PREVALENCE OF SEDENTARY LIFESTYLE AMONG WORKERS IN KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANISATION'S INSTITUTES IN NAIROBI METROPOLITAN

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Prevalence of Sedentary Lifestyle among Workers in Kenya Agricultural and Livestock Research Organisation's Institutes in Nairobi Metropolitan

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DECLARATION

The research proposal is my original work and has not been submitted for the award of a degree in any other university.

Signature……..Date……

Richard M Njue

This research proposal has been submitted for examination with our approval as University supervisors:

Signature……..Date……

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JKUAT, Kenya

Signature……..Date……

Dr Florence Muchiri

KALRO,

DEDICATION

This work is dedicated to my wife Selina for the support which gave me peace of mind.

ACKNOWLEDGEMENT

The authour wishes to express his gratitude to KALRO staff and management in the selected institutes who willingly participated in this study.

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LIST OF NOMENCLATURE AND ABBREVIATIONS

AU	African Union
BMI	Body Mass Index
CLBP	Chronic Low Back Pain
FGD	Focus Group Discussion
ILO	International Labour Organization
KALRO	Kenya Agricultural and Livestock Research Organization
KII	Key Informant Interview
MVPA	Moderate to Vigorous Physical Activity
NCDs	Non Communicable Diseases
NARL	National Agricultural Research Laboratories
SPSS	Statistical Package for Social Sciences
SDG	Sustainable Development Goals
STISA	Science Technology and Innovation Strategy for Africa
VAT	Visceral Adipose Tissue
WC	Waist Circumference
WHtR	Waist to Height Ratio
WHO	World Health Organization

ABSTRACT

People who spend too much time being sedentary are more likely to develop musculoskeletal disorders and other non- communicable diseases (NCDs). This health risk is likely to increase with increasing sedentary office setting and lifestyle. In Kenya, the sedentary lifestyle is on the increase while its baseline data has not been documented appropriately. This study investigated prevalence of sedentary lifestyle among workers in seven selected institutes within Kenya Agricultural and Livestock Research Organisation (KALRO). The study concentrated on a population of 820 office and laboratory workers in seven KALRO institutes located in the Nairobi Metropolitan. The sample size (n= 96), was calculated using Daniel's formula for prevalence studies. A Cross-sectional survey was employed on respondents and subjective questionnaires administered. Waist to height ratio (WHtR) and waist circumference (WC) was measured using a stretch resistant tape in accordance with WHO, 2008 guidelines. The WHtR (> 0.5) revealed that prevalence of overweight and central obesity was high in females, (92.6%) than in males (88%) while (90.38%) was for combined gender. The WHtR increased with income, ($\tau_b = 0.516, p=0.07$) and had an influence on ailmements such as fatigue and muscle soreness after a days's work ($p=0.657$). Factors influencing sedentary lifestyle most of which were outside the workplace setting were: use of motorized transport (73%) which increased with earnings and social economic status $p<0.05$ with no output for respondents earning less than kenya shillings 15,000; screen time (64.7%); reliance on house help for domestic chores (56.5%) and occupational (78.4%) with $p>0.05$ for sitting for office and laboratory workers. None of the sampled institutes had invested in ergonomic chairs or policies/programs for NCDs screening and management. The study concluded that there was a high prevalence of sedentary lifestyle among KALRO employees in the selected institutes resulting in overweight, central obesity and related ailments. These findings provide a basis for management in KALRO to encourage physical activity among its workers by intervening at individual, environmental and policy level.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

A sedentary job is characterized by one requiring much sitting with little or no exercise (American Heritage Dictionary, 2016). Most of the sedentary jobs are the white collar, a category that majority of Kenyans associate with high income and prestige (Christine, 2010). This category of workers is at a greater risk of low occupational physical activity and high sedentary time (Smith *et al,* 2016) and are more likely to develop chronic conditions and other non- communicable diseases (NCDs). In Kenya, the fight against these diseases which account for 27% of deaths suffered by those between 30 and 70 years is complicated by cultural factors including the perception of overweight and obesity as a sign of prosperity associated with white collar jobs (Shi, 2015). Further, the actual burden of these diseases is poorly understood and people don't know that they suffer from the condition and therefore don't seek treatment (Ali and Xavier, 2017). This lifestyle among white-collar workers both at work and at home has been on the increase while baseline data on sedentary lifestyle has not been documented appropriately and may not be nationally representative or accurate (Kenya Stepwise Survey for NCDs report, 2015). The reason for this increase may be attributed to a large shift towards less physically demanding work in the office setting, passive transport, technological advances in the house, and more passive pursuits for leisure thus making the working population to be more exposed to sedentary behaviour (Parry & Straker, 2013). Consequently, absenteeism, loss of man-hours and insurance premiums have increased due to associated lifestyle diseases (March & McLennan, 2017).

Non-communicable diseases (NCDs) are the leading causes of morbidity and mortality globally, causing more deaths than all other causes combined, and they strike hardest at the world's low and middle – income populations (Kenya National Strategy for the Prevention and Control of NCD, 2015). The major NCDs according

to the report are cardiovascular conditions (13%), cancers (7%), and diabetes (4.56%). This trend is worrying since according to WHO (2010) report on global status, NCDs are projected to increase by 15% globally between 2010 and 2020. The greatest increase will be in Africa, the Eastern Mediteranean, and Soth- East Asia, where they will increase by 20%.

A study carried out in Nigeria on the prevalence of physical activity among adults in a metropolitan Nigerian city by Adewale *et al,* (2013), revealed that the proportion of adults that met the WHO recommendations and guidelines of physical activity among Nigerian adults varied significantly by socio-demographic characteristics and that those who were divorced /separated, did not own a car, and had a lower social economic status, low education level and blue collar occupation were likely to be physically active. Factors that promote sedentary behaviour include leisure, transportation, housework and occupation domain (Lina *et al*, 2016). Out of the four domains, leisure, transportation and housework happen outside the workplace. According to Murtagh *et al*, (2017) interventions targeting outside of workplace setting may be at individual level (behavioural change after learning through seminars/counselling about health risks associated with sedentary lifestyle), environmental level (limiting TV viewing by installing lockout systems that prompt change of behaviour) and policy level (providing prompts, and invitation to encourage standing events).

On transportation domain, Owen *et al,* (2011) argue that use of cars in the suburban areas has lengthened the period of sedentariness which refers to the amount of time spent sitting in the cars to perform a journey to and from workplaces and short journeys to attend to demands of family and friends. Further on occupation domain, employers should ensure that their workers do not spend a significant amount of time sitting as a way of providing a safe system of work (Allana, 2018). However, the level of implementation of these health services in most of the countries with an expanding economy is low (Mrema *et al,* 2015). Globally, the content and multidisciplinary nature of occupational health services correspond to international

guidance but the coverage, comprehensiveness and content of services remain largely incomplete due to lack of infrastructure and shortage of multi-professional human resource (Rantanen *et al,* 2017). In Kenya, the Occupational Health and Safety Act, 2007 is not explicit on duties of the employer in reduction and prevention of sedentary lifestyle described by the World Day of Safety and Health at Work, (2015) as a new hazard fuelled by the growing use of computers and automated systems.

This study was set to investigate sedentary lifestyle prevalence among office and laboratory workers in selected institutes in Kenya Agricultural and Livestock Research Organization (KALRO). The study focused on this cadre of staff because office and laboratory occupation is characterised by sedentary behaviour. The findings of this study provide a basis for management in KALRO to encourage physical activity among its workers by intervening at individual, environmental and policy level for a reduced sedentary lifestyle.

Metropolitan or urban setting has an influence on sedentary lifestyle and adolescents from urban settings are more likely to be overweight and obese as observed by Xu *et al*, (2010). This coupled with the proximity of the selected institutes informed the decision to choose the Nairobi Metropolitan region as the study area. The selected institutes comprised of coffee, horticulture, veterinary, agricultural mechanisation, genetic resource, NARL, food crops and biotechnology as shown in Kenya (figure 1-1).

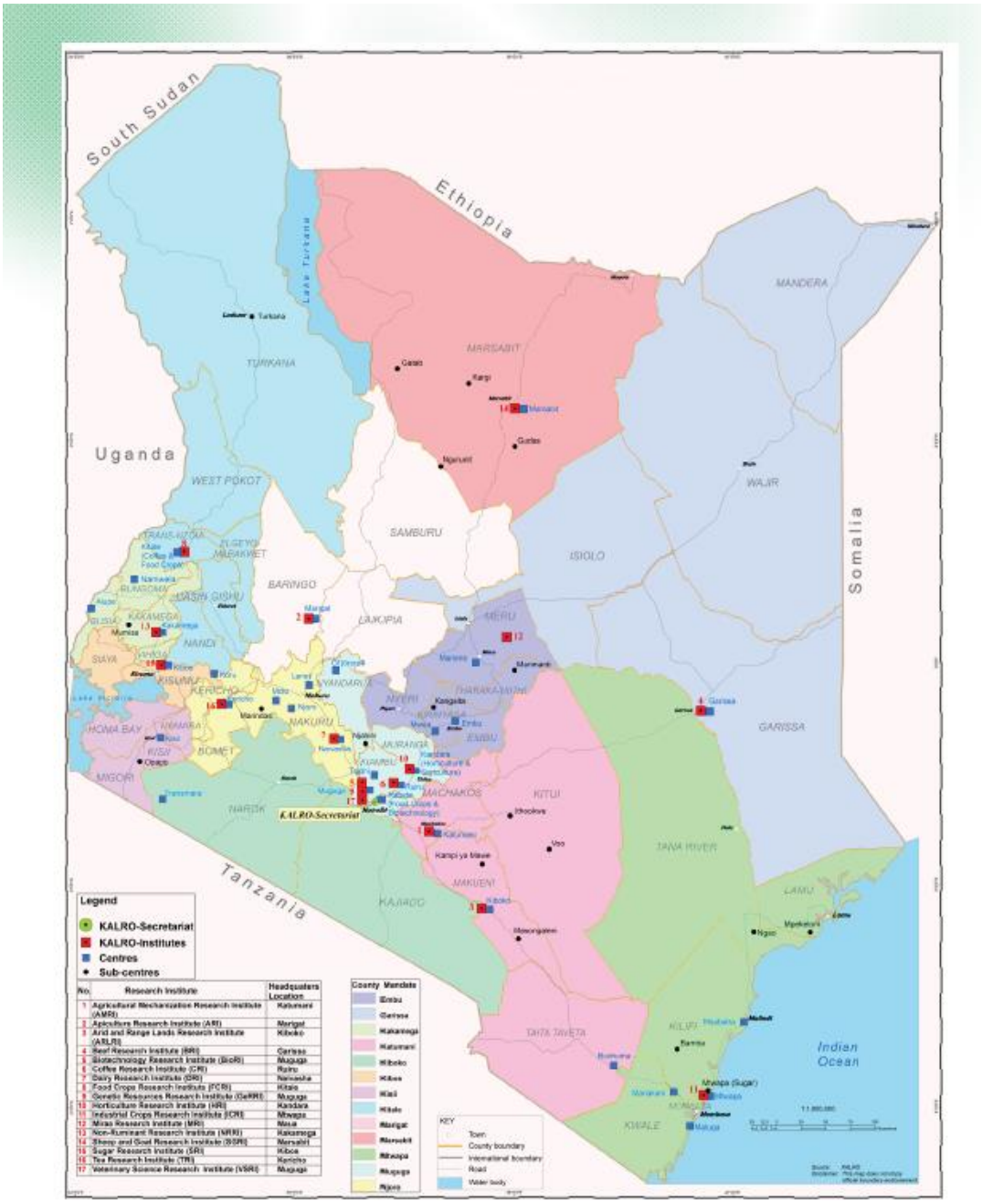

Figure 0.1: KALRO Institutes their location and county mandates

Source: KALRO Strategic Plan 2017-2021

1.2 Statement of the problem

The white-collar jobs which are characterized by high sedentary time are associated by a majority of Kenyans with hefty pay cheque and prestige. However, the workers in these jobs are at a greater risk of low occupational physical activity and high unbroken sitting time due to the less physically demanding work in the office setting, passive transport, technological advances in the house/office and pursuits for leisure. It has been established from other studies that there exists a relationship between sedentary lifestyle and chronic non-communicable diseases (Bay and Hamilton,2003). Office and laboratory occupation is permeated by this sedentary behavior and puts the workers at risk of chronic health conditions.

These workers are more likely to develop chronic conditions and other non – communicable diseases (cardiovascular, diabetes and obesity, colon cancer, osteoporosis, and lipid disorders) which in Kenya, accounts for 27% of deaths suffered by workers in their productive life (30-70) years (Shi, (2015). Other associated consequences are absenteeism, loss of man hours and increased insurance premiums. According to Stuart and Francesc (2017), hypertension disease rates resulting from sedentary lifestyle were more in East Africa (25%) than Western Africa (15%) and that South Africa had the highest prevalence with the disease ranging from 42% to 54% which is considered highest in the continent. Globally, the age – standardised prevalence of sedentary lifestyle was 27.5% in 2016 with difference between sexes of more than 8 points (23.4% in men , 31.7% in women) (Regina *et al,* 2018).

1.3 Justification of the study

Most of the sedentary jobs are the white collar jobs (Christine, 2010) and workers in this category are at a greater risk of low occupational physical activity, high sedentary time (Smith *et al,* 2016) and are more likely to develop chronic conditions and other non- communicable diseases (NCDs). This study was set to analyse prevalence of sedentary lifestyle among the office and laboratory workers in Kenya

Agricultural and Livestock Research Organisation (KALRO) selected research institutes in Nairobi Metropolitan. Office and laboratory occupation is permeated by this sedentary behavior and puts the workers at risk of chronic health conditions.

With a population of more than 2000 employees, KALRO is a major employer in the agricultural and livestock sector in Kenya. The organisation plays a critical role in the realisation of Vision 2030 which places major emphasis on research in technology generation and creation of new knowledge considered as kingpins in national development. These goals will be achieved if the health and safety of employees are treated as paramount as advocated by the United Nations Sustainable Development Goals (SDGs) goal three, Science Technology and Innovation for Africa (STISA, 2024), and Kenya Vision 2030 where health is a constituent of social pillars. The results of this study provide a basis for policymakers in KALRO to develop policies and programs that encouraged physical activity in and outside the workplace and invest in programs that prenvent chronic and NCDs among workers.

1.4 Hypothesis

H_o The Waist to Height Ratio (WHtR) of workers in KALRO is no different from safe limits set by WHO.

1.5 Objective

1.5.1 Main objective

To determine the prevalence of sedentary lifestyle among workers in KALRO's research institutes in Nairobi Metropolitan.

1.5.2 Specific objectives

a) To establish policies and programs available to mitigate effects of sedentary lifestyle of the study employees in KARLO institutes located in Nairobi Metropolitan.
b) To assess the anthropometric indices (WC,WHtR) of the study employees in KARLO institutes in Nairobi metropolitan.
c) To identify the factors influencing sedentary behaviour of the study employees in KARLO institutes in Nairobi Metropolitan.

