

**FACTORS ASSOCIATED WITH ATTITUDE AND
PRACTICE OF RED MEAT CONSUMPTION AND
AWARENESS OF LIFESTYLE DISEASES AMONG
RESIDENTS OF LAISER HILL LOCATION,
KAJIADO NORTH COUNTY**

LILIAN NYOMENDA BOSIRE

MASTER OF SCIENCE

(Public Health)

**JOMO KENYATTA UNIVERSITY OF
AGRICULTURE AND TECHNOLOGY**

2015

**Factors associated with attitude and practice of red meat
consumption and awareness of lifestyle diseases among residents
of Laiser Hill location, Kajiado North County**

Lilian Nyomenda Bosire

**A thesis submitted in partial fulfillment for a degree of master of
science in public health at Jomo Kenyatta University Of
Agriculture And Technology**

2015

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature..... Date.....

Lilian .N. Bosire

This thesis has been submitted for examination with our approval as university supervisors

Signature..... Date.....

Professor Anselimo .O. Makokha
JKUAT, KENYA

Signature.....Date.....

Dr. Charles Mbakaya
KEMRI, KENYA

DEDICATION

I dedicate this thesis to my loving family James, Hellen, David, Emma, Michael and Joseph for their tireless support during this entire period.

ACKNOWLEDGEMENTS

I would like to sincerely and warmly thank all the persons who participated in helping me towards the achievement of this work. First I thank God for his grace and strength throughout this study.

To my supervisors, Professor Anselimo .O. Makokha, JKUAT and Dr. Charles Mbakaya, KEMRI, I want to thank you for your support and guidance as I was writing this thesis.

I also thank all the reviewers and other staff of KEMRI and JKUAT for shedding light into the areas that needed further consultations and new perspective.

To the residents of Laiser Hill, Kajiado North County thanks for allowing us into your homes and for your full cooperation.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES	viii
LIST OF APPENDICES	x
LIST OF ABBREVIATIONS AND ACRONYMS	xi
DEFINITION OF TERMINOLOGIES	xiii
ABSTRACT	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the study	1
1.2 Problem statement.....	4
1.3 Justification	5
1.4 Research questions	5
1.5 Objectives.....	6
1.5.1 General objective	6
1.5.2 Specific objectives	6
CHAPTER TWO: LITERATURE REVIEW	7
2.1 The global burden of chronic diseases	7
2.2 Role of red meat as a contributing factor towards lifestyle diseases	12
2.2.1 Meat consumption and cancer risk	12
2.2.2 Breast cancer	13
2.2.3 Colorectal cancer	15
2.2.4 Prostate cancer	16
2.3 Meat and diabetes.....	17

2.4 Red meat and cardiovascular diseases	18
2.5 Red meat and obesity	19
CHAPTER THREE: MATERIALS AND METHODS	22
3.1 Study design.....	22
3.2 Study site.....	22
3.3 Study population	22
3.4 Inclusion criteria.....	23
3.5 Exclusion criteria	23
3.6 Sample size determination	23
3.7 Sampling procedures.....	24
3.8 Data collection	24
3.9 Data management and analysis	25
3.10 Ethical considerations	26
3.11 Study limitations	26
CHAPTER FOUR: RESULTS	27
4.1 Demographic characteristics	27
4.2 Perception towards red meat consumption	28
4.3 Perceived health benefits of red meat consumption.....	28
4.3 Most important characteristic when buying meat products	29
4.3 Practice of red meat consumption	30
4.4 Awareness of lifestyle diseases	32
4.4.1 General awareness of lifestyle diseases	32
4.4.2 Awareness of high intakes red meat as a contributor to common lifestyle diseases ..	33
4.4.3 Other factors causing lifestyle diseases	33
4.4.4 Awareness of risk of getting lifestyle diseases	34

4.4.5	Awareness of cure of lifestyle diseases.....	35
4.5	Bi-variate analysis	35
4.5.1	Association between demographic characteristics and attitude towards red meat consumption	35
4.5.1 .1	Multivariate analysis	36
4.5.2	Association between demographic characteristics and practices of red meat consumption.....	37
4.5.2.1	Multivariate analysis	38
4.5.3	Association between demographic characteristics and awareness of lifestyle diseases	39
5.5.3.1	Multivariate analysis	41
CHAPTER FIVE: DISCUSSION.....		42
5.1	Attitude and perceptions of red meat consumption.....	42
5.2	Practice of red meat consumption	43
5.3	Awareness levels of lifestyle diseases.....	44
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS		46
6.1	Conclusion	46
6.2	Recommendations	46
REFERENCES.....		48
APPENDICES		60

LIST OF TABLES

Table 4.2: Perceived health benefits of red meat consumption.....	29
Table 4.3: Practice of red meat consumption.....	31
Table 4.4: Responses on awareness of lifestyle diseases, definition, red meat and lifestyle diseases.....	32
Table 4.5: Awareness of high intakes of red meat as a contributor to common lifestyle diseases.....	33
Table 4.6: Association between demographic variables and attitude towards red meat consumption.....	36
Table 4.7: Logistic regression of age, education level and marital status and attitude towards red meat consumption.....	37
Table 4.8: Association between demographic variables and practices of red meat consumption.....	37
Table 4.9: Logistic regression of education level and practice of red meat consumption.....	39
Table 4.10: Association between demographic variables and awareness of lifestyle diseases..	40
Table 4.11: Logistic regression of marital status and awareness of lifestyle Diseases.....	41

LIST OF FIGURES

Figure 4.1: Perceptions towards consumption of red meat	28
Figure 4.2: Characteristic considered important when buying meat products.....	29
Figure 4.3: Other factors that cause lifestyle diseases	34
Figure 4.4: Risk of getting lifestyle diseases	34
Figure 4.5: Awareness of cure of lifestyle diseases	35

LIST OF APPENDICES

Appendix 1	Consent form.....	63
Appendix 2	Questionnaire.....	69
Appendix 3	Scientific steering committee authorization letter.....	79
Appendix 4	Ethical clearance.....	80
Appendix 5	Ethics training.....	81

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AICR	American Institute of Cancer Research
ANOVA	Analysis of Variance
BMI	Body Mass Index
CD	Compact Disk
CHD	Coronary Heart Disease
CPHR	Centre for Public Health Research
CVD	Cardiovascular Disease
DNA	Deoxyribonucleic Acid
FAO	Food and Agriculture Organization
HCAs	Heterocyclic Amines
IQ	Imidazo-quinolines
HDL	High Density Lipoprotein
HIV	Human Immune Virus
IHD	Ischaemic Heart Disease
KEMRI	Kenya Medical Research Institute
LDL	Low Density Lipoprotein
NCD	Non - Communicable Disease
NGOs	Non-governmental organizations
PAHs	Polycyclic Aromatic Hydrocarbons
PhIP	Phenylimidazo pyridine
SPSS	Statistical Package for Social Sciences

WCRF	World Cancer Research Fund
WHA	World Health Assembly
WHO	World Health Organization

DEFINITION OF TERMINOLOGIES

Attitude	In this study it means the mental outlook or position in regards to red meat consumption
Awareness	In this study this is the respondent's knowledge and information about lifestyle diseases.
Household	It means members of a family occupying a housing unit.
Practice	The habit/custom or regular consumption of red meat.
Processed meat	Means meat that has undergone a method of preservation other than freezing for example sausages, ham and hamburgers.
Red meat	Meats that are red when raw and not white when cooked for example lamb and beef.
Resident	A person who resides in this particular location at the time of study.

ABSTRACT

Chronic diseases are increasingly becoming a concern in developing nations. The transition from a predominantly plant-based diet to a diet high in meat has been identified as a noteworthy contributor to the rise in chronic disease and the greatest increase of these diseases is in the African and Eastern Mediterranean regions. Common preventable risk factors underlie most of these lifestyle diseases and among them is consumption of large amounts of red meat. The objective of the study was to assess the attitudes and practices of red meat consumption and awareness levels of lifestyle diseases among residents of Laiser hill.

The study design used was descriptive cross-sectional. Cluster sampling was used to select households. Laiser Hill was first divided into 100 clusters of 120 households based on the 2009 census enumeration areas. Four clusters were randomly chosen for data collection using a questionnaire. Data analysis was done using SPSS software. In bivariate analysis Pearson Chi-square test and Fishers exact test were used to measure the association between the dependent and independent variables. For variables with frequencies of less than five observations Fisher Exact Test was used to test the association Multivariate binary regression using the odds ratio was used to model those associations that were significant at $p < 0.05$. Data was presented using tables and charts.

Slightly over half of the respondents (51.7%) were female. 29.7% of the respondents were aged 18-28 and 42.6% had tertiary level of education 42.6%. Half of the respondents (50.1%) were married and those in formal employment were 45%. Majority of the respondents (90.1%) were aware of what lifestyle diseases were with 83.7% being able to correctly define them and 90.7% being in agreement that over-consumption of red meat was a contributor to these diseases. However this awareness had not led to any changes in the consumption patterns of red meat as 44% consumed red meat 4-5 times a week and 7.2% consumed red meat every day. The main factor affecting choice of type of meat was price.

Binary logistic regression was used to model the relationship between demographic characteristics and attitudes, practices and awareness of lifestyle diseases respectively. Relationships between age ($\chi^2 = 12.069$, df (4), $p=0.017$), education ($\chi^2 = 7.142$, df (2),

p=0.028) and marital status (11.939 (p=0.003) and attitude towards red meat consumption were statistically significant. A cross tabulation of demographics characteristics and practices towards red meat consumption also indicated that there was a significant relationship between education level and practices. This was supported by chi square results ($\chi^2 = 10.262$, df (2), p=0.006). Relationship between marital status and awareness of lifestyle diseases was statistically significant ($\chi^2 = 13.724$, df (3), p=0.003). Age, gender, education and occupation were not statistically significant in explaining awareness of lifestyle diseases.

This study recommended a multi-sectorial approach in tackling non-communicable diseases. It encourages working together of health sectors, private and governmental agencies, NGOs, the civil society, political will and above all the involvement of the community at large

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Developing countries are undergoing a rapid epidemiological transition, from infectious diseases such as diarrhea and pneumonia to chronic ones such as heart disease. A number of factors have led to this growing burden of chronic disease and include urbanization, industrialization and globalization. Africa bears a significant proportion of the global burden of chronic diseases. The World Health Organization (WHO) projects that over the next ten years the continent will experience the largest increase in death rates from cardiovascular disease, cancer, respiratory disease and diabetes (WHO, 2005). Rising morbidity and mortality from chronic diseases co-exist with an even greater burden of infectious disease, which still accounts for at least 69% of deaths on the continent (Young, 2009). Many African health systems are underfunded and under-resourced and struggle to cope with the cumulative burden of infectious and chronic diseases.

Three of the most important risk factors for chronic disease—unhealthy diet, physical inactivity, and tobacco use—are related to lifestyle choices (Barry, 2001). The worldwide transition from a predominantly plant-based diet to a diet high in meat has also been identified as a contributor to the rise in chronic disease (Popkin & Du, 2003). Animal products are the main source of saturated fats that promote cardiovascular disease (Walker *et al.*, 2005) and the sole source of cholesterol intake. Comparative studies reveal that those who follow plant based diets generally have lower weights than those who do not (Melby *et al.*, 1985) even across ethnic groups (Berkow & Banard, 2006). While not conclusive, evidence suggests that the increase in worldwide obesity and diabetes may in part be associated with increased animal-product consumption, in addition to decreased exercise and other factors (Popkin & Du, 2003).

The classic study by Armstrong and Doll (1975) revealed significant association between meat consumption and colon cancer incidence in over 25 countries. Studies in Japan revealed a rising incidence in colorectal cancer with greater adoption of Western dietary habits and consumption of meat, milk, eggs, and fats and oils (Kuriki *et al.*, 2004; Kuriki & Tajima, 2006). Other studies revealed similar associations between rising meat consumption in Asian countries and colon cancer incidence and/or mortality (Tominaga & Kuroishi 1997; Lee *et al.*, 2008) Although confounding factors must also be considered, these and other studies collectively provide strong evidence of the causal link between meat and colorectal cancer (Chao *et al.*, 2001; Cross *et al.*, 2007; WCRF/AICR, 2007).

In 2007, the World Cancer Research Fund and the American Institute for Cancer Research panel report concluded that there was convincing evidence to limit red meat intake, completely avoid processed meat, and follow a plant-based diet to reduce the overall risk for cancer (WCRF/AICR, 2007). Consumption of various animal products is also associated with increased risk for other cancers. Endometrial cancer risk is associated with increased intake of total energy, fat, and protein from animal sources (Xu *et al.*, 2007). A meta-analysis found an increased endometrial cancer risk with increased meat, particularly red meat consumption (Bandera *et al.*, 2007). Dairy-product consumption has been associated with prostate cancer (Mitrou *et al.*, 2007; Chan *et al.*, 2001; Kurahashi *et al.*, 2008). The European Prospective Investigation into Cancer and Nutrition study of 142, 251 men found that high intake of dairy calcium and protein increased the risk of prostate cancer (Allen *et al.*, 2008). Calcium from non-dairy foods was not associated with increased cancer risk.

In recent studies, breast cancer risk has been associated with higher intake of processed meat, total meat, and/or red meat (Boyd *et al.*, 2003; Cho *et al.*, 2006; Taylor *et al.*, 2007; Linos *et al.*, 2008;) and with higher intakes of total and saturated fats (Boyd *et al.*,

2003). Healthcare costs attributable to meat consumption are substantial, estimated in the U.S. at between \$29 billion and \$61 billion per year, in 1992 (Barnard *et al.*, 1995).

In contrast, many studies suggest that those who consume plant-based diets have decreased risk, mortality, and/or progression of cardiovascular disease, (Ornish *et al.*, 1998; Kwok *et al.*, 2000; Key *et al.*, 1998) diabetes, (Barnard *et al.*, 2006) certain cancers, (Saxe *et al.*, 2006; Ornish *et al.*, 2005; Cui *et al.*, 2007) and obesity (Key *et al.*, 1999; Ornish *et al.*, 1990). Diets high in legumes, whole grains, fruits, and vegetables appear to be protective against these chronic diseases (Slavin *et al.*, 2001; Slavin, 2003; Everitt *et al.*, 2006).

Concerns for red meat have always focused on the fact that it is high in fat, saturated fat, and cholesterol. While fat content of different cuts of meat varies markedly, there is little doubt that the commonly consumed types are high in total fat averaging about 50 percent of calories. Several hypotheses have been proposed for the observed relationship between red meat and cancer risk. First, the high iron content of red meat may promote the generation of free radicals, molecules that lead to oxidation of DNA. Oxidized DNA has been linked to cancer. One study at Wayne State University in Detroit showed that both beef and pork intake were linked to DNA damage and, therefore, possibly to cancer risks (Collins *et al.*, 1998).

Another theory focuses on the changes that occur when red meat is cooked, especially at high temperatures under moist conditions. This leads to the production of compounds in meat called heterocyclic amines (HCAs). These are mutagen compounds that can cause changes in DNA and raise risk for cancer. The way meat is prepared affects production of HCAs. Those who eat meat that is fried or well done have a greater risk for cancer than those who eat meat cooked in other ways. Furthermore, certain individuals are fast metabolizers of HCAs. They metabolize the compounds more quickly, putting them at greater risk for cancer. One study found that fast metabolizers who consumed well done meat were three times more likely to develop colon cancer than slower metabolizers.

The relationship held when the two groups consumed meat that was prepared to the rare or medium stage. And when fast metabolizers consumed meat that was well-done, their cancer risk was six times greater than slow metabolizers who ate rare or medium-cooked beef (Lang *et al.*, 1994). The rate at which a person metabolizes HCAs is genetically determined. Heterocyclic amines may also raise risk for heart disease, since there is some evidence that they damage heart muscle cells.

