AWARENESS STATUS AND ASSOCIATED RISK FACTORS OF HYPERTENSION AMONG ADULT PATIENTS ATTENDING YALA SUB-COUNTY HOSPITAL, SIAYA COUNTY, KENYA

BY

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health (Epidemiology and Population Health) in the School of Public Health and Community Development

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DECLARATION

This thesis is my original work and has not been presented by any other person in any university for the award of a certificate, diploma or degree. Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with Departmental requirements.

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ACKNOWLEDGEMENTS

My journey towards the completion of this thesis could not have materialized without the blessings of the Almighty God. To the valuable time, academic counsel and patience of my supervisors, Dr. Ng'wena Magak and Dr. Lilian Ogonda.

My sincere gratitude goes to my lecturers, at Maseno University School of Public Health, for their overwhelming support during my course work.

Last but not least, special thanks go to the Medical superintendent- Yala Sub-County hospital, for allowing me carry out the study at the hospital.

DEDICATION

To my wife Linet, whose prayers, encouragements, financial support and fortitude served as a driving force to continue with my studies, my son, Jayden for understanding and accommodating my busy schedule during this research, my late father Solomon Awino and to my mum Mrs. Rusanael Awino, for always trusting in my potential.

ABSTRACT

Hypertension is a major public health problem that affects approximately 26% of adult population worldwide. It is a significant risk factor for cardiovascular diseases, stroke and renal failure, and causes about 7.1 million deaths per year worldwide. The prevalence of hypertension is suggested to be increasing worldwide, particularly in developing countries due to nutritional transition and westernization. Moreover, lack of awareness regarding the disease status increases incidence of complications and mortality. Although modifiable through lifestyle interventions and medical management, hypertension accounts for approximately 64% of stroke cases in Kenya. There is little information regarding awareness of hypertension status and risk factors among patients seeking healthcare from public hospitals in Kenya, including Yala sub county hospital. The study aimed to determine the awareness of hypertension status and risk factors among adult patients attending Yala sub-county hospital, in Siaya County. The study used hospital-based cross-sectional design. A sample of 393 participants aged 18 years and above presenting at the out -patient clinic of the hospital for treatment between February and March 2015, were selected using systematic sampling with a random start. Blood pressure and anthropometric measurements were taken for all participants. A field-tested, structured questionnaire was used to collect information on demographics, awareness and risk factors for hypertension. Descriptive statistics was used to calculate percentage of participants who were classified to be aware of their hypertension status, with the total hypertensive participants as the denominator. Logistic regression analysis was used to test the association between significant variables and hypertension. All tests were two-tailed and a *p*-value < 0.05 was considered as statistically significant. Of the 145 (36.9%) study participants who were hypertensive, 60 (41.4%) were not aware of their hypertension status. Binary logistic regression showed that age above 30 years (OR=12.0; 95% CI=2.7 to 52.3), marital status (Widowed OR= 16; 95% CI=6.34 to 40.52), smoking, BMI (overweight OR 2.98; 95% CI= 1.85 to 4.79 Obese OR= 4.23; 95% CI= 2.15 to 8.30 p <0.001), waist circumference (OR= 2.39; 95% CI= 1.57 to 3.64 p< 0.001) were independent predictors of hypertension. However, increasing level of education was inversely related to hypertension. In conclusion, the high proportion unaware of their hypertension status could lead to delay in treatment initiation which ultimately increases complications arising from the disease. All the identified risk factors except age are modifiable through lifestyle change interventions. Therefore there is need for the health care workers to hold regular health education to increase awareness of hypertension status and promote healthy lifestyle.

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LIST OF ABBREVIATIONS

AOR: Adjusted Odds Ratio

AWP: Annual work Plan

BMI: Body Mass Index

BP: Blood Pressure

CVD: Cardiovascular diseases

DBP: Diastolic blood Pressure

DHIS: District Health Information System

HT: Hypertension

JNC: Joint National Committee on Prevention, Detection, Evaluation and Treatment of High BP

KHSSPI Kenya Health Sector Strategic and Investment Plan

MOH: Ministry of Health

NCD: Non-communicable diseases

OR: Odds Ratio

RR: Relative Risk

SBP: Systolic Blood Pressure

SSA: Sub Saharan Africa

WC: Waist circumference

WHO: World Health Organization

WHR: Waist Hip Ratio

MUERC: Maseno University Ethical review Committee

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Hypertension is the intermittent or sustained elevation in diastolic or systolic blood pressure above the normal. It is defined as having a systolic blood pressure (SBP) of ≥140 and/or a diastolic blood pressure (DBP) of ≥90 mm Hg. (WHO, 2003). Hypertension is a significant public health problem, with prevalence estimates of approximately 1 billion individuals worldwide (WHO 2008). It is the main risk factor for stroke, renal failure and also cardiovascular disease mortality, which accounts for 20 – 50% of all deaths (Kearney *et al.* 2004).

Epidemiological studies have shown that the prevalence of HTN varies between different countries (Kearney *et al.* 2004). Several studies have also shown rural versus urban differences on blood pressure levels throughout sub-Saharan Africa (Fuentes *et al.* 2000; Agyemang 2006; Addo *et al.* 2007). The rapid increase in prevalence of hypertension in developing countries is most marked in the urban population, and is likely related to changing life-styles (Godfrey *et al.* 2005). Although once considered a lifestyle disease in urban setting (Ezzati *et al.* 2005; Addo *et al.* 2007), the modern technological advances and economic development have led to reduction in level of physical activity, increase in stresses of life and unhealthy diets amongst the rural population as well (Mittal and Singh 2008; Maletnlema 2002; Adedoyin *et al.* 2008). This in turn may increase the risk of conditions such as hypertension in rural areas (Ejim *et al.* 2011). Yala in Gem sub-county Kenya is a rural area where rapid urbanization, economic development and rise in affluence are being witnessed. This study therefore, aimed to identify the possible risk factors for hypertension among adult patients seeking health care at Yala sub-county hospital.

Individual's awareness of their hypertension status is an important component required for adopting preventive and therapeutic measures for this illness and hence reduction in occurrence of its detrimental sequel (Knight *et al.* 2001). In some sub-Saharan Africa countries like Malawi, population based studies have reported up to 95% of hypertension cases being undiagnosed and about three quarters of the participants reported to have never had their blood pressure checked (Msyamboza *et al*., 2012). In Kenya, there is limited data on awareness of hypertension status among clients visiting hospitals. The few documented community hypertension surveys in Kenya showed varied awareness of hypertension status. For instance a study done by Hendriks *et al.*, (2012) in rural areas of Nandi district showed an awareness status of hypertension at 6%, and among slum dwellers in Nairobi revealed an overall awareness status of hypertension at 19.5%. (Van de Vijver et al., 2013).

Hypertension data from Kenya Health Sector Strategic and Investment Plan (KHSSPI) 2013-2017, ranks hypertension at number nine cause of mortality (1.6% of total deaths) and number five (3.1% of total DALYs) in terms of risk factor for DALYS (KHSSPI-MOH 2013). In addition, a study by Ogeng'o *et al*., 2015 showed that the most common comorbidity for ischemic stroke was hypertension at 64.1%. With this background, coupled with paucity of data from other hospitals in Kenya, the present study aimed to determine the awareness of hypertension status among clients attending Yala sub-county hospital.

1.2 Statement of the Problem

Despite being modifiable through lifestyle interventions and medical management, hypertension accounts for approximately 64% of stroke cases in Kenya, thus suggesting inadequately controlled blood pressure of most patients in Kenya.

The prevalence of hypertension is suggested to be increasing in Kenya where modern technological advances and economic development have led to rise in adoption of unhealthy lifestyles including reduction in level of physical activity and unhealthy diets amongst both urban and rural population. Yala, in Gem sub-county, is one of the rural places where rapid urbanization, economic development and rise in affluence are being witnessed in Kenya. This in turn increases the risk of conditions such as hypertension.

In Kenya, episodic health education is usually done in the health care facilities for the few patients already diagnosed with hypertension. Such an approach makes self-management strategies and other cost effective interventions inaccessible to those at risk or those with undiagnosed hypertensive individuals (Kiberenge *et al*., 2010). Individual's awareness of hypertension status and identification of its associated risk factors is important in order to adopt preventive and therapeutic measures for this illness (Knight *et al.* 2001).

1.3 Significance of this Study

Hypertension in adults has a great impact on the quality of life of individuals with important implications on the economy (Lloyd-Jones *et al.*; Knight *et al.* 2001; Lopez *et al.* 2006). Uncontrolled hypertension may also result in detrimental illnesses ((Kearney *et al.* 2004; Kearney *et al.* 2005; Gaddam *et al.* 2009; Murphy *et al.* 2009) that place a great strain on health care delivery system. Indeed coronary heart disease (CHD) has emerged as the leading cause of death among older Africans (Alberts *et al.* 2005). However, hypertension represents one of the most preventable cause of death in humans (WHO 2008) and one of the most significant modifiable risk factors for cardiovascular diseases (Kengne *et al.* 2009).

Lifestyle interventions (Haslam *et al.* 2005; Dickinson *et al.* 2006; He *et al.* 2013) and effective medical management of hypertension are well-established targets to decrease morbidity, prevent its complications and mortality in patients (Law *et al.* 2003). Effective interventions will therefore require increased individual's awareness of hypertension status and the identification of its associated risk factors.

The study aimed to assess the awareness of hypertension status and associated risk factors of hypertension among patients seeking health care from Yala Sub-County hospital, in Gem Sub-County. Data obtained from the study could be used by policy makers in the development and implementation of effective hypertension prevention and control strategies to reduce the detrimental sequel of the disease.

1.4 Objectives of the Study

1.4.1 General Objective

To determine the awareness of hypertension status and associated risk factors among adult patients attending Yala sub-county hospital.

1.4.2 Specific Objectives

1. To determine the awareness of hypertension status among adult patients attending Yala sub-county hospital.
2. To assess the non-modifiable risk factors for hypertension among adult patients attending outpatient services at Yala sub-county hospital.
3. To assess the modifiable risk factors for hypertension among adult patients attending outpatient services at Yala sub-county hospital.

1.5 Research Questions

1. What is the awareness of hypertension status among adult patients attending Yala sub-county hospital.?
2. What are the non-modifiable risk factors for hypertension among adult patients attending outpatient services at Yala sub-county hospital?
3. What are the modifiable risk factors for hypertension among adult patients attending outpatient services at Yala sub-county hospital?