1.6 Research questions

a) What are the policies and programs available to mitigate effects of sedentary lifestyle among the study employees in KALRO institutes in Nairobi Metropolitan?
b) Who are at risk of physical in-activity among employees in various KALRO institutes in Nairobi Metropolitan?
c) What are the factors influencing sedentary behaviour of the study employees in KALRO institutes in Nairobi Metrpolitan?

1.7 Scope of the study

The study focused on the prevalence of sedentary lifestyle among the employees in KALRO institutes located in Nairobi metropolitan. It identified factors influencing sedentary behaviour among the employees and those that might be at risk of physical inactivity. It also investigated the policies and programs available in KALRO which might mitigate effects of sedentary lifestyle. The study area covered seven out of the seventeen KALRO institutes in Kenya.

Conceptual framework

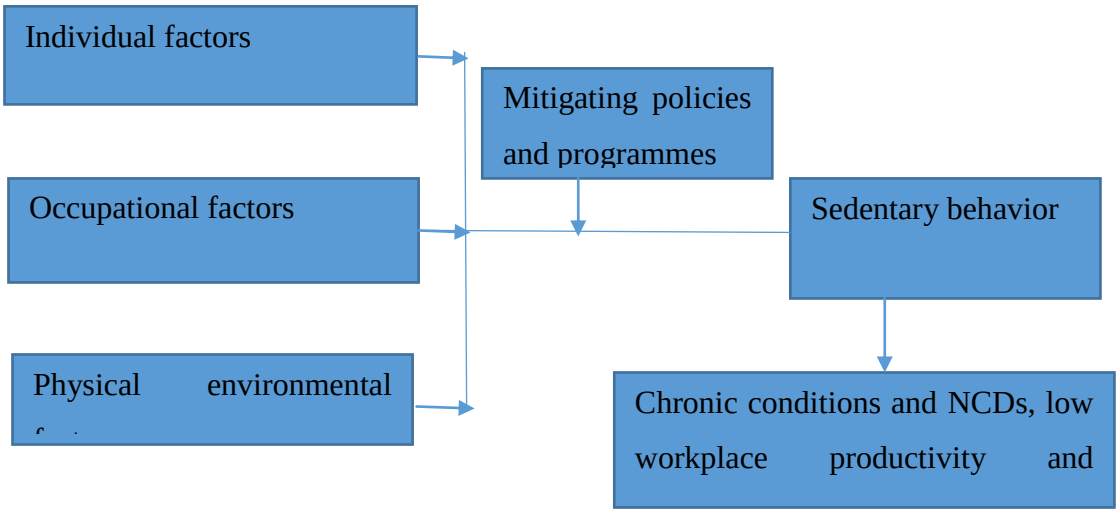

Figure 0.2: Conceptual framework

Figure 1-2 shows the independent or casual variables which contribute to sedentary behaviour. These include individual, occupational, and physical environmental factors. The intervention (modifying) variable were the mitigation policies and programs put in place by the employer and the dependent variable (outcome) without the modifying variable was chronic conditions and NCDs.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical principles

Most of the sedentary jobs are the white collar jobs which majority of Kenyans associate with hefty pay checks and prestige (Christine, 2010). White collar workers are at a greater risk of low occupational physical activity and high sedentary time (Smith *et al*, 2016). Over time, there has been a large shift towards less physically demanding work such as increasing use of computers in the office, passive transport, use of technology in the house (washing machines, dish washers etc.) , and more passive pursuits for leisure (Parry and Straker,2013). This sedentary lifestyle leaves no time for physical activity (Kirigo, 2012). Sedentary life style is contrary to human nature since man was created to be active and energetic: this shift from a physically demanding life to reduced physical activities have exposed people to high risk of developing various health conditions such as obesity, hypertension, cardiac disorders, vitamin deficiencies, cancers, to mention but a few (Mfrekemfon *et al*,2015).

As early as 17th century, sedentary life style has been associated with ill health as revealed by Berdino Ramazani, an occupational physician who discovered that sedentary life style with its associated physical inactivity has adverse effects on metabolism, cardiac output, physical function and wellbeing (Owen *et al,* 2010). Most adults spend about 8-12 hours per day being sedentary out of the average 16 waking hours (Mathews *et al*, 2008). According to Hamilton *et al*, (2008) being too sedentary has negative health effects. This occurs because sitting for long period results in reduced use of the large muscles in the back, trunk and legs. These large muscles consume much of the body's intake of sugars and fats. So not using these muscles when sitting down, means there are higher than normal levels of blood glucose and fats increasing the risk of range of health conditions such as obesity. When one is seated, the lower part of the leg has no activity. Being in this position on

a regular basis predisposes a person to blood clots. Desk jobs also tends to make a person to develop a bad posture adopted from the kind of chair they are using. This brings about fatigue and muscle soreness for the individual who does his work while seated (Kirigo, 2012). People who spend too much time being sedentary have a higher mortality rate than people who are less sedentary and are more likely to develop type 2 diabetes and cardiovascular disease (Baumann *et al*, 2013).

The World Health Organisation (WHO) in its Global Strategy on Diet, Physical Activity and Health, (2017) held that, globally around 31% of adults aged 15 and over were insufficiently active in 2008 (men 28% and women 34%). Approximately 3.2 million deaths each year are attributable to insufficient physical activity. In 2008, prevalence of insufficient activity was highest in the WHO region of Americas and the Eastern Mediterranean region. The current level of physical inactivity are partly due to insufficient participation in physical activity and an increase in sedentary behaviour during occupational and domestic activities (WHO, 2017).

Health is a fundamental right and a key indicator of sustainable development. According to WHO, (2016) on Sustainable Development Goals (SDGs), goal three is on good health and well-being with occupational health and safety being among the key business themes addressed by this goal. By the year 2030, the SDG targets to reduce by one-third premature mortality from non-communicable diseases (NCDs) through prevention, treatment and promotion of well- being (WHO, 2016). In its 2011 annual report, the SDG commitment was that of reducing the rate of new cases of occupational illness per 10, 000 employees by 30 % by 2013 based on 2008 baseline. One of the implementing methodologies was supporting healthy lifestyles through workplace well-being programs. Another global body with health as one of its key pillars is Science Technology and Innovation Strategy for Africa (STISA-2024). In STISA, health is considered as one of the six distinct priority areas that will contribute to the achievement of the African Union (AU) vision. STISA's priority number 2 is prevention and control of diseases. Every year millions of Africans die of communicable and NCDs that are preventable and treatable. African countries will

not develop economically and socially without substantial improvement in healthcare delivery (STISA-2024,(2014). Health is also a constituent of the Kenya Vision 2030 social pillars where it provides that, the country aims to provide an efficient integrated and high quality affordable health care to all citizens. Priority will be given to preventive care at community and household levels through decentralised national health care (Ministry of health, 2013). This synergy is directed towards the worker for sustainable development and wealth creation. Employers should therefore invest in programs to enhance worker's health and well-being.

The steps towards workers health and well-being will include reduction of occupational sedentary time. Mike et al, (2014) in his systemic review and meta-analysis of evidence on activity on reducing occupational sedentary time, came up with the following activity permissive work-stations which can be effective to reduce sedentary time without compromising work performance; fixed standing desks (with or without provision of height adjustable chairs) workstations adjustable to full standing height;treadmill desks; cycle ergometers; pedal devices fitted underneath the desk that can be used while doing usual desk-based job tasks.

Another approach to improving workplace physical activity and sedentary behaviour includes interrupting work with short bouts of exercises or active breaks (Griffins et al, 2007). Participatory workplace interventions can reduce sedentary time, increase the frequency of breaks and improve light activity and moderate to vigorous physical activity (MVPA) of office workers by using a variety of inventions (Sharon, 2013).

2.1.1 World Health Organisation (WHO) Recommendation on Physical-Activity

WHO, (2017) in their Global Strategy on Diet, Physical Activity and Health made the following global recommendations on physical activity for health with the overall aim of providing national and regional level policy makers with guidance on the dose- response relationship between the frequency duration, intensity, type and total amount of physical activity needed for the prevention of NCDs.

The recommended levels of physical activity for adults aged 18-64 includes leisure time activity (walking, dancing, gardening, hiking, swimming), transportation (walking, or cycling) and occupational (work). In order to improve cardiorespiratory and muscular fitness, bone health, reduce the risk of NCDs and depression:

1. Adults aged between 18-64 should do at least 150 minutes of moderate – intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous – intensity aerobic physical activity throughout the week on an equivalent combination of moderate and vigorous – intensity activity.

2. Muscle – strengthening activities should be done involving major muscle groups on 2 or more days a week.

These recommendations are relevant to all healthy adults aged between 18-64 years unless specific medical conditions indicate to the contrary. They are applicable for all adults irrespective of gender, race ethnicity or income level. They also apply to individuals in this range with chronic non-communicable conditions not related to mobility such as hypertension or diabetes.

2.1.2 The Burden of NCDs in Kenya

NCDs are the leading causes of morbidity and mortality globally, causing more deaths than all other causes combined, and they strike hardest at the world's low and middle – income populations (NCD Strategy Kenya, 2015). The Stepwise Survey for NCDs Risk Factors, (2015) report has it in record that NCDs account for 50% of total hospital admission and 55% of hospital deaths in Kenya. The major NCDs according to the report are cardiovascular conditions (13%), cancers (7%), and diabetes (4.56%). This trend is worrying and could be the reason why WHO, 2006 raised a red flag and warned that if serious measures are not taken by 2020, NCDs will account for 73% of all deaths globally. This disease has the potential to reduce productivity, curtail economic growth and trap the poorest people in chronic poverty (Shi, 2015). Treatment of NCDs is expensive and has forced many affected families

into poverty. While general ailments reduce household income by 13.63 %, NCDs reduce income by 28.64 % (Mwai and Muriithi, 2015) and are 51.35 % more likely to incur catastrophic expenditures compared to households afflicted by communicable diseases. The components of the costs of illness include direct costs from treatment of morbidity and indirect costs caused by low productivity (lost workdays) and foregone earnings caused by premature mortality (Colditz, 1999).

2.1.3 NCDs Prevention and Control in Kenya

The Kenya strategy for the prevention and control of NCDs 2015- 2020 is the Ministry of Health's strategic blue print launched in July 2015 for the NCD prevention and control in a period of five years (Ministry of Health, 2015). Among the pillars of this strategy are: to promote healthy lifestyle and implement interventions to reduce the modifiable risk factors for NCDs; unhealthy diets, physical inactivity and harmful use of alcohol; establish mechanisms to raise priority accorded to NCDs at National and County level and to

integrate their prevention and control policies across all government sectors; promote and conduct research and surveillance for the prevention and control of NCDs; promote local and international partnership for the prevention and control of NCDs.

The World Bank Group recommends that the Government of Kenya needs to prioritise preventative over curative health noting that the health expenditure remains less than 5% of gross domestic product (GDP) with curative rather than the preventative health continuing to receive the highest share of the total budget (World Bank Group, 2014).

2.1.4 Sedentary lifestyle, established anthropometric indices and obesity

It is well known that obesity and sedentary lifestyle coexist and that both are associated with cardiovascular disease in women and increases the risk of elevated blood sugar and hypercholesterdemia (Ann Smith *et al*, 2012). The global epidemic of overweight and obesity is rapidly becoming a major public health problem in

many parts of the world (WHO, 2016). Obesity does not have a purely genetic basis according to Adams, (2000) although genetics play a large role in susceptibility. The increasing prevalence of overweight and obesity is associated with diet related chronic diseases including diabetes, cardiovascular diseases, stroke, hypertension and certain cancers (WHO, 2016). Studies have shown that in older individuals, an increase in body weight is not simply due to increase in energy intake but significant reduction in energy expenditure due to sedentary lifestyle (Pouran *et al*, 2015).

The established anthropometric indices for the prediction of NCDs include, body mass index (BMI), waist circumference (WC), waist to height ratio (WHtR), and waist to hip ratio (WHR) (Shuang Chan *et al* , 2016). Among the four, WHtR was shown to be better correlated with metabolic risk factors and prediction of whole body fat percentage and visceral adipose tissue (VAT) mass which is correlated with disease trajectories but not fully accounted for through BMI evaluation (Mitchelle *et al*,2017; Wen-Cheng Li *et al* 2013). A study by Wen- Cheng Li, *et al* ,(2013) on Taiwanese adults has it that a WHtR greater than 0.5 is a simple ,yet effective indicator of centralized obesity and associated cardio metabolic risk even among individuals deemed healthy according to BMI and waist circumference. The risk of developing diabetes and cardiovascular disease begins to rise with WHtR above 0.5. WHtR is more precise in measuring life expectancy. It also beats the BMI and waist circumference matrix (Ashwell, 2005). Both Ashwell, (2005) and Swainson, *et al,* (2017), agree that WHtR; is easier to calculate than BMI and it works for any race, age, or gender and that a measuring tape is not needed to use it. With a piece of string a person can measure their height then fold the string in half and check to see it fits around their waist.

Measuring someone's waist is important because it accounts for levels of central fat which accumulates around the organs and is particularly closely linked to conditions like stroke and heart disease (Ashwell, 2005).

Waist circumference (WC) is improved by relating it to height to categorized fat distribution of different genders and ages. WHtR is simple and practical

anthropometric index to identify higher metabolic risks in normal and overweight men and women (Hsieh, *et al*, 2002). For women a WC of 80cm indicates an increased risk of chronic disease while the measurement for men is 88 cm or more. These measurements apply only to adults and not children and pregnant women (Jensen *et al*, 2013). Another limitation of WC as documented by WHO, (2008) is that the usefulness of WC as a first step diagnostic tool when assessing an individual's risk of diabetes is unclear.

People who are obese have body mass index (BMI) equal or greater than 30. BMI is a measure of body fat based on height and weight that applies to adult men and women aged 20 years and over. People who are underweight have a BMI of less than 18.5. Normal weight is 18.5 to 24.9 (WHO, 2017).

The limitations of BMI (Gurunathan and Myles, 2016) are that, it does not distinguish between the proportion of weight due to fat or muscle. It is less accurate in certain groups including; certain ethnic groups such as South Pacific islanders' population (South Asians, Chinese, and Japanese), body builders or weight lifters, pregnant women, the elderly and people with physical disability, people with eating disorders and those with extreme obesity.