Toxic compounds, called nitroso compounds, are produced in the colon when red meat is consumed. These mutation-causing compounds increase dramatically in proportion to increased red meat consumption. One hypothesis is that the unabsorbed iron from meat is responsible for this effect (Bingham *et al.*, 1996).

1.2 Problem statement

There has been an increasing trend of meat consumption in the developing countries, Kenya included, in the recent past. Delgado, (2003) called this trend a Livestock Revolution. This Revolution has been driven by population growth, urbanization and income change. While consumption patterns for dairy and other livestock products have recently been studied, meat had continued to receive very little attention.

Food and agricultural organization estimated that the most common form of livestock products consumed by households in Kenya related to meat and red meat in particular was the most widely consumed compared to other types of meat. Although excessive consumption of red meat according to Popkin and Du (2003) elicited health concerns, it was also recognized that it was the preferred source of proteins for most households who were particularly inclined towards meat. Despite the concerns about red meat, there is limited documented information about meat consumption patterns and the level of awareness of the risks associated with consumption of red meat in Kenya.

1.3 Justification

Today, chronic diseases are a major public health problem worldwide. The World Health Organization in 2005 estimated that 61% of all deaths (35 million) and 49% of the global burden of disease were attributable to chronic diseases. By 2030, the proportion of total global deaths due to chronic diseases was expected to increase to 70 per cent and the global burden of disease to 56 per cent. The greatest increase of these diseases was anticipated to be in the African and Eastern Mediterranean regions (WHO, 2007).

Common preventable risk factors underlined most of these lifestyle diseases and among them was consumption of large amounts of red meat. This study provided further insights into attitudes and perception of red meat consumption among residents of Laiser hill location. It also helped to establish red meat consumption patterns among residents of Laiser hill and understand the awareness level of lifestyle diseases among red meat consumers. In light of the findings appropriate strategies that focus on prevention would help ease the burden that these diseases have on the health sector as a whole as they pose great threat not only to public health but also economic growth at local, national and global levels.

1.4 Research questions

1. What is the attitude and perception of red meat consumption among residents of Laiser hill in Kajiado North County?
2. What is the red meat consumption pattern among residents of Laiser Hill in Kajiado North County?
3. What is the awareness level of lifestyle diseases among red meat consumers in Laiser Hill in Kajiado North County?
4. What is the association between attitude, practices of red meat consumption and awareness of lifestyle diseases with socio-demographic characteristics?

1.5 Objectives

1.5.1 General objective

To determine factors associated with attitude and practices of red meat consumption and awareness levels of lifestyle diseases among residents of Laiser hill.

1.5.2 Specific objectives

- 1 To establish the attitude and perception of red meat consumption among residents of Laiser hill.
- 2 To determine red meat consumption patterns among adult residents of Laiser hill.
- 3 To establish awareness levels of lifestyle diseases among red meat consumers.
- 4 To determine the association between attitude, practices of red meat consumption and awareness of lifestyle diseases with socio-demographic characteristics?

CHAPTER TWO

LITERATURE REVIEW

2.1 The global burden of chronic diseases

The burden of chronic diseases is rapidly increasing worldwide. It has been calculated that, in 2001, chronic diseases contributed approximately 60% of the 56.5 million total reported deaths in the world and approximately 46% of the global burden of disease (WHO, 2002). The proportion of the burden of non-communicable diseases is expected to increase to 57% by 2020. Almost half of the total chronic disease deaths are attributable to cardiovascular diseases; obesity and diabetes are also showing worrying trends, not only because they already affect a large proportion of the population, but also because they have started to appear earlier in life.

The chronic disease problem is far from being limited to the developed regions of the world. Contrary to widely held beliefs, developing countries are increasingly suffering from high levels of public health problems related to chronic diseases. In five out of the six regions of WHO, deaths caused by chronic diseases dominate the mortality statistics (WHO, 2002). Although human immunodeficiency virus/acquired immunodeficiency syndrome (HIV and AIDS), malaria and tuberculosis, along with other infectious diseases, still predominate in sub-Saharan Africa and will do so for the foreseeable future, 79% of all deaths worldwide that are attributable to chronic diseases are already occurring in developing countries (WHO, 2002).

It is clear that the earlier labeling of chronic diseases as “diseases of affluence” is increasingly a misnomer, as they emerge both in poorer countries and in the poorer population groups in richer countries. This shift in the pattern of disease is taking place at an accelerating rate. Furthermore, it is occurring at a faster rate in developing countries than it did in the industrialized regions of the world half a century ago (Popkin, 2002).

This rapid rate of change, together with the increasing burden of disease, is creating a major public health threat which demands immediate and effective action. It has been projected that, by 2020, chronic diseases will account for almost three-quarters of all deaths worldwide, and that 71% of deaths due to Ischaemic Heart Disease (IHD), 75% of deaths due to stroke, and 70% of deaths due to diabetes will occur in developing countries (WHO, 2010). The number of people in the developing world with diabetes will increase by more than 2.5-fold, from 84 million in 1995 to 228 million in 2025 (Aboderin *et al.*, 2001).

On a global basis, 60% of the burden of chronic diseases will occur in developing countries. Indeed, cardiovascular diseases are even now more numerous in India and China than in the economically developed countries in the world put together (WHO, 2002). As for overweight and obesity, not only has the current prevalence reached unprecedented levels, but the rate at which it is annually increasing in most developing regions is substantial (Popkin., 2002) The public health implications of this phenomenon are staggering, and are already becoming apparent.

The rapidity of the changes in developing countries is such that a double burden of disease may often exist. India, for example, at present faces a combination of communicable diseases and chronic diseases, with the burden of chronic diseases just exceeding that of communicable diseases. Projections nevertheless indicate that communicable diseases will still occupy a critically important position up to 2020 (Murray & Lopez, 1996). Another example is that of obesity, which is becoming a serious problem throughout Asia, Latin America and parts of Africa, despite the widespread presence of under nutrition. In some countries, the prevalence of obesity has doubled or tripled over the past decade.

Chronic diseases are largely preventable diseases. Although more basic research may be needed on some aspects of the mechanisms that link diet to health, the currently

available scientific evidence provides a sufficiently strong and plausible basis to justify taking action now. Beyond the appropriate medical treatment for those already affected, the public health approach of primary prevention is considered to be the most cost-effective, affordable and sustainable course of action to cope with the chronic disease epidemic worldwide. The adoption of a common risk-factor approach to chronic disease prevention is a major development in the thinking behind an integrated health policy. Sometimes chronic diseases are considered communicable at the risk factor level (Choi, 2001). Modern dietary patterns and physical activity patterns are risk behaviors that travel across countries and are transferable from one population to another like an infectious disease, affecting disease patterns globally. While age, sex and genetic susceptibility are non-modifiable, many of the risks associated with age and sex are modifiable. Such risks include behavioral factors for example diet, physical inactivity, tobacco use, alcohol consumption; biological factors for example dyslipidemia, hypertension, overweight, hyperinsulinaemia and finally societal factors, which include a complex mixture of interacting socioeconomic, cultural and other environmental parameters.

Diet has been known for many years to play a key role as a risk factor for chronic diseases. Interestingly the traditional Masai are known for a culture where the men exclusively consume meat, milk, and blood and yet lifestyle diseases are uncommon. Early studies by George Mann and collaborating researchers published a paper in the *Journal of Atherosclerosis Research* documenting a lack of heart disease in Masai men, at least as assessed by risk factors, physical exams, and ECG's (Mann, *et al* 1964). Cholesterol levels were low high blood pressure was uncommon, and they were very slim. The average BMI was about 20, which is the lower limit of the "healthy range" by current US standards. The population they studied was limited by age. About 60% of the men were under 44 and only three out of 400 men were over 55 years old. They were further limited by their ability to detect heart disease by using just physical exam and ECG

Furthermore, Dr. Mann, who published some of the early research, did an autopsy study of 50 Masai men and found that they had extensive atherosclerosis. They had coronary intimal thickening on par with older American men. Over 80% of the men over age 40 had severe fibrosis in their aorta yet there were no heart attacks shown on autopsy and these men still had functional heart vessels without blockages because their vessels had become larger. Researchers thought this might have been related to their rather extreme daily physical activity. Typically the Masai walk a lot, getting much more exercise per day than the typical Westerner (Mann, *et al* 1964).

Perhaps the best dietary survey done on Masai people is from the early 1980s, done by the International Livestock Centre of Africa. This was at a time there had already been a dietary transition occurring among the Masai. Nonetheless, Masai women and children were found to consume large amounts of milk from their herd animals. Interestingly, they only consumed meat about 1-5 times per month. Again, the men's intake was too difficult to accurately track but it seemed that they had more access to meat (Nestle, 1986). The myth that the Masai ate nothing but milk, blood and meat was derived from the idealized diet of young warriors called moran, a diet that men only ate for 15 years of their life. A study by Merker showed that even the supposed exclusivity of the warrior diet was a gross exaggeration and ignored their extensive use of herbs and tree barks, as well as the fact that necessity often drove them to consume honey, roots, tubers and fruit as sources of water and calories while on the march (Merker, 1971).

According to another study by Johns, Maasai usually consumed meat with or as soup, using 28 different herbs to make the soups, using the herbs in levels that made the food bitter. They also added a dozen plants to milk to prepare a tea-like beverage called orkiowa. Screening of 12 of the Masai food additives found that 82 percent contained potentially hypocholesterolemic saponins and/or phenolics. The Masai, when questioned, stated that a person would not maintain health without using these additives. They recognized the most widely used of additives, okiloriti (*Acacia nilotica*) was a

digestive aid, flavoring, and nervous system stimulant (in high doses). The Masai's appreciation of the digestive effects of these herbs likely related to their ability to stimulate bile flow to emulsify fats in their high fat diet, lack of which would lead to diarrhea. Scientifically "Acacia nilotica is a herb that has strong free radical scavenging compounds, and displays anticancer, antimutagenic, anti-inflammatory, antimicrobial, antifungal, anthelmintic (kills worms), antidiarrheal, and antiplatelet-aggregation activities (Johns, 1996). Therefore the noteworthy factors to be considered in the Masai immunity to lifestyle diseases despite their high fat diet were fitness, which was remarkable and the wide use of herbal additives,

What is apparent at the global level is that great changes have swept the entire world since the second half of the twentieth century, inducing major modifications in diet, first in industrial regions and more recently in developing countries. Traditionally, plant based diets have been swiftly replaced by high-fat, energy-dense diets with a substantial content of animal-based foods. But diet, while critical to prevention, is just one risk factor. Physical inactivity, now recognized as an increasingly important determinant of health, is the result of a progressive shift of lifestyle towards more sedentary patterns, in developing countries as much as in industrialized ones. Recent data from Saõ Paulo, Brazil, for example, indicate that 70-80% of the population are remarkably inactive (Matsudo *et al.*, 2002) The combination of these and other risk factors, such as tobacco use, is likely to have an additive or even a multiplier effect, capable of accelerating the pace at which the chronic disease epidemic is emerging in the developing countries.

The need for action to strengthen control and prevention measures to counter the spread of the chronic disease epidemic is now widely recognized by many countries, but the developing countries are lagging behind in implementing such measures. Encouragingly, however, efforts to counteract the rise in chronic diseases are increasingly being assigned a higher priority. This situation is reflected by the growing interest of Member States, the concerned international and bilateral agencies as well as nongovernmental

organizations in addressing food and nutrition policy, health promotion, and strategy for the control and prevention of chronic diseases, as well as other related topics such as promoting healthy ageing and tobacco control. The 1992 International Conference on Nutrition specifically identified the need to prevent and control the increasing public health problems of chronic diseases by promoting appropriate diets and healthy lifestyles (WHO, 1992) The need to address chronic disease prevention from a broad-based perspective was also recognized by the World Health Assembly in 1998 and again in 1999. In 2000, the World Health Assembly passed a further resolution on the broad basis of the prevention and control of non communicable diseases WHO (2000) and in WHO (2002) adopted a resolution that urged Member States to collaborate with WHO to develop “...a global strategy on diet, physical activity and health for prevention and control of non communicable diseases, based on evidence and best practices, with special emphasis on an integrated approach...” (WHO, 2010).

2.2 Role of red meat as a contributing factor towards lifestyle diseases

2.2.1 Meat consumption and cancer risk

Carcinogenic compounds in cooked meat are responsible for the risk of developing cancer when large amounts of red meat are consumed. They include: Heterocyclic Amines (HCAs), a family of mutagenic compounds, are produced during the cooking process of many animal products, including chicken, beef, pork, and fish. Even meat that is cooked under normal grilling, frying, or oven-boiling may contain significant quantities of these mutagens (Skog *et al.*, 1998; Robbana-Barnat *et al.*, 1996; Thiebaud *et al.*, 1995). The longer and hotter the meat is cooked, the more these compounds form. In some studies, grilled chicken has formed higher concentrations of these cancer-causing substances than other types of cooked meat (Sinha *et al.*, 1995). The major classes of heterocyclic amines include amino-imidazo-quinolines, or amino-imidazo-quinoxalines (collectively called IQ-type compounds), and amino-imidazo-pyridines such as PhIP. IQ-type compounds and PhIP are formed from creatine or creatinine,

specific amino acids, and sugars (Jagerstad *et al.*, 1991). All meats (including fish) are high in creatine, and HCA formation is greatest when cooking meat at high temperatures, as is most common with grilling or frying. Consumption of well-done meat and PhIP has been associated with increased risk of breast cancer and colon cancer. A recent case-control study at the University of Utah that included 952 subjects with rectal cancer and 1205 controls found that men and women with the highest consumption of processed or well-cooked meat had an increased risk of rectal cancer (Murtaugh *et al.*, 2004). Grilling or broiling meat over a direct flame results in fat dropping on the hot fire and the production of polycyclic aromatic hydrocarbon-containing flames. Polycyclic aromatic hydrocarbons (PAHs) adhere to the surface of food and the more intense the heat, the more PAHs are present. They are widely believed to play a significant role in human cancers (Norat & Riboli, 2001). A fairly consistent association between grilled or broiled, but not fried, meat consumption and stomach cancer implies that dietary exposure to PAHs may play a role in the development of stomach cancer in humans (WCRF, 1997).

2.2.2 Breast cancer

Countries with a higher intake of fat, especially fat from animal products, such as meat and dairy products, have a higher incidence of breast cancer (Armstrong and Doll, 1975; Carroll and Braden, 1985; Rose *et al.*, 1986). In Japan, for example, the traditional diet is much lower in fat, especially animal fat, than the typical western diet, and breast cancer rates are low. In the late 1940s, when breast cancer was particularly rare in Japan, less than 10 percent of the calories in the Japanese diet came from fat (Land *et al.*, 1990). The American diet is centered on animal products, which tend to be high in fat and low in other important nutrients, with 30 to 35 percent of calories coming from fat. When, Japanese girls are raised on westernized diets, their rate of breast cancer increases dramatically.

Even within Japan, affluent women who eat meat daily have an 8.5 times higher risk of breast cancer than poorer women who rarely or never eat meat (Hirayama, 1990). One of the reasons is that fatty foods boost the hormones that promote cancer. The consumption of high-fat foods such as meat, dairy products, fried foods, and even vegetable oils causes a woman's body to make more estrogens, which encourage cancer cell growth in the breast and other organs that are sensitive to female sex hormones. This suggests that, by avoiding fatty foods throughout life, hormone-related cancer risk decreases. A 2003 study, found that when girls aged eight to ten reduced the amount of fat in their diet, even very slightly, their estrogen levels were held at a lower and safer level during the next several years. By increasing vegetables, fruits, grains, and beans, and reducing animal-derived foods, the amount of estradiol (a principal estrogen) in their blood dropped by 30 percent, compared to a group of girls who did not change their diets (Dorgan *et al.*, 2003).