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the relevant literature deemed necessary in helping understanding the subject under review. It provides a critical review of literature related to awareness of hypertension status and its associated risk factors. It is discussed under the following sub-headings: awareness of hypertension status, non-modifiable risk factors and modifiable risk factors. An operational framework was used to explain the relationships amongst the various variables.

2.2 Awareness of Hypertension Status

The World Health Organization has identified hypertension, or high blood pressure, as the leading cause of cardiovascular mortality. The World Hypertension League (WHL), an umbrella organization of 85 national hypertension societies and leagues, recognized that more than 50% of the hypertensive populations worldwide were unaware of their condition (Chockalingam, 2007). In economically developed countries like USA, Canada and England, awareness of hypertension status was at 81%, 83% and 65% respectively (Joffres *et al*., 2013). This could be due to massive health campaigns and community sensitization about hypertension through mass media in these developed countries.

In a systematic review and meta-analysis to assess the recent burden of hypertension in sub-Saharan Africa, Ataklte *et al*., (2014), found awareness of hypertension status between 7% and 56%. This was based on studies published between 2000 and 2013. In Southwest Ethiopia, a

hospital-based cross-sectional survey conducted on 734 participants aged 15 years or older, only 35.1% of them were aware of their hypertension status (Gudina *et al*., 2013). In Angola, though community based survey of 1,464 adults aged 18 to 64 years conducted in Bengo province, amongst the hypertensive individuals, only 21.6% were aware of their status (Pires *et al.* 2013). Awareness of hypertension status was more in the females than the males, and increase with advance in age. This low awareness of hypertension status reported in this study could have been attributed to the lower cut off for the upper age limit of the study participants and since awareness increases with advance age (Mathenge *et al*., 2010), the study could have included more of the elderly participants. In terms of sex distribution of awareness of hypertension status, it is true females were more aware of their status because generally females tend to be more concerned about their health than their male counterparts (Vlassoff, 2007).

However, the awareness of hypertension status was much higher than that found in South Eastern Nigeria which was at 2.8% (Andy *et al*., 2012). This was a cross-sectional study involving 3869 participants 15 years and above in three rural communities in the Cross River and Akwa Ibom states of Nigeria. The difference could be due to inclusion of more of the elderly in the Angola study than the Nigeria study and also the Angola study had a smaller sample size. The Nigeria study had a limitation in that there was no age and sex categorization of hypertension awareness status.

Across East Africa, awareness of hypertension status varies from country to country. For instance, in a study done in adults of urban Ilala district and Rural Shari village of Kilimanjaro Tanzania by Edwards *et al*., (2000), just fewer than 20% of the hypertensive participants were aware of their diagnosis. This was a two linked cross-sectional population base survey done. The awareness between the urban and the rural participants was not differentiated and may be it could have been higher in the urban residents due to easy access to information in the urban than in the rural areas. Comparably, a community-based cross-sectional study among 842 adult residents aged 20 years or older of the rural district of Rukungiri in Uganda between January and February 2006, awareness status of hypertension was very low, with nine out of ten unaware of their condition (Wamala *et al*., 2009). However, in both studies hypertension awareness was not categorized with respect to age and sex.

In Kenya, there is limited data on awareness of hypertension status among clients visiting hospitals. The few documented community hypertension surveys in Kenya showed varied awareness of hypertension status. For instance a study done by Hendriks *et al.*, (2012) showed an awareness status at 6%. This was a cross-sectional survey involving 800 households members aged 18 years or more of dairy cooperative farmers and their families of rural Nandi district. The study population in this survey consisted of individuals and their household members, participating in a microcredit program and in a dairy cooperative respectively. These specific characteristics preclude generalization of conclusion regarding hypertension awareness status in the rural population of Kenya. Like some other studies done across Africa, there was no characterization of awareness with reference to sex and age. Comparably, a cross-sectional population-based survey conducted among 5190 adults aged 18 years and older slum dwellers in

Nairobi revealed an overall awareness of hypertension status at 19.5%. Awareness was more in the females (30.7%) than the males (10.8%).

In a study of ischemic cortical stroke in a Kenyan referral hospital, Ogeng'o *et al*., 2015, found that hypertension was the most common (64.1%) comorbidity to cortical stroke. This was a retrospective study done at Kenyatta National Hospital in Nairobi. It involved retrieval of records from registry of black adult patients aged 18 years and above with a diagnosis of cortical stroke during a five year period extending from January 2007 to December 2011. In Kenya, episodic health education is usually done in the health care facilities for the few patients already diagnosed with hypertension. Such an approach makes self-management strategies and other cost effective interventions inaccessible to those at risk or those with undiagnosed hypertensive individuals (Kiberenge *et al*., 2010). With this background, coupled with paucity of data, the present study aimed to determine the awareness of hypertension status among clients attending Yala sub-county hospital which might help policy makers in planning for preventive programs reduce the detrimental sequel of the disease.

2.3 Non modifiable Risk Factors for Hypertension

2.3.1 Sex

Studies across Africa have shown varied results with respect to relationship between hypertension and sex. For instance, in a cross-sectional population based study of 2120 adults aged 18 years or older in the regional capitals of Cameroon, male sex was identified as a significant predictor of hypertension (Dzudie *et al*., 2012). In this study the population was self selected hence generalization of the study findings might not be possible.

Similar findings were also demonstrated by (Pires *et al.* 2013), this was a community based survey of 1,464 adults aged 18 to 64 years in northern Angola. The proportion of hypertension was higher in men (26.4%) than women (19.8%). The reason of this male preponderance could be due a gene possessed by males which makes them more prone to hypertension. These findings are also supported by research studies in animals. For instance, male hypertensive rats were found to have significantly higher systolic and diastolic blood pressures compared with hypertensive female rats; normotensive male and female rats had similar diastolic blood pressure, but males had slightly higher systolic blood pressure than females (Maris *et al.* 2005). Although males have a gene that influence hypertension more than females, when compared at the same age, no differences in findings were noted between postmenopausal women and men of the same age (Vasan *et al.* 2002).

However, contrary to the above findings, in a study by Wamala *et al*., 2009, female participants were 1.5 times more likely to be hypertensive than their male counterparts. This was a community-based cross-sectional study of adults aged 20 years or older in rural district of Rukunguri, Uganda.

2.3.2 Age

With respect to age, in a community-based survey of 1464 adults aged 18-64 years conducted in Bengo Province, Nothern Angola, the study found that younger women had the lowest hypertension prevalence followed by younger men and the prevalence of hypertension was shown to be strongly associated with older age with an OR of 7.2 in women and an OR of 1.7 in

men (Pires *et al*., 2013). The advanced age increases the risk of exposure to the lifestyle risk factors for hypertension and hence the observed increase in hypertensive risk with aging. The other reason could be due to stiffening of the walls of blood vessels as one advances in age thus increases the likely hood of being hypertensive.

Similar results was found in studies by (Wamala *et al.* 2009), in a community-based cross-sectional study of 842 adults aged 20 years or older in Rukunguri district, Uganda. Participants with hypertension were significantly older with an average age of 44.5 years, compared to normal- tensive participants who had an average age of 37.6 years. Indeed, hypertension is the most frequent cause of heart failure above the age of 50 years and a major cause of death among the elderly (Ezzati *et al.* 2002; Lawes *et al.* 2008). However, detection and control of hypertension at any age can significantly decrease the risk of developing complications such as CVD, stroke and kidney failure (Neal *et al*., 2000), in addition to the mortality with which it is associated (Lawes *et al.* 2006; WHO 2008).

2.4 Modifiable Risk Factors

2.4.1 Socioeconomic Factors

2.4.1.1Education

In the developed world, in a multi-country study by Stamler (1992), found that age-adjusted systolic blood pressure was 1.3mmHg higher (*p-value* = 0.05) for men and 4.5mmHg (*p-value* < 0.001) for women with 10 fewer years of education. The less educated were found to have higher sodium excretion, greater body mass, and a higher alcohol intake leading to increased blood pressure (Stamler etal 1992)

In a community based survey of 1,464 adults aged 18 to 64 years in northern Angola Pires *et al*., (2013), the prevalence of hypertension was found to increase as the level of education decreased, those with lowest education were twice much likely to be hypertensive than those with highest education.

Similarly, in a community-based cross-sectional study of 842 adults aged 20 years or older in Rukunguri district, Uganda. Participants reporting to had attained tertiary level of education were more likely to be hypertensive, compared to those reporting to have never received any formal education. Participants reporting to had attained tertiary education were nearly 3 times more likely to be hypertensive compared to those reporting to have never gone to school Wamala *et al*., (2009)

Contrary to the above findings, in a population based survey of 4801 participants aged 13 years above carried in rural Uganda, Maher *et al*., (2011), found that extremes of education (none and secondary or above) among men was independently associated with high blood pressure. The difference in this study finding could be due to differences in sample size and age categorization. Similarly, study done by Alwan *et al*., (2014) which was a family-based cross-sectional study that examined the genetic determinants (SKIPOGH study) of adults 18 years or older, there was no association between education and hypertension.

2.4.1.2 Occupation

Chronic diseases incur costs for drugs, health insurance, medical consultations, laboratory tests, transportation and food (Dias da Costa *et al.* 2002). Low socioeconomic status and financial

difficulties have been found to be associated with high blood pressure (Mendez *et al.* 2003; Steptoe *et al.* 2005). In a study which was undertaken in an urban area of Jamaica, a middle-income developing country; found that blood pressure was substantially higher in poor men with a low level of education. Conversely, women with a high income experienced higher blood pressure than did those with a low income (Mendez et al., 2003).

Similarly in a study done in Mexico by Fernald and Adler (2008) found that women in low-income rural populations were found to be more likely to have higher SBP, as were those who perceived that they had higher status in the community. In the developed world, there is a well-established inverse association between socioeconomic status (SES) and blood pressure. In the developing world, however, these relationships are not as clear, particularly in the middle-income countries undergoing epidemiologic and nutritional transition. Association of low income and hypertension could be due to stressful situations experienced by this group of persons which might indirectly increase the chances of being hypertensive.