2.2 Legal Framework

The employers have a duty to ensure that workers do not spend significant amount of time sitting, otherwise they could be breaching their health and safety obligation to provide a safe system of work by not reducing their workers sedentary time (Allana, 2018). Although the literature review lacks direct legislation on sedentary lifestyle, the International Labour Organisation (ILO) in its Occupational Health Services Convention, (1985) (NO.161) enumerated the following functions which the occupational health services should undertake to ensure that there exists a healthy and safe working environment for all: risk assessment and management; monitoring of the working environment and working practices which may affect workers' health; advice on planning and organisation of work; advice on occupational health , safety,

hygiene, and ergonomics as well as on collective and individual protective measures and equipment; design and implementation of preventive programmes for the improvement of working practices; collaboration in providing information , training and education; organising first aid and emergency treatment and design, establishment, implementation , and management of workers' health surveillance schemes that will facilitate preventive action; and referral to health care and rehabilitation.

The level of implementation of these occupational health services in most of the countries with expanding economy is however, low as advocated by Mrema *et al,* (2015) who observes that occupational health services are scanty and limited to a few enterprises that can afford it and existing laws and regulations are not comprehensive enough to cover the entire population, thus making implementation of legislation weak and fail to protect the workers. Globally, the content and multidisciplinary nature of occupational health services corresponds to international guidance but the coverage, comprehensiveness and content of services remain largely incomplete due to lack of infrastructure and shortage of multi-professional human resources (Rantanen *et al,* 2017).

In Kenya, the Occupational Health and Safety Act, (2007) is not explicit on duties of the employer in reduction and prevention of sedentary lifestyle described by the World Day for Safety and Health at Work, (2015) as a new hazard fuelled by the growing use of computers and automated systems. The employers, according to Allana Furlan, (2018) can encourage their workers to be more physically active by;

Changing work system e.g., providing sit-stand workstations and conducting standing meetings; redesigning work tasks, if possible , to enable greater variability in movement or posture; providing workers with regular breaks that involve physical activity, such as walking; encourage workers to ride their bikes to work or catch public transport rather than drive; providing workers with corporate gym memberships; encouraging workers to stand up and stretch every 30 minutes;

organising physical activities for workers such as friendly cricket match and setting up a pedometer challenge for workers to walk 10,000 steps a day.

2.3 Previous works relevant to the study

A study carried out in Nigeria on prevalence of physical activity among adults in a metropolitan Nigerian city by Adewale *et al*, (2015), revealed that the proportion of adults that met the WHO recommendations and guidelines of physical activity among Nigerian adults varied significantly by socio-demographic characteristics. The study further notes that those who were divorced /separated, did not own a car, and had a lower social-economic status –as indicated by low income, low education level and blue collar occupation were more likely to be physically active. Their conclusion was that interventions based on ecologic model of health behaviours maybe necessary in promoting physical activity among Nigerian adults.

On factors that promote sedentary behaviour, Lina *et al*, (2016) enumerated leisure, transportation, housework and occupation as the causal domain. Out of the four domains, leisure, transportation and housework happen outside the workplace. According to Murtagh *et a*,(2017) interventions targeting outside of workplace setting may be at individual level (behavioral change after learning through seminars/counselling about health risks associated with sedentary lifestyle), environmental level (limiting TV viewing by installing lockout systems to prompt change of behaviour) and policy level (providing prompts and invitation to encourage standing events). On transportation domain, Owen *et al*, (2011) argues that , use of cars in the suburban areas has lengthened the period of sedentariness which refers to the time spent sitting in the cars to perform a journey to and from workplaces and to attend to demands of family and friends.

Moruri (2008), in his study on overweight and obesity in association with physical activity and eating habits among bus drivers in Nairobi, Kenya found out that lack of physical activity is associated with overweight and / obesity among bus drivers. The study recommends encouragement of physical activity or coming up with simple

policy guidelines which should include the health benefits or breaking up prolonged sitting time. Another study by Jepkemoi (2006), on prevalence of physical inactivity among school going adolescents in Nairobi, Kenya found out that the amount of habitual physical activity is decreasing dramatically in this age range. The study further highlighted the need for health promotions intervention aimed at promoting physical activity among school going learners.

A study by Bey and Hamilton, (2003) on the effects of suppression of skeletal muscles during long bouts of muscular inactivity revealed that there is a relationship between sedentary behaviour and chronic diseases. In addition to the physical consequences of sedentary behaviour, evidence now suggests that prolonged sedentary behaviour has negative impact on neural and cognitive health (Vaynman and Gomez-Pinilla, 2006).

A study on contribution of office work to sedentary behaviour associated risks by Parry and Stracker, (2013) concluded that office work contributes significantly to overall sedentary exposure and therefore the associated health risk of sedentary behaviour. Further, compared to non-work periods, occupational sedentary time of office workers was significantly more prolonged with fewer breaks. Although office work has traditionally been considered a low risk occupation in terms of chronic health outcomes, it may in fact increase the mortality and cardiometabolic disorders due to overall accumulated sedentary time and especially sustained sedentary time at work.

A study on reduction of occupational sedentary time by Maike *et al*, (2014) came up with activity permissive workstations in office- based workplaces which is likely to reduce office worker's sedentary time without compromising work performance. The activity permissive workstation may have either of the following; fixed standing desks which may have or not include height adjustable chairs, workstations adjustable to full standing height, tread mill desks, cycle ergometers, pedal devices fitted underneath the desk that can be used while doing usual desk-based job tasks.

A review of occupational physical activity and sedentary behaviour correlates by Smith et al, (2016) revealed that intervention efforts to increase occupational physical activity and reduce sedentary time may be most effective when targeted at white collar jobs.

On the spread of hypertension in Africa, a study by Ali and Xavier, (2017) shows that the disease rates were more in East African (25%) than in Western Africa (15%) and that South Africa had the highest prevalence with the disease ranging from 42% to 54% which may be considered to be the highest in the continent. The reason for this according to the study is that in East Africa, people are bent towards fast foods and sedentary lifestyle while in South Africa, the diets are rich in refined foods, lifestyles are sedentary and obesity is a norm. The burden of this disease is not well understood and most people do not know that they suffer from this condition. They therefore do not seek for treatment and this aggravates the condition.

Kumuntu Mukandoli, (2004) in a study on predisposing factors of chronic low back pain among sedentary office workers in Nairobi, Kenya unveiled that the condition was predominant at the middle age group between 30 and 49, and at the age of more than 50 years. Majority spent most of the working hours seated, had been using the same seat for more than 5 years and were taking a break after only 5 hours or longer. These working conditions, coupled with awkward posture, have been reported to be one of the possible predisposing factors of chronic low back pain (CLBP) among office workers. Therefore, intervention to target these predisposing factors of CLBP need to be developed thus to prevent CLBP in this modern time. A similar study by Isaac and Mehdi , (2013) indicate that age, duration of occupation, daily computer usage, incorrect body posture, work overload, poor ergonomic knowledge, social support, depression and somatization were significantly associated with musculoskeletal pains.

James Levin of the Mayo Clinic- Arizona State University Obesity Solutions Initiative, (2014) unveiled that sitting is the new smoking and that people lose two hours of life for every hour they sit. Levin is optimistic that the revolution to

overthrow sitting is at hand. He sees the arrival of dynamic offices with walking paths from department to department and active senior centres.

Julia, (2014) in her study aimed at addressing the problem of obesity and associated cardiometabolic risk in black South Africa women asserts that the relationship between activity and cardiometabolic risk may be confounded by socioeconomic status and lifestyle behaviour.

A study on physical inactivity prevalence among Mexican adults by Medina *et al,* (2013) revealed that adults in obese category, 60-69 age group, and those in the highest economic status were more likely to be physically inactive. The results of this study were in tandem with another one done in West Africa by Abubakari *et al,* (2009) on prevalence and time trends in diabetes and physical inactivity among West African population which found an association between physical inactivity and being older (>or = 50) and urban residence.

On prevalence of physical inactivity between males and females, a study by Ying *et al,* (2014) found out that females were more likely to be more physically inactive that males.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study design

Descriptive research design using cross sectional survey was adopted for this study. The quantitative research approach was used to collect facts which were captured in numerical format. This approach is used for testing objectives by examining the relationship among variables. These variables in turn can be measured typically on instruments so that numerical data can be analysed using statistical procedures (Creswell, 2014).

3.2 Study area and population

A metropolitan or urban setting has an influence on sedentary lifestyle and people living here are more likely to be overweight and obese as observed by Xu *et al,* (2010). This coupled with the proximity of the selected institutes from each other informed the decision to choose the Nairobi Metropolitan region as the study area.

This study covered seven (located in Nairobi metropolitan region) out of the seventeen KALRO institutes (appendix 3) scattered in different counties in Kenya. Figure 3-1 shows the study area made up of Nairobi, Kajiando, Machakos, Kiambu and Murang'a Counties which form the metropolitan region.

Courtesy: kevinogutu-wordPress.com 2012

Red - Nairobi County

Green - Kajoado County

Yellow - Machakos County

Purple - Kiambu County

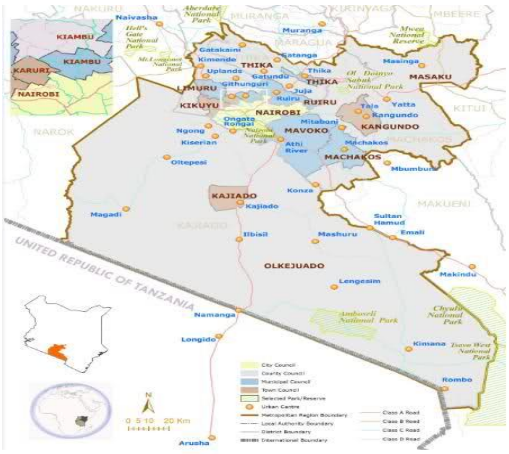

Figure 3.1: The Nairobi Metropolitan region.

The study population comprised of workers in offices and laboratories in sampled institutes. The study focused on this cadre of staff because office and laboratory

occupation is characterised by sedentary behaviour.The institutes to participate in the study comprised of, coffee horticulture, veterinary, NARL, agricultural mechanisation, genetic resource, food crops and biotechnology.

Table 3-1 shows the seven selected institutes, their location and their mandates.

Table 3.1: Selected KALRO Research Institutes and their locations.

	Research Institute	Location	County
1	Agricultural mechanisation	Katumani	Machakos
2	Biotechnology	Muguga	Kiambu
3	Food crops	Kabete (NARL)	Nairobi
4	Coffee	Ruiru	Kiambu
5	Genetic resource	Muguga	Kiambu
6	Horticulture	Thika	Kiambu
7	Veterinary	Muguga	Kiambu

3.3 Sampling method

Random sampling method was used in distribution of the study questionnaires and depending on the number of participants required from every selected institutes, the questionnaires were distributed at 40% office, 40% laboratory, and 20% field staffs. The inclusion criteria involved all employees working in KALRO offices and laboratories in selected institutes while the exclusion encompassed employees in research fieldwork, newly employed, those with a known pre-existing medical condition, those with a disability and those unwilling to participate in the study. In order to assess the employees at risk of physical inactivity, the study adopted waist to height ratio (WHtR) as the anthropometric index for the physical measurement of the participants in the prediction of obesity, NCDs and assessing central fat distribution. The method was easier to calculate, did not require heavy or sophisticated equipment and worked for all ages, race and gender. The measurement method could be used even where there was no measuring tape. With a piece of string a participant's height

was taken, then the string was folded in half and then checked to see whether it fitted around his/her waist. If it did not fit then the height to waist ratio was greater than 0.5 which meant that the subject was at risk of NCDs and obesity related diseases.

Waist circumference was measured in centimetres at the midpoint between the lower margin of the palpable rib and the top of the iliac crest using a stretch to resist tape that provides a constant 100 gram tension as provided by the WHO, 2008 guidelines. The subject was requested to wear light loose clothing and stand with feet close together, arms at the sides and body weight evenly distributed. Standing height was measured to the nearest 0.1centimetre using the same tape used to measure waist circumference. The subjects were requested to remove shoes, slippers and socks. The height to weight ratio (WHtR) was calculated by dividing waist size (cm) by height (cm).

3.4 Sample size determination

The sample size was calculated using Daniel's formula for prevalence studies (Naing et al, 2006).

$$n = \frac{Z^2 NP(1-P)}{d^2(N-1) + Z^2 P(1-P)}$$

Where,

n = sample size

Z = statistical level of confidence

P = expected prevalence or proportion

d = precision

N= total population

To calculate the study sample size, a level of confidence of 95% and a conventional value of Z of 1.96 was used. The expected proportion P which was the prevalence value was taken at 50% and the precision, d was at 9.6%. The study sample size, n= $1.96^2*820*0.5*0.5/0.96^2*819+0.5*0.5$ (= 96).

The study sample was distributed using the respective institute population (Table 3-2).

Table 3.2: Sample distribution

Research Institute	No. of workers	Percentage	Study sample
Coffee	140	17	16
Horticulture	100	12.2	12
Food crops	170	20.7	20
Genetic	60	7.3	7
Biotechnology	130	15.8	15
Agricultural mechanisation	150	18.3	18
Vetrinary	70	8.5	8
Total	820	100	96

3.5 Research Instruments

Among the research instruments used in this study were questionnaires which were in two sets, one for the workers and the other for the management in the selected KALRO institutes and were administered through face to face interview. Other instruments included a camera, a stretch resistant tape measure (in accordance with WHO, 2008 guidelines), and a checklist.

3.6 Data collection, processing and analysis

Quantitative data was collected using two sets of structured subjective questionnaires which were pretested to ensure suitability before being administered. One set gathered workers data on sedentary lifestyle and parameters influencing occupational

sedentary behaviour, while the second assessed the available policies and programs in the selected institutes aimed at mitigating sedentary lifestyle among the workers. Subjective questionnaires were preferred for this study because the measures expected were in form of self and proxy report. Secondary data was obtained from service records and reports. Data was processed using statistical package for social sciences (SPSS- Version 20) and MS Excel computer software. Analysis was done using frequencies and statistical tests. The data was also subjected to statistical correlational tests using measure of central tendency to determine relationships between independents and dependents variables. Spearman Rho and Kendalltai-b was used to check similarities in data collected. Data was presented using statistical tables and charts.

3.6 Ethical consideration

Permission to undertake the study was sought from the relevant authorities including, Jomo Kenyatta University of Agriculture and Technology (JKUAT) Institute of Energy and Environmental Technology; Kenya Agricultural and Livestock Research Organization and National Commission for Science, Technology and Innovation (NACOSTI) permit number P/19/54251/31128. Informed consent was obtained from participants before participating in the study.

CHAPTER FOUR:

RESULTS AND DISCUSSION

4.1 Response rate

The study findings were presented, analysed and interpreted using data obtained from the respondents through a subjective questionnaire whose response rate was 56 %. The target respondent in this study was 96 but only 54 returned the questionnaires which were considered to adequately represent the view of the respondents according to Babbie, (1995) who provides that if data is 53% or more it is adequately representative. The response by the management in all the seven selected KALRO institutes to the questionnaire on available policies and programs for mitigating effects of sedentary lifestyle among employees in KALRO was 100%. The response rate per the selected institute was as shown in table 4.1 below:

Table: 4.1: Response rate per the selected institute

Research Institute	Study sample	Returned questionnaires
Coffee	16	8
Horticulture	12	5
Food crops	20	12
Genetic	7	4
Biotechnology	15	8
Agricultural mechanization	18	12
Vetrinary	8	5
Total	96	54

4.2 Respondents social demographic profile

4.2.1 Gender

Of the 54 respondents 46.3% were male and 53.7% female as shown in figure 4-1.