Harvard researchers recently conducted a prospective analysis of 90,655 premenopausal women, ages 26 to 46, enrolled in the Nurses' Health Study II and determined that intake of animal fat, especially from red meat and high-fat dairy products, during premenopausal years is associated with an increased risk of breast cancer. Increased risk was not associated with vegetable fats (Cho *et al.*, 2003). In addition, researchers at the Ontario Cancer Institute conducted a meta-analysis of all the case-control and cohort studies published up to July 2003 that studied dietary fat, fat-containing foods, and breast cancer risk. Case-control and cohort study analyses yielded similar risk results, with a high total fat intake associated with increased breast cancer risk. Significant relative risks for meat and saturated fat intake also emerged, with high meat intake increasing cancer risk by 17 percent and high saturated fat intake increasing cancer risk by 19 percent (Boyd *et al.*, 2003).

Several studies show meat intake to be a breast cancer risk factor, even when confounding factors, such as total caloric intake and total fat intake, are controlled (De Stefani *et al.*, 1997; Matos *et al.*, 1991). Part of the reason may be that meat becomes a

source of carcinogens and/or mutagens, such as HCAs, that are formed while cooking meat at high temperatures. A review of HCAs showed that certain HCAs are distributed to the mammary gland and that humans can activate HCAs metabolically (Snyderwine *et al.*, 1994). As a consequence, frequent meat consumption may be a risk factor for breast cancer (De Stefani *et al.*, 1997).

2.2.3 Colorectal cancer

As with breast cancer, frequent consumption of meat, particularly red meat, is associated with an increased risk of colon cancer (Singh & Fraser, 1998; Giovannucci *et al.*, 1994). Total fat and saturated fat, which tend to be substantially higher in animal products than in plant-derived foods, and refined sugar, all heighten colon cancer risks. At Harvard University, researchers zeroed in on red meat, finding that individuals eating beef, pork, or lamb daily have approximately three times the colon cancer risk, compared to people who generally avoid these products (Giovannucci *et al.*, 1994; Willett *et al.*, 1990). A review of 32 case-control and 13 cohort studies concluded that meat consumption is associated with an increase in colorectal cancer risk, with the association being more consistently found with red meat and processed meat (Norat & Riboli, 2001). And, in the recently published Cancer Prevention Study II, involving 148,610 adults followed since 1982, the group with the highest red meat and processed meat intakes had approximately 30 to 40 percent and 50 percent higher colon cancer risk, respectively, compared to those with lower intakes (Chao *et al.*, 2001). In this study, high red meat intake was defined as 3 ounces of beef, lamb, or pork for men and 2 ounces for women daily, the amount in a typical hamburger. High processed meat intake (ham, cold cuts, hot dogs, bacon, sausage) was defined as 1 ounce eaten 5 or 6 times a week for men, and 2 or 3 times a week for women—the amount in one slice of ham. In addition, earlier studies have also indicated that those consuming white meat, particularly chicken, have approximately a threefold higher colon cancer risk, compared to vegetarian (Fraser, 1999).

Secondary bile acids are probably part of the problem. In order to absorb fat, the liver makes bile, which it stores in the gallbladder. After a meal, the gallbladder sends bile acids into the intestine, where they chemically modify the fats eaten so they can be absorbed. Unfortunately, bacteria in the intestine turn these bile acids into cancer-promoting substances called secondary bile acids. Meats not only contain a substantial amount of fat; they also foster the growth of bacteria that cause carcinogenic secondary bile acids to form. Cooking methods that promote the formation of HCAs are believed to play a significant role in colorectal cancer risk. A case-control study in North Carolina that analyzed meat intake by level of doneness, cooking method, and estimated intake of HCAs in 620 colon cancer patients and 1038 controls, found that not only was red meat intake positively associated with colon cancer risk, but also pan-frying was the riskiest way to prepare meat due to high HCA formation (Butler *et al.*, 2003). Confirmation of the link between frying and colorectal cancer risk was adduced in the review mentioned above, where high frying temperature was found to increase colon cancer risk almost twofold, and rectal cancer risk by 60 percent (Norat & Riboli, 2001).

2.2.4 Prostate cancer

Prostate cancer is one of the leading cancers among men in the U.S., and researchers have explored a number of possible dietary factors contributing to prostate cancer risk. These include dietary fat, saturated fat, dairy products, and meat, as well as dietary factors that may decrease risk, such as the consumption of carotenoids and other antioxidants, fiber, and fruit. As with breast cancer risk, a man's intake of dietary fat, which is abundant in meat and other animal products, increases testosterone production, which in turn increases prostate cancer risk. One of the largest nested case-control studies, which showed a positive association between prostate cancer incidence and red meat consumption, was done at Harvard University in an analysis of almost 15,000 male physicians in the Physicians' Health Study (Gann *et al.*, 1994). Although this study primarily analyzed plasma fatty acids and prostate cancer risk, the authors found that men who consumed red meat at least five times per week had a relative risk of 2.5 for

developing prostate cancer compared to men who ate red meat less than once per week. The most comprehensive dietary cohort study on diet and prostate cancer risk reported on nearly 52,000 health professionals in Harvard's Health Professionals Follow-Up Study, which completed food frequency questionnaires in 1986 (Giovannucci *et al.*, 1993). The report, based on 3 to 4 years of follow-up data, found a statistically significant relationship between higher red meat intake and the risk of prostate cancer, with red meat as the food group with the strongest positive association with advanced prostate cancer. These and other study findings suggest that reducing or eliminating meat from the diet reduces the risk of prostate cancer (Kolonel, 1996)

2.3 Meat and diabetes

The adoption of a western diet characterized by high intakes of red and processed meat as well as other components, including refined grain products, snacks, sweets, French fries, and pizza, is believed to contribute to the epidemic of type 2 diabetes in the world (Hirnsworth HP., 1935). A diet high in red meat has long been suspected as an important and independent contributor to risk of type 2 diabetes. This hypothesis was first generated based on the evidence from ecologic and migrant studies (Kawate *et al.*, 1979; Pratley, 1998) and subsequently supported by several cross-sectional and prospective studies of dietary patterns and diabetes (Gittelsohn *et al.*, 1998; Williams *et al.*, 2000; Van Dam *et al.*, 2002).

Since the Seventh Day Adventists Study first reported a positive association between total meat intake and risk of type 2 diabetes in a population with a large proportion of vegetarians (Snowdon & Philips, 1985) few studies have specifically assessed this relation between meat consumption and incidence of diabetes. Two recent cohort studies in U.S. men and women observed a significant association between frequent consumption of processed meat and an increased risk of type 2 diabetes (Schulze *et al.*, 2003; Van Dam *et al.*, 2002).

Red meat, especially processed meat, contains certain types of preservatives, additives, or other chemicals arising from meat preparation, including preservation, packaging, and cooking. These compounds include nitrates and nitrites added in meat processing as well as a variety of heterocyclic amines and polycyclic aromatic hydrocarbons formed in red meat, especially when cooked well done (Lijinsky, 1999). These compounds can be converted to *N*-nitrosamines (Lijinsky, 1999) which were found to be toxic to pancreatic β -cell (LeDoux *et al.*, 1986). Consumption of foods with a high content of nitrites and nitrosamines has been associated with type 1 diabetes (Dahlquist *et al.*, 1990; Virtanen *et al.*, 1994; Helgason and Jonasson, 1981). Also, advanced glycation and lipoxidation end products produced during the cooking or processing of meat have been associated with insulin resistance and diabetes-related complications in animal models (Hofmann *et al.*, 2002) and human subjects (Peppas *et al.*, 2002; Vlassara *et al.*, 2002). Therefore, such specific compounds mainly present in processed meat might largely explain the observed significant association between processed meat intake and type 2 diabetes.

2.4 Red meat and cardiovascular diseases

Red meat is often viewed as being harmful for heart health on the grounds of its fat and saturated fat content. Data regarding the association between red meat intake and the risk of CHD is conflicting. Several large studies comparing vegetarians to non-vegetarians have found an increased risk of CHD in persons who consume meat. In men, a 2-fold increase in risk was associated with eating beef more than 3 times per week (Snowdon *et al.*, 1984). In the Nurse's Health Study, women with a higher ratio of red meat to fish and poultry intake had significantly higher risk of CHD although neither red meat alone nor fish alone was significantly associated with harm or benefit after adjusting for other cardiovascular risk factors (Hu *et al.*, 1999). In another study, greater consumption of heme-iron, which is mainly derived from red meat, was associated with a higher risk of fatal and non-fatal CHD events (Ascherio *et al.*, 1994).

One mechanism by which red meat intake could increase CHD risk is by increasing levels of harmful cholesterol. Increased total cholesterol has long been associated with increased risk of CHD. Total cholesterol is composed of three main elements: Low-density lipoprotein cholesterol (LDL cholesterol), High-density lipoprotein cholesterol (HDL cholesterol) and triglycerides. Increased levels of LDL cholesterol and triglycerides in particular have been associated with higher risk of CHD (Connor *et al.*, 1997). LDL cholesterol is therefore called bad cholesterol. In contrast, HDL cholesterol has been found to protect against CHD and therefore, increased levels are desirable and therefore is called good cholesterol. The reason red meat has the potential to increase CHD risk is because it contains a high proportion of saturated fat. Saturated fat can be converted to both good and bad cholesterol in the body. Hence, these changes could offset one another resulting in no increase in CHD risk. Conversely, a reduction in total and saturated fat intake may cause a drop in HDL cholesterol that would offset the benefit of a reduction in LDL cholesterol. Furthermore, a large part of the saturated fat in beef is stearic acid, which has little effect on blood lipid (Bonanome & Grundy, 1988). Overall; it appears that the risk of CHD associated with fat intake might, in the end, depend upon the total balance of cholesterol raising saturated fats and cholesterol lowering unsaturated fats. Apart from its effects on cholesterol levels, red meat could contain other elements, such as animal proteins, that might adversely affect CHD risk factors, but this hypothesis has not been proven.

2.5 Red meat and obesity

The World Health Organization (WHO) defines obesity as a condition in which excess body fat has accumulated to such an extent that health may be adversely affected. The degree of body weight is usually expressed as BMI; this is the ratio of weight in kilograms to the square of height in meters. The BMI is used to classify a person's body weight as underweight (BMI less than 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), or obese (BMI greater than 30) (WHO, 2000). In addition, it is customary to indicate the amount of abdominal fat mass. This can vary considerably

among individuals who have the same BMI. Abdominal fat is reported by measuring the waist circumference or the waist-to-hip circumference ratio. The waist circumference is thought to provide a better correlate with abdominal fat mass than the waist-to-hip ratio. High abdominal fat mass is frequently referred to as central obesity. This form of obesity has been shown to have more morbidity than if the fat distribution is predominantly on the hips (WHO, 2000).

The Diogenes project used data from ninety thousand men and women over about seven years and found that higher intake of total protein, and protein from animal sources was associated with subsequent weight gain for both genders, strongest among women, and the association was mainly attributable to protein from red and processed meat and poultry rather than from fish and dairy sources. There was no overall association between intake of plant protein and subsequent changes in weight (Halkjær *et al.*, 2010). They also found an association between red meat consumption and increased waist circumference in a 1998 survey of about five thousand vegetarian and non-vegetarian people found that vegetarians had about 30% lower BMIs (Appleby *et al.*, 1998). A 2006 survey of fifty thousand women found that those with higher western diet pattern scores gained about two more kilograms over the course of four years than those who lowered their scores (Schulze, 2006).

A ten-year follow up of 80,000 men and women found that ten-year changes in body mass index was associated positively with meat consumption as well as with weight gain at the waist (Seifert *et al.*, 1992.). In a Mediterranean population of 8,000 men and women, meat consumption was significantly associated with weight gain (Bes-Rastrollo *et al.*, 2006). Data from the National Health and Nutrition Examination Survey showed consistent positive associations between meat consumption and BMI, waist circumference, obesity and central obesity (Wang & Beydoun, 2009). A survey of twins found that processed meat intake was associated with weight gain (Hasselbalch *et al.*, 2010). Western diets, which include higher consumption of red meats, are often

associated with obesity (Song *et al.*, 2009; Paradis *et al.*, 2009). Obesity greatly increases the risk for conditions such as type 2 diabetes, hypertension, dyslipidemia, gall bladder disease, sleep apnea, osteoarthritis, and lower back pain.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study design

This was a descriptive cross-sectional study.

3.2 Study site

The study was conducted in Laiser Hill location of Ongata Rongai, Kajiado North County.

Ongata Rongai is located between the Kaputiei plains and the Western slopes of the Ngong hills all within Kajiado. Rongai began in the late 1950's, first as a cattle market in present day Ongata Rongai shopping centre and as a stone mining township, therefore meat had been sold in this area from this time. The township is divided into five administrative units namely Kware, Mosoi Range, Laiser Hill, Ongata Rongai, and Entumoto locations, according to the 2009 Housing and Population census.

Laiser Hill was purposively sampled as it has a long history of frequent consumption of red meat. Furthermore, Laiser had homogeneity of socioeconomic status of the residents. It was dominated by the middle-class.

3.3 Study population

The target population of the survey consisted of all private households in this area. The survey did not cover other collective living quarters such as students' hostels, old-age homes, hospitals, prisons and was therefore only representative of non-institutionalized households. The household heads were chosen to be interviewed.

3.4 Inclusion criteria

Those respondents included in the study were adult red meat consumers and those who gave consent

Only one respondent from each household was interviewed.

3.5 Exclusion criteria

Any one below the age of 18 was excluded from the study. Also excluded were respondents who did not consume red meat. Those who declined to participate in the study were also excluded.

3.6 Sample size determination

The sample size chosen was calculated using the Fischer's Exact Probability Test as shown below:

$$n = Z^2 * pq / d^2 \quad (\text{Fisher and Yates, 1996})$$

Where:

n= desired sample size if sample population is above 10,000

Z= standard normal deviate at a required confidence level (in this case 95% confidence level)

p=proportion in population estimated to have particular characteristics

q=1-p

d=level of precision at 95% confidence level

Therefore sample size in this case

$$z=1.96$$

$$p=0.5$$

$$q=0.5$$

$$d=0.05$$

$$n = 1.96^2 * 0.5 * 0.5 / 0.05^2 = 385$$

The value of $p= 0.5$ was used because the proportion of attitudes and practices of red meat consumption and awareness levels of lifestyle diseases was not known.

Ten percent of the questionnaires were added to cater for non response which gave a target sample size of 423.

3.7 Sampling procedures

Cluster sampling was used to select households. Laiser Hill was first divided into 100 clusters of 120 households based on the 2009 census enumeration areas. Four clusters were then randomly chosen. Households in these clusters were chosen for data collection. To reduce bias of household selection, the first house to be visited was determined by the random walk method which involved two separate steps. The method entailed (1) randomly choosing a starting point and a direction of travel within the sample cluster, (2) conducting an interview in the nearest household, and (3) continuously choosing the next nearest household for an interview until the target number of interviews has been obtained.

3.8 Data collection

Data was collected using a semi-structured questionnaire (Appendix 2). The questionnaire was pretested on 10 respondents to ensure they were clear, the contents were suitable, understandable and there was a sequence in the flow of questions. The questionnaire was then refined for final use. All questionnaires were in the English language and also in Kiswahili for those who were not able to understand English but understood Kiswahili.

The initial part of the questionnaire covered the respondent's demographic information which included age, sex, level of education, occupation, average monthly income and marital status. Part two covered questions on attitudes and perceptions on red meat consumption. Part three covered questions on respondents' practices on red meat

consumption and part four covered questions on respondents' awareness of lifestyle diseases.

Most of the data collection was done all day during the weekend when most family members were present. Some data collection was also done during the weekdays where some respondents were still available.