2.4.1.3 Marital Status

Literature on marital status and hypertension is inconclusive and some focused on comparing currently married to never married persons (McCausland *et al*., 2014, Lipowitcz and Lopuzanska, 2005). For instance, in a cross-sectional study of 325 adults aged 20 years or older Mc Causeland *et al*., (2014), found out that in adjusted models, being married was associated with lower night time systolic blood pressure, and was greater in married men than women. Though, this study only the married was compared against the unmarried, the widowed and the divorced which are special type of the unmarried was not considered.

In a similar study which compared hypertension among the married and the unmarried Lopowicz *et al*., (2005), found that never married men had on average higher SDP and DBP than married men. This study involved a bigger sample size of 2,271 Polish men aged 25-60 but still it was found that never married had a higher risk of hypertension when compared to married men. In a larger community-based study conducted among 17,230 participants aged 30 to 7o years in Saudi Arabia Al-Nozha *et al*., (2007) found out that hypertension was highest among the widowed than single participants. Contrary to above findings, El Bcheraoui *et al*., (2014) in a national multistage survey of individuals aged 15 years or older in Saudi, found no association between marital status and high blood pressure after adjusting for confounders. The difference could have been due to difference in study setting and sampling procedure. The widowed are more prone to hypertension; this could be associated with the psychological stress faced by this group of people. Capell *et al.,* (2001), showed that psychological factors could affect the entire neuroendocrine system ultimately leading to hypertension.

2.4.2 Behavioural Factors

2.4.2.1 Physical Activity

Adequate physical activity has been shown to have many health-promoting effects and has a direct, independent role in reducing hypertension Rodgers *et al*., (2004). Findings from large and well-controlled epidemiological studies support an inverse, independent, and graded association between exercise capacity and mortality risk in pre hypertensive and hypertensive individuals (Kokkinos *et al*., 2009, Faselis *et al*., 2012).

For example, in a cohort of 4631 hypertensive veterans with multiple cardiovascular risk factors, who successfully completed a graded exercise, test mortality risk was 13% lower for every 1-MET increase in exercise capacity Kokkinos *et al*., (2009). When compared with the least-fit individuals (exercise capacity ≤5 METs), mortality risk was 34% lower for those in the next fitness category (5.1–7.0 METs) and progressively declined to over 70% for individuals with the highest exercise capacity (>10 METs). When the presence or absence of additional risk factors within fitness categories (least-fit to most-fit) was considered, the least-fit individuals (≤5 METs) with additional risk factors had a 47% higher mortality risk than those without risk factors. This increased risk was eliminated in the next fitness category (5.1–7.0 METs) and declined to ≈≥50% in those with an exercise capacity >7.0 METs, regardless of cardiovascular risk factor status.

A decrease in daily activity is related to hypertension. A seven year study of 2548 middle-aged Japanese men who either had no hypertension or took hypertensive drugs assessed the relationship between daily activities and the risk of hypertension. The study found that daily activity was inversely related to the incidence of hypertension ((Nakanishi *et al.* 2005). Similarly (Kruk 2007) demonstrated that physical activity could be helpful in the prevention of the most frequent chronic diseases. This study involved review of published research from 2004 through to March 2007. The results showed that the maximal magnitude of the risk reduction reported was 49% for cardiovascular and heart diseases. However, in a family-based cross-sectional study that examined the genetic determinants (SKIPOGH study) of adults 18 years or older, there was no association of physical activity and hypertension Alwan *et al*., (2014). This could have been due to difference in study design and setting.

2.4.2.2Alcohol Consumption

Several studies have demonstrated a non-linear relationship between alcohol and blood pressure. In a study of Healthy normotensive men entered a 4-period crossover study comparing in random order 4 weeks of control–abstinence with similar periods of daily consumption of red wine (375 mL; 39 grams alcohol), de-alcoholized red wine (375 mL), or beer (1125 mL; 41 grams alcohol). Both blood pressure and the heart rate significantly increased in healthy normotensive men after drinking 40 grams of red wine or beer ((Zilkens *et al.* 2005).

In a prospective cohort study by Baik and Chol, 2008, which included 3833 male and female Koreans aged 40-69 years and free of metabolic syndrome at baseline. Upon follow-up, heavy drinking, in particular among liquor drinkers, was associated with an increased risk of metabolic syndrome by influencing its components. Compared with nondrinkers, the multivariate relative risk of the metabolic syndrome for very light drinkers consuming 0.1 to 5 g of alcohol per day (g/d) was 1.06, that for light drinkers consuming 5.1 to 15 g/d was 1.13, that for moderate drinkers consuming 15.1 to 30 g/d was 1.25, and that for heavy drinkers consuming >30 g/d was 1.63. All individual components of the metabolic syndrome were significantly associated with heavy drinking, particularly among heavy liquor drinkers. Several mechanisms have been proposed for the relationship between heavy drinkers and elevated BP. Suggested mediators of a direct effect include: 1) stimulation of the sympathetic nervous system, endothelin, renin-angiotensin-aldosterone system, insulin (or insulin resistance), or cortisol; 2) inhibition of vascular relaxing substances, e.g., nitric oxide; 3) calcium or magnesium depletion.

Similarly, (Fuchs *et al.* 2001) in a cohort study of 8334 participants aged 45 to 64 years in Porto Alegre, Brazil, who were free of hypertension and coronary heart disease at baseline. The results showed that consumption of 210g or more of ethanol per week (approx. 3 drinks per day) was associated with an increased risk of hypertension. The odds ratio was 1.47 after adjustment for race, age, BMI, education, and diabetes. The same was demonstrated by (Sesso *et al.* 2008) in a prospective study of 28,848 women from the Women's prospective study and 13,455 men from the physician's health study in USA free of baseline hypertension, cardiovascular disease and cancer. In men, alcohol intake was positively and significantly associated with the risk of hypertension and persisted after multivariate adjustment. Models stratified by baseline systolic blood pressure (<120 versus ≥120 mm Hg) or diastolic blood pressure (<75 versus ≥75 mm Hg) did not alter the relative risks in women and men. Light-to-moderate alcohol consumption decreased hypertension risk in women and increased risk in men. The threshold above which alcohol became deleterious for hypertension risk emerged at ≥4 drinks per day in women versus a moderate level of ≥1 drink per day in men.

On the effect of moderate alcohol consumption on hypertension, (Thadhani *et al.* 2002) prospectively examined the association between alcohol consumption and subsequent risk of hypertension among 70,891 women 25 to 42 years of age. The results found that in the age-adjusted analysis, the relative risk of hypertension according to level of alcohol consumption followed a J-shaped curve. After adjustment for other confounding factors including BMI, the J-shaped relationship became more pronounced. Compared with women who abstained, the relative risk of hypertension was lowest among women drinking 0.25 to 0.50 drinks per day and highest among women drinking more than 2 drinks per day. This low to moderate alcohol intake

association with lower incidence of hypertension could be due to increases in high-density lipoprotein (HDL) and apolipoproteins A_1 and A_2, antioxidant effects, and reduced platelet aggregability.

In conclusion, excess alcohol consumption is related to high blood pressure and its complications, whereas light to moderate alcohol consumption is a factor in maintaining good health. However, higher intake levels are associated with increased risk for hypertension, cardiomyopathy and other cardiac complications, hemorrhagic and thrombotic strokes, certain kinds of cancer, hepatitis, cirrhosis, pancreatitis, gastritis, suicide, accidents, violence, and alcohol abuse and dependence. Because of these risks, alcohol intake should not be encouraged.

2.4.2.3 Tobacco Use

In spite of the great number of observations which show the certainty of cardiovascular damage from smoking, the opinions on that are not yet unanimous (Aureio, 2011). In a study to determine the pressor response to smoking, (De Cesaris *et al.* 1992) studied 10 normotensive and 10 mild or moderate essential-hypertensive smokers (> 20 cigarettes daily) were compared with 2 comparable groups of non-smokers. All participants were asked to smoke 4 cigarettes during 1 hour; blood pressure (BP) and heart rate (HR) were monitored beat-to-beat by a non-invasive device (Finapres Ohmeda) during the smoking period and during the immediately preceding non-smoking hour. Furthermore, all subjects underwent 24-hour ambulatory BP monitoring. In all groups, each cigarette induced a similar and statistically significant increase from baseline for both BP and HR.

Similarly in another study of the relationship between smoking and hypertension was a 14-year longitudinal study which was conducted in Japanese male workers at a steel company between 1991 and 2005. The study revealed that smoking is independently related to the onset of hypertension and systolic hypertension in Japanese male workers. The significant odds ratios of smoking were 1.13 for hypertension and 1.15 for systolic hypertension (Dochi *et al.* 2009). Smoking increases the built ups of unsaturated fats in the blood vessels, a condition called atherosclerosis which might lead to hypertension. Cigarette smoke also contains nicotine which raises heart rate, narrows blood arteries and hardens their walls; this might lead to increased blood pressure.

In Kenya, a population-based cross-sectional survey of participants aged 18 years and older study done in two major slums in Nairobi, by van de Vijver *et al*., (2013), current smokers were almost two times more likely to be hypertensive than the non smokers in both sexes. Though in this study the ex smokers were not analysed.

2.4.3. Physical Factors

2.4.3.1 Body Mass Index

Several studies done across the globe have shown that as the body mass index increases, blood pressure also increases. For instance, in a cohort study of 300 Japanese-Americans, using a 10 to 11 year follow-up, (Hayashi *et al.* 2003) found that intra-abdominal fat measured using computed tomography was significantly related to hypertension.

Similarly (Goma *et al.* 2011), in a cross-sectional study with multy stage cluster sampling technique of adults aged 25 years and above in Lusaka, urban Zambia, found that the obese were approximately 2.5 times more likely to be hypertensive than those with the normal weight. Likewise in a nationwide cluster-specific cross-sectional study of adults aged 16 years and above carried out in ten regions of Cameroon in 2013, Kingue *et al*., (2015) observed that the prevalence of hypertension increased with advancement of body mass index.

In rural Uganda, Wamala *et al*., (2009), noted that having a BMI greater than 25 was significantly associated with hypertension, the association being highest in subjects with BMI of 30 or higher, with an adjusted OR of 5.07 [95% CI= 2.79 – 9.21], compared to subjected with BMI less than 25. In Kenya, in a population-based household survey in Kibera slums of Nairobi, Kenya, Joshi *et al*., 2014, observed that per unit increase in BMI, SBP increased by 0.2 mmHg in both gender, and DBP increased by 0.08 mmHg (0.12 mmHg males, 0.06 mmHg females).