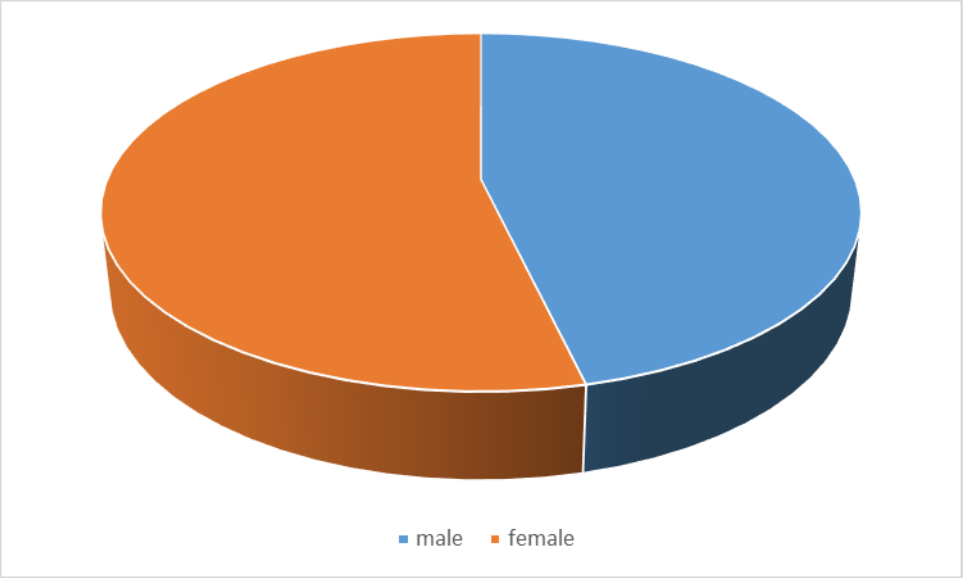

Figure 4.1: Respondents by gender

4.2.2 Marital status

On marital status, (57.4 %) were married, (33.3%) single, (5.6%) windowed, (1.9%) separated and 1.9% did not respond to this question.

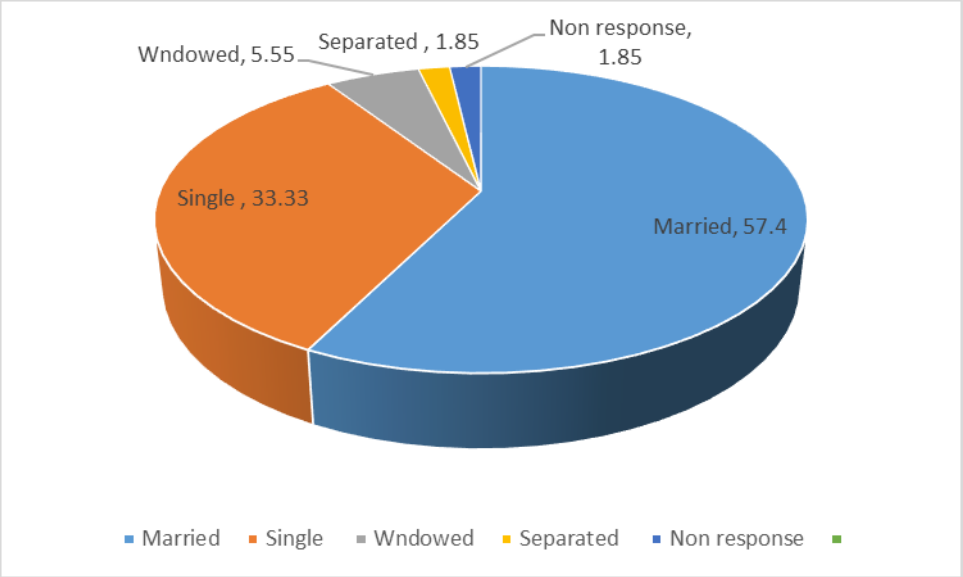

Figure 4.2: Respondent's marital status

4.2.3 Level of education

The data respondent's level of education was mostly college and above which represented (92.6%) as shown in figure 4.2.3

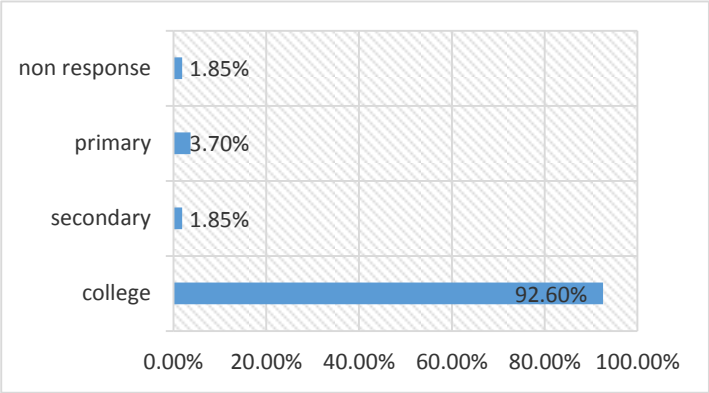

Figure 4.3: Respondent's level of education

4.2.4 Respondent's occupation

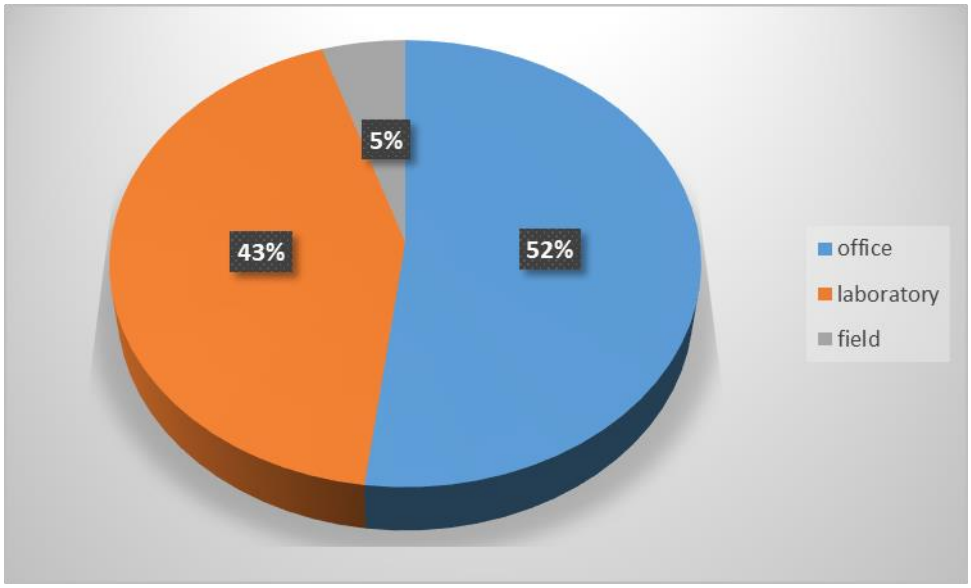

Figure 4.4: Respondent's occupation

The data revealed that (52 %) worked in the office with (43%) in the laboratory, and (5%) in the field research.

4.2.5 Respondents age

The age bracket of the respondents was as indicated in chart 4-5. Notably, (65%) of the respondents were 45 years and above.

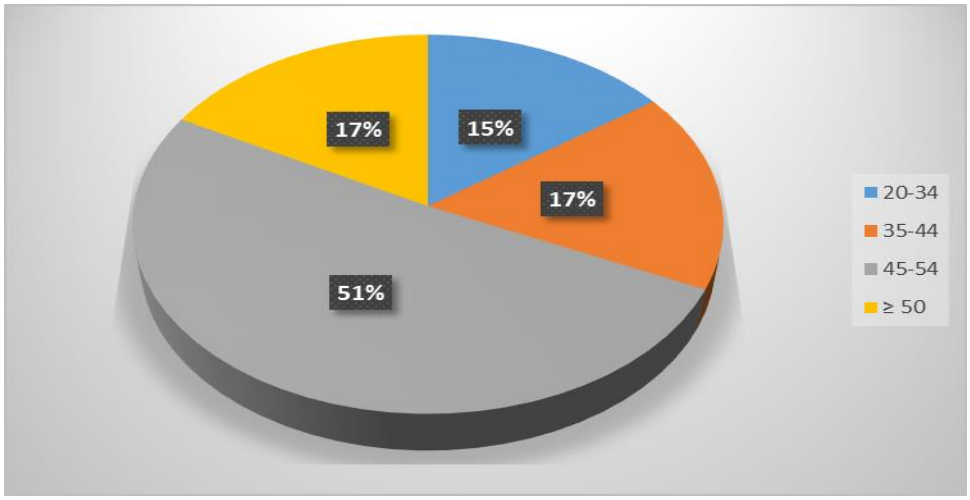

Figure 4.5 Age of the respondents

Respondents earning

The analysed data revealed that 55% of the respondents were earning Ksh. 46,000.00 and over.

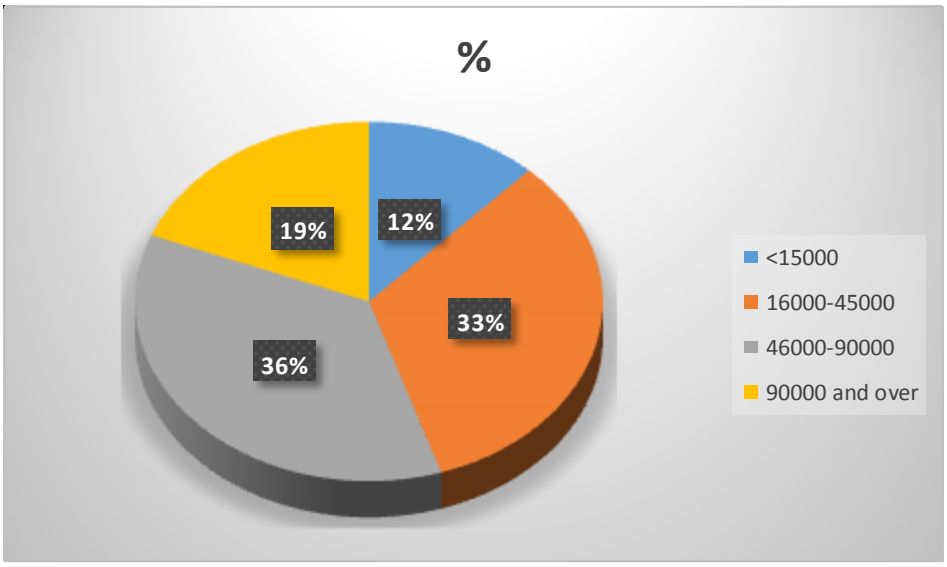

Figure 4.5: Respondents' earnings

4.3 Available policies, programs and health facilities

4.3.1 Availability of operational health facility in the study institutes

The results indicated that 3 (Agricultural mechanization, Coffee, and Vetrinary), out of 7 or 43% of the selected institutes had operational health facilities which infered that only 360 employees out of the total study population of 820 or 44% had access to in house medical services. Workers spend the better part of their waking hours at the work place and there was no better place to have a medical staff on hand. In addition, treating sore throat, cut fingers, helping employees stay healthy by offering on site preventive tests, screening and healthy coaching to encourage healthful habits were areas of interest. (Mitchel, 2011). Further, to mitigate sedentary lifestyle in the workplace, it is necessary for the employers to encourage workers to participate in physical activity. However, this may not be possible if the medical condition of the workers is not known and documented. For example it may not be safe for workers with known high blood pressure or rheumatoid arthritis to join in the physical activity without medical approval. By understanding the workers' health profile, the health provider in the health facility can identify the risk factors within the respective

institute and maintain record and follow ups which may provide the required interventions to ensure that all workers can safely participate in more physical activities.

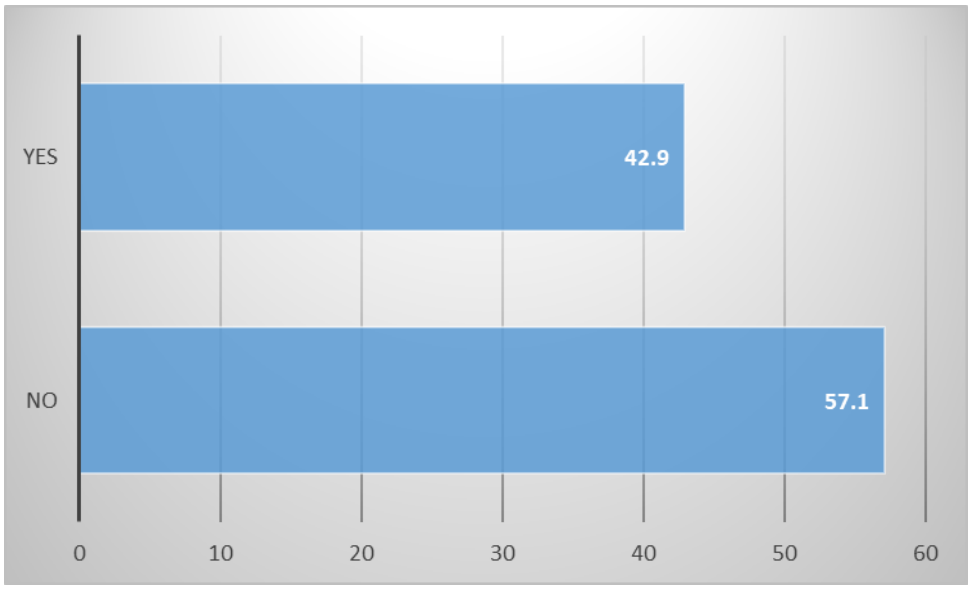

Figure 4.6: Institutes with operational health facility

4.3.2 Physical fitness and membership of gym or sports club

None of the selected institutes had any organized programs that encouraged workers to engage in exercise and fitness by allowing for physical activity and membership of a gym or sports club. This meant that the management of the sampled institute did not find it necessary to encourage physical activity and a safe system of work among the workers.

4.3.3 Organized quarterly screening programs

The respondents response to organised screening programs was poor as only 14% of the study institutes posted good response. This was indicative of lack of awareness among the KALRO employees on the importance of lifestyle diseases screening, management and health surveillance. The researcher deduced that the management in

the selected KALRO institutes had poor organizational facilitation and approaches to synthesize and encourage their employees to live a non sedentary lifesyle.