3.9 Data management and analysis

All filled questionnaires were checked for their completeness before the interviewer left that area. Where information was missing the interviewer revisited the respondent for further information unless they had initially declined to disclose. Upon processing of all the field data, analysis was done under the domain of descriptive statistics using SPSS Version 17 software. Two questions on attitude were open ended while one was closed, while those on practices were close ended and those on awareness involved a mixture of closed and open ended questions. Responses on open ended questions were grouped around central themes according to the responses given. They were then coded and analyzed accordingly. At first, the coding was open whereby data was broken down, examined, compared, conceptualized, and categorized. This data coding represented the gradual building up of categories out of the data. Later, axial coding was employed. This involved the data being put back together in new ways after open coding, by making connections between categories. Bivariate analysis using Chi-square test and Fishers Exact Test was then done to measure the association between the independent and dependent variables. For variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Odds Ratio (OR) and 95% Confidence Interval (CI) were used to estimate the strength of association between independent variables and the dependent variable. The threshold for statistical significance was set at $p < 0.05$. Multivariate binary regression using the odds ratio was used to model those associations that were significant in binary analysis, Significance was determined at values of $p < 0.05$. Data was presented using tables and charts.

3.10 Ethical considerations

Ethical clearance for this study was sought from the KEMRI scientific steering committee (SSC), Ethical review committee (ERC), and JKUAT board of post graduate studies.

The study provided no harm to the individual and was entirely based on the principle of voluntary participation. The participants were informed of their rights to privacy and confidentiality. An informed consent form was issued to the respondents before administration of questionnaires. No coercion or intimidation was used to obtain any information. Data collected was strictly confidential and all information collected was filed and all files kept under lock and key in a cabinet.

3.11 Study limitations

Non-response - this was especially in reference to respondents not at home at the time of visit. This was minimized by conducting most of the interviews on the weekend where the likelihood of them being available was higher

Ethical issues – some respondents were resistant as they were concerned that their information could be accessed by others. However this was minimized by assuring the respondents of utmost confidentiality and privacy and that no questionnaires contained their names for identification.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics

The total number of respondents was 387. The demographic characteristics of the respondents as summarized in Table 4.1 showed that there were almost similar proportion of females (51.7%, 200) compared to males (48.3%, 187). 58.4% of the respondents were aged 18-38 years. A higher proportion of the respondents (42.7%) had tertiary and university education while 27.1% were high school graduates. Half of the respondents (50.1%) were married.

Table 4.1: Demographic characteristics of the respondents

Demographics		Frequency	Percent (%)
Sex	Male	187	48.3
	Female	200	51.7
Age	18-28	115	29.7
	29-38	111	28.7
	39-48	89	23
	49-58	40	10.3
	>58	32	8.3
Education Level	No school	0	0
	Primary	0	0
	Secondary	105	27.1
	College	165	42.7
	University	117	30.2
Marital Status	Single	184	47.5
	Married	194	50.1
	Separated	7	1.9
	Divorced	2	0.5
Occupation	Formal employment	174	45
	Casual employment	52	13.4
	Business person	151	39

Farmer	8	2.1
Others(Unemployed)	2	0.5

4.2 Perception towards red meat consumption

Perceptions given as illustrated in Figure 4.1 were grouped according to those associated with taste, those associated with the nutritional value/health promoting attributes and, those related to quantity eaten. Seventy four percent 74.7% (289) said they liked consumption of red meat mainly because of the taste, 22.7% (88) reported that caution should be taken in its consumption and it should be consumed in moderation while 2.6 % cited that they liked red meat mainly because it built the body and promoted health.

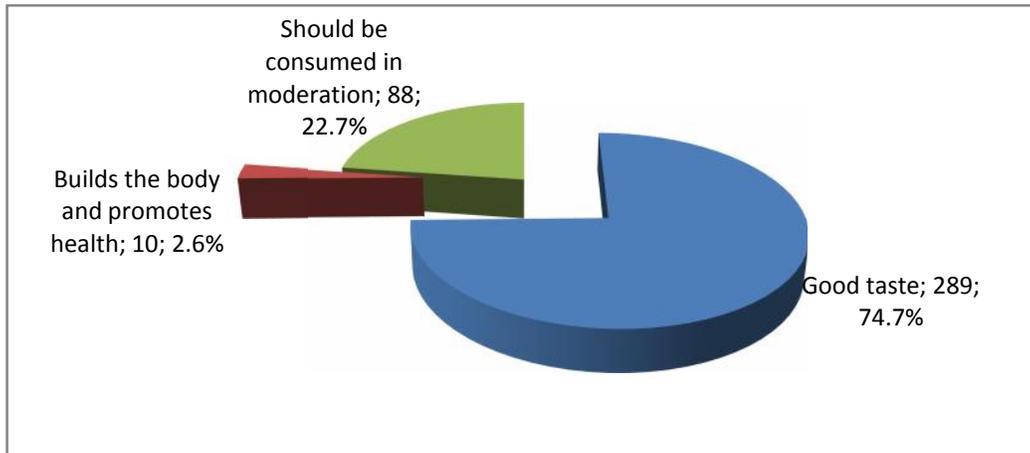


Figure 4.1 Perceptions towards consumption of red meat

4.3 Perceived health benefits of red meat consumption

Responses from perceived health benefits of meat consumptions illustrated in Table 4.2 were grouped as to those associated with protein, energy and to those related to vitamins and minerals. About ninety percent, 90.4%, were of the opinion that red meat was a good source of protein, another 7.5%, said that it was a source of energy while 2.1 %, said red meat was a good source of vitamins and minerals.

Table 4.2: Perceived health benefits of red meat consumption

Health benefit	Frequency	Percent
Good source of proteins	350	90.4%
Provides some vitamins /minerals	8	2.1%
Source of energy	29	7.5%
Total	387	100%

4.3 Most important characteristic when buying meat products

Majority of the respondents (49.6%, 192) as illustrated in Figure 4.2 said that when considering to buy meat products the most important characteristics they considered was price followed closely by nutritional value (40.1%, 155). Taste was also considered (9.8%, 38) with an insignificant number considering where the meat came from (0.5%, 2). The findings implied that when purchasing meat products the respondent's primary concern was price and not nutritional value (Figure 4.2).

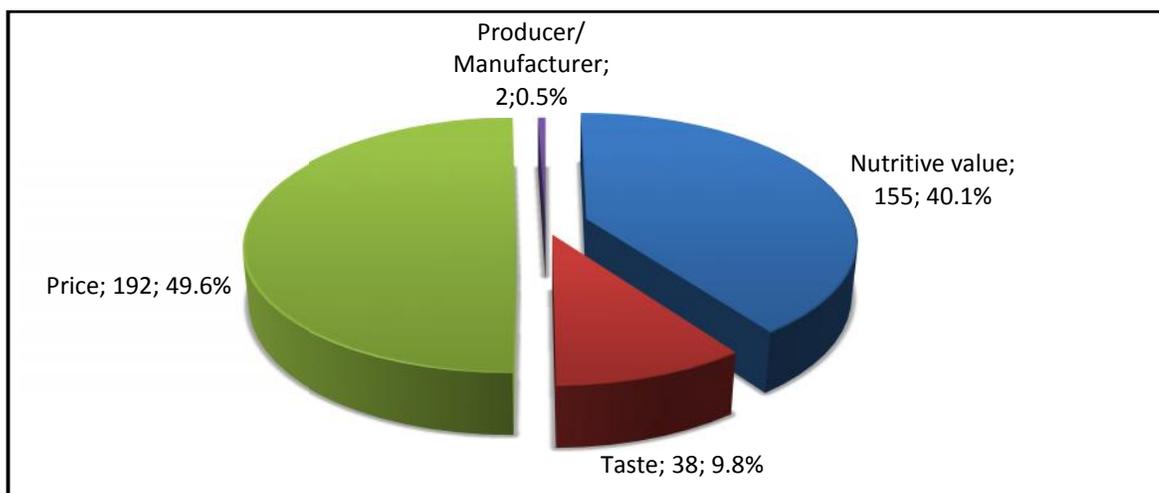


Figure 4.2: Characteristic considered important when buying meat products

4.3 Practice of red meat consumption

When asked how the respondents prepared their meat, 25% of the respondents said that they preferred to boil the meat, 70% said that they liked to fry their meat while 5% said that they preferred to cook their meat in an oven or barbecued.

Furthermore, 89.4% of the respondents preferred their meat well done, 10.1% preferred medium cooked meat and the rest 0.5% preferred their meat rare. For 31% of respondents, the quantity of meat consumed in the last two years had increased, for 24.2% of respondents it had decreased while for 44.2% of the respondents the quantity had remained the same.

The quantity of meat consumed by respondents in a week showed that, most of them consumed meat after every other day (4 times a week) representing 43.4%. Those who ate meat twice a week were 27.2%, 22.2% ate once a week while only 7.2% ate meat every day.

The actual quantity of meat consumed by individuals, per meal, in grams showed that; most respondents, 66.9% consumed less than 250 grams (1-3 portions of regular serving spoon), 28.9% consumed between 250-500 grams (4-6 portion of regular serving spoon), while 4.2% consumed between 500 grams -1 kg (more than 6 regular serving spoon).

To ascertain the number of times in a week in which respondents consumed processed meat (including one or more of sausages, smokies, hamburgers hotdogs) showed that; most respondents, 42% did not take processed meat weekly. Thirty five percent of the respondents took 1-2 times weekly, 15% took 3-4 times weekly, while 8% who took more than four times weekly.

The number of times respondents consumed roast meat revealed that 41% consumed roast meat once every weekend, 10% consumed two to three times in a week, 6%

consumed more than three times in a week, and 43% said that they did not take roast meat weekly but only on special occasions.(Table 4.3)

Table 4.3: Practice of red meat consumption

Question	Choice	Percent
Meat preparation	Boiled	25%
	Stewed	70%
	Barbecued /oven	5%
Preference of doneness	Well done	89.4%
	Medium	10.1%
	Rare	0.5%
Change in quantity consumed(last 2 yrs)	Has increased	31%
	Has decreased	24.2%
	Remained same	44.8%
Frequency of red meat consumption	Everyday	7.2%
	4-5 times a week	43.4%
	Twice a week	27.2%
	Once a week	22.2%
Estimated consumption per meal	0-0.25kg	66.9%
	0.26-0.5kg	28.9%
	0.6-1kg	4.2%
Frequency of processed meat consumption	1-2times a week	35%
	3-4times a week	15%
	4-5times a week	8%
	Don't take	42%
Frequency of consumption of roast meat	On weekends	41%
	2-3times a week	10%
	>3 times a week	6%
	Don't take	43%

4.4 Awareness of lifestyle diseases

4.4.1 General awareness of lifestyle diseases

Ninety percent of the respondents said they were aware, and the rest 10% said they were unaware of what lifestyle diseases were. In a follow up to actually determine if the respondents could define what lifestyle diseases were, according to the best of their knowledge, 83.7% said that they were diseases that came about as a result of lifestyle choices, 8.8% of the respondents said that they were diseases which came about in old age, 5.7% said that they were diseases that came as a result of ethnicity and genetics, and the rest, 1.8% said that they are diseases from other infectious diseases. Majority (90.7%) of the respondents indicated that red meat consumption was factor causing lifestyle diseases while 9.3% said it was not a factor that caused lifestyle diseases (Table 4.4).

Table 4.4: Responses on awareness of lifestyle diseases, definition, red meat and lifestyle diseases

Question	Choice	Percentage
Aware what lifestyle diseases were	Yes	90%
	No	10%
Definition of lifestyle diseases	Diseases of old age	8.8%
	Diseases of ethnicity and genetics	5.7%
	Diseases of lifestyle choices	83.7%
	Diseases from other infectious diseases	1.8%
Whether consumption of red meat can cause lifestyle diseases	Yes	90.7%
	No	9.3%

4.4.2 Awareness of high intakes of red meat as a contributor to common lifestyle diseases

The following as illustrated in Table 4.5 was the levels of awareness of high intakes of red meat as a contributor to lifestyle diseases.

Table 4.5: Awareness of high intakes of red meat as a contributor to common lifestyle diseases

Lifestyle disease	Awareness of high intakes of red meat and lifestyle diseases	
	N	Yes
Cancer	221	57%
Diabetes	240	62%
Obesity	298	77%
Hypertension	259	67%
Cardiovascular diseases	251	65%

4.4.3 Other factors causing lifestyle diseases

Respondents listed the following factors; excessive drinking (14%), smoking (5%), sedentary lifestyle (33%), stress (2%), inheritance (9%), use of drugs (9%) and (28%) said that they did not know what contributed to lifestyle diseases. Figure 4.3 indicates that sedentary lifestyle was a major contributor.

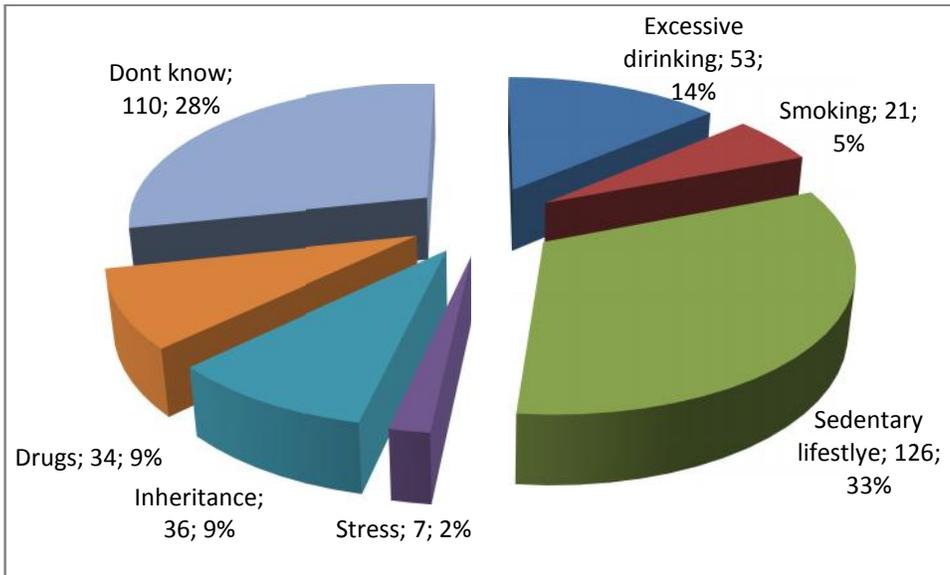


Figure 4.3: Other factors that cause lifestyle diseases

4.4.4 Awareness of risk of getting lifestyle diseases

Results in Figure 4.4 indicated that 98% of the respondents were of the opinion that anybody was at risk from the very young to the old of getting lifestyle diseases. This was a major shift from the notion that these diseases were affecting mostly wealthy and old people.

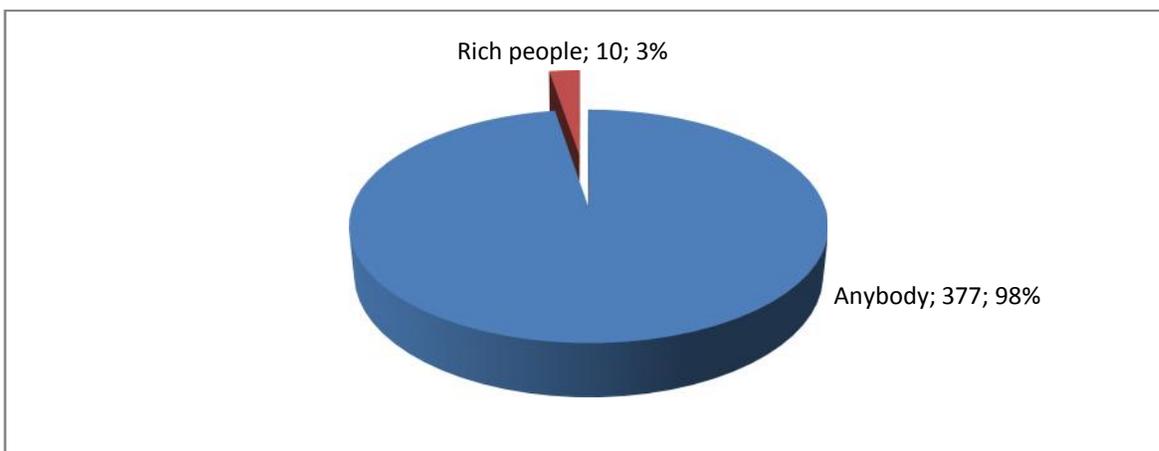


Figure 4.4: Risk of getting lifestyle diseases

4.4.5 Awareness of cure of lifestyle diseases

Sixty two percent (62%) of respondents indicated that the diseases could be cured but only when discovered early while (38%) of respondents did not believe that the diseases could be cured (Figure 4.5).

