ASSESSMENT OF OCCUPATIONAL RISK FACTORS AND HEALTH EFFECTS OF COMPUTER USE AMONGST BANKERS IN NAIROBI COUNTY KENYA

ANTHONY NJIRU NYAGA

MASTER OF SCIENCE IN

OCCUPATIONAL SAFETY AND HEALTH

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

2026

Assessment of Occupational Risk Factors and Health Effects of Computer Use amongst Bankers in Nairobi County Kenya

Anthony Njiru Nyaga

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Occupational Safety and Health of the Jomo Kenyatta University of Agriculture and Technology

2026

DECLARATION

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

Signature……………………………………Date……………………………...

Anthony Njiru Nyaga

This thesis has been submitted for examination with our approval as the University Supervisors:

Signature ……………………………………. Date ………………………………

Dr. Charles Mburu, PhD

JKUAT, Kenya

Signature ……………………………………. Date ………………………………

Dr. Benson Karanja, PhD

JKUAT, Kenya

DEDICATION

I dedicate this work to the Almighty God and to my family for their encouragement and support throughout my studies.

ACKNOWLEDGEMENT

I would like to acknowledge my family members, friends and colleagues who supported me throughout the process of developing this research project. Special appreciation goes to Dr Charles Mburu and Dr. Benson Karanja for their relentless guidance and mentorship during the process of this thesis development.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATION AND ACROYMS

BMI	Body Mass Index
CVS	Computer Vision Syndrome
ICT	Information and Communication Technology
ILO	International Labor Organization
MBBS	Bachelor of Medicine and Bachelor of Surgery
MSDs	Musculoskeletal disorders
NIOSH	National Institute for Occupational Safety and Health (NIOSH
OSHA	Occupation Safety and Health Act
USA	United States of America
VDT	Visual Display Terminal
WHO	World Health Organization
WMSDs	Work-Related Musculoskeletal Disorders
ERC	Ethics Review Committee

ABSTRACT

The use of computers has increased significantly during the 21st century. Most financial institutions have integrated computer devices in their day-to-day operations. This has improved the productivity and efficiency of most employees. However, the use of computers has also been associated with adverse health effects. Some of the documented health issues caused by computers include visual disorders and Musculoskeletal disorders (MSDs). This study aimed to assess the occupational risk factors and health effects of computer use amongst bankers in Nairobi County Kenya. Specifically, the study aimed to determine the individual risk factors of computer use and their health effects amongst bankers in Nairobi County Kenya, to evaluate the environmental risk factors of computer use and their health effects amongst bankers in Nairobi County Kenya and to assess the level of knowledge and awareness on risk factors and health effects of computer use amongst bankers in Nairobi County Kenya. This study was anchored on the health brief theory and the Bio- psychosocial Model. The study applied proportionate stratified random sampling method. A sample size of 368 bank workers from across the 17 sub counties in Nairobi was enrolled into the study. Data was collected using semi structured questionnaires, observational checklist and taking actual measurement on the employees and the work environment. It was then analyzed using SPSS software Version 25 and then summarized using descriptive statistics. It was presented in form of pie charts, tables and bar graphs. Chi square was applied to demonstrate the strength of association between independent and dependent variables. Results showed prevalence of visual disorders with 54.1% of bank workers experiencing watery eyes while 50.3% of the workers experience burning senstaions. Results also indicated prevalence of musculoskeletal symptoms amongst the bankers with workers experiencing neck pain taking up 19.9% of the population and a significant 19% having shoulder problems. From the study, individual risk factors such as body mass index ($p=0.028$), working duration before taking a break($p=0.048$), working hours with computers($p=0.038$) and number of hours spent sitting($p=0.037$) were significantly associated with occurrence of musculoskeletal and visual symptoms. Ergonomic considerations such as use of adjustable seat heights($p=0.003$) and well cushioned seats($p=0.002$) were significantly associated with occurrence of musculoskeletal symptoms. Results also showed that eye-related health effects were influenced by factors such as break frequency($p=0.004$) and distance from the screen($p=0.045$). The study recommends that it is imperative for organizations to implement tailored ergonomic guidelines and promote adherence to recommended break intervals so as to safeguard the musculoskeletal and visual health of employees engaged in prolonged computer use. Additionally, educational initiatives aimed at raising awareness about the importance of maintaining healthy weight, taking regular breaks, and optimizing workstation ergonomics could further enhance employee well-being in the workplace. The study also recommends that organizations should incorporate ergonomics in the design of work places so as to promote health, comfort and efficiency at work place while preventing strain and injuries.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The banking sector is one of the most technology-intensive industries globally, relying heavily on computer-based systems for customer service, financial transactions, record management and communication. According to Assefa et al., (2023) seventy five percent of all the daily activities involve use of computers. In almost every company, institution, office or even home there is use of computers. This has boosted the work output in a great way. However, use of computer has also posed many dangers to human health and has also led to deterioration to the quality of life of workers interacting with computers. According to National Institute of Occupational Safety and Health (2023), computer vision syndrome affects 90% of the people who spend three hours or more daily on computers.

