAL MEASUEMENTS		
Blood Glucose		
81. During the last 12 hours have you had anything to eat	1. Yes	☐

or drink, other than water?		2. No	
82. Fasting blood glucose		mmol/L	☐
83. Time of day fating blood glucose taken.	Hours	Minutes	☐