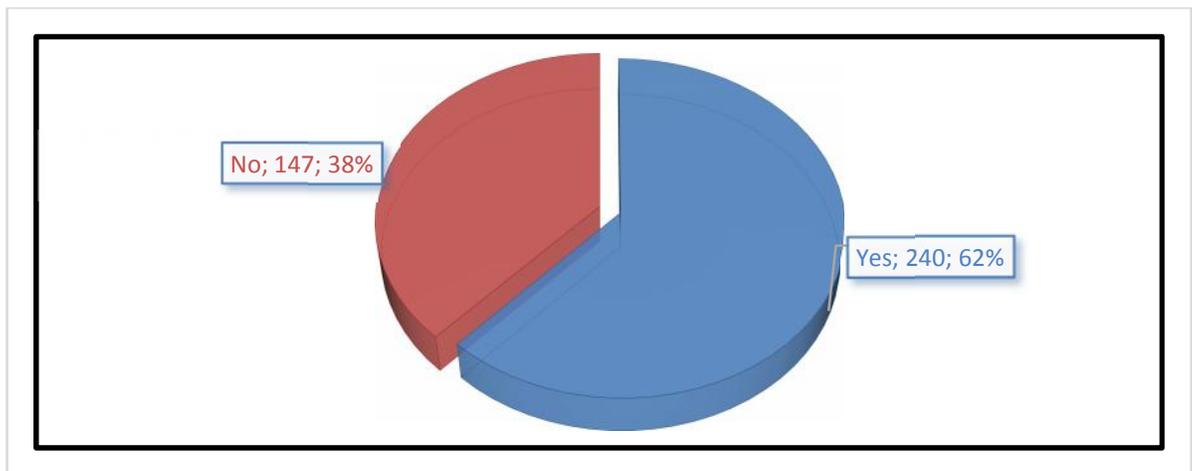


Figure 4.5: Awareness of cure of lifestyle diseases

4.5 Bivariate analysis

4.5.1 Association between demographic characteristics and attitude towards red meat consumption

For those variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Fisher Exact Tests was conducted for occupation and marital status. Relationships between age ($\chi^2 = 12.069$, df (4), $p=0.017$), education ($\chi^2 = 7.142$, df (2), $p=0.028$), marital status (11.939, $p=0.003$) and attitude towards red meat consumption were statistically associated (Table 4.6). Gender and occupation were not statistically significant in explaining attitudes towards red meat consumption.

Table 4.6: Association between demographic variables and attitude towards red meat consumption

Demographics		Attitude				Fishers exact test and Chi Square
		Negative Attitude		Positive Attitude		
		N	%	N	%	
Age	18-28	64	56	51	44	$X^2 = 12.069$ ($p=0.017$) df(4)
	29-38	59	53	52	47	
	39-48	35	39	54	65	
	49-58	12	30	28	70	
	>58	17	53	15	47	
Gender	Male	100	53	89	47	3.116 ($p=0.078$) df(1)
	Female	87	44	111	56	
Education	High school	61	58	44	42	$X^2 = 7.142$ ($p=0.028$) df(2)
	College	79	45	86	55	
	University	47	44	70	56	
Occupation	Formal emplmnt	78	45	96	55	Fisher Exact test 4.990 ($p=0.262$)
	Casual emplmnt	24	46	28	54	
	Businessperson	82	54	69	46	
	Farmer	2	25	6	75	
	Others	1	50	1	50	
Marital status	Married	77	40	117	60	Fisher Exact Test 11.939 ($p=0.003$)
	Single	105	57	79	43	
	Separated	4	57	3	43	
	Divorced	1	50	1	50	

4.5.1 .1 Multivariate analysis

Table 4.7 shows that age group of over 58 years was statistically associated with attitude towards red meat consumption ($p=0.024$). The odds of having a good attitude were 3.119 times higher for those aged over 58 years compared to those aged 18-28 years.

High school education was statistically associated with attitude towards red meat consumption ($p<0.05$). The odds of having a good attitude were 4.408 times higher for those with university education compared to those with high school education.

Table 4.7: Logistic regression of age, education level and marital status and attitude towards red meat consumption

Variable	B	S.E.	DF	p-value.	O.R	95% C.I.	
						Lower	Upper
18-28			4	0.183	1.000		
29-38	0.702	0.503	1	0.163	2.019	0.753	5.415
39-48	0.472	0.451	1	0.295	1.603	0.663	3.879
49-58	0.781	0.426	1	0.067	2.184	0.947	5.034
>58	1.137	0.505	1	0.024	3.119	1.159	8.396
High school			2	0.017	1.000		
College	-0.199	0.263	1	0.45	0.82	0.49	1.372
University	1.484	0.635	1	0.019	4.408	1.27	15.299
Married			3	0.22	1.000		
Single	0.582	1.499	1	0.698	1.79	0.095	33.778
Separated	-0.04	1.501	1	0.979	0.961	0.051	18.187
Divorced	-0.06	1.68	1	0.972	0.942	0.035	25.335
Constant	-0.554	1.538	1	0.718	0.574		
-Coefficient for constant		S.E. – Standard Error		DF – Degrees of Freedom			
OR – Odds Ratio		CI – Confidence Interval		Sig- Significance			

4.5.2 Association between demographic characteristics and practices of red meat consumption

Association between education level and practices towards red meat consumption illustrated in Table 4.8 indicated that there was a significant association between education level and practices. This was supported by chi square results ($\chi^2 = 10.262$, df (2), $p=0.006$). For variables with frequencies of less than five observations Fisher Exact Test was used to test the association. Fisher Exact Tests was conducted for age, occupation and marital status. The relationship between age and attitude was insignificant (7.776, $p=0.093$) similarly occupation (5.900 ($p=0.167$) and marital status had insignificant associations (1.849 ($p=0.582$)).

Table 4.8: Association between demographic variables and practices of red meat consumption

Demographics		Poor Practice		Good Practice		Chi Square & Fisher Tests
		N	%	N	%	
Age	18-28	18	16	97	84	Fisher Test 7.776 (p=0.093)
	29-38	14	13	97	87	
	39-48	8	8	81	92	
	49-58	9	23	31	77	
	>58	1	3	31	97	
Gender	Male	26	14	163	86	0.230 (p=0.632) df(1)
	Female	24	12	174	88	
Education	High school	12	11	93	89	X ² =10.262 (p=0.006) df(2)
	College	31	19	134	81	
	University	7	5	110	95	
Occupation	Formal employment	26	15	148	85	Fisher Test 5.900 (p=0.167)
	Casual employment	9	17	43	83	
	Business person	13	9	138	81	
	Farmer	2	25	6	75	
	Others	0	0	2	100	
Marital status	Married	22	11	172	89	Fisher Test 1.849 (p=0.582)
	Single	28	15	156	85	
	Separated	0	0	7	100	
	Divorced	0	0	2	100	

4.5.2.1 Multivariate analysis

Binary logistic regression was used to model relationship between education level and red meat consumption practices. Table 4.9 shows that high school education was statistically associated with red meat consumption practices (p<0.009). University education was statistically associated with red meat consumption practices (p<0.003). The odds of having good practices were 0.275 times lower for those with university education compared to those with high school education.

Table 4.9: Logistic regression of education level and practice of red meat consumption

Variable	B	S.E.	Wald	DF	p-value.	O.R	95% C.I.	
							Lower	Upper
High school			9.489	2	0.009	1		
College	-0.707	0.496	2.031	1	0.154	0.493	0.187	1.304
University	-1.291	0.438	8.692	1	0.003	0.275	0.117	0.649
Constant	2.755	0.39	49.936	1	0.000	15.714		

-Coefficient for constant S.E. – Standard Error DF – Degrees of Freedom
 OR – Odds Ratio CI – Confidence Interval Sig- Significance

4.5.3 Association between demographic characteristics and awareness of lifestyle diseases

According to Fisher exact test the relationship between marital status and awareness was statistically associated (13.263, p=0.002) whereas age (4.723, p=0.314), gender ($\chi^2=0.977$ p= 0.323), education ($\chi^2=1.776$ p= 0.412) and occupation (1.899, p=0.724) had insignificant association with awareness (Table 4.10)..

Table 4.10: Association between demographic variables and awareness of lifestyle diseases

Demographics		Awareness				Chi Square & Fisher Exact Test
		Poor Awareness		Good Awareness		
		N	%	N	%	
Age	18-28	98	85	17	15	Fisher Test 4.723 (p=0.314)
	29-38	89	80	22	20	
	39-48	77	86	11	14	
	49-58	36	90	4	10	
	>58	30	94	2	6	
Gender	Male	165	87	24	13	0.977 (p=0.323) df(1)
	Female	165	84	32	16	
Education	High school	92	88	13	12	$X^2 = 1.776$ (p= 0.412) df(2)
	College	143	87	22	13	
	University	95	82	21	18	
Occupation	Formal employment	148	86	25	14	Fisher Test 1.899 (p=0.724)
	casual employment	43	83	9	17	
	Business persons	131	87	20	13	
	Farmer	6	75	2	25	
	Others	2	100	0	0	
Marital status	Married	176	91	17	9	Fisher Test 13.263 (p=0.002)
	Single	148	80	36	20	
	Separated	4	57	3	43	
	Divorced	2	100	0	0	

5.5.3.1 Multivariate analysis

Binary logistic regression was used to model relationship between marital status and awareness of lifestyle diseases. Table 4.11 shows that being married was statistically associated with awareness towards lifestyle diseases ($p < 0.05$).

Table 4.11: Logistic regression of marital status and awareness of lifestyle Diseases

Variable	B	S.E.	Wald	D F	P value	O.R	95% C.I.	
							Lower	Upper
Married	1.4	0.505	6.24151	3	0.015	1	1.170	9.533
Single	0.582	1.499	0.151	1	0.698	1.79	0.095	33.778
Separated	0.472	0.451	1.096	1	0.295	1.603	0.663	3.879
Divorced	-0.06	1.68	0.001	1	0.972	0.942	0.035	25.335
Constant	-21.205	28419.1 3	0	1	0.999	0		

-Coefficient for constant S.E. – Standard Error DF – Degrees of Freedom
 OR – Odds Ratio CI – Confidence Interval Sig- Significance

CHAPTER FIVE

DISCUSSION

5.1 Attitude and perceptions of red meat consumption

Majority of the respondents 74.7%, (289) indicated that taste was the major contributing factor to their (high, 99999999) consumption. This corroborates with previous other studies that reported taste as the single largest driver for maintaining meat consumption habits even in situations of uncertainty or risk (Goodson *et al.*, 2002, Verbeke, 2001, Grunert and Anderson, 2000, Richardson *et al.*, 1994). However 22.7%, (88) of the residents reported that caution should be taken in its consumption and it should be consumed in moderation. These results complement the recommendations by the American Institute for Cancer Research and the World Cancer Research Fund to reduce red and processed meat intake to decrease mortality and cancer incidence (Kahn *et al.*, 1984; WCRF/AICR, 2007).

A study done in meat consumption in Europe found that the lower the price of a product the more people would buy it. It was reported that while beef had the highest mean per-capita consumption, it also had the lowest mean price and the opposite was true for fish. The mean price of poultry was nearly as high as for fish (Rivera-Ferre, 2009; Westhoek *et al.*, 2011). Recent demand studies also indicate that price still has some explanatory importance in meat demand (Bansback, 1995). In the study when considering purchasing meat products price was a consideration at 49.6% with an insignificant number (0.5%) considering where the meat came from. This is however in contrast to studies done in Tuscany, Italy where the importance purchase criteria showed that expiration date, freshness, and taste were the most important when purchasing red meat (Marija *et al.*, 2005).

Associations between age and attitude towards red meat consumption showed that there was a statistical relationship between age and attitude of red meat consumption ($p < 0.05$).

Binary logistic regression used to model this association showed the odds of having a good attitude were 3.119 times higher for those aged over 58 years compared to those aged 18-28 years. This could be associated with increased risk of acquiring communicable diseases as one gets older. This is supported by WHO report that susceptibility to NCDs increase with age where older populations tend to experience a greater share of deaths due to NCDs compared to younger populations. (WHO 2010)

Studies done by Woodward, (1988), Beardsworth & Keil, (1991) and Richardson *et al.*, (1993, 1994) indicated that more educated respondents had better nutritional awareness of meat and were more concerned on perceived unhealthiness of red meat. Association of education levels and attitudes towards red meat consumption indicated that there was statistical association between education and attitude towards red meat consumption ($p < 0.05$). The odds of having a good attitude were 4.408 times higher for those with university education compared to those with high school education.

Marital status also played a role in determining attitude as comparisons of marital status against indicated that there was statistical association between marital status and attitude of red meat consumption ($p = 0.003$) but this association was not significant when modeled using logistic regression. Other demographic characteristics like gender ($\chi^2 = 3.116$, $df (1)$, $P = 0.078$), and occupation ($\chi^2 = 0.370$, $df (4)$, $p = 0.946$) against attitudes towards red meat consumption indicated that there was no significant association between them and attitude of red meat consumption.

5.2 Practice of red meat consumption

Changes that occur when red meat is cooked, especially at high temperatures under moist conditions lead to the production of compounds in meat called heterocyclic amines (HCAs). These are mutagens compounds that can cause changes in DNA and raise risk for cancer. Therefore the way meat is prepared affects production of HCAs. Those who eat meat that is fried or well done have a greater risk for cancer than those

who eat meat cooked in other ways (Lang *et al.*, 1994). In this study good practices of meat preparation were therefore reported in 25% of the respondents who preferred to boil their meat while poor practices were seen in 5% who preferred to cook their meat in an oven or barbecued. Studies done on the Masai diet revealed that they mainly preferred half cooked meat and raw meat mixed with blood (Merker, 1971). Therefore in our study poor practices were seen in 89.4% of the respondents preferred their meat well done.

A research done by World Cancer Research Fund recommended that people limit consumption to 500g (cooked weight) of red meat a week and completely avoid processed meat. In the study good practices were observed in 66.9% who consumed less than 250 grams (1-3 portions of regular serving spoon) while poor practices were observed 4.1% who consumed between 500 grams -1 kg (more than 6 regular serving spoon) per sitting. The number of times in a week in which respondents consumed processed meat (including one or more of sausages, smokies, hamburgers hotdogs) showed that 42% had good practices as they did not take processed meat weekly.

In their study, Liu and Deblitz (2007) found that consumers who were well educated possessed good income which was an important purchasing criterion for beef consumption in China. In this study there was a significant relationship between education level and practices ($P < 0.05$). The odds of having good practices were 0.275 times lower for those with university education compared to those with high school education. This can further be supported by studies done on red meat consumption and preferences in Tekirda Province, Turkey by Ebru *et al.*, (2015) where the increased level of education of the consumers increased consumption of red meat as well.

5.3 Awareness levels of lifestyle diseases

Good awareness was seen in 90% of the respondents, who were aware of lifestyle diseases with 83.7% being able to correctly identify what they were. 90.7% of the

respondents could also associate high consumption of red meat to cause of lifestyle diseases, with over 50% associating red meat with different lifestyle diseases. These finding can be compared to a community study done in Sudan on lifestyle patterns and the awareness of the risks of non-communicable diseases where respondents were aware of the benefits of all lifestyle habits that are related to NCDs including consumption of white meat however, they consumed red meat much more. Knowledge of the Sudanese community with regards to healthy diet was found to be quiet adequate. However, the daily lifestyle practices were almost unhealthy and contradicted their knowledge (Eiman *et al.*, 2014).