The above observations could be due to the rapid weight gain increases regional blood flow, cardiac output and heart rate and the increased cardiac output could be due increased extracellular volume expansion. All these partly explain the increased likelihood of hypertension in the obese than their normal-weight counterparts.

In summary, some of the above risk factors have been determined in few documented community studies in Kenya. But still there was need to establish the associated risk factors for hypertension among hospital clients because the risk factors are not homogenous and to prioritize on prevention strategies for hypertension.

2.5 Operational Framework

For the study on cardiovascular diseases (CVD), an adaptation of the conceptual framework of Wong and colleagues (Wong *et al.,* 2005) is used. This is quite a complete framework on CVD. Since the study only focused on the hypertension part of the CVD and only specific risk factors were considered (see figure 2.1)

The boxes on the left were independent variables i.e., awareness of hypertension status and risk factors for hypertension which were considered in terms of non-modifiable factors, socio-economic factors, behavioural factors . These factors were analyzed to determine their association with hypertension.

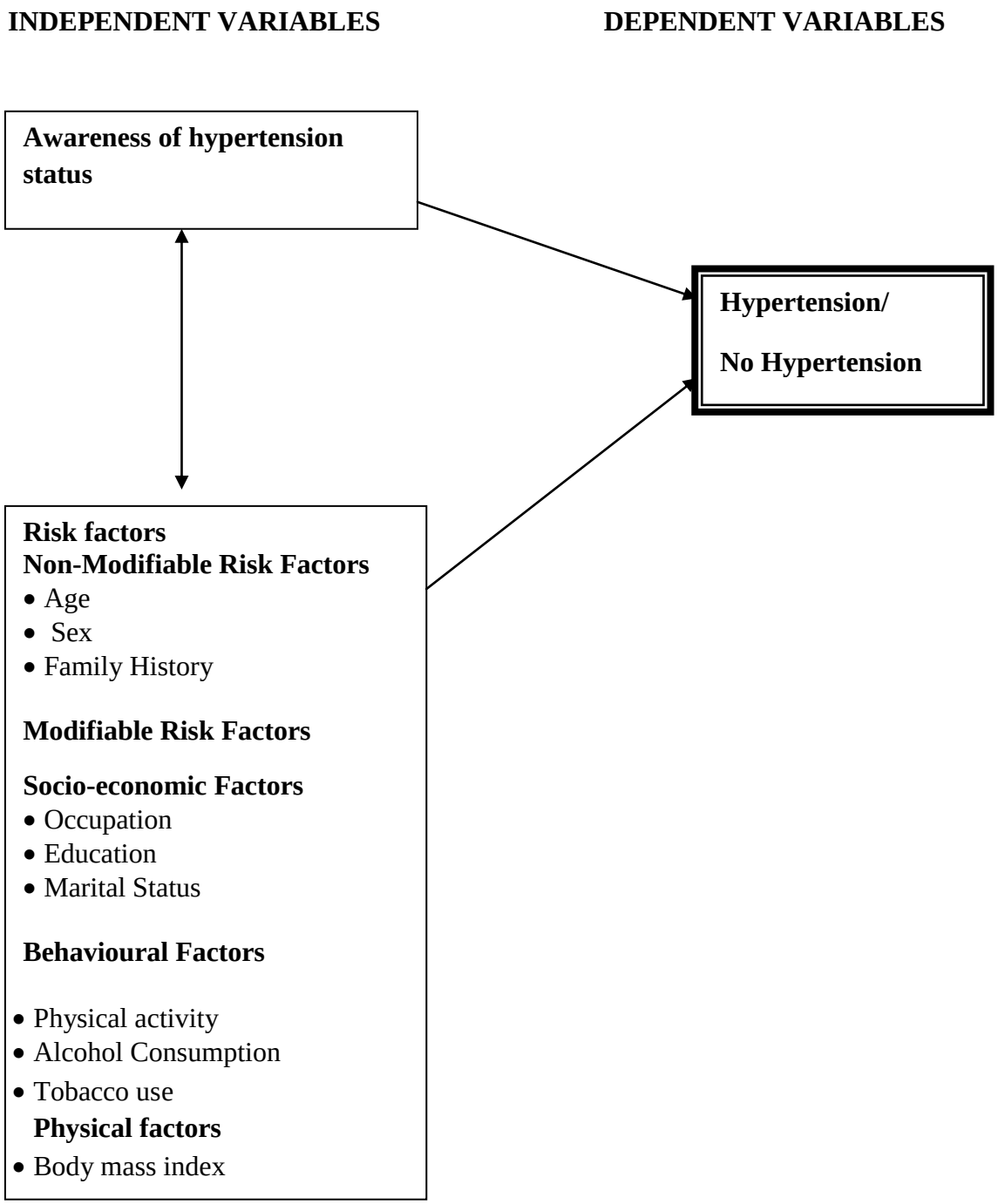

Figure 2.1: Operational Framework of associated risk factors for Hypertension

(Modified from Wong *et al*., 2005)

2.6 Measurement of Variables

Age : Subjective response in years from 18 years of age.

Sex : Recorded as male or female as observed

Family History : Indication whether there is or there is not a nuclear family member with hypertension.

Occupation : What best describes participant's main work status over past 12 months

Education : The highest level of education attained

Marital Status : Described response as never married, married, divorced or widowed

Physical activity : Assessed as a continuous variable by asking participants to report the number of hours per week they spend playing sports. Adequate physical activity was considered in participants who reported at least 150 hours per week

<u>Alcohol Consumption</u>

Current drinkers : Those reported to have taken alcohol within the last 30 days before the study interview day.

Ex- drinkers : Those who reported to have stopped taking alcohol in the past 12 months prior to this study

None drinkers : Adults who reported no history of drinking alcohol in their lifetime.

<u>Tobacco use</u>

Non-smokers : Adults who have never smoked a cigarette in their entire life.

Current smokers : Adults who smoke cigarettes every day (daily) or some days (nondaily).

Former smokers : Those who had stopped smoking at least 12 months before this study interview.

Body mass index : was calculated as weight (kg)/ (height (m) ×height (m)). In kg/m^2

Underweight : Body Mass Index of less than 18.5 kg/m^2

Normal weight : Body mass index of 18.5 kg/m^2 - 24.9 kg/m^2

Overweight : Body Mass Index of between 25.0 kg/m^2 – 29.9 kg/m^2

Obesity : Body Mass Index equal to or greater than 30 kg/m^2.

Waist circumference: measured in centimeters at the midpoint between the inferior margin of the last rib and the crest of the ilium

High waist circumference: in male above 94 centimeters and in the females above 80 centimeters

Hypertension : Systolic (and/ or diastolic) BP of 140 (90) mmHg or higher or if they were on BP lowering medications over the last 15 consecutive days

Awareness of hypertension status : Participants responding **Yes** or **No** to the question 'Have you ever been told by a doctor or health professional that you had hypertension?'

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

This chapter discusses the research materials and methods that were applied for the study. The key sections include study area, study population, study design, sampling strategy, data instruments, data collection, data analysis, limitations, and ethical considerations.

3.2 The Study Area

The study was carried out at Yala Sub county hospital. The hospital is situated in Yala division, Gem Sub County, of Siaya County. It is situated 42 kilometers northwest of Kisumu City and is approximately 500 metres off Kisumu- Busia road. It is the largest facility in the sub county with a catchment population of approximately 24,000 persons (Annual work plan 2014/2015). It is a government owned facility which provides both outpatient services including but not limited to general outpatient services, MCH services, dental services, comprehensive care clinic and inpatient care services. Daily adult outpatient attendance is between 140 and 200 clients. The hospital is the only referral facility within Gem Sub County serving 33 other small facilities. Yala hospital has 22 nursing staff against standard norm of 50, medical officers are 2 against a standard norm of 6, and clinical officers are 3 against a standard norm of 10. Generally there is one nurse and clinical officer serving the outpatient department at any particular time. There is usually one automated blood pressure machine at the outpatient department which occasionally breaks down making adherence to service protocols difficult.

Yala is one of two divisions of Gem Constituency, Siaya County, has a population of 83,823 with an urban population of 2,438 (KNBS, 2009). Yala is situated at 0.1° North latitude, 34.53° East longitude and 1373 meters elevation above the sea level (**See Appendix 3 for study area map**).

3.3 Study Population

The study population was adult clients aged 18 years or older attending outpatient services at the hospital.

3.4 Study Design

This was a hospital based cross-sectional study.

3.5 Sample Size and Sample Size determination

Sample size of study was calculated using the formula Z^2Pq/d^2 (Mugenda *et al.* 2003).

$$\mathbf{n} = \frac{\mathbf{Z^2Pq}}{\mathbf{d^2}}$$

Where:

n = the desired sample size (when the target population is greater than 10,000)

Z = standard normal deviation set at 1.96 which corresponds to 95% confidence interval

p = proportion of the target population estimated to have a characteristic that is being measured. (No documented hospital prevalence studies in Kenyan, therefore p taken at 50% to maximize sample size.)

q = 1-p (1-0.5) = 0.5

d = degree of accuracy desired set at 0.05

Therefore,

$$\mathbf{n} = \frac{\mathbf{1.96^2 \times 0.5 \times 0.5}}{\mathbf{0.05^2}} = \mathbf{384}$$

Including 10% non response n was 1.1 × 384= **422 Respondents**

3.6 Inclusion Criteria

Male and female outpatient clients aged 18 years and above attending Yala hospital willing to participate in the survey.

3.7 Exclusion Criteria

All patients with severe illnesses, acute life-threatening conditions, and severe injury, including patients with head injuries, were excluded from the study.

3.8 Sampling Procedure

The study participants were selected through both simple random and systematic sampling. The first study participant of the day was selected through simple random procedure. This was done by giving the first five participants random papers labeled one to five, the client who picked paper number one became participant number one in the study. After which the subsequent participants of the day was through systematic sampling (after every 14th patient). The sampling interval was obtained by dividing 6000 (previous year's two months outpatient visit, as sampling frame) by 422 (the sample size). This procedure of interval selection was repeated daily until a sample size of 422 participants was met. This took two months.