4.3.4 Employer's promotion of workers wellbeing at the work place

The results revealed that all the selected institutes had centralized waste bins to encourage worker to take light exercises by walking to the bins. Among the selected institutes, 42.9% allowed regular breaks from sitting by standing up every 30 minutes and 71.4% provided drinking water in their laboratories and offices so as the employee could take water frequently and have frequent visit to the toilet. Employers should ensure that their workers do not spend significant amount of time sitting, otherwise they could be breaching their health and safety obligation to provide a safe system of work by reducing their workers sedentary time (Allana, 2018).

Of the sampled respondents, 64.8% indicated they had been sitting on the same chair for more than five years (Figure 4-8).

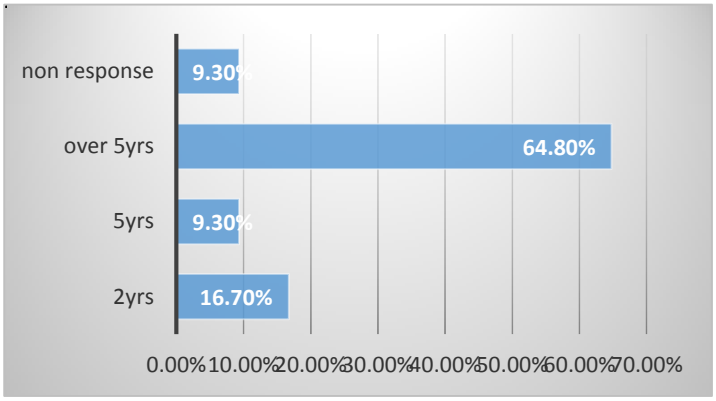

Figure 4.7:Respondents sitting on the same chair in the office/Laboratory

The observation made by the researcher was that in all the sampled seven institutes, non-had invested in ergonomic chairs. Workers spend more time sitting on an office

chair than on anything else often for more than eight hours a day as was evident in our results on occupational sedentary. This then means a well-designed, comfortable sitting position is important for improved posture and performance not to mention keeping back pain, muscle soreness and neck pains at bay (Kate, 2017).

The study argues from these results that due to their work place situation and positioning, KALRO employees over time may gradually become unproductive and the selected KALRO institutes may find themselves with large staff turnover coupled with significant health bills occasioned by sitting on worn out non ergonomic chairs.

4.3.5 Available policies to mitigate sedentary lifestyle and work environment

The results indicated that none of the selected institutes had;

a) policy on how to hold walking meetings
b) Policy on how to hold standing meetings
c) Policy on maximum time a normal siting meeting should take

Only one out of the seven sampled institutes had a policy to address ergonomics and work place design. All selected institutes reported that they did not provide electronically adjustable desk with integrated treadmill or a treadmill and a stationary cycle ergometer. The data analysis indicated that none had either an active workstation or work site programs targeting obesity factors such as behaviour change modifications, health education, health risk assessment and appraisal, or weight and stress management. These result allows the study to deduce that KALRO work environment encouraged employee to have a sedentary lifestyle at the work place.

4.4 Employees at risk of physical in-activity in various KALRO institutes

4.4.1 Waist to Height Ratio (WHtR)

The measurement of waist to height ratio (WHtR) and waist circumference (WC) indicated that the prevalence of overweight and obesity was higher in females at

(89.28%) than in males at (88.46%). This was in agreement with a study by Yin *et al,* (2014) on prevalence and factors associated with physical inactivity among Malaysian adults which found out that females were more likely to be more physically inactive than males. The prevalence for both gender combined was 88.88%. This high percentage of the total staff with WHtR > 0.5 was indicative of a sedentary lifestyle prevalence among the sampled KALRO staff in the selected institutes.

Results of WHtR by gender were as shown in table 4-2.

Table 4.2: WHtR Ratio by Gender

Gender	With WHtR below 0.5	With WHtR above 0.5	Total	% WHtR below 0.5	% WHtR above 0.5
Female	3	25	28	10.71	89.28
Male	3	23	26	11.53	88.46
Combined	6	48	54	11.11	88.88

Further, the correlations test revealed that WHtR increased with income, *(τ_b = 0.070, p= 0.516*) and had an influence on ailments such as fatigue and muscle soreness after a day's work (*p=0.657).* as shown in the Kendall's tau-b correlation in table 4-3.

Table 4.3: Correlations between waist to height ratio and monthly income (KES)

		Waist to height raio	Income per month in kenya shillings
Kendall's tau_b	Correlation coefficient	1.000	0.070
	Significance (2-tailed)	.	0.516
	N	54	54
Kendall's tau_b	Correlation coefficient	0.070	1.000
	Significance (2-tailed		0.516
	N	54	54

WHtR has been proposed as an alternative measure of obesity (Trent and Jane Watson, 2016) and it is a good proxy for central fat which has a greater health risk than fat stored in other parts of the body. The WHtR range of all the participants was as shown in figure 4.9.

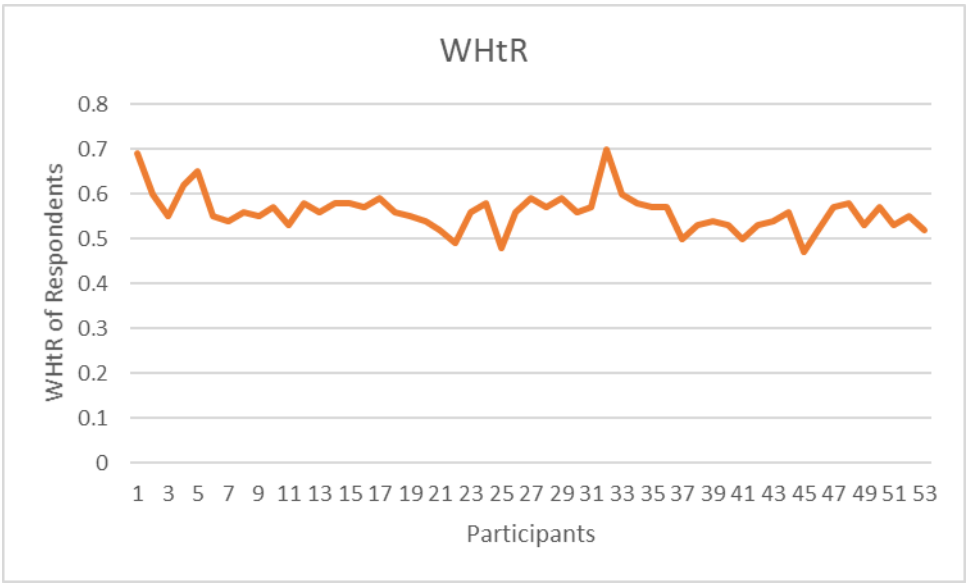

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Figure 4.8: WHtR for KALRO staff

4.4.2 Central Obesity - Waist Circumference

The recommended waist circumference (WC) by WHO, 2008 is ≤102cm for men and ≤88 cm for women. The WC measurement carried out on respondents of both gender was as shown in the table 4.4.

Table 4.4: Waist circumference of participants per Gender

Females	Waist below 88 cm	Waist above 88cm	Total	% WC > recommended waist size
	5	23	28	82.14
Male	Waist below 102cm	Waist above 102cm	Total	% WC > recommended waist size
	23	3	25	12
Combined	28	26	54	48.14

The waist circumference results indicated that (82.14%) of sampled females had measurements above the recommended 88.9cm while for men only (12%) had measurement above the recommended 102cm. This was an indication that more females were obese than males in the selected institutes in KALRO. Both the WHtR and WC results showed that there was significant central obesity among male and female workers of the sampled KALRO institutes. This was indicative that the sampled staff at KALRO were at risk of NCDs and obesity related diseases such as stroke, cardivacular and diabetes according to Ashwell, (2005). Aswell and Swanson, *et al* (2017), also indicated that individuals with WHtR > 0.5 had a lower life expectancy. Similarly, Hsieh,*et* al, (2002) also averts that individuals with WHtR > 0.5 values are overweight and are at risk of metabolic disorders and chronic NCDs. These results further revealed the sampled KALRO staff in the selected insitutes had a sedentary lifetyle because significant number of them had high central obesity values.The two measures employed were established anthropometric indices for the prediction of NCDs and according to a study on Taiwanese adults by Wen- Cheng Li, *et al*, (2013), a WHtR greater than 0.5 is an effective indicator of central obesity.

Table 4.5: Ratio of Female to Male with WHtR ratio above and lower than 0.5

Ratio	Above 0.5	Below 0.5
Ratio of Female : Male	10.18 :1	1:1.62

When the study compared the ratio of female to male with waist above the recommended measurements, it was found out that 81.46:8 or 10.18:1 which was approximately 10:1 was the ratio of women to men which meant that for every 10 females with waist circumference greater than the recommended measurement, there was 1 male.

Further , the study sought to establish the statistical correlations between the respondents' age, waist circumfrence, WHtR, and income per month and the results were as shown in the table 4.6.

Table 4.6: Statistical correlations between age, waist circumfrence and monthly income

			Age	Waist circumference in cm	Waist to Height Ratio	Income per month in Kenya Shillings
Kendall's tau_b	Age	Correlation Coefficient	1.000	0.100	0.102	0.396**
		Sig.(2-tailed)	.	0.365	0.344	0.001
		N	54	54	54	54
	Waist circumference in cm	Correlation Coefficient	0.100	1.000	0.625**	0.069
		Sig.(2-tailed)	0.365	.	0.000	0.526
		N	54	54	54	54
	Waist to Height Ratio	Correlation Coefficient	0.102	0.625**	1.000	0.070
		Sig.(2-tailed)	0.344	0.000	.	0.516
		N	54	54	54	54
	Income per month in Kenya Shillings	Correlation Coefficient	0.396**	0.069	0.070	1.000
		Sig.(2-tailed)	0.001	0.526	0.516	.
		N	54	54	54	54

From the analysis it was observed that there was a positive correlation between respondents' age and waist circumrefence measurements ($\tau_{b=}$ *0.100, p=0.365*). This

indicated that the respondent physical activity reduced as they advanced in age and as their earnings per month increased ($\tau_{b=}$ *0.396, p=0.001).*

Table 4.7: Statistical correlation between WHtR and fatigue/muscle soreness afer a day's work

		WHtR	Muscle soreness afetr days' work
	Correration coefficient		
WHtR	Sign.	1.000	-0.52
	N	-	0.657
		54	54
Muscle soreness	Correlation coefficient		
	Sign.	-0.52	1.000
		0.657	-
	N	54	54

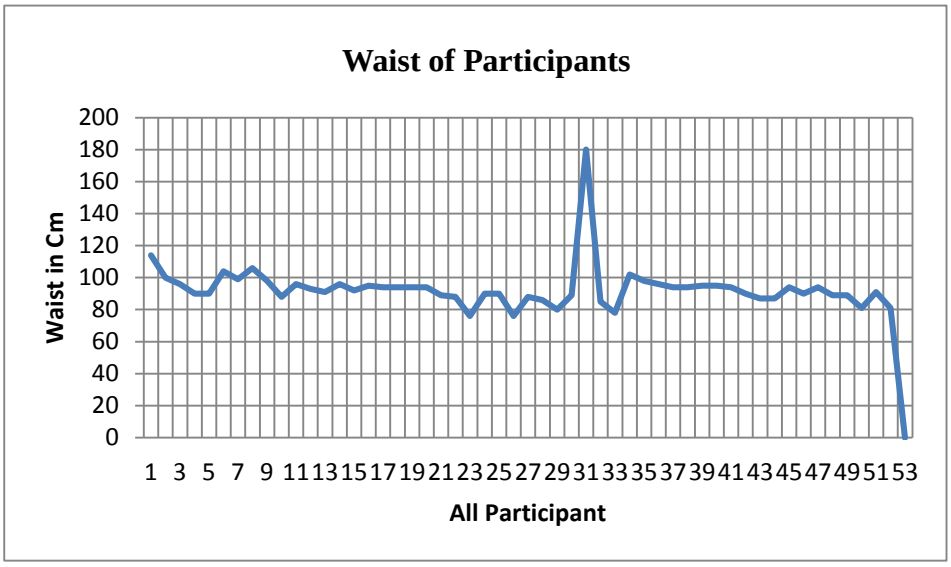

Figure 4.9: Waist of participants

The waist circumference of all participants is shown in figure above. Notably an isolated case of a male participant with waist size 180 cm and WHtR of 0.7 was observed. This observation points out the need for further research involving a wider population to identify if there are similar cases and underlying reasons for such high WHtR and waist circumference in order to make informed decisions on possible interventions.

4.5 Factors influencing sedentary behaviour of the study employees in selected KALRO institutes

Factors influencing sedentary lifestyle according to Sugiyama, *et al*, (2011) includes; individual factors (age, gender, poor health, and education), Occupational factors (type of work and the organisation of the workplace), physical environmental factors (low residual density, poorly connected streets and limited land diversity), and societal trends factors (the move towards urbanization, car use, mechanization and increasing use of technology for every task that involves sitting). Other factors as enumerated by Lina *et al*, (2016) include leisure and house hold domains. This study

focused on these factors and their association with respect to sedentary lifestyle among the respondents.

The means of communicating to work was one of the factors influencing the sedentary behaviour of the respondents. The study considered this in relation to age, income per month and type of occupation

4.5.1 Respondent's age cross-tabulated against how they commuted to work

The study sought to know how the respondent's age related to how they commuted to and from work. From the results, it was evident that as they advanced in aged (≥ 35 years), the tendency was towards motorized means to and from work as indicated in figure 4-11.

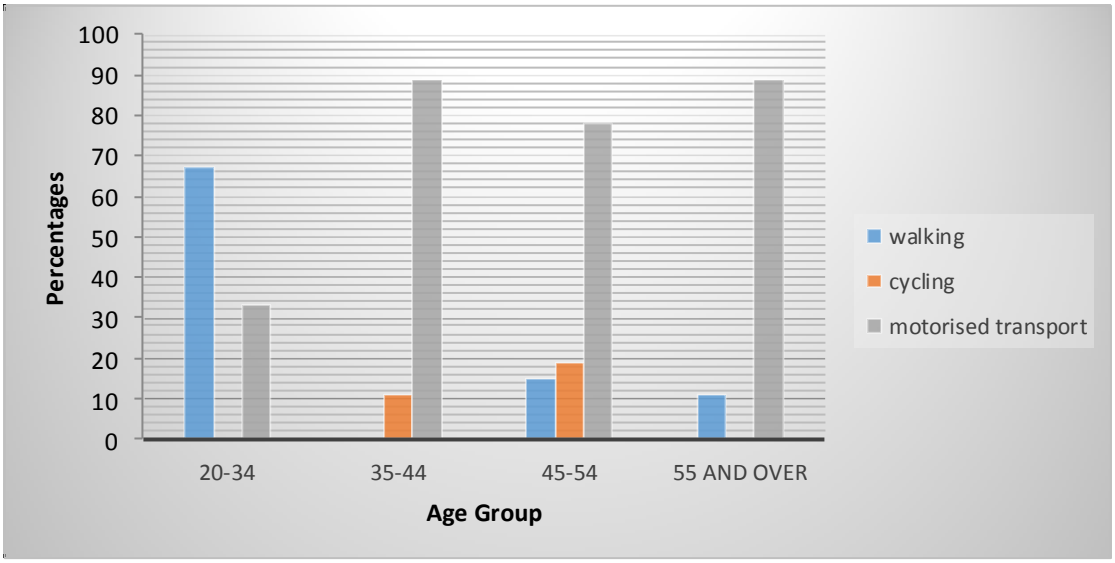

Figure 4.10: Relation between age and how respondents commuted to and from work

Most (88.8%) of the older respondents (≥ 50years) used motorized transport to and from work. This was indicative that indulgence in physical activity reduced as

respondents advanced in age. Studies have shown that in older individuals, increase in body weight is not simply due to increase in energy intake but significant reduction in energy expenditure due to sedentary lifestyle (Pouran *et al,* 2015). Further, the results were in agreement with a study on physical inactivity prevalence and trends among Mexican adults by Medina *et al*, (2013) which revealed that adults in obese category, 60-69 age group, and those in highest economic status were more likely to be physically inactive. Abubakari *et al*, (2009) study on prevalence and time trends in diabetes and physical inactivity among adults in West African population also found an association between physical inactivity and being older (> or =50 years) and urban residence.