There was a major shift from the notion that these diseases were affecting mostly wealthy and old people as 98% of the respondents were of the opinion that anybody was at risk from the very young to the old of getting lifestyle diseases. 62% of the respondents reported that the diseases could be cured but only when discovered early with 38% of respondents reporting that the diseases could not be cured. Other common factors reported to contribute to lifestyle diseases included excessive drinking and smoking (14%), sedentary lifestyle (33%), stress (2%), inheritance (9%), use of drugs (9%) and (28%) don't know.

Associations of demographic characteristics like age ($p=0.314$), gender ($p=0.323$), education ($p=0.412$), occupation ($p=0.724$) and awareness of lifestyle diseases indicated that there was no statistical association between them and awareness of lifestyle diseases. Association of marital status and awareness of lifestyle diseases indicated that there was statistical association between marital status and awareness of lifestyle diseases. This was shown by Fishers Exact test of 13.263($p=0.002$).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

Taste was a major (74.7%) contributing factor in consumption of red meat. The major (90%) perceived health benefit of consumption of red meat was that it had nutritive value. The primary consideration when considering purchasing meat products was price.

There was a significant relationship between age and attitude toward red meat consumption as older (>58) respondents had better attitudes than younger (18-28) respondents. There was also a significant relationship between education and attitude as those with university level of education had better attitudes than those with high school level of education.

Most respondents (70 %) liked to stew their meat and red meat was mainly consumed four times in a week. There was significant relationship between education and practices. We can also conclude that majority of the respondents (90%) were well aware of what lifestyle diseases were.

6.2 Recommendations

This study recommends:

1. Increased health promotion especially in relation to practices of red meat consumed.
2. Continued awareness campaigns on the dangers of overconsumption of red meat in relation to its contribution to non-communicable diseases.

3. A multi-sectorial approach in tackling non-communicable diseases should include health sectors, private and governmental agencies, NGOs, the civil society, political will and above all the involvement of the community at large.

REFERENCES

- Aboderin I. (2001). Life course perspectives on coronary heart disease, stroke and diabetes: key issues and implications for policy and research. Geneva, World Health Organization.
- Allen, N., Key T., & Appleby, P. (2008). Animal foods, protein, calcium and prostate cancer risk: the European perspective investigation into cancer and nutrition. *British Journal of Cancer*, 1574 – 81.
- Appleby, P., Thorogood, M., Mann, J., & Key T. (1998). Low body mass index in non-meat eaters: the possible roles of animal fat, dietary fibre and alcohol. *Journal of the International Association for the Study of Obesity* 22, 454–460.
- Armstrong, B., & Doll, R. (1975). Environmental factors and cancer incidence and mortality in different countries, with special reference to dietary practices. *International Journal of Cancer*, 15, 617–31.
- Ascherio, A., Willett, W., Rimm, E., Giovannucci E., & Stampfer M. (1994) Dietary iron intake and risk of coronary disease among men. *Circulation*, 89, 969-974.
- Bandera, E., Kushi L., Moore D., Gifkins D., & McCullough M. (2007) Consumption of animal foods and endometrial cancer risk: a systematic literature review and meta-analysis. *Cancer Causes Control*, 18, 967– 88.
- Barry Popkin (2001). "Trends in Diet, Nutritional Status, and Diet-related Non-communicable Diseases in China and India: The Economic Costs of the Nutrition Transition," *Nutrition Reviews* 59, 379-90
- Barnard, N., Nicholson A., & Howard J. (1995). The medical costs attributable to meat consumption. *Preventive Medicine*, 24, 646 –55.
- Bansback, B. (1995). Towards a broader understanding of meat demand: presidential address. *Journal of Agricultural Economics*, 46, 287-308
- Barnard, N., Cohen, J., & Jenkins D. (2006). A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. *Diabetes Care*, 29, 1777– 83.
- Beaglehole, R., Ebrahim S., & Reddy S. (2007). Prevention of chronic diseases: a call to action. *Lancet* 307, 2152–57

- Beardsworth, A., & E. Keil (1991). Vegetarianism, Veganism and Meat Avoidance. *British Food Journal* 93, 19-24.
- Berkow, S., & Barnard, N. (2006) Vegetarian diets and weight status. *Nutrition Reviews*; 64:175– 88.
- Bes-Rastrollo, M., Sanchez-Villegas, A., Gomez-Gracia, E., Martinez, A., Pajares, R., & Martinez-Gonzalez, M. (2006). Predictors of weight gain in a Mediterranean cohort: the Seguimiento Universidad de Navarra Study. *American Journal of Clinical Nutrition* 83, 362–370.
- Bingham, S., Pignatelli, B., Pollock, J., Ellul, A., Malaveille, C., Gross, G., Runswick, S., Cummings, J., & O'Neill, I. (1996). Does increased endogenous formation of N-nitroso compounds in the human colon explain the association between red meat and colon cancer? *Carcinogenesis*, 17, 515-523.
- Bonanome A., & Grundy S. (1998). Effect of dietary stearic acid on plasma cholesterol and lipoprotein levels. *New England Journal of Medicine*, 318, 1244-1248.
- Boyd NF, Stone J, Vogt KN, Connelly BS, Martin LJ, Minkin S.(2003) Dietary fat and breast cancer risk revisited: a meta-analysis of the published literature. *British Journal of Cancer*, 89 :1672-85.
- Butler L.M., Sinha R., Millikan R.C., Martin C.F., Newman B., Gammon M.D, Ammerman A.S., Sandler R.S. (2003) Heterocyclic amines, meat intake, and association with colon cancer in a population-based study. *American Journal of Epidemiology*, 157,434-45.
- Carroll K.K., Braden L.M. (1985) Dietary fat and mammary carcinogenesis. *Nutrition and Cancer* ; 6,254-9
- Chan J.M., Stampfer M.J., Ma J., Gann P.H., Gaziano J.M., Giovannuci E.L. (2001) Dairy products, calcium, and prostate cancer risk in the Physician's Health Study. *American Journal of Clinical Nutrition*, 74,549 –54
- Chao A., Thun M.J., Connell C.J., (2001). Meat consumption and risk of colorectal cancer. *Journal of American Medical Association*, 293,172– 82
- Cho E, Spiegelman D., Hunter D.J, (2003). Premenopausal fat intake and risk of breast cancer. *Journal of National Cancer Institute* ,95,1079-85.

- Cho E., Chen W.Y., Hunter D.J. (2006). Red meat intake and risk of breast cancer among premenopausal women. *Archives of Internal Medicine* 166, 2253–9.
- Choi B.C., Bonita R., McQueen D.V. (2001). The need for global risk factor surveillance. *Journal of Epidemiology and Community Health*, 55,370.
- Collins AR, Harrington V, Drew J, Melvin R. (1998) Nutritional modulation of DNA repair in human intervention study. *Journal of American Dietary Association*, 98, 524
- Connor WE, Connor SL, Katan MB, Grundy SM, Willett WC (1997). Should a low-fat, high-carbohydrate diet be recommended for everyone? *New England Journal of Medicine* 337, 562–567
- Cross AJ, Leitzmann MF, Gail MH, Hollenbeck AR, Schatzkin A, Sinha R(2007). A prospective study of red and processed meat intake in relation to cancer risk. *Public Library of Science Medicine*; 4,325
- Cui X, Dai Q, Tseng M, Shu XO, Gao YT, Zheng W.(2007) Dietary patterns and breast cancer risk in the shanghai breast cancer study. *Cancer Epidemiology Biomarkers Prevention*; 16,1443– 8.
- Dahlquist GG, Blom LG, Persson LA, Sandstrom AI, Wall SG(1990)Dietary factors and the risk of developing insulin dependent diabetes in childhood. *British Medical Journal* 300,1302–1306,
- De Stefani E, Ronco A, Mendilaharsu M, Guidobono M, Deneo-Pellegrini H. (1997) Meat intake, heterocyclic amines, and risk of breast cancer: a case-control study in Uruguay. *Cancer Epidemiologic Biomarkers Prevention*; 6(8),573-81.
- Delgado C. (2003) Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution. *Journal of Nutrition*, 133 (11).
- Dorgan JF, Hunsberger SA, McMahon RP, (2003). Diet and sex hormones in girls: findings from a randomized controlled clinical trial. *Journal of National Cancer Institute*; 95,132-41.
- Eiman MI, Muna H, Abdelmoneim,(2014). Lifestyle patterns and awareness of risks of NCDs. *Sudan Medical Journal* 50 (2).

- Ebru O., Neslihan Y., Hasan G., Halil K., (2015). A Research on Red Meat Consumption and Preferences: A Case Study in Tekirda Province. *Turkish Journal of Agriculture - Food Science and Technology*, 3(6), 466-471.
- Everitt AV, Hilmer SN, Brand-Miller JC. (2006) Dietary approaches that delay age-related diseases. *Clinical Interventions in Aging*; 1,1131.
- Fisher R.A., Yates F. (1996). Statistical Methods for Research workers. London. Oliver and Boyd
- Fraser G.E (1999). Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists. *American Journal of Clinical Nutrition*, 70,532S-8S.
- Gann PH, Hennekens CH, Sacks FM, Grodstein F, Giovannucci EL, Stampfer MJ.(1994) Prospective study of plasma fatty acids and risk of prostate cancer. *Journal of National Cancer Institute*, 86(4),281-6.
- Giovannucci E, Rimm EB, Colditz GA, Stampfer MJ, Ascherio A, Chute CC, Willett WC. A (1993). Prospective study of dietary fat and risk of prostate cancer. *Journal of National Cancer Institute*; 85 (19),1571-9.
- Giovannucci E, Rimm EB, Stampfer MJ, Colditz GA, Ascherio A, Willett WC.(1994). Intake of fat, meat, and fiber in relation to risk of colon cancer in men. *Cancer Research*, 54(9),2390-7. .
- Gittelsohn J., Wolever T.M., Harris S.B., Harris-Giraldo R., Hanley A.J., Zinman B. (1998). Specific patterns of food consumption and preparation are associated with diabetes and obesity in a Native Canadian community. *The Journal of Nutrition* 128, 541-547
- Goodson K. J., W. W. Morgan, J. O. Reagan, B. L. Gwartney, S. M. Courington, J. W. Wise, and J. W. Savell. (2002). Beef customer satisfaction: factors affecting consumer evaluations of clod steaks. *Journal of Animal Science* ,80,401-408.
- Grunert, K. G. and Andersen, S. (2000). Purchase decision, quality expectations and quality experience for organic pork. Paper presented at the 9th Food Choice Conference, Dublin, 28-31.

- Halkjær, J.; Olsen, A.; Overvad, K.; Jakobsen, M. U.; Boeing, H.; Buijsse, B.; Palli, D.; Tognon, (2010). Intake of total, animal and plant protein and subsequent changes in weight or waist circumference in European men and women: The Diogenes project. *International Journal of Obesity* ,35, 1104–1113.
- Hasselbalch, A. L. Heitmann, B. L.; Kyvik, K. O.; Sørensen, T. I. A. (2010). Associations between dietary intake and body fat independent of genetic and familial environmental background. *International Journal of Obesity* 34 (5), 892–898.
- Helgason T, Jonasson MR (1981). Evidence for a food additive as a cause of ketosis-prone diabetes. *Lancet* 2,716–720,
- Himsworth HP (1935).Diet and the incidence of diabetes mellitus. *Clinical Science* 2,117–148.
- Hirayama T (1990). A large-scale cohort study on the effect of life style on the risk of cancer by each site. in Japanese Gan No Rinsho. *Japan Journal of Cancer Clinics*, 233-42.
- Hofmann SM, Dong HJ, Li Z, Cai W, Altomonte J, Thung SN, Zeng F, Fisher EA, Vlassara H:(2002) Improved insulin sensitivity is associated with restricted intake of dietary glycoxidation products in the db/db mouse. *Diabetes* 51,2082–2089.
- Hu FB, Stampfer MJ, Manson J.E, Ascherio A, Colditz GA, Speizer FE (1999). Dietary saturated fats and their food sources in relation to the risk of coronary heart disease in women. *American Journal of Clinical Nutrition* 70(6),1001-1008.
- Jagerstad M, Skog K, Grivas S (1991) Olsson K. Formation of heterocyclic amines using model systems. *Mutation Research*;259 (3-4),219-33.
- Kawate R, Yamakido M, Nishimoto Y, Bennett PH, Hamman RF, Knowler WC (1979). Diabetes mellitus and its vascular complications in Japanese migrants on the Island of Hawaii. *Diabetes Care* 2,161–170.
- Key TJ, Davey GK, Appleby PN. (1999). Health benefits of a vegetarian diet. *Proceedings of Nutrition Society*; 58,271–5.
- Key TJ, Fraser GE, Thorogood M. (1998) Mortality in vegetarians and non-vegetarians: a collaborative analysis of 8300 deaths among 76,000 men and women in five prospective studies. *Public Health Nutrition*, 1,33– 41.

- Kahn HA., Phillips RL., Snowdon DA., Choi W., (1984). Association between reported diet and all-cause mortality: twenty-one-year follow-up on 27,530 adult Seventh-Day Adventists. *American Journal of Epidemiology* ,119 (5) 775- 787
- Kolonel L.N. (1996). Nutrition and prostate cancer. *Cancer Causes Control* (1),83-44.
- Kurahashi N, Inoue M, Iwasaki M, Sasazuki S, Tsugane AS.(2008). Japan Public Health Center–Based Prospective Study Group. Dairy product, saturated fatty acid, and calcium intake and prostate cancer in a prospective cohort of Japanese men. *Cancer Epidemiology Biomarkers Prevention*; 17,930 –7.
- Kuriki K, Tajima K. (2006). The increasing incidence of colorectal cancer and the preventive strategy in Japan. *Asian Pacific Journal of Cancer* 7,495–501.
- Kuriki K, Tokudome S, Tajima K.(2004). Association between type II diabetes and colon cancer among Japanese with reference to change in food intake. *Asian Pacific Journal of Cancer*; 5,28 –35.
- Kwok TK, Woo J, Ho S, Sham A. (2000). Vegetarianism and ischemic heart disease in older Chinese women. *Journal of the American College of Nutrition*; 19,622–7.
- Land CE, Boice JD Jr, Shore RE, (1990). Breast cancer risk from low dose exposure to ionizing radiation: results of parallel analysis of three exposed populations. *Journal of National Cancer Institute*. 65, 353–368
- Lang NP, MA Butler J,Massengill M, Lawson RC, Stotts M, Hauer-Jensen and FF Kadlubar.(1994). Rapid metabolic phenotypes for acetyl-transferase and cytochrome P4501A2 and putative exposure to food borne heterocyclic amines increase risk for colorectal cancer and polyp. *Cancer Epidemiology, Biomarkers Prevention* 3, 675-682
- LeDoux SP, Woodley SE, Patton NJ (1986). Mechanisms of nitroso urea-induced b-cell damage: alterations in DNA. *Diabetes* 35, 866 – 872
- Lee SI, Moon HY, Kwak JM. (2008). Relationship between meat and cereal consumption and colorectal cancer in Korea and Japan. *Journal of Gastroenterological Hepatology* ; 23,138 – 40.
- Lijinsky W (1999). N-nitroso compounds in the diet. *Mutation Research* 443,129–138.