3.9 Study Instruments

Face-to-face interview was used, during which data was collected using a field tested standardized questionnaire (Appendix II).

One data assistant that had a diploma in clinical medicine was recruited to help in data collection. He was trained for three days on how to conduct the interview and to do anthropometric measurements.

3.10 Data Collection

Information was collected on various socio-demographic factors such as age, sex and marital status, level of education, employment status and education. In addition to questions on these socio-demographic information, the questionnaire also included questions on smoking habits, alcohol consumption, physical activity, parental history of hypertension and personal medical history (where the diagnosis was made by a physician) of hypertension.

3.10.1 Blood Pressure Measurement

The physical examination included blood pressure (BP) and anthropometric measurements. The blood pressure (systolic and diastolic) was measured using a standardized protocol (Appendix 2) with the participant in a seated position, and after at least 3 min rest. The BP measurements were performed on the right arm (for the purpose of standardization) using automated sphygmomanometers (OMRON M3 HEM-7200-E Omron Matsusaka Co Ltd, Kyoto, Japan). Special attention was given to the use of appropriate cuff sizes (13×23 cm or 16×30 cm). Three blood pressure readings were taken 1 minute apart. The average of the last 2 readings was used in the analysis (Cappuccio *et al.* 2004).

3.10.2 Anthropometric Measurement

Weight (to the nearest 0.5 kg) was measured using the Heine Portable Professional Adult Scale 737 (Seca gmbh & Co. kg Humburg, German). Participants were asked to stand still, face forward, and place arms on the sides of the body.

The Seca Brand 214 Portable Stadiometer (Seca gmbh & Co. kg Humburg, German) was used to measure the height of the participant. Height was measured without the participant wearing foot or head gear. Before the reading was taken, the participant was requested to have feet together, heels against the back board, knees straight, and look straight ahead. Height was recorded in meters to the nearest 0.5 cm.

The Figure Finder Tape Measure was used to measure the waist circumference in centimeters. This measurement was taken in a private room. The midpoint between the inferior margin of the last rib and the crest of the ilium were marked using a tape measure. With the assistance of the participant, the tape measure was wrapped around the waist directly over the skin or light clothing. Just before the measurement was taken, the participant was requested to stand with their feet together, place their arms at their side of their body with the palms of their hands facing inwards, and breathe out gently

Body mass index (BMI) in kg/m^2) was calculated as weight (kg)/ (height (m) ×height (m)).

3.11 Data Entry

Collected data was entered using Epi Data version 3.1. Data was double entered and validated. The data entry template had consistency and range checks embedded in it. The validated data was exported to SPSS version 20 for analysis.

3.12 Data Analysis

Data was analyzed using both descriptive and inferential statistics. Overall prevalence of hypertension was calculated as the percentage of participants classified as hypertensive, with all study participants as the denominator. Comparisons, among groups for quantitative data and prevalence of hypertension were done with the χ^2 test. Chi square test was used to determine significance between independent variables (age, sex, level of education, marital status, waist circumference, BMI, occupation, smoking status, alcohol drinking status, family history of hypertension, physical activity) and hypertension. Significant variables at $p \leq 0.3$ were entered into logistic regression model to determine factors predictive of hypertension. Finally, factors which remained significant at $p \leq 0.05$ after adjusting for all others were considered independently associated with hypertension. Associations are reported in terms of odds ratios (OR) with 95% confidence intervals (CIs).

3.13 Ethical Considerations

Authority to conduct this study was obtained from the School of Graduate Studies (SGS) of Maseno University. Ethical approval was sought and granted by Maseno University Ethics and Review Committee, (ERC).

Permission to conduct the study was obtained from Yala sub-county health department and hospital administration. The purpose of the study was explained to the study participants, after which written consent for voluntary participation obtained from them before administration of the questionnaire (See appendix 1, consent form).

Confidentiality of the respondents was maintained throughout the study by ensuring that names or identifications numbers do not appear on the questionnaires and that the data collected is stored in a safe password protected data base. Consented participants were allowed to; withdraw from the study at any point before completion of interview. Participants with hypertension (known or screened-detected) received on-site medical counseling and referred back to their attending physician (known cases), or to specialists within the hospital for workup and long-term management.

3.14 Study Limitations and Potential Biases

3.14.1 Limitations

Hypertension was defined based on a mean figure of repeated measurements at only one visit. In a community-based survey for hypertension, this procedure is correct. However, as a true diagnosis of hypertension should be based on repeated measurements, with at least at one additional visit showing BP >140/90 mm Hg (Weber *et al*., 2014) the estimated prevalence of hypertension from this study may have been slightly overestimated.

Furthermore, not all important risk factors were studied such as race, religion and salt consumption. Other risk factors that could only be diagnosed through a chemical panel were not studied. Thus, hypertension could not be fully characterized in this study.

Treatment and control of hypertension was not assessed. However, the study reports on a major outcome of hypertension: the awareness of hypertension status and some risk factors in a hospital set up. This has provided valuable insights with baseline information for future intervention targets and in-depth research

3.14.2 Minimization of Observer Bias

This was done through the following measures

a. Development of a protocol for the collection, measurement and interpretation of information
b. Use of standardized questionnaire or calibrated instruments, such as use of automated BP measuring machine
c. Training of one interviewer who had a diploma in clinical to act as data assistant.

CHAPTER FOUR: RESULTS

4.1 Introduction

The study aimed to determine the awareness of hypertension status and its associated risk factors among patients attending Yala sub county hospital. Therefore, this chapter presents the findings of the study. The results are in pie charts and tables.

4.2 Characteristics of the Study Participants

Data collected from 393 out of 422, who consented to participate in the study, was analyzed. This was 93.1 % response rate. The sex distribution of the study population was 249 (63.4%) females and 144 (36.6%) males. The overall mean age was 39.53±16.43 years (Males = 40.21±16.46 years, Females = 39.14±16.42 years)

The majority (63.6%, n=250) of the participants were married. In terms of education, most of the study participants completed primary school (30.3%, n=119), those with no formal schooling were the least at 15.8%, n=62. Most (35.4%, n=139) of the study participants were self employed, while government employees were the least (13%, n=51). In terms of smoking status, non smokers were the majority (82.4%, n=324). Non alcohol drinkers were the majority at 87.8%, n=308 of the study participants (See Table 4.1).

Table 4.1: Characteristics of Study Participants

	Males	**Females**	**Totals**
	n (%)	**n (%)**	**N (%)**
Age (in years)			
18-19	5 (3.5)	17(6.8)	22(5.6)
20-29	45(31.2)	77(30.9)	122(31.0)
30-39	27(18.8)	44(17.7)	71(18.1)
40-49	19(13.2)	35(14.1)	54 (13.7)
50-59	24(16.7)	42 (16.9)	66 (16.8)
60-69	18(12.5)	25(10.0)	43 (10.9)
70years and above	6(4.2)	9 (3.6)	15 (3.8)
Marital status			
Never married	39(27.1)	53(21.3)	92(23.4)
Widowed	7(4.9)	42(17.7)	51(13.0)
Married	98(68.1)	152(61.0)	250(63.6)
Education			
No formal	18(12.5)	44(17.7)	62(15,8)
Primary	40(27.8)	79(31.7)	119(30.3)
Secondary	32(22.2)	66(26.5)	98(24.9)
Tertiary	53(36.8)	60(24.1)	113(28.8)
Occupation			
Government employee	26(18.1)	25(10.0)	51(13.0)
Self employed	58(40.3)	81(32.5)	139(35.4)
Non employee	27(18.8)	90(36.1)	117(29.8)
Student	33(22.9)	53(21.3)	86(21.9)
Family history			
Yes	33(22.9)	68(27.3)	291(74.0)
No	110(76.4)	181(72,7)	102(26.0)
Adequate Physical activity			
Yes	81(56.2)	141(56.6)	222(56.6)
No	63(43.8)	108(43.4)	171(43.5)
BMI			
Normal	87(60.4)	127(52.0)	214(54.5)
Underweight	10(6.9)	8(3.2)	18(4.6)
Overweight	34(23.6)	80(32.1)	114(29.0)
Obese	13(9.0)	34(13.7)	47(12.0)
Waist circumference			
High	19(13.2)	153(61.4)	172(56.2)
Normal	125(86.8)	96(38.6)	221(56.2)

4.3 Awareness of Hypertension Status among Study Participants

The study results showed that out of the 145 participant who were hypertensive, 60 (41.4%) were not aware of their hypertensive status, while 85 (58.6%) were aware of their hypertensive status, of which 30 (35.3%) were male and 55(64.7%) female as shown in Figure 4.1

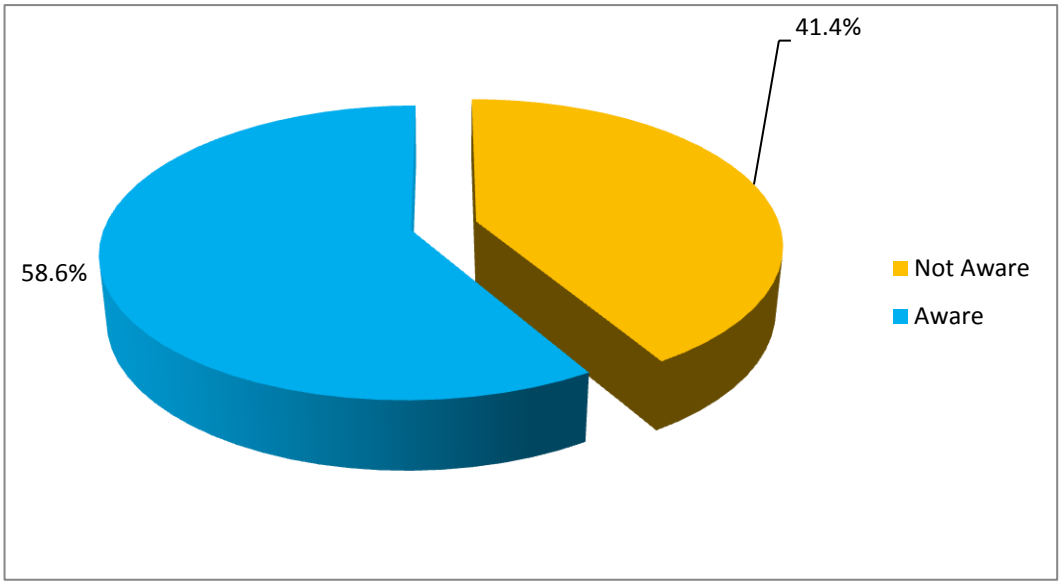

Figure 4.1: Awareness of hypertension status among patients in Yala Sub county hospital.