Most of the health impacts that are caused by use of computers are mostly by the working environment. Poor working conditions affect the workers' health. The psychological, social and physical aspects affect the health of office workers daily according to WHO (2023). The supplementary hazardous factors in the work environment might be bad lighting or bad smells causing sick building syndrome. The main physiological stress factor at workplace is badly designed workplace. The number of occupational diseases is the specific indicator of influence of existing hazards and risk factors on the worker in the work environment (Badea et al., 2022).

According to ILO (2024) the work environment risks include musculoskeletal disorders (MSDs), visual disorders and fatigue. Musculoskeletal disorders are conditions affecting the ligaments, muscles, nerves, tendons and other soft tissues and joints of the neck, upper limbs (shoulders, arms, hands, wrists, fingers), back or lower limbs (knees, hips, feet). Symptoms include pain, swelling, tingling and numbness, and may result in difficulty moving or long-term disability if no action is taken. Visual disorders involve the damages to the eyes. This can lead to impaired visual performance, headaches, and tired, red or sore eyes. These symptoms may be caused by concentrating on the screen for a long time, poor positioning of the computer, flickering screens, inadequate lighting, glare and refection, or poor legibility of paper or screen documents. Stress involves the adverse reaction people have to excessive pressure or other types of demand placed on them.

In USA approximately 143 million people use computers every day and more than 90% of the people suffer from computer vision syndrome. In addition to that, 90% of the children in USA use computers in school and it causes both musculoskeletal and vision disorders at an early age. Hence 1.3% of revenue is spent annually in USA on treatment and diagnosis cost of both musculoskeletal and visual disorders that is approximately tens of billions of dollars (American Optometric Association, 2023)

In Britain, according to a survey of self-reported work-related illnesses in 2015, an estimated 43,000 a worker from Britain ascribes musculoskeletal symptoms to their work, including 27,000 with back pain, 10,000 upper limb or neck complaints, and 11,000 with work-related musculoskeletal disorders (WMSDs) of the lower limb. However, for MSDs of slow onset or inter-mitten time course and those which may relate to cumulative long-term exposures, attribution of symptoms is difficult in the individual case, leading to a potential under- or overestimate of the number of work-related cases.

People use mobile phones more often for entertainment in Saudi Arabia. The most common health disorders reported include; leg pain, arm pain, headache, burning sensation, excessive tearing, excessive blinking, difficulty in focusing on near objects and neck pain. The frequently applied ergonomic practice in Saudi Arabia was adjusting display brightness based on the surrounding light brightness (Aljaradin et al. 2024).

In Africa, musculoskeletal disorder is a significant cause of morbidity and mortality in the general population and in many occupational groups. It is also the leading cause of disability and absenteeism from work throughout and significantly restricts normal activity and occupation. Individuals suffering from chronic musculoskeletal disorder experience huge social, mental, physical and occupational disruptions.

Prevalence of lower back pain among workers was 73.5% especially in South West Nigeria that was linked with long working hours and lack of knowledge on sitting position. In addition, a study conducted in Abuja, Nigeria, reported that 40% of computer users engaged as security and exchange commissioner has suffered from at least one health disorder Nigerian occupational health study (2023) indicated that health disorders in Nigeria are more prevalent amongst the undergraduate scholars. There is therefore a great need to create awareness in Nigeria so as to help the public to know the health effects of computer usage.

In Ethiopia, a research conducted on banking and office work study showed more than 73% of computer users who are working as bankers, secretaries, data processors, were developing computer vision syndrome (Assefa et al., 2023). Prevalence of CVS was found to be higher in Debre Tabor town government institutions in Ethiopia. Monthly salary, daily exposure time, type of work, and knowledge were the most determinant of CVS. Hence, optimizing the exposure time and improving the awareness of users by rigorous training and management support are important to tackle the problem.