It was observed from the results that those aged between 35 and 44 years or the middle age were either cycling or using motorized transport and did not walk to and from work. This was in agreement with a study by Kelly *et al*, (2018) which stated that physical activity (PA) declines during mid-life were characterised by reduction in light intensity PA with increases in sedentary time. In a study on cycling and walking for individual and population health benefits (Public health England, 2018) it was evident that cycling and walking have the same health outcomes and that the former is a good example of moderate to vigorous PA.

4.5.2 Respondents' Income per month in Kenya shillings cross-tabulated against how they commuted to and from work

The cross tabulation of the respondent's income per month against how they commuted to and from work revealed that most of those earning more than Kenya shillings 46,000 used motorized transport.

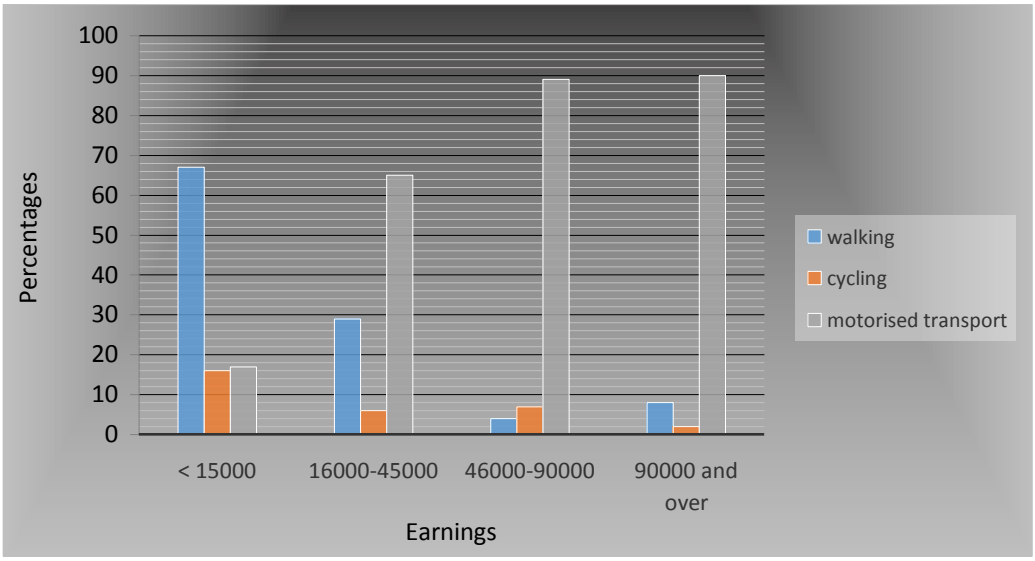

Figure 4.11: Relation between monthly earning and respondents' mode of commuting

From the data, it was observed that most of those with an income less than 15,000 walked to and from work (66.6%), while those with income of, 46,000-90,000 and above used motorized transport. For respondents earning less than Kenya Shillings 15,000 the data was normally distributed about walking which indicated that walking was their preferred means of transport. Those earning from Kenya shillings 16,000-45,000 were negatively skewed toward none- motorized transport. For all with income above Kenya shillings 46,000, data was skewed toward motorized transport and those with income above Kenya shillings 90,000 all drove their own car to and from work.

Table 4.8: Skewness and Kurtosis of monthly income against mode of commuting

Income per month in Kenya Shillings		Statistic	Std. Error
Less than 15,000	Skewness	1.537	.845
	Kurtosis	1.429	1.741
16,000-45,000	Skewness	-.438	.550
	Kurtosis	-1.197	1.063
46,000-90,000	Skewness	-1.847	.524
	Kurtosis	2.810	1.014
90,000 and over	Skewness	-1.658	.687
	Kurtosis	2.045	1.334

When tests for normality was done using Shapiro- wilk test, all *p* values were below 0.05 with no out put for respondents earning less than Kshs.15,000 as indicated in table 4.9 below.

This indicated that use of motorized transport among the respondents increased with earnings and socioeconomic status.

Table 4.9: Test for normality using Shapilo- Wilk test.

Respondents earnings in kenya shillings			
	Statistic	Df	Significance
Less than 15,000	0.566	8	0.000
16,000-45,000	0.763	9	0.008
46,000-90,000	0.796	26	0.005
90,000 and above	0.637	9	0.001

The observed excessive use of personal vehicles to and from work among those earning Kenya Shillings ≥ 90,000 could be attributed to personality traits, or respondents may have become habituated to using cars as observed by Juneman and

Mohammad, (2015) in a study on use of public transportation in greater Jakarta. Owen, *et al.* (2011) in a study on adults' sedentary behaviour determinants and interventions, add that in suburban areas, the use of cars has lengthened the period of sedentariness among citizens, which in this case refers to the amount of time spent on sitting in the cars to perform a journey to and from their workplaces.

4.5.3 Type of occupation cross-tabulated against how the respondents commuted to and from work

The study sought to know how the respondent's type of occupation related to how they commuted to and from work. The data revealed that 94.7% of those in laboratory work and 64.2% of office workers used motorized transport to commute to and from work.

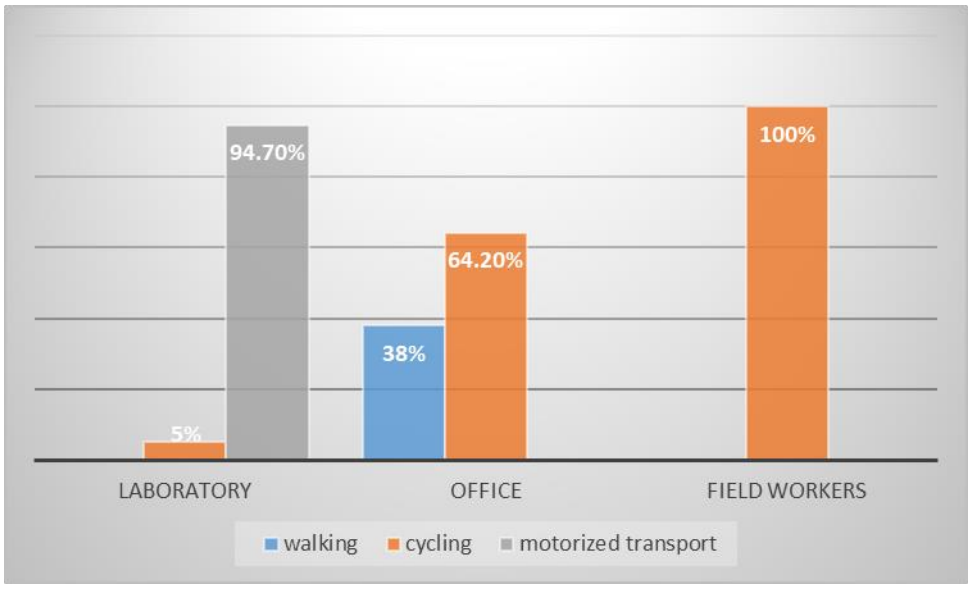

Figure 4.12: Type of occupation against how respondents commuted to and from work

Further, since laboratory and office work is characterised by much sitting through-out the day, the assessment of occupational sedentary was carried out using the following questions under a section in the questionnaire which sought to know the

workplace sitting profile: “How many hours did you work in the last 7 days?”; “During the last 7 days, how many days were you at work?”; “how would you describe your typical work day in the last 7 days? (This involves only your work day and not travel to and from work, or what you did in your leisure time). “Indicate the percentages for sitting, standing, walking, heavy labour or physical tasks”. “Does this form an impression of your monthly daily routine in the last three months?” The analysis of the hours respondents worked in a week indicated a mean of 41.6 hours and a standard deviation of 14.5. The data for how many hours per week had a skewness of -0.935 and a kurtosis of 4.657 showing that it was not normally distributed but had a kurtosis towards working for 40 hours per week. On how many days per week the respondents worked, the data had a skewness of 2.496 and a kurtosis of 10.285 which was indicative that the data was not normally distributed but was kurtotic around 5 days per week. This indicated that most respondents worked an average of 40 hours in a 5 days week. The skewness and kurtosis analysis for the hours against the days worked was as shown in table 4-10.

Table 4.10: Skewness and Kurtosis analysis of hours against the days worked in a week

	Hours worked for the last 7 days	Days worked for last 7 days
Skewness	-0.935	2.496
Std. error	0.327	0.327
Kurtosis	4.657	10.285
Std. error	0.6644	0.644

The analysis on how respondents described their typical working day in the last 7 days indicated that those who worked in the field did not respond to sitting down and driving option. They spent most of their time walking. The results using Shapiro-Wilk showed $p<0.05$ for sitting for office workers, walking, heavy labour and sitting for laboratory workers.

Table 4.11: Tests for Normality

	Occupation	Statistic	Df	Significance p values	Statistic	Df	Significance p values
Sitting including driving	Office	0.181	28	0.019	0.907	28	0.017
	Driving	0.314	3	0.000	0.893	3	0.363
	Laboratory	0.250	20	0.002	0.726	20	0.000
Standing	Office	0.228	28	0.001	0.892	28	0.007
	Field	0.260	2	0.000	0.000	0.000	
	Driving	0.328	3	0.000	0.871	3	0.298
	Laboratory	0.187	20	0.066	0.893	20	0.031
Walking	Office	0.146	28	0.129	0.911	28	0.021
	Driving	.253	3	0.000	0.964	3	0.637
	Laboratory	0.282	20	0.000	0.849	20	0.005
Heavy labour or physical tasks	Office	0.357	28	0.000	0.524	28	0.000
	Field	0.260	2	0.000	0.0000	0.000	
	Driving	.175	3	0.000	1.000	3	1.000
	Laboratory	.495	19	0.000	0.460	19	0.000

On gender basis, the data revealed that male had *a skewness* of 1.905 for hours worked per week and female had -0.782. The data was skewed for male but approximately normally distributed for female. The kurtosis of 2.707 for males and 2.321 for female indicated the data was *kurtotic* for both male and female. For the number of days worked in a week, the results revealed female had a skewness of 2.602 with a kurtosis of 11.75 for male. This was an indication that for both male and female respondents, the data was both skewed and kurtotic which further inferred that the data was independent of gender meaning that both male and female worked 40 hours per 5 days week. By analysing the skewness and kurtosis for gender against the number of days and hours worked, the results were as shown in table 4-12.

Table 4.12: Kurtosis and skewness analysis: Gender against days worked in a week

	Gender		Statistic	Std. error
Hours worked last 7 days	Male	Skewness	1.905	0.464
		Kurtosis	2.707	0.902
	Female	Skewness	-.782	0.448
		Kurtosis	2.321	0.872
Days at work last 7 days	Male	Skewness	2.485	0.464
		Kurtosis	10.748	0.902
	Female	Skewness	2.602	0.448
		Kurtosis	11.759	0.872

Most respondents spent significant time sitting (78.4%) in the place of work as compared to walking within the office/laboratory (15.6%) or lifting heavy objects (6%). This meant that occupational sedentary was high among the respondents. The results were in agreement with Allan, (2018) who argues that on occupation domain, employers should ensure that their workers do not spend significant amount of time sitting as a way of providing a safe system of work.

4.5.4 Time spent by the respondents while commuting to work

The study sought to establish the time spent sitting in the cars to perform a journey to and from respondents' workplaces while on motorised transport. The results revealed that (44.6 %) spent more than 1 hour in traffic. This could be attributed to traffic jams experienced during the peak hours in Nairobi metropolitan region. The long-time taken to commute to and from work added to the respondents' sedentary time. This falls under transportation domain where Owen *et al,* (2011) argues that use of cars in suburban areas has lengthened the period of sedentariness which refers to the amount of time spent in the cars to perform a journey to and from workplaces and short journeys.

Table 4.13: Motorized transport against time taken to commute to and from work

Time (in minutes)	Frequency	Percentage
≤ 30	8	15
31≥ 60	7	14.9
61≥90	23	40.8
91≥120	2	3.8
Total	40	74.5
Did not respond	14	25.5
Total	54	100.0

Statistics for skewness and kurtosis if one used motorized transport and how long they took to commute to and from work revealed a skewness of 0.133 and a Kurtosis of 3.172 showing it was not normally distributed but had significant kurtosis towards spending 60 minutes to and from work as shown in table 4.14

Table 4.14: Kurtosis and skewness analysis of the time spent using motorised transport.

	Statistic	Standard error
Skewness	0.133	0.374
Kurtosis	3.172	0.733

4.5.5 Lifestyle trends

The part of the questionnaire assessing the respondents' profile on sitting at the workplace indicated that the respondents were spending too much time sitting in the workplace (78.4%) and that they were working for a *mean* of 41.1 hours in a 5 days week. It was important that the study established whether this sedentary lifestyle equally reflected at home by assessing how they spent their weekend and leisure time.

The lifestyle trends that influence sedentary behaviour were revealed by the respondents by giving details on how many hours they spent watching television at home after work and how they spent a typical weekend. The study revealed the following:

Most of the respondents spent significant proportion of their weekend watching TV as depicted in figure 4.14.