(Awareness was defined as a positive response to question, 'did a doctor ever tell you that you have (had) high BP?')

Awareness of hypertension status increased with advancing age, peaked at the age group between 50-59 years old. In terms of sex distribution awareness status was slightly more in the females 64.7% (n=55) than their male counterparts (see Figure 4.2).

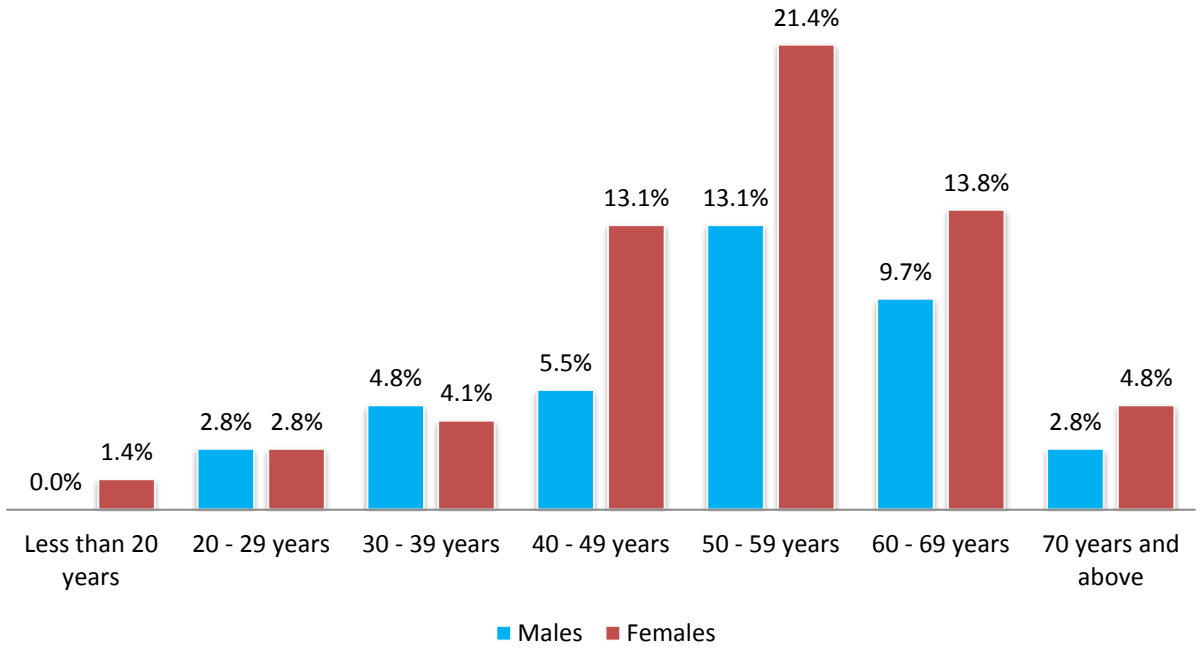

Figure 4.2: Age and Sex Distributed Hypertension Awareness Status

4.4 Non Modifiable Risk Factors for Hypertension

Age was the only non modifiable risk factor for hypertension (X^2=154.393, p <0.001) as shown in table 4.2

Table 4.2: Non Modifiable Risk Factors for Hypertension

Parameter	HT		Total (N)	X^2	*d*f	P value
	No n (%)	Yes n (%)				
Gender				0.388	1	0.533
Male	88(61.1)	56(38.6)	144(36.6)			
Female	160(64.3)	89(35.7)	249(63.4)			
Age(Years)				154.393	6	<0.001
18-19	20 (90.9)	2(9.1)	22(5.6)			
20-29	115(93.3)	8(6.6)	123(31.0)			
30-39	57(83.1)	13(16.9)	70(18.1)			
40-49	27(50.0)	27(50.0)	54(13.7)			
50-59	16(22.7)	50(77.3)	66(16.8)			
60-69	9(20.9)	34(79.1)	43(10.9)			
>=70 yrs	4(26.7)	11(73.3)	15(3.8)			
Family history of				0.154	1	0.695
HT	63(15.8)	39(38.6)	102(26.0)			
Yes	185(63.6)	06(36.4)	291(74.0)			
No						

4.5 Modifiable Risk Factors for Hypertension

The study found the following risk factors significantly associated with hypertension marital status (X^2=47.478, p <0.001); inverse relationship was observed between level of education and prevalence of hypertension (X^2= 27.260, *P* <0.001); occupation (X^2=45.401, p <0.001); tobacco use (X^2=10.395, p 0.001); body mass index (X^2=30.856, p < 0.001) and waist circumference (X^2=16.954, p <0.001).

However, there was no significant statistical association between alcohol consumption (X^2=1.422, p=0.233), physical activity (X^2=0.413, p=0.520) and hypertension. The summary of the results are as shown in Table 4.3

Table 4.3: Modifiable Risk Factors for Hypertension

Parameter	HT		Total (N)	X^2	*D*f	P value
	No n (%)	Yes n (%)				
Marital status				48.851	4	<0.001
Never married	84(91.3)	8(8.7)	92(23.4)			
Widowed	22(39.6)	29(60.4)	51(12.2)			
Married	142(56.8)	108(43.2)	250(63.6)			
Occupation						
Government employee	24(47.1)	27(52.9)	51(13.0)	45.401	3	<0.001
Self employed	58(62.6)	59(50.4)	139(35.4)			
Non-employee	58(49.6)	59(50.4)	117(29.8)			
Student	79(91.9)	7(8.1)	86(21.9)			
Education level						
No formal schooling	24(38.7)	38(61.3)	62(15.8)	27.260	3	<0.001
Primary school	70(58.8)	49(41.2)	119(30.3)			
Secondary school	66(67.5)	32(32.7)	98(24.9)			
Tertiary school	88(77.2)	26(22.8)	114(29.0)			
Alcohol consumption						
Non-drinker	217(70.4)	91(29.6)	297(87.8)	1.422	1	0.233
Ex-drinker	2(100.0)	0(0.0)	56(0.57)			
Current drinker	25(61.0)	16(39.0)	41(11.7)			
Smoking status						
Non-smokers	216(69.4)	108(30.6)	324(83.7)	10.395	2	0.001
Ex-smokers	16(50)	16(50.0)	32(7.6)			
Current smokers	16(43.2)	21(56.8)	37(8.7)			
Body mass index						
Normal	161(74.5)	55(25.5)	216(54.5)	30.856	3	<0.001
Underweight	11(68.7)	5(31.3)	16(4.6)			
Overweight	58(49.6)	59(50.4)	117(29.0)			
Obese	18(40.9)	26(59.1)	44(12.0)			
Waist circumference						
Normal	159(71.9)	62(28.1)	221(56.2)	16.954	1	<0.001
High	89(51.7)	83(48.3)	172(43.8)			

Using binary logistic regression the following risk factors were identified as independent predictors of hypertension; age, marital status, employment status, smoking, BMI, waist circumference and education level. Increasing age was statistically significant independent predictor of hypertension; respondents in the age bracket of 40-49 were 10 times likely to be

hypertensive than those below 30 years OR (95% CI) = 10.0 (2.13-47.04) p= 0.004. In terms of marital status, the widowed were 16 times more likely to be hypertensive than those never married, OR (95 CI) = 16.01 (6.34-40.52) p = <0.001. With regards to smoking status, the current smokers were approximately 3 times likely to be hypertensive than the non smokers, OR (95% CI) = 2.63 (1.32-5.23), p= 0.006. Increasing BMI, was also an independent predictor for hypertension; the obese were 4 times likely to be hypertensive than those with normal weight, OR (95% CI) = 4.23 (2.15-8.30) p = 0.001. Participants with high waist circumference were 2 times likely to have hypertension than those with normal waist circumference OR (95 %CI) = 2.39 (1.57-3.64) p = <0.001. The summary of the results are as shown in Table 4.4

Table 4.4: Logistic Regression of Statistically Significant Risk Factors in Bivariate Analysis

Characteristic	OR (95% CI)	S.E	Wald	*df*	*p* value
Age group					
18- 19 years	Reference				
20 - 29 year	0.70 (0.14 - 3.52)	0.83	0.19	1	0.661
30 - 39 years	2.28 (0.47 - 11.00)	0.80	1.05	1	0.304
40 - 49 years	10.00 (2.13 - 47.04)	0.79	8.50	1	0.004
50 - 59 years	31.25 (6.58 - 148.53)	0.80	18.73	1	<0.001
60 - 69 years	37.78 (7.41 - 192.56)	0.83	19.10	1	<0.001
>=70 years	27.50 (4.32 - 174.89)	0.94	12.33	1	0.004
Level of education					
No formal schooling	Reference				
Primary school	0.44 (0.24 - 0.83)	0.32	6.48	1	0.011
Secondary school	0.31 (0.16 - 0.59)	0.34	12.24	1	0.001
Tertiary	0.19 (0.10 - 0.37)	0.34	23.92	1	<0.001
Marital status					
Never married	Reference				
Widowed	16.01 (6.34 - 40.52)	0.47	34.36	1	<0.001
Married	7.99 (3.71 - 17.20)	0.39	28.17	1	<0.001
Smoking status					
Non smokers	Reference				
Ex-smokers	2.00 (0.96 - 4.15)	0.37	3.46	1	0.063
Current smokers	2.63 (1.32 - 5.23)	0.35	7.51	1	0.006
Waist circumference					
Normal	Reference				
High	2.39 (1.57 - 3.64)	0.21	16.63	1	<0.001
Body mass index					
Normal	Reference				
Under weight	1.33 (0.44 - 4.0)	0.56	0.26	1	0.61
Overweight	2.98 (1.85 - 4.79)	0.24	20.32	1	<0.001
Obese	4.23 (2.15 - 8.30)	0.34	17.55	1	<0.001

CHAPTER FIVE: DISCUSSION

5.1 Awareness of Hypertension Status

Correct knowledge of blood pressure status can be regarded as the first step in the prevention of the cardiovascular complications of hypertension as such knowledge could serve as a platform for making necessary health decisions and developing adequate healthy behavior and lifestyle (Kengne *et al*., 2011).