- Liu, H., Deblitz, C. (2007). Determinants of beef consumption in China. Working Paper 41, Asian Agribusiness Research Centre (AARC) Charles Sturt University, Australia
- Linus E, Willett WC, Cho E, Colditz G, Frazier LA.(2008). Red meat consumption during adolescence among premenopausal women and risk of breast cancer. *Cancer Epidemiology Biomarkers Prevention*; 17,2146 -51.
- Matos EL, Thomas DB, Sobel N, Vuoto D.(1991). Breast cancer in Argentina: case-control study with special reference to meat eating habits. *Neoplasma*; 38 (3),357-66.
- Marija R., Luca C., Ante K., (2005). Preferences and buying behavior of beef consumers in Tuscany. Bologna, Italy
- Matsudo, S.M.M., Matsudo, V.R., Araújo, T., Andrade, D., Andrade, E., Oliveira, L. and Braggion, G. (2002). Level of physical activity in São Paulo State population: analysis according to gender, age, sócio- economic level, geographic distribution, and knowledge. *Brazilian Journal of Science and Movement*, 10(4), 41-50
- Mann GV., Shaffer RD., Anderson RS., Sandstead HH (1964). Cardiovascular Disease in the Masai. *Journal of atherosclerosis research*,4, 289-312.
- Merker Moritz (1971). The Masai: Ethnographic Monograph of an East African Semite People. Harvard University Press,Harvard
- Melby CL, Hyner GC, Zoog B, (1985). Blood pressure in vegetarians and non-vegetarians: A cross-sectional analysis. *Nutrition Research*; 5,1077– 82.
- Mitrou PN, Albanes D, Weinstein SJ. (2007). A prospective study of dietary calcium, dairy products and prostate cancer risk. *International Journal of Cancer*; 120,2466 –73.
- Murray CJ, Lopez AD, (1996). The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge, Harvard School of Public Health on behalf of the World Health Organization and the World Bank,

- Murtaugh MA, Ma KN, Sweeney C, Caan BJ, Slattery ML (2004). Meat Consumption patterns and preparation, genetic variants of metabolic enzymes, and their association with rectal cancer in men and women. *Journal of Nutrition*, 134(4),776-784.
- Nestel P. A.(1986). Society in transition; developmental and seasonal influences on the nutrition of Maasai women and children. *Food and nutrition bulletin*, 8,2-18.
- Norat T, Riboli E, (2001). Meat consumption and colorectal cancer: a review of epidemiologic evidence. *Nutrition Revealed*, 59(2),37-47.
- Ornish D, Brown SE, Sherwitz LW (1990). Can lifestyle changes reverse coronary heart disease? *Lancet*, 336,129 –33.
- Ornish D, Scherwitz LW, Billings JH. (1998). Intensive lifestyle changes for reversal of coronary heart disease. *Journal of American Medical Association*,280,2001–2007.
- Ornish D, Weidner G, Fair WR (2005). Intensive lifestyle changes may affect the progression of prostate cancer. *Journal of Urology*,174,1065–9.
- Paradis, A. -M.; Godin, G.; Pérusse, L.; Vohl, M. -C. (2009). Associations between dietary patterns and obesity phenotypes. *International Journal of Obesity*, 33, 1419–1426.
- Peppas M, Goldberg T, Cai W, Rayfield E, Vlassara H (2002). Glycotoxins: a missing link in the “relationship of dietary fat and meat intake in relation to risk of type 2 diabetes in men.” *Diabetes Care*25,1898–1899.
- Johns, T. (1996). Phytochemicals as Evolutionary Mediators of Human Nutritional Physiology, *International Journal of Pharmacognosy* , 34,5,327-34.
- Popkin B.M (2002). The shift in stages of the nutritional transition in the developing world differs from past experiences. *Public Health Nutrition*, 5, 205--214.
- Popkin BM and Du S. (2003). Dynamics of the nutrition transition toward the animal foods sector in China and its implications: a worried perspective. *Journal of Nutrition* 2; 133,3898S–3906S

- Pratley RE (1998). Gene-environment interactions in the pathogenesis of type 2 diabetes mellitus: lessons learned from the Pima Indians. *Proceedings of the Nutrition Society* 57,175–181.
- Richardson, N.J., H.J.H. MacFie, and R. Shepherd. (1994). Consumer Attitudes to Meat Eating. *Meat Science* 36 (1-2), 57-65.
- Richardson, N.J.,R. Shepherd, and N.A. Elliman. (1993). Current Attitudes and Future Influences on Meat Consumption in the U.K. *Appetite* 21, (1), 41-51.
- Rivera-Ferre, M.G.(2009). Supply vs demand of agri-industrial meat and fish products: A chicken and egg paradigm? *International Journal of Sociology of Agriculture and Food*, 16(2),90-105.
- Robbana-Barnat S, Rabache M, Rialland E, Fradin J (1996). Heterocyclic amines: occurrence and prevention in cooked food. *Environmental Health Perspective*, 104,280-8.
- Rose DP, Boyar AP, Wynder EL (1986). International comparisons of mortality rates for cancer of the breast, ovary, prostate, and colon, and per capita food consumption. *Cancer* ,58,2363-71.
- Saxe GA, Major JM, Nguyen JY, Freeman KM, Downs TM, Salem CE.(2006) Potential attenuation of disease progression in recurrent prostate cancer with plant-based diets and stress reduction. *Integrative Cancer Therapies* ,5,206 –13.
- Schulze MB, Manson JE, Willett WC, Hu FB (2003). Processed meat intake and incidence of type 2 diabetes in younger and middle-aged women. *Diabetologia* 46,1465–1473
- Schulze, MB.(2006). “Dietary Patterns and Changes in Body Weight in Women.” *Obesity* 14,(8), 1444-1453.
- Seifert, R.; Höer, A.; Schwaner, I.; Buschauer, A.(1992). "Histamine increases cytosolic Ca²⁺ in HL-60 promyelocytes predominantly via H₂ receptors with an unique agonist/antagonist profile and induces functional differentiation". *Molecular Pharmacology* 42 (2), 235–241.
- Singh PN, Fraser GE (1998). Dietary risk factors for colon cancer in a low-risk population. *American Journal of Epidemiology*,148 (8),761-74.

- Sinha R, Rothman N, Brown ED, (1995). High concentrations of the carcinogen 2-amino-1-methyl-6-phenylimidazo-4, 5 pyridine PhIP occur in chicken but are dependent on the cooking method. *Cancer Research*, 55, 4516-19.
- Skog KI, Johansson MAE, Jagerstad MI, (1998). Carcinogenic heterocyclic amines in model systems and cooked foods: a review on formation, occurrence, and intake. *Food and Chemical Toxicology*, 36, 879-96.
- Slavin J. (2003). Why whole grains are protective: biological mechanisms. *Proceedings of the Nutrition Society*, 62, 129 –34.
- Slavin JL, Jacobs D, Marquart L, Wiemer K.(2001). The role of whole grains in disease prevention. *Journal of American Diet Association*, 101,780 –5.
- Snowdon DA, Phillips RL (1985). Does a vegetarian diet reduce the occurrence of diabetes? *American Journal of Public Health* 75, 507–512.
- Snowdon DA, Phillips RL, Fraser GE (1984). Meat consumption and fatal ischemic heart disease. *Preventive Medicine* , 13(5),490-500.
- Snyderwine E.G (1994). Some perspectives on the nutritional aspects of breast cancer research. Food-derived heterocyclic amines as etiologic agents in human mammary cancer. *Cancer*,74, 1070-7.
- Song, Y., Park, M. J., Paik, H. -Y.,& Joung, H. (2009). Secular trends in dietary patterns and obesity-related risk factors in Korean adolescents aged 10–19 years. *International Journal of Obesity* 34 (1), 48–56.
- Taylor EF, Burley VJ, Greenwood DC, Cade JE.(2007) Meat consumption and risk of breast cancer in the UK Women’s Cohort Study. *British Journal of Cancer* ;96,1139 – 46.
- Thiebaut HP, Knize MG, Kuzmicky PA, Hsieh DP, Felton JS (1995). Airborne mutagens produced by frying beef, pork, and a soy-based food. *Food Chemical Toxicology* ;33(10),821-8.
- Tominaga S, Kuroishi T.(1997). An ecological study on diet/nutrition and cancer in Japan. *International Journal of Cancer*; S10, 2– 6.

- Van Dam RM, Rimm EB, Willett WC, Stampfer MJ, Hu FB (2002). Dietary patterns and risk for type 2 diabetes mellitus in U.S. men. *Annals of Internal Medicine* 136, 201–209.
- VanDam R, Rimm EB, Stampfer MJ, Hu FB (2002). Dietary fat and meat intake in relation to risk of type 2 diabetes in men. *Diabetes Care* 25, 417–424.
- Verbeke W. (2001). Beliefs, attitude and behaviour towards fresh meat revisited after the Belgian dioxin crisis. *Food Quality and Preference*, 12, 489-498.
- Virtanen SM, Jaakkola L, Rasanen L, Ylonen K, Aro A, Lounamaa R, Akerblom HK, Tuomilehto J (1994). Nitrate and nitrite intake and the risk for type 1 diabetes in Finnish children: Childhood Diabetes in Finland Study Group. *Diabetic Medicine* 11, 656–662
- Vlassara H, Cai W, Crandall J, Goldberg T, Oberstein R, Dardaine V, Peppas M, Rayfield EJ (2002). Inflammatory mediators are induced by dietary glycotoxins, a major risk factor for diabetic angiopathy. *Proceedings of the National Academy of Sciences USA* 99, 15596–15601
- Walker P, Rhubart-Berg P, McKenzie S, Kelling K, Lawrence RS (2005). Public health implications of meat production and consumption. *Public Health Nutrition*, 8, 348 –56.
- Wang, Y. and Beydoun, M.A. (2009). "Meat consumption is associated with obesity and central obesity among US adults". *International Journal of Obesity* 33 (6), 621–628.
- Westhoek, T. Rood, M.v.d. Berg, J. Janse, D. Nijdam, M.A. Reudink, E. Stehfest (2011). The protein puzzle: the consumption and production of meat, dairy and fish in the European Union. PBL (Netherlands Environmental Assessment Agency), The Hague/Bilthoven.
- World Health Organization (1992). International Statistical Classification of Diseases, 10th Revision. Geneva, WHO
- WHO (2000). Obesity: preventing and managing the global epidemic, Report of a WHO Consultation. WHO Technical Report Series 894 Geneva : WHO
- WHO (2002). Reducing risks, promoting healthy life. Geneva : World Health Report.
- WHO, (2010). Global Status Report on Non-Communicable Diseases. Geneva : WHO
- Willett WC, Stampfer MJ, Colditz GA, Rosner BA, Speizer FE (1990). Relation of meat, fat, and fiber intake to the risk of colon cancer in a prospective study among women. *New England Journal of Medicine*, 1664-1672.

- Williams DE, Prevost AT, Whichelow MJ, Cox BD, Day NE, Wareham NJ (2000) A cross-sectional study of dietary patterns with glucose intolerance and other features of the metabolic syndrome. *British Journal of Nutrition* 83, 257–266
- Woodward, J. (1988). Consumer Attitudes towards Meat and Meat Products. *British Food Journal* 90 (3), 101-104.
- World Cancer Research Fund/American Institute for Cancer Research (1997). Food, nutrition and the prevention of cancer: a global perspective. Washington, DC, *American Institute for Cancer Research* , 530-534.
- World Cancer Research Fund/American Institute for Cancer Research (2007). Food, nutrition, physical activity and the prevention of cancer: a global perspective. Washington DC: AICR
- WHO (2005). Preventing Chronic Disease: A Vital Investment. Geneva.
- World Health Organization (2007). Prevention of cardiovascular disease: guideline for assessment and management of cardiovascular risk. WHO Press.
- World Health Organization (1992). World Summit for Children: A Practical Handbook for Multiple-Indicator Surveys: New York: WHO
- Young F, Critchley JA, Johnstone LK, Unwin NC (2009). A review of co-morbidity between infectious and chronic disease in Sub Saharan Africa: TB and Diabetes Mellitus, HIV and Metabolic Syndrome, and the impact of globalization. *Globalization and Health* 5,9
- Xu W-H, Dai Q, Xiang Y-B (2007). Nutritional factors in relation to endometrial cancer: a report from a population-based case– control study in Shanghai China. *International Journal of Cancer*; 120,1776 – 81.

APPENDICES

Appendix 1: Consent form

Title: Factors associated with attitude and practice of red meat consumption and awareness of lifestyle diseases among residents of Laiser Hill location, Kajiado North County.

Institutions: Jomo Kenyatta University of Agriculture and Technology and Kenya Medical Research Institute (KEMRI)

Location: Laiser Hill, Kajiado North County

Investigator: Lilian Nyomenda Bosire

Supervisors

1. Professor Anselimo Makokha-JKUAT
2. Dr Charles Mbakaya – KEMRI

Purpose of the research

The purpose of this study is collect information to establish the attitudes and perceptions of red meat consumption among residents of Laiser hill, to determine meat consumption patterns among adult residents of Laiser hill and to establish awareness levels of lifestyle diseases among red meat consumers.

Description of the research

This research will involve your participation in answering loosely structured questionnaire that will take about one hour to complete. You are being invited to take part in this research because we feel that your input as a resident of this area will contribute much to our understanding and knowledge of lifestyle diseases.

Potential harm, discomforts and risks

No physical harm will come to you as you take part in the research however. There is a risk that you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics. However, we do not wish for this to happen. You do not have to answer any question or take part in the survey if you feel the questions are too personal or if talking about them makes you uncomfortable.

Potential benefits

Your participation is likely to help us find out more about how to prevent and treat lifestyle diseases in the community and also guide policy makers and community leaders on policies that can be implemented to promote better lifestyle choices in our community.

Confidentiality

We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research will be kept private. Any information about you will have a number on it instead of your name. Only the researcher will know what your number is and we will lock that information up with a lock and key. Data will be kept for a period one year after completion of research.

Compensation

There is no direct compensation to volunteers for their participation

Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You may change your mind later and stop participating even if you agreed earlier. If you withdraw your information will be confiscated so that no other

person can have access to it.

Contact information

If you have any questions or concerns about the study or in the event of a study related injury you may contact me on:

Address: 20944-00100, Nairobi.

Telephone number: 0724315377

e-mail:i2008c@yahoo.co.uk

My supervisors:

Professor A.O. Makokha –JKUAT

Telephone 0713817436

Dr Charles Mbakaya –CPHR

Telephone 0722846964

For any questions pertaining to the rights as a research participant the contact person is:

The Secretary, KEMRI Ethics Review Committee,

P.O Box 54840-00200, Nairobi.

Telephone numbers 020-2722541, 0722205901, 0733400003

Email:erc@kemri.org

Consent

Should you agree to participate in the study, please sign your name below, indicating that you have read and understood the nature of the study, your responsibilities as a study participant, the inconveniences associated with voluntary participation in the study

and that all your questions and concerns concerning the study have been answered satisfactorily. You will receive a copy of this signed consent form to take away with you.

Signature of Study Participant and Date

Signature of Person Obtaining Consent and Date

Signature of Witness and Date.....

FOMU YA KIBALI

Mada: Mambo yanayohusiana na maoni na mazoeo ya kula nyama nyekundu na kiwango cha ujuzi kuhusu magonjwa yasiyoambukizwa kwa wakazi wa Laiser Hill, counti ya Kajiado kusini.

Taasisi: Jomo Kenyatta University of Agriculture and Technology na Kenya Medical Research Institute (KEMRI)

Eneo : Laiser Hill, Kajiado North County

Mchunguzi: Lilian Nyomenda Bosire

Wasimamizi

1. Professor Anselimo Makokha-JKUAT
2. Dr Charles Mbakaya – KEMRI

Lengo la utafiti

Majongwa yasioyaambukizwa yameenea na kufanya maafa ya watu tuliowapenda na hata kutegemea. Tungependa kutafuta njia za kupambana na magonjwa haya na kupata suluhu. Tunamatumaini kuwa utaweza kutusaidia kwa kutueleza yale unayoyajua kuhusu majonjwa haya na zile itikada umechukua kujisalimisha kutokana na magojwa haya. Maoni yako yataenda mbali kuchangia katika uwekaji wa mikakati ya kuzuia uenezaji wa magonjwa haya.

Utaratibu wa utafiti

Utafiti huu utakuwajibu kujibu maswali kadhaa kwa muda usiopiya saa moja. Umealikwa kuchangia kwa utafiti huu kama mkaazi wa eneo hili kwani maoni yako yatachangia pakubwa sana.

Hatari/ machungu

Hakuna madhara yoyote itatokea kwa wale wote watakaohusika katika utafiti huu.