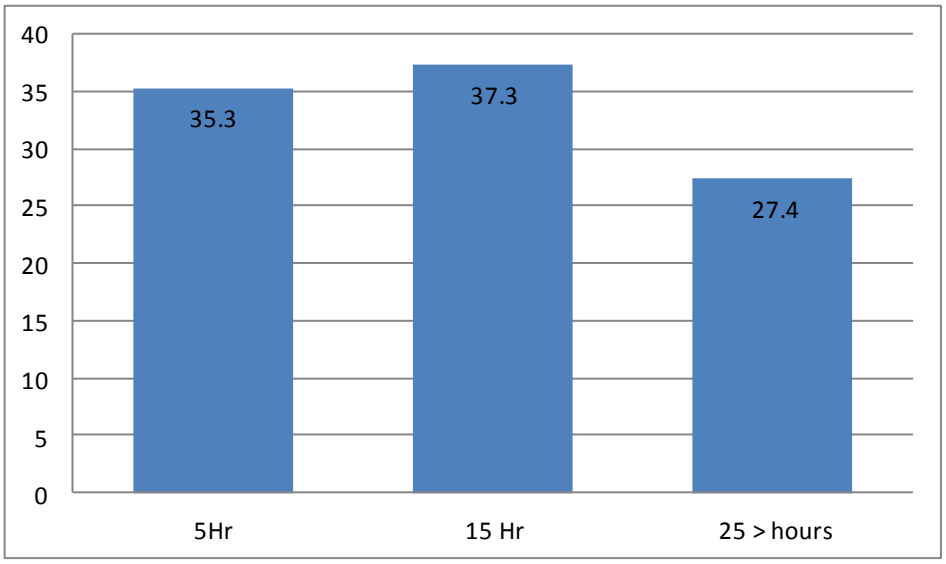

Figure 4.13: Time spent watching television over the weekend

Notably 64.7% of the respondent spent over 15 hours in front of the TV on weekends. According to Thyfault, (2010) the legs are not used when sitting or lying prone. The legs and backside contain some of the largest muscles in our body. When sitting in a chair or lying on a couch, the muscles are slack and levels of blood sugar and bad cholesterol rise adversely affecting the health.

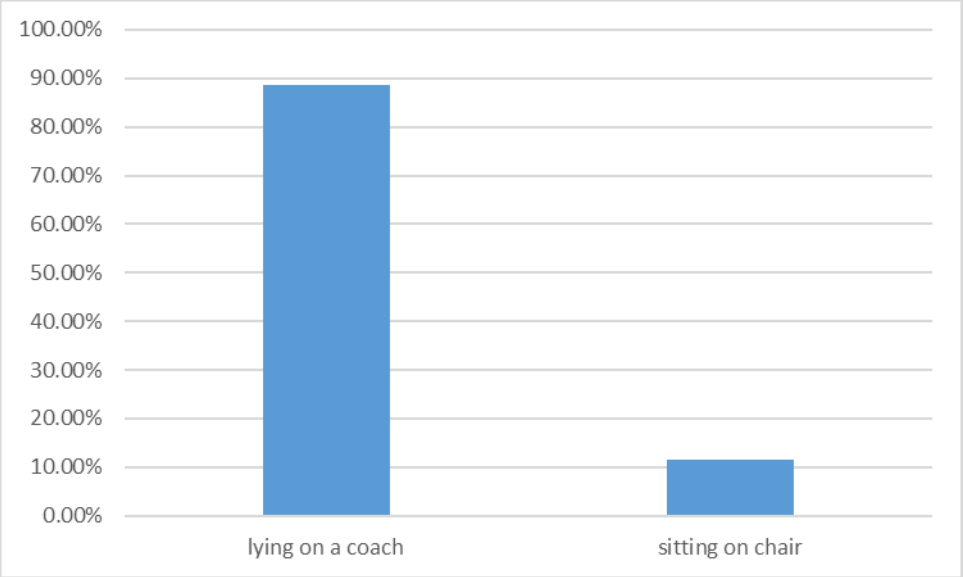

Figure 4.14: Respondent's sitting mode while watching the TV

Most respondents preferred being indoor, lying on the couch while watching TV. More specifically 68% of respondent confirmed that they preferred to spend most of their weekend at home lying on the couch and only 14% and 18 % preferred being involved in Physical activity and socialising with friends respectively.

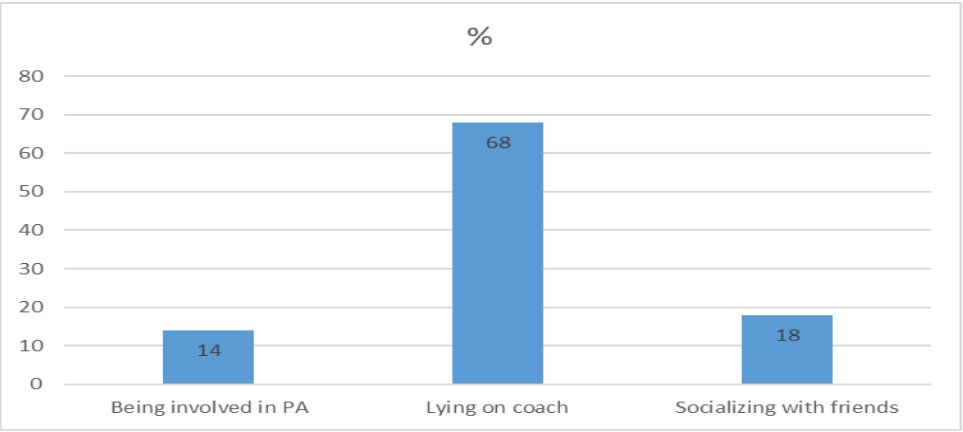

Figure 4.15: How respondents spent their weekend

Only 23.1 % confirmed that they either used dish washer or washing machine at home.

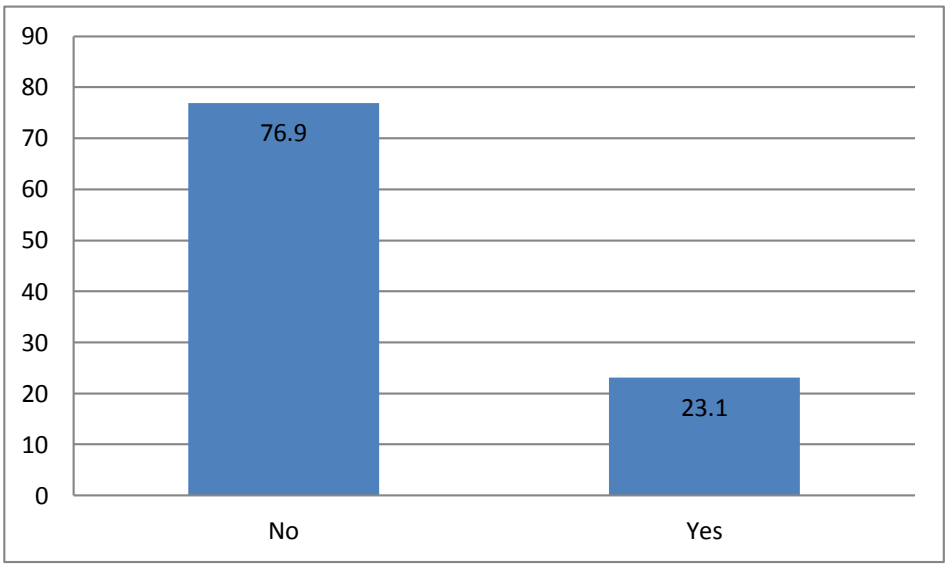

Figure 0.16: Respondents with dish washer or washing machine at home

(e) On housework domain, the results were as shown in table 4-18.

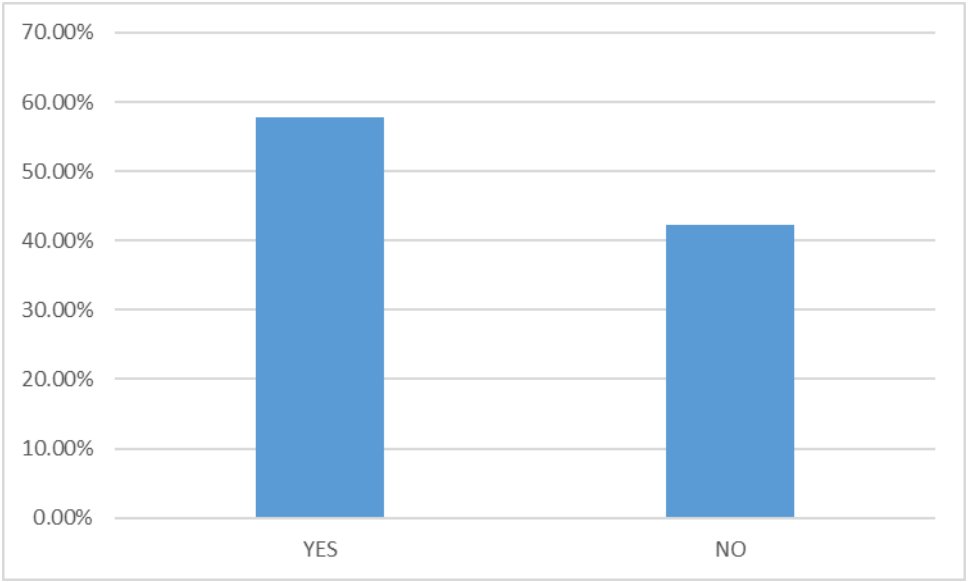

Figure 4.17: Respondents with house helps at home

In physical activity domains, house chores falls under the four major domains category which includes transportation, occupational and leisure. Kindula, (2014) stated that in Kenya, nearly everyone, except the very poor, hires domestic help. A

study by Alex *et al,* (2006) on practice of physical activities and associated factors in adults in Brazil found out that the proportions of active individuals were, (14.8%) leisure, (38.2%) occupational, (11.7%) transportation, and (48.5%) household chores. This was in agreement with the results of this study as it was observed that, 57.7% of the respondents delegated all their house chores to house helps after spending significant time (78.4%) sitting in the office and (44.6%) in the traffic for more than 60 minutes. Kirigo, (2012) confirms such lifestyle reduces use of their large muscles, back trunk and legs hence reduction of the body intake of sugar and fats thus increasing their health risk and tendency to develop obesity. Kirigo, (2012) further argues that those who spend a lot of time sitting down have a predisposition of having blood clots, developing a bad posture and frequent fatigue and muscle soreness. Further, the researcher deduced that KALRO employees in the selected institutes were sedentary and were at risk of developing type 2 diabetes and cardiovascular disease.

Spearman (-0.451) revealed that there was a negative correlation at (p= - 0.01) significant level. This indicated that those respondent who earned higher income were the ones who had dish washers and washing machines. However among the respondents, spearman p value of (-0.659) revealed significant and negative correlations among the respondent as shown in table 4.15.

Table 0.15: Statistical correlation between the respondents' earning against those that had dish washers/ washing machines and house helps

			Income per month in Kenya shillings	Respondents with dishwashing machines at home	Respondents with hose helps who handles all chores at home
Spearman's	Income per month in kenya shillings	Correlation coefficient	1.000	0.541	-0.659
		Sig.(2 tailed)	-	0.001	-
		N	54	54	54
	Respondents with dish washing machines at home	Correlation coefficient	0.541	1.000	.0466
		Sig.(2tailed)	0.001	-	-
		N	54	54	54
	Respondents with househelps	Correlation coefficient	-0.659	0.466	1.000
		Sig.(2tailed)	-	-	-
		N	54	54	54

This indicated that as the respondents earned more they acquired house help to do all their house chores. The research showed that KALRO employees in the selected institutes used house help as compared to using mechanized methods of cleaning

clothes and dishes and the ones who had high income (> 46000 making up 56.5%) were the ones who employed house help to perform their house chores as shown in figure 4.19.

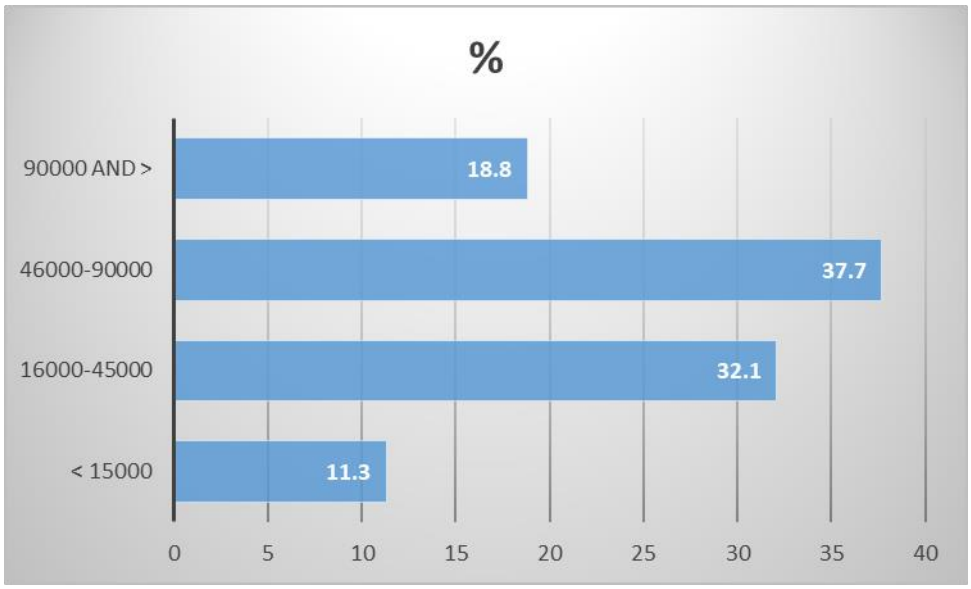

Figure 4.18: Cross tabulation of respondents using househelp against earnings

4.5.6 Medical history and work influence trends

The study sought to know the respondent's medical history and whether they had ailments related to sedentary lifestyle. The analysed data indicated that respondents suffering from chronic low back pain (LBP) after a day's work in the office or laboratory were 52%. Respondents suffering from fatigue and muscle soreness after a day's work were 72.5% while 15.7% reported they suffered from high blood pressure and 45% suffered from neck and shoulder pain (NSP). Neck and shoulder pain and low back pain have recently been identified as problems in many countries. The use of new technology has led to high rates of computer, mobile phone and other electronic products. These factors lead to lack of exercise and skeletal – muscle dysfunction (Zhi *et al*, 2013). The assessment of NSP and LBP were carried out using the following questions under the section on medical history and work influences trends in the questionnaire: "For the past three months, have you suffered

from chronic low back pain after a long day's work". The options provided in the answers were: "occasionally (in a period of 1 to 3 times a month); "often (in a period of 1 to 3 times a week)"; "always (more than 3 times a month)". The given answers with often and always indicated presence of NSP and LBP. This was not without the consideration of the pre-existing musculoskeletal conditions. The results revealed that 5.4% of the respondents indicated they suffered from diabetes. None of the respondents indicated that they suffered from any form of cancer.