In this study, 58.6% of the hypertensive was aware of their hypertension status. Slightly half of the participants were unaware of their hypertension status. This could imply a delay in initiation of treatment and could lead to increased complications associated with hypertension. Though this awareness of hypertension status was higher than that found in studies done in Southwest Ethiopia (35.1%) (Gudina *et al*., 2013), Angola (21.6%) (Pires *et al.,* 2013), in Uganda (10%) (Wamala *et al.,* 2009) and in rural Kenya of Nandi district (6%) (Hendriks *et al*., 2012). This difference could be due to heterogeneity of the study setting and methodologies. However the awareness is lower than that found by studies done in developed countries. In the USA, for instance, awareness of hypertension status is as high as 76%, (Mittal *et al*., 2002), reflecting the success achieved by a coordinated policy to detect individuals with higher-than-optimal BP levels.

Awareness of hypertension status in this study was significantly higher among female participants. This could be explained by the fact that females appear to be more concerned with their health compared to males, and this is expected since health status may affect body image which is more important for females (Vlassoff, 2007). This difference among the sexes could also be explained by the fact that women are more in contact with healthcare services than men through maternal child health programs. Similar findings were also demonstrated by Van de Vijver *et al*., 2013; Pires *et al*., 2013. The study demonstrated that awareness of hypertension status increased with increasing age in men and women. Older people tend to be more at risk of developing hypertension are also expected to be more concerned with their health status compared to the younger age group. This result was similar to that found by Mathenge *et al*., (2010); Dzudie *et al*., 2012. .

Awareness of hypertension status in Africa is lagging behind many world regions. A possible contributory factor would be the affordability of the cost of health care, which remains a major barrier in the African setting as out-of-pocket spending is the main source of funding for health care costs (Pereira *et al*., 2009). Significant numbers of individuals with hypertension in Africa are unaware of their condition and, among those with diagnosed hypertension, treatment is frequently inadequate (UN 2011)

5.2 Non Modifiable Risk Factors for Hypertension

Out of the three factors, this study found age as the only non modifiable risk factor for hypertension.

With respect to age, adults aged 40 years or older were more likely to be hypertensive compared to those in the younger age groups. This is consistent with findings from Gudina *et al*., 2013, who found out that the advanced age were more likely to be hypertensive than their younger counter part. Edwards et al., (2000), too determined that hypertensive men and women in rural and urban areas in Tanzania tended to be significantly older compared to those who were not hypertensive. Likewise, study done by Wamala et al., (2009), Participants with hypertension were significantly older with an average age of 44.5, compared to normal- tensive participants who had an average age of 37.6. This could be due to the fact that advance age increases the risk of exposure to the lifestyle risk factors for hypertension and hence the observed increase in hypertensive risk with aging.

5.3 Modifiable Risk Factors for Hypertension

This study observed several risk factors which were associated with hypertension, including educational level, marital status, alcohol use, smoking status and weight. It should be noted three modifiable factors including tertiary education, alcohol use and being overweight or obese were identified in the World Health Report of 1997 as risk factors for hypertension (WHO 1998). Several studies have reported alcohol use to be a risk factor for hypertension. Here in Africa, many researchers (Agyemang, 2006; Aubert, 1998; Baik *et al*., 2008; Fuchs *et al*., 2001; Sesso *et al*., 2008) among others have demonstrated an association between alcohol use (moderate to

heavy consumption) and hypertension. Though in this study there was no statistical significance in association between alcohol consumption and hypertension. This could be due to the fact that only alcohol drinkers and non drinkers were analyzed, no attention to quantity i.e., moderate to heavy consumption was considered.

This study found an inverse relationship between hypertension and education, those participants with higher the education level had a lower the chance of having hypertension. This could be due to the fact that in this study most of the overweight and obese participants were less educated. This observation could also be explained by the less awareness of dietary habits among the less educated that reduce the incidence of hypertension, particularly the amount of salt intake that was found to play an important role in the development and control of hypertension (Sacks *et al*., 2001). This finding was supported by previous studies done Pires *et al*., (2013), and Wamala *et al*., (2009). The study findings were also similar to those from a study conducted in an urban population in early epidemiological transition in Tanzania where Bovet *et al.*, (2002), reported that non-educated men were more likely to have higher systolic blood pressure than those with primary education ($p < 0.01$). Likewise in the developed world, for instance in a multi-country study by Stamler (1992), it was found that age-adjusted systolic blood pressure was 1.3mmHg higher (*p-value* = 0.05) for men and 4.5mmHg (*p-value* < 0.001) for women with 10 fewer years of education.

This study also revealed an increased hypertension prevalence among the widowed, OR 16.01 (95% CI) (6.34-40.52), p = <0.001. This may be associated with the psychological stress faced by this group of people. Capell *et al.*, (2001), showed that psychological factors could affect the

entire neuroendocrine system ultimately leading to hypertension. Similar observation was also noted by Al-Nozha *et al*., (2007) in a larger community-based study conducted among 17,230 participants aged 30 to 7o years in Saudi Arabia, it was found out that hypertension was highest among the widowed than single participants. Contrary to above findings, El Bcheraoui *et al*., (2014) in a national multistage survey of individuals aged 15 years or older in Saudi, found no association between marital status and high blood pressure after adjusting for confounders.

The findings in this study showed an association between cigarette smoking and hypertension, with current smokers being 2 times more likely to be hypertensive than the non-smokers. Cigarette smoking makes blood vessels and blood cells sticky, allowing cholesterol to build up inside them. This was called atherosclerosis (Winstanley *et al.,* 1995). This in turn could lead to raised blood pressure and clot formation. Likewise it can cause increased BP by increasing sympathetic activity (Kong *et al*., 2002). This finding was similar to those obtained by previous studies, (De Cesaris *et al.,* 1992; Dochi *et al.,* 2009).

Participants with a BMI greater than 25 were more likely to be hypertensive compared to those with a BMI of 25 or lower. These findings imply that having a normal weight, or losing weight among those who were overweight or obese, would reduce the chances of developing hypertension. BMI was also greatly influenced by dietary practices like high intake of saturated fatty acids, tobacco use and low physical activity (Brundtland 2002). However, in this study only two were determined i.e., tobacco use and physical activity. Tobacco use was significantly

associated with hypertension ($p < 0.001$). Perhaps the risk imposed by these is all reflected in the BMI of the individual.

In Tanzania, Bovet *et al.*, (2002) found that body mass index was strongly and independently associated with systolic and diastolic blood pressure (1.01 mmHg systolic BP per 1 kg/m^2 increase in BMI). In Nigeria, Agyemang (2006) has also reported an independent association between BMI and BP. Similar results were reported by Önal *et al.*, (2004) who found that hypertensive adults aged 25 years or older were twice more likely to be overweight or obese in Istanbul, Turkey.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents summary of the main findings, conclusions drawn, recommendations and suggestions for further research.

6.2 Summary of the Main Findings

6.2.1 Awareness of Hypertension Status

Awareness of hypertension status was at 58.6% (n=85), of which 64.7% (n=55) were females. Awareness of hypertension status was high among the elderly than the younger study participants.

6.2.2 Non Modifiable Risk Factor for Hypertension

Only age was the identified non modifiable risk factor for hypertension

6.2.3 Modifiable Risk Factors for Hypertension

Independent modifiable predictors of hypertension identified included BMI (X2=30.856, p<0.001), waist circumference (X2=16.954, p<0.001), smoking (X2=10.395, p0.001), educational level (X2=27.260, p<0.001), employment (X2=45.401, p<0.001) and marital status (X2=48.851, p<0.001)

6.3 Conclusion

6.3.1 Awareness of Hypertension Status

Approximately a half of the study participants were unaware of their hypertension status. This could lead to delay in treatment initiation which ultimately increases complications arising from the disease.

6.3.2 Associated Risk Factors for Hypertension

All the identified risk factors except age are modifiable either through behavior or lifestyle modification

6.4 Recommendations

6.4.1 Recommendation on Awareness of Hypertension

Health workers should be encouraged to sensitize clients attending hospital through regular health education on hypertension. This initiative could help in improving awareness of hypertension status among hospital attending clients.

6.4.2 Recommendations on the Non Modifiable Risk Factors for Hypertension

Health workers should prioritize the elderly clients who visit the hospitals in terms of health talks and promotional messages on hypertension.

6.4.3 Recommendations on the modifiable risk factor for hypertension

Regular health promotion talks in hospitals. This should involve topics on health benefits of weight reduction, smoking cessation and health benefits higher education.

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APPENDICES

Appendix 1: Introduction and Consent

Hello,

My name is Awino Bob Otieno. I am conducting a survey on awareness and determinants of hypertension among clients attending the hospital. I would very much appreciate your participation in this survey. Findings of this study will therefore be useful to raise awareness among policy makers and the public at large, about the magnitude of high blood pressure and its related determinants, and thereby contribute to the design and implementation of appropriate interventions. The survey usually takes between 10 to 20 minutes to complete.

Your participation is purely voluntary; we will keep your answers as confidential as possible. Your name will not be written on the survey, neither will it be used during the production of the final report and will only be used for the purpose of the study. If I should come to any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are important.

At this time, do you want to ask me anything about the survey?

Signature of interviewee:

RESPONDENT AGREES TO BE INTERVIEWED . . . . . …….....1

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED. . ……2

Secretary- MUERC
Cell phone +254 721 543 976, +254 733 230 878
Email: sbonuke@gmail.com

Researcher: - Bob O. Awino
Cell: +254720328750
Email: bobawino@yahoo.com

Appendix 2: Questionnaire

Questionnaire No…… Date…… Time of interview…….....