Faida/ manufaa

Utafiti huu ni kwa ajili ya masomo. Matokeo ya utafiti huu yatafaidi sayansi ya kiafya kuweza kushughulikia mahitaji ya afya katika jamii yetu.

Malipo ya utafiti

Yeyote ambaye angependelea kuhusishwa katika utafiti huu hatahitajika kutoa wala hatapewa aina yoyote ya malipo kwa usaidizi atakaotoa.

Kutojihusisha

Kama mhusika, una uhuru wa kukataa kuhusishwa katika utafiti huu wala hakuna hatari, machungu ama vitisho vyovyote vitakavyoambatana na uamuzi wako.

Usiri

Matokeo na maneno yote yatakayotokana na utafiti huu yatawekwa kwa usiri wa hali ya juu. Hakuna jina la mhusika litatumiwa; ilhali nambari maalumu tu ndizo zitakazotumika. Hoji zote zitawekwa ndani ya kabati na kufungwa ndipo ziwe salama. Baada ya mwaka mmoja zitateketezwa kwa moto.

Kujitolea

Ndio uwe mhusika katika utafiti huu, utajitolea kwa moyo wako wote na wala hautalazimishwa na yeyote. Tunashukuru kujitolea kwako. Unaweza kuwasiliana nami katika

Sanduku la Posta: 20944-00100, Nairobi.

Simu Nambari: 0724315377

Barua pepe: i2008c@yahoo.co.uk

AMA

Professor A.O. Makokha –JKUAT

Telephone 0713817436

Dr Charles Mbakaya –CPHR

Telephone 0722846964

Kwa maswali yeyote kuhusu kibali changu kufanya utafiti huu unaweza wasiliana na:

Secritari, KEMRI Ethics Review Committee

P.O.BOX 54840-00200, Nairobi.

Nambari ya Simu 020-2722541, 0722205901, 0733400003

Barua pepe :erc@kemri.org

Kibali cha kuhusishwa

Ukukubali kujnihusisha weka sahihi yako kuonyesha ya kwamba umesoma ama umesomewa na kuelewa vizuri sana maana ya kuhusishwa katika utafiti huu na kwamba umeelezewa vizuri sana jukumu lako.

Sahihi ya mhusika an tarehe -----

Sahihi ya mtafiti na tarehe-----

Sahihi ya mshahidi na Tarehe -----

APPENDIX 2: SEMI- STRUCTURED QUESTIONNAIRE

Name of interviewer.....serial number

Date.....

We wish to learn about your knowledge, attitudes and practices regarding lifestyle diseases associated with red meat consumption. The information you provide will help in implementing better preventive measures. Your answers will not be released to anyone and will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. Your participation is voluntary and you may choose to stop at any time. Thank you for your assistance.

Please tick the most suitable answer.

SOCIO-DEMOGRAPHIC QUESTIONS

1. What is your age bracket?

1. 18-25

2. 26–33

3. 34–42
 4. 43-50
 5. above 50
2. What is your gender?
 1. Male
 2. Female
 3. What is the highest level of education you have completed?
 1. No school
 2. Primary
 3. Secondary
 4. Tertiary
 4. What is your main occupation?
 1. Formal employment
 2. Casual employment
 3. Businessperson
 4. Farmer
 5. Others (specify)
 5. What is your marital status?
 1. Married
 2. Single
 3. Separated
 4. Divorced

ATTITUDE ON RED MEAT CONSUMPTION

6. What is your general perception/opinion towards consumption of red meat?
7. In your opinion what are the health benefits of consumption of red meat?

8. What characteristic / feature is the most important when you buy meat products?

1. Nutritive value
2. Taste
3. Price
4. Producer/Manufacturer
5. Package

PRACTISES OF RED MEAT CONSUMPTION

9. How do you usually prepare the meat?

1. Boiled
2. In oven
3. Barbecue
4. Fried In oil
5. Stewed
6. Others (specify)

10. How do you prefer your meat?

1. Well done
2. Medium cooked
3. Rare (cooked slightly)

11. During the last 2 years, the quantity of meat purchased monthly or weekly has:

(Please give reason why)

1. It has increased
2. It has decreased
3. It has remained the same

12. How many times in a week do you consume fried beef or goat including lunch time either as itself or mixed with other dishes e.g vegetables?

1. Everyday
2. After every other day
3. Twice a week
4. Once a week
5. Other (specify)

13. However many times you consume the red meat what quantity do you take at once?

1. Less than half a kg
2. between half a kg and 1 kg
3. More than 1 kg
4. Other (please specify)

14. In a week how many times do you consume any of the following processed meat (sausages, hotdogs, smokies or hamburgers)?

1. 1-2 times a week
2. 3-4 times a week
3. 4-5 times a week
4. Don't take

15. How many times in a week do you consume roast meat (nyama choma) either at home or away?

1. Once on the weekends
2. 2-3 times in a week
3. More than 3 times
4. Others(specify)

AWARENESS OF LIFESTYLE DISEASES

16. Are you aware of what lifestyle diseases are?

1. Yes
2. No

17. In your opinion, how would you best define lifestyle diseases?

1. They are diseases that come about because of old age
2. They are diseases that come about because of our ethnicity and genetics
3. They are diseases that come about as a result of our lifestyle choices
4. They are diseases that arise we get from other/infectious diseases.

18. In your opinion do you think consumption of red meat can be a factor that causes lifestyle diseases?

1. Yes
2. No

19. Are you aware that high intakes of red meat can contribute to the following diseases? Please answer yes or no to each disease according to the best of your knowledge

Diseases	Yes	No
1. Diabetes		
2. Cancer		
3. Obesity		
4. Hypertension (high blood pressure)		
5. Cardiovascular diseases (diseases of the heart e.g. heart attack)		

20. In your opinion which other factors can cause a person to get a lifestyle disease?

21. In your opinion, who can get a lifestyle disease?

1. Anybody
2. Only poor people
3. Only alcoholics
4. Only drug user
5. Other (please explain):

22. Can lifestyle diseases be cured?

1. Yes
2. No

FOMU YA MASWALI KWA WAKAZI WA LAISER HILL

Jina la anyehoji.....namba ya fomu

Tarehe.....

Tungependa kujua zaidi juu ya maarifa,mtazamo na mazoea ya kula nyama nyekundu na ile hali ya kujua magonjwa yanayohusishwa na ukulaji wa nyama nyekundu. Maelezo utakayotupatia hayataonyeshwa yeyote nayatabakia siri.Jina lako halitaandikwa kwa fomu hii au kwingine.Kujihusisha kwako ni kwa hiari na unaweza kukataa wakati wowote. Asante kwa usaidizi wako.

Tafadhali chagua jibu inayokufaa

MASWALI YA KIJAMII NA IDADI YA WATU

1. Una umri upi?
 1. 18-25
 2. 26-33
 3. 34-42
 4. 43-50
 5. Zaidi ya 50
2. Jinsia yako ni ipi?

1. Kiume
2. Kike
3. Umesoma hadi kufikia wapi?
 1. Sijasoma
 2. Kidato cha nane
 3. Sekondari
 4. Chuo kikuu
4. Kazi yako haswa ni gani?
 1. Nimeandikwa kazi
 2. Vibarua vya muda
 3. Mfanyibiashara
 4. Mkulima
 5. Zingine
5. Jinsia yako kwa jamii ni ipi?
 1. Nimeolewa
 2. Sijaolewa
 3. Tumewachana kwa muda
 4. Tumetalakiana

KIPIMA MTAZAMO KUHUSU ULAJI WA NYAMA NYEKUNDU

6. Maoni yakoni ipi kuhusu ulaji wa nyama nyekundu?
7. Kwa maoni yako ni faida gani unaweza pata kutokana na ulaji wa nyama nyekundu?
8. Ni kitu gani unachozingatia unapotaka kununua nyama? onyesha kwa alama kutoka 1 hadi 5, (1) ikiashiria iliyo muhimu sana na (5) ikiashiria isiyomuhiimu sana.
 1. Umuhimu wake kwa mwili

2. Inavyoonja
3. Bei
4. Mwenye kutengeneza
5. Vile imefungwa

MAZOEYA YA KULA NYAMA NYEKUNDU

9. Kawaida unatayarisha aje nyama yako?

1. Nachemsha
2. Tanuri
3. Barbecue
4. Nachomakwa mafuta
5. Ninakaanga
6. Zingine (zitambulish)

10. Unapendelea nyama yako iive kiasi gani?

1. Iive kabisa
2. Iive kiasi tu
3. Iive kidogo

11. Kwa muda wa miaka miwili iliyopita kiasi ya nyama unayonunua kwa mwezi au wiki:

(tafadhali tupe sababu)

1. Imeongezeka
2. Imepungua
3. Imebakia ile ile

12. Ni mara ngapi kwa wiki unakula nyama iliyokaangwa hata ikiwa imechanganywa na vyakula vingine?

1. Kila siku
2. Baada ya siku moja

3. Mara mbili kwa wiki

4. Mara moja kwa wiki

5. Zingine(zitambulishe)

13. Kulingana ya uzoefu wako ni kiwango kipi unachukua mara hiyo?

1. Chini ya nusu kilo

2. Kati ya nusu kilo na kilo

3. Zaidi ya kilo

4. Zngine(zitambulishe)

14. Kwa wiki ni mara ngapi unakula nyama zifuatazo (Sausage, Hotdogs, Smokies, Hamburgers)?

1. Mara 1-2 kwa wiki

2. Mara 3-4 kwa wiki

3. Mara 4-5 kwa wiki

4. Sili

15. Kwa wiki ni mara ngapi unakula nyama choma nyumbani au kwingine

1. Mara moja wakati wa jumamosi au jumapili

2. Mara 2-3 kwa wiki

3. Zaidi ya mara 3

4. Zingine (zitambulishe)

KUJUA KWA MAGONJWA YASIYOAMBUKIZWA

16. Unatambua majongwa yasiyoambukizwa ni gani?

1. Ndio

2. Hapana

17. Kwa maoni yako ni gani kati ya hizi inayoeleza maana ya majongw yasiyoambukizwa?

1. Ni magonjwa yanayokuja juu ya uzee
2. Ni magonjwa yanayokuja juu ya ukabila wetu au ukoo wetu
3. Ni magonjwa yanayokuja juu ya jinsi tunavyoishi maisha yetu
4. Ni magonjwa yanayokuja juu ya magonjwa mengine

18. kwa maoni yako unadhani kula kwa nyama nyekundu kunachangia kupata magonjwa haya

1. Ndio
2. Hapana

19. Unajua kuwa ulaji wa kiwango kikubwa cha nyama nyekundu kumehusishwa na magojwa yafuatayo? tafadhali jibu ndio ama hapana kwa kila ugonjwa kadri ya uwezo wako

1. Ugonjwa wa sukari
2. Saratani
3. Kunona kunaopindukia
4. Shinikizo la damu
5. Magonjwa ya moyo

20. Kwa maoni yako ni nini kingine kinaweza changia kupata magonjwa haya

21. Kwa maoni yako ni nani anaweza pata magonjwa haya

1. Yeyote
2. Wasiojiweza kiuchumi
3. Wanaochukuwa pombe zaidi
4. Wanaochukuwa madawa ya kulevyo
5. Wengine (watambulisho)

22. Magonjwa haya yana tiba?

1. Ndio
2. Hapana

Asante sana kwa kushiriki.

**APPENDIX 3: SCIENTIFIC CLEARING COMMITTEE AUTHORIZATION
LETTER**



KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel (254) (020) 2722541, 2713549, 0772-206301, 0735-130303; Fax: (254) (020) 2720030
E-mail: director@kmri.org info@kmri.org Website: www.kmri.org

ESACIPAC/SSC/100910

25th September, 2012

Lilian Nyomenda Bosire

Thro'
Director, CPIIR
NAIROBI

Forwarded
[Signature]
26/09/2012

REF: SSC No. 2388 (New) – Attitudes and practices of red meat consumption and awareness of lifestyle diseases among residents of Laiser Hill Location, Kajiado North County.

I am pleased to inform you that the above mentioned proposal, in which you are the PI, was discussed by the KMRI Scientific Steering Committee (SSC), during its 194th meeting held on 4th September, 2012 and has since been approved for implementation by the SSC.

Kindly submit 4 copies of the revised protocol within 2 weeks from the date of this letter i.e, 10th October, 2012 to SSC for onward transmission to ERC office.

We advise that work on this project can only start when ERC approval is received.

Sammy Njenga, PhD
SECRETARY, SSC

Encl.

In Search of Better Health

APPENDIX 4: ETHICAL CLEARANCE



KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54940 - 00200 NAIROBI Kenya
Tel: (254) (020) 2722641, 2713349, 0722-205901, 0733-400003; Fax: (254) (020) 2720090
E-mail: director@kemri.org info@kemri.org Website: www.kemri.org

KEMRI/RES/7/3/1

March 11, 2013

TO: LILLIAN NYOMENDA BOSIRE,
PRINCIPAL INVESTIGATOR

THROUGH : DR. YERI KOMBE;
DIRECTOR, CPHR

RE: SSC PROTOCOL NO. 2388 – REVISED (*RE-SUBMISSION*):
ATTITUDES AND PRACTICES OF RED MEAT CONSUMPTION AND
AWARENESS OF LIFESTYLE DISEASES AMONG RESIDENTS OF
LAISER HILL LOCATION, KAJIADO NORTH COUNTY

Forwarded
15/03/2013

We acknowledge receipt of:

- The Revised Study Protocol – version 1.1 dated January 18, 2013;
- The Revised Informed Consent Documents – English and Kiswahili versions.

This is to inform you that the Ethics Review Committee (ERC) reviewed the documents listed above and is satisfied that the issues raised at the initial review have been adequately addressed.

The study is granted approval for implementation effective this **11th day of March 2013**. Please note that authorization to conduct this study will automatically expire on **March 10, 2014**. If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by **January 28, 2014**.

Any unanticipated problems resulting from the implementation of this protocol should be brought to the attention of the ERC. You are also required to submit any proposed changes to this protocol to the ERC to initiation and advise the ERC when the study is completed or discontinued.

You may embark on the study.

Sincerely,

KEAS
DR. ELIZABETH BUKUSI,
ACTING SECRETARY,
KEMRI/NATIONAL ETHICS REVIEW COMMITTEE

In Search of Better Health

APPENXIX 5

APPENDIX 6: ETHICS TRAINING

CITI Collaborative Institutional Training Initiative

Biomedical Research - Basic/Refresher Curriculum Completion Report Printed on 5/25/2012

Learner: lilian bosire (username: nyomenda)

Institution: Kenya Medical Research Institute

Contact Information 20944

nairobi, 00100 kenya

Department: itromid

Phone: 0724315377

Email: i2008c@yahoo.co.uk

Biomedical Research - Basic/Refresher: Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in biomedical research with human subjects.

Stage 1. Basic Course Passed on 03/26/12 (Ref # 7626954)

Required Modules	Date Completed	Score
Belmont Report and CITI Course Introduction	03/12/12	3/3 (100%)
History and Ethical Principles	03/12/12	5/6 (83%)
Basic Institutional Review Board (IRB) Regulations and Review Process	03/12/12	5/5 (100%)
Informed Consent	03/12/12	3/4 (75%)
Social and Behavioral Research for Biomedical Researchers	03/12/12	4/4 (100%)
Records-Based Research	03/12/12	2/2 (100%)
Genetic Research in Human Populations	03/12/12	2/2 (100%)
Research With Protected Populations - Vulnerable Subjects: An Overview	03/12/12	4/4 (100%)
Vulnerable Subjects - Research Involving Prisoners	03/13/12	4/4 (100%)
Vulnerable Subjects - Research Involving Children	03/13/12	3/3 (100%)
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates	03/13/12	3/3 (100%)
International Studies	03/13/12	1/1 (100%)
FDA-Regulated Research	03/16/12	5/5 (100%)

<https://www.citiprogram.org/members/learners/learnbystage.asp?srkeyID=19AEE2B3-AE62-4C8D-AFB...>