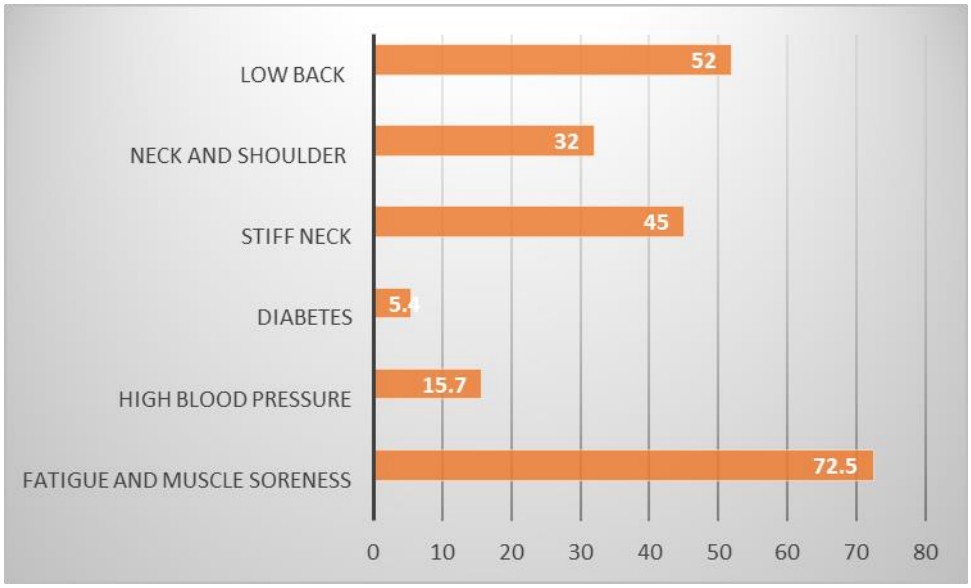

Figure 4.19: Respondents suffering from ailments related to sedentary lifestyle

From the results, it was observed that 15.7 % had high blood pressure which meant that (84.3%) had indicated no to this condition, 5% indicated they had diabetes which translates to (94.1%) no to this condition and (100%) no to any form of cancer. This was in tandem with findings of Stauart Ali and Fransecs Xavier (2017) who stated that the actual burden of the disease (NCDs) is poorly understood and people don't know that they suffer from the condition and therefore don't seek treatment as shown in figure 4.21.

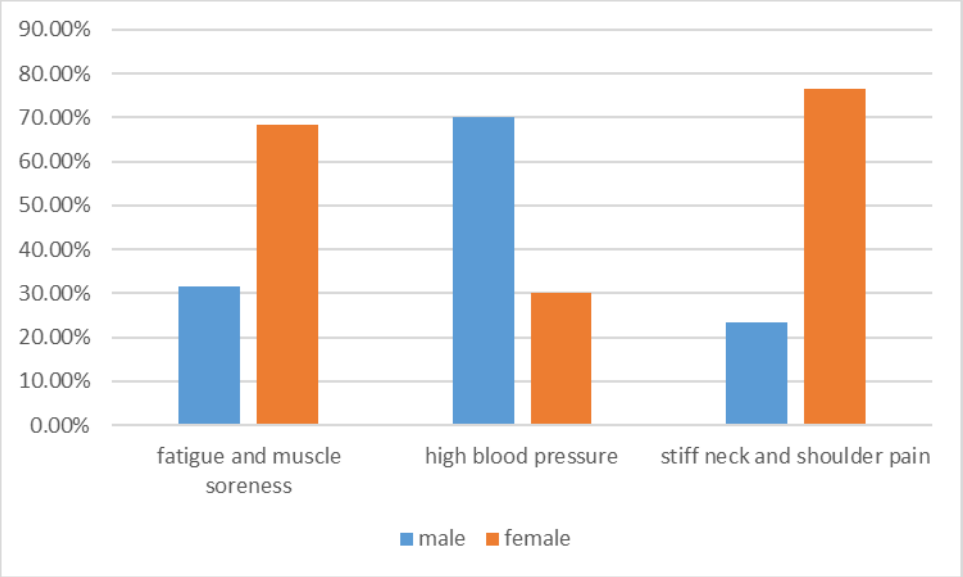

Figure 4.20: Respondents who had sought for medication by gender.

A total of 43.2% did not seek medical attention despite having a medical condition and 25.6% did not respond. The study observed that most respondent did not do frequent medical check-up even when in pain. This was indicative of lack of awareness on the importance of having frequent medical check-ups. On gender basis, the respondents who suffered fatigue and muscle soreness after a long day's work and had not sought for medical attention were 31.5% male and 68.5 % female. The cross tabulation of cases of high blood pressure against whether the affected had sought for medical attention revealed that 70% male and 30% female had not, while for those who suffered from stiff neck and shoulder pain the result revealed 76.4% female and 23.5% male had not sought for medical attention.

CHAPTER FIVE:

CONCLUSIONS, AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this study was to assess sedentary lifestyle prevalence among workers in Kenya Agricultural and Livestock Research Organisation (KALRO).

The study concluded that there was high prevalence of sedentary lifestyle among KALRO employees in the selected institutes as observed in the study's specific objective below:

5.1.1 Policies and programs available to mitigate effects of sedentary lifestyle

There was no advocacy on the part of the management on the importance of policies and programs to mitigate effects of sedentary lifestyle among the employees in selected KALRO institutes.

5.1.2 Employees at risk of physical inactivity and their WHtR

The high number of respondents of both gender with WHtR above 0.5 and WC above the recommended measurements 88.9 cm for females and 101.6 cm for males was indicative of sedentary prevalence among KALRO employees. Female employees were considered to have higher sedentary prevalence.

5.1.3 Factors influencing sedentary behaviour

Use of motorized transport, screen time, delegation of house chores to house helps and occupational domains played a significant role in the prevalence of sedentary lifestyle among KALRO employees in selected institutes. These factors increased with earnings, and age.

5.2 Recommendations

The recommendations based on findings of this research are:

a) KALRO to ensure that all institutes have an operational dispensary. This will help employees to stay healthy by offering on site preventive test, NCDs screening and health coaching. This will encourage healthful habits aimed at encouraging workers to reduce the noted high WHtR and resultant obesity.
b) KALRO management to organise programs to encourage workers to engage in exercises and fitness by allowing for physical activity and membership of a gym or sports club in line with the WHO, 2017 recommendations on physical activity. This might create a supportive culture and environment for individual behaviour change.
c) KALRO management to invest on ergonomic chairs. Sampled workers spent more than 40 hours in a week on an office chair. A well designed comfortable sitting option is important for improved posture and performance (Kate, 2017)
d) For the desired outcome of prevention and management of obesity at the workplace to be achieved, KALRO management to introduce policies and programs to mitigate effects of sedentary lifestyle. which should be aimed at addressing physical activity and behaviour change by intervening at individual, environmental, and policy level through education and counselling sessions.
e) A concerted effort by KALRO management to reduce occupational sedentary without compromising work output is necessary. This might be achieved by introducing activity permissive workstations with fixed standing desks which may or not include adjustable chairs (Maike *et al,* 2014).
f) This research findings of this study should be replicated to include other institutes so as to establish standardized policy and programs to mitigate sedentary lifestyle among employees in KALRO.

5.3 Future research

This study recommends that further research needs to be carried out to reveal the impacts of this high sedentary lifestyle and its consequences for both employers and employees.

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APPENDICES

Appendix I: Informed Consent Form

TITLE: Assessing Sedentary Lifestyle Prevalence Among Workers in Kenya Agricultural and Livestock Research Organisation.

Research Statement

My name is Richard Mwaniki Njue and I am a student at Jomo Kenyatta University of Agriculture and Technology. I am undertaking a research on sedentary prevalence among workers in Kenya Agricultural and Livestock Research Organisation. This is to invite you to be a participant in this research. You have a choice on whether to participate or not. If you have any clarifications that you may require before you make your decision, kindly feel free to ask me at any time.

Purpose

The purpose of this study is to investigate sedentary lifestyle prevalence among workers in KALRO and it is purely academic in partial fulfilment for the award of Masters of Science sDegree in Occupational Safety and Health.

Study Procedure

This study will involve your participation in answering a few open ended questionnaire that will take approximately one hour. We are inviting you to participate in this research because we feel that your input as KALRO worker will contribute much to our quest for knowledge on sedentary prevalence levels and the associated health related problems. If you are in agreement to be one of the participants, kindly give your consent by signing at the space provided on the consent form.

Risks

We wish to state that we do not anticipate any physical harm will come to you by taking part in this research.

Benefits

By you taking part in this research, it will help us in determining the sedentary lifestyle prevalence levels in KALRO and its health effects to workers and also guide policy makers on recommending the mitigating policies and programs. This is meant to promote better occupational health and safety of the KALRO workers.

Confidentiality

The information given in this questionnaire will be kept in private and will not be shared to anyone outside the research team.

Participation

Your participation in this research will be on voluntary basis. It will therefore be your choice whether to participate or not. You are free to change your mind midstream and your information will be confiscated.

What Participation Involves

If you agree to participate in this study, you will be required to fill in the attached questionnaire.

Appendix II: Questionnaire for KALRO laboratory and office workers in selected institutes

Questionnaire S/NO.....

TITLE: Assessing Sedentary Lifestyle Prevalence Among Workers in Kenya Agricultural and Livestock Research Organisation

(The questions will be administered by the researcher)

Section 1: Social – Demographic profile

Age (a) 20-34 years [ ]; (b) 35-44 years [ ]; (c) 45-54 [ ] years; (d) 55 and over [ ]

Gender (a) Male [_] (b) Female [_]

Marital status (a) Married [_] (b) Single [_] (c) Widow/widower [_] (d) separated [ ]

Educational level (a) Primary [_] (b) Secondary [_] (c) College and over [_]

Occupation (a) office [ ] (b) field [ ] (c) driving [ ] (d) laboratory [ ]

Income per month in Kenya shillings (a) less than 15,000 [ ] (b) 16,000-45,000 [ ] (c) 46,000-90000 (d) 90,000 and over [ ]

House hold motor vehicle ownership (a) yes [ ] (b) no [ ]

Section 2: Sitting at workplace profile

How many hours did you work in the last 7 days? [ ] hours

During the last 7 days, how many days were you at work? [ ] days

How would you describe your typical work day in the last 7 days? (this involves only your work day and not travel to and from work , or what you did in your leisure time)

Sitting (include driving) %

Standing %

Walking %

Heavy labour or physical tasks %

Total 100%

How long have you been sitting on the same chair in the office/ laboratory?

2 years [ ] (b) 5 years [ ] (c) over 5 years [ ]

Section 3: Lifestyle trends profile

How do you commute to and from work?

Walking [ ]

Cycling on a bicycle [ ]

By public transport [ ]

Driving own car [ ]

If your answer to question one is (c) or (d) how long does it take you to commute to and from work?

On a typical weekday, how many hours do you spend watching the television at home?

Five [ ]

Fifteen [ ]

Twenty five [ ]

4.How would you describe your sitting mode while watching the television?

Lying on the couch [ ]

Seated on an arm chair [ ]

5. How would you describe your typical weekend?

Lying on the couch and watching the television or reading a book [ ]

Being involved in physical activity like cleaning the car, doing the laundry, etc. [ ]

Socialising with friends at local outlets [ ]

6. Do you have a dish washer or washing machine at home?

Yes [ ]

No [ ]

7. Do you have a house help who handles all the chores at home?

Yes [ ]

No [ ]

Section 4: Physical measurements of waist to height ratio (WHtR)

Kindly allow us take the measurements of your waist and body height using the measuring tape provided. We request that you be in light clothing to enable us to get the correct waist measurement. For correct measurement of your height, please stand with feet close together, arms at the side and shoulders straight.

Waist circumference in centimetres [ ]

Height measurement in centimetres [ ]

Section 5: Medical history and work influences trends

Do you suffer from chronic low back pain? (a) yes[ ] (b) no [ ]

Do you suffer from fatigue and muscle soreness after a long day's work (a) yes (b) [

Do you suffer from;

High blood pressure, yes [ ]; no [ ]

Diabetes, yes [ ]; no [ ]

Any form of cancer, yes [ ]; no [ ]

Stiff neck and shoulders pain, yes [ ]; no [ ]

4.If your answer to any of the above questions is yes, have you sought for any medication? (a) yes [ ]; (b) no [ ]

5.Have you been tested for high blood pressure or diabetes in the recent past (a) yes [ ] (b) no [ ]

Appendix III: Questionnaire for selected KALRO institutes on available policies and programs to mitigate effects of sedentary lifestyle among employees.

Questionnaire S/NO…….

TITTLE: ASSESSING SEDENTARY LIFESTYLE PREVALENCE AMONG WORKERS IN KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANIZATION.

1 Institute's reference (kindly tick [A]; [B]; [C]; [D]; [E]; [F]; [G]

Number of workers in the institute

Does the institute have an operational dispensary [yes]; [no]

Does the institute organise programs that encourage workers to engage in exercise and fitness by allowing for physical activity and membership of a gym or sports club [yes]; [no]

Does the institute organise for quartely programs for hypertension and other non cummunicable diseases screening and management [yes]; [no]

If your answer to the above question is yes, how is the employee turnout [good]; fair]; [poor]

As the employer's role in and responsibility for the promotion of well-being in the workplace, does your worksite have any othe following:

Regular breaks from sitting by to standing up every 30 minutes [no]; [yes]

Poster signage to encourage workers to use the stairs in place of lift [no]; [yes]

Provision of drinking water in laboratories and offices to encourage workers to drink lots of water for frequent toliet trips [yes]; [no]

Centralised waste bins to encourage workers light exercise [yes]; [no]

Policy on holding a walking meeting [no] [yes]

Policy on holding a standing meeting [yes]; [no]

Policy on maximum time a normal sitting meeting should take [yes]; [no]

Policy addressing ergonomics and workplace design [yes]; [no]

Active workstation with electronically height adjustable desk with integrated treadmill or a tredmill plus a stationery cycle ergometer [yes] ; [no]

Worksite programs targeting obesity factors such as behaviour modifications , health education , health risk assessment and appraisal, weight management , stress management [yes]; [no]

Thank you for participating in this study. The information given in this questionnaire will be kept private and will not be sahred with anyone outside the research team.

Sign …….

Date ……

Appendix IV: KALRO Research Institutes and their locations

	Research Institute	Location	County
1	Agricultural mechanisation	Katumani	Machakos
2	Apiculture	Pekerra	Baringo
3	Arid and range lands	Kiboko	Makueni
4	Beef	Garissa	Garissa
5	Soil and water	Kabete	Nairobi
6	Coffee	Ruiru	Kiambu
7	Dairy	Naivasha	Nakuru
8	Food crops	Kitale	Tranzoia
9	Genetic resource	Muguga	Kiambu
10	Horticulture	Thika	Kiambu
11	Industrial crops	Mtwapa	Kilifi
12	Miraa	Maua	Meru
13	Non ruminant	Kakamega	Kakamega
14	Sheep and goats	Marsabit	Marsabit
15	Sugar	Kibos	Kisumu
16	Tea	Kericho	Kericho
17	Veterinary	Muguga	Kiambu