Demographic Information

Code

1. Sex (Record male/Female as observed) Male……..1 C1
   Female..….2
2. How old are you? Years
   C2
3. What is the highest level of education you completed C3
   No formal schooling……1
   Primary school completed……...2
   Secondary school…….3
   Tertiary……4
4. What is our marital status? C4
   Never married……1
   Separated……2
   Divorced.....…...3
   Widowed……..……..4
   Married……..….5
5. Which of the following describes your main work status over past 12 months? C5
   Government employee……1
   Self-employee……..2
   Non-employee…….3
   Student…….…4
6. Taking the past year, can you tell me what the average earnings of the household C6
   Per week
   Or per month
   Or per year

Step 1: Behavioral Measurements
Tobacco Use

7. Do you currently smoke any tobacco products such as cigarettes, cigars/pipes T1
   Yes…..1
   No……2 ***If No go to T4***
8. Do you currently smoke tobacco products daily? T2
   Yes…..1

No……2 ***If No go to T4***

9. How old were you when you first started smoking daily? Age (Years) T3
10. In the past, did you ever smoke daily? T4
    Yes…..1
    No…….2

Alcohol Consumption

11. Have you ever consumed an alcoholic drink such beer, wine, spirits, chang'aa A1a
    Yes……1
    No…….2 If ***No, go to D1***
12. Have you consumed an alcoholic drink within the past 12 months? A1b
    Yes……1
    No…….2 If ***No, go to D1***
13. During the 12 months, how frequently have you had at least 1 alcoholic drink? A2
    Daily……..1
    5-6 days per week…….2
    1-2 days per week.....3
    1-3 days per month……..4
    Less than once a month……5
14. Have you consumed an alcoholic drink within the past 30 days? A3
    Yes…….1
    No……..2 ***If No go to D1***
15. During the past 30 days, on how many occasions did you at least have one alcoholic drink? A4

Diet

16. In a typical week, on how many days do you eat fruits? D1
    Number of days …….
17. In a typical week, on how many days do you eat vegetables? D2
    Number of days ……
18. What type of cooking oil do you often use for meal preparation in your household? D3
    Liquid oil……1
    Cooking fat…….2

Physical Activity

19. Does your work involve vigorous intensity activity that causes large increases in breathing or heart rate like (carrying heavy loads, digging or construction work)? P1
    Yes……1
    No…….2 ***If No, go to P3***

20. In a typical week, on how many days do you do vigorous-intensity activities as part of your work? P2
    Number of days……
21. How much time do spend doing vigorous-intensity activities at work on a typical day? P3
    Hours……
    Minutes…
22. Do you walk or use bicycle for at least 10 minutes continuously to get to and from places? P4
    Yes…….1-
    No……..2
23. 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? P5
    Yes……1
    No…….2

History of raised blood pressure

24. Have you ever had your blood pressure measured by a doctor or health worker? H1
    Yes……1
    No…….2
25. Have you ever been told by a doctor/health worker that you have raised blood pressure or hypertension? H2
    Yes……1
    No…….2
26. Are you currently receiving any treatment for high blood pressure prescribed by a doctor/health worker? H3
    Yes……1
    No…….2

27 Any member of your family with or has had high blood pressure H4

Yes
No if No sk-ip 28

28 What is your relation with the family member who had? H5

Mother Only
Father Only
Both Mother and Father
Sisters only

Brother only
Both Brother and Sister
Grand Father only
Grand Mother Only
Both Grand Mother and Father

Step 2: Physical Measurements

29	Height in centimeters …….		M1
30	Weight in kilograms ……..		M2
31	Waist circumference in centimeters……		M3

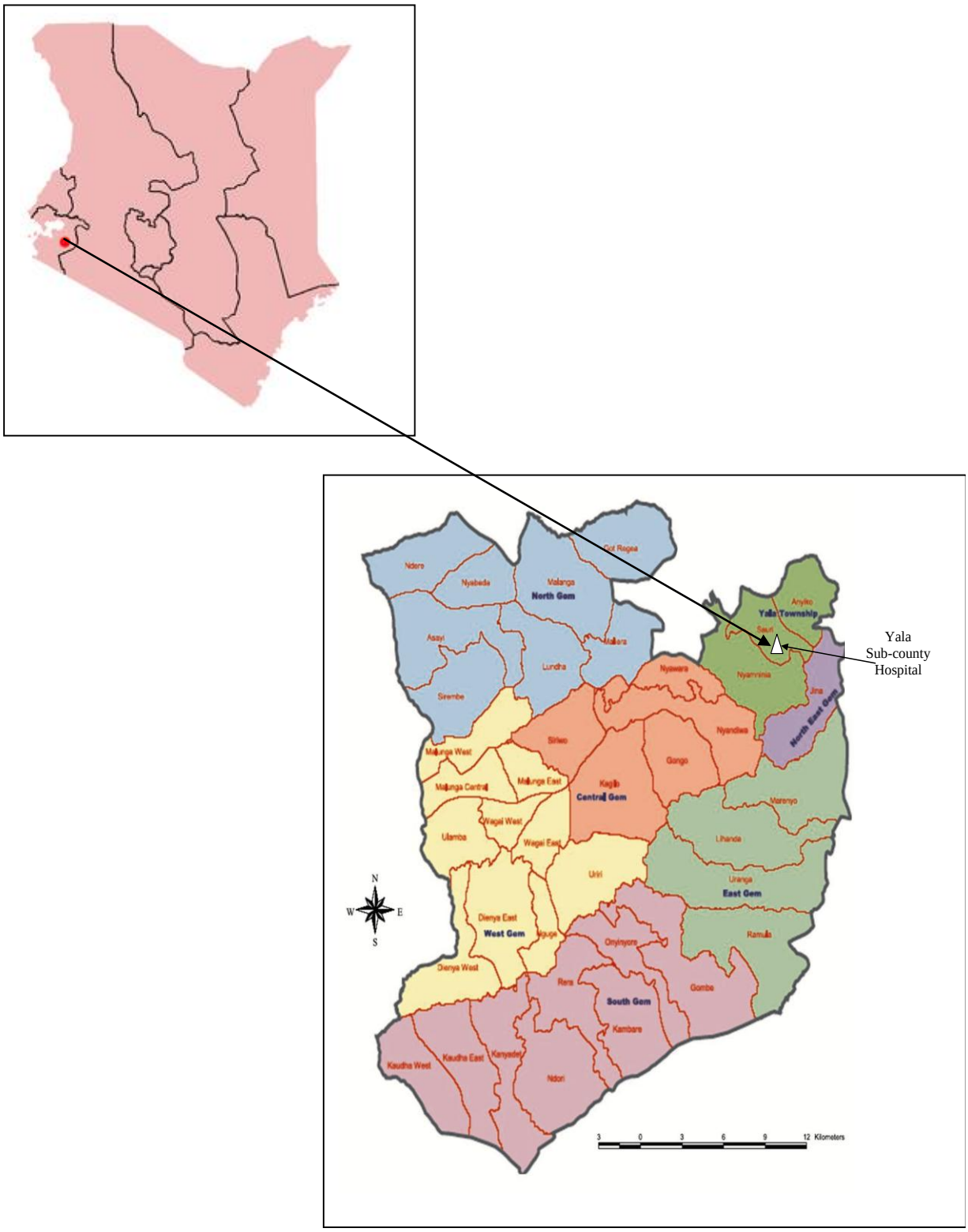
Blood Pressure

32	Cuff size used	Small	M4
		Medium	
		Large	
33	Reading 1	Systolic(mmHg)	M5a
		Diastolic (mmHg)	M5b
	Reading 2	Systolic (mmHg)	M6a
		Diastolic (mmHg)	M6b
	Reading 3	Systolic (mmHg)	M7a
		Diastolic (mmHg)	M7b

THE END

Thank you for participating!

Appendix 3: Map of Study Area



Appendix 4: Work Plan

	YR. 2013/14								YR 2015	
Activity	**Jan**	**Mar**	**Apr**	**May**	**June**	**Aug**	**Oct**	**Nov**	**Dec**	**Jan-July**
Concept Note Development										
Concept Note Presentation										
Proposal Writing/Presentation										
Piloting										
Data Collection										
Data Analysis										
Presentation of Results										
Thesis Writing										
Thesis Submission										

Appendix 5: Research Budget

Item	**Total Cost (Kshs)**
Development of Research tools	
Stationery	10,000
Production of draft tools	5,000
Piloting	5,000
Revision and correction of research instruments	6,000
Sub total	**26,000**
Data Collection	
Sub total	**25,000**
Data Analysis	
Coding and Analysis of data	10,000
Production of first thesis draft	5,000
Production of final thesis copy	5,000
Conferences and publication	10,000
Sub total	**30,000**
Total	**96,000**
Miscellaneous (10%)	**9,600**
Grand total	**95,600**

Appendix 6: MUERC Approval Letter

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221
Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 16th February, 2015

TO: Bob Otieno Awino,
PG/MPH/00025/2012
Department of Public Health
School of Public Health and Community Development
P. O. Box, Private Bag
Maseno, Kenya

REF: MSU/DRPI/MUERC/000123/14

RE: Prevalence, Awareness and Determinants of Hypertension among Adult Patients attending Yala Sub-County Hospital, Gem-Sub County, Kenya. Proposal Reference No: MSU/DRPI/MUERC/000123/14

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 16th day of February, 2015 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 15th February, 2016. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 10th January, 2016.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 10th January, 2016.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES
16 FEB 2015
MASENO UNIVERSITY

Yours faithfully,

Dr. Bonuke Anyona
Secretary, Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED

Appendix 7: Research Authorization Letter from the Hospital

MEDICAL SUPERINTENDENT

YALA SUB-COUNTY HOSPITAL

P. O. BOX 302,

YALA.

16TH FEBRUARY 2015

TO: DR BOB AWINO OTIENO

PG/MPH/00025/2012

DEPARTMENT PUBLIC HEALTH,

SCHOOL OF PUBLIC HEALTH AND COMMUNITY DEVELOPMENT,

MASENO UNIVERSITY,

P.O. BOX PRIVATE BAG

MASENO KENYA

Dear Sir

REF: AUTHORIZATION LETTER TO CONDUCT A STUDY AT YALA -SUB COUNTY HOSPITAL

This is to inform you that following your approval to conduct a study in this facility by the Maseno University Ethics and Review Committee **(MUERC),** you are hereby granted permission by this hospital to carry out your study.

Take note that the study automatically expires on **15th February 2016** hence should you wish to continue, then due process has to be followed as is already advised by the Ethics and Review Committee.

I want to wish you well in your study in this hospital and looking forward to sharing with you the results.

Much regards

Yours sincerely,

Dr Collins Otieno Oginga,

Medical Superintendent

Yala Sub County Hospital

MEDICAL SUPERINTENDENT
YALA SUB DISTRICT HOSPITAL
16 FEB 2015
P.O. Box 302 YALA