In Uganda, most organizations use computers for a long period. Health disorders associated with computers are becoming quite common as people spend hours looking at various gadgets such as computers, phone screen, and I pad. Currently health disorders affect over 50% of office workers in Uganda. The figure is likely to increase as more people are opting for smaller electronic devices for most of their work. Even after a day's work, when many people return home, they run to their television sets whose light can equally affect them (Masele, 2019). Other studies further indicated that over 80% of Ugandan workers suffered from musculoskeletal disorders associated with computer use. The risk factors that were identified included awkward postures, lifting of heavy objects and mental exhaustion.

In Kenya, with the rapid scale up of computers across most occupations, health disorders related to the eyes and musculoskeletal systems have emerged. Most workers in Kenya are likely to get work-related musculoskeletal disorders due to long working hours, lifting of heavy objects, wrong postures and repetitive movement. The most common musculoskeletal disorder includes low back, the neck, shoulder and ankle/feet.

Recent studies indicated that office interiors of most work places in Kenya are seemingly constructed, not with sound ergonomic principles in mind, but rather to achieve aesthetics and visual impact. Muma (2019) added that the level at which ICT is embraced in Kenya has progressed and institutions like banks have embraced information technology to an extent of integrating all its programs with information technology hence exposing staffs to health disorders. However, lack of awareness of the health disorders is a key barrier to early detection, health seeking and practice of preventive measures. In addition, there is limited training on occupational risk factors that lead to health disorders due to computer usage (Muma, 2019). There is therefore need to further assess the occupational risk factors and health effects of computer use amongst bankers in Nairobi County Kenya, building on the previous studies on musculoskeletal disorders due to computer use by Tanui, (2019) and Omondi, (2014).

1.2 Statement of the Problem

The banking sector in Kenya has shown tremendous growth over the last decade. Matching with this growth has been the increase in use of computers as most financial institutions have adopted digital banking at levels such as customer service, account management amongst others. One of the key objectives of occupation safety and health is to protect workers from adverse health effects emanating from the work place. Nairobi County hosts the largest concentration of commercial bank headquarters and branches in Kenya. Consequently, thousands of bank employees spend prolonged hours using computers in performing routine banking operations.

Prolonged exposure to computers is associated with adverse health effects on the visual systems as well as the musculoskeletal system. Working conditions in the banks are characterized by repetitive tasks which require high concentrations, strict deadlines coupled with high targets. These coupled with long working hours which is more than 52hrs a week according to labour laws of Kenya can cause workers to experience symptoms such as impaired vision, red eye, neck pains, back pains, carpi tunnel syndrome and headache. Ill health results in lower productivity, absenteeism and increased medical costs which can have negative impacts on the overall performance of an organization. Although studies have examined computer-related health effects among office workers and other occupational groups in Kenya, limited empirical evidence exists regarding occupational risk factors and their associated health effects among bankers in Nairobi County. This study therefore seeks to fill this gap.

1.3 Justification

Banking sector is an essential part of the economy but banks have incurred losses over time due to occupational health issues associated with computer use. This can be expressed in terms of aspects such as staff absenteeism and detrimental health effect. Adverse health effects emanating from computer use translate to increased medical expenses to the bank. Despite the extensive researches on the occupational safety and health, little is known on the occupational risk factors and health effects of computer use among bankers in Kenya. This study was done in Nairobi since Nairobi is Kenya's financial capital, most commercial bank headquarters are located in Nairobi, the county has the highest concentration of computer-based banking operations and that findings from Nairobi are likely to provide valuable evidence for improving occupational health practices within the banking sector.

This study will build on the existing knowledge and create awareness on occupational risk factors and health effects of computers use within the banking sector. It will also contribute significantly on the banking sector more so in the implementation of some occupational safety and health policies.

The findings and recommendation from the study will assist Commercial banks in Nairobi County, Bank employees, Occupational safety and health regulators, The Ministry of Health and Researchers and policymakers.

1.4 Objectives of the Study

1.4.1 Main Objective

To assess the occupational risk factors and health effects of computer use amongst bankers in Nairobi County Kenya

1.4.2 Specific Objectives

The specific objectives are:

1. To determine the individual risk factors of computer use and their health effects amongst bankers in Nairobi County Kenya
2. To evaluate the work environmental risk factors of computer use and their health effects amongst bankers in Nairobi County Kenya
3. To assess the level of knowledge and awareness on risk factors and health effects of computer use amongst bankers in Nairobi County Kenya

1.5 Research Questions

1. What are the individual risk factors of computer use and their health effects amongst bankers in Nairobi County Kenya?
2. What are the environmental risk factors of computer use and their health effects amongst bankers in Nairobi County?
3. What is the level knowledge and awareness on the risk factors and health effects of computer use amongst bankers in Nairobi County Kenya?

1.6 Null Hypothesis

H_{01}: There are no individual risk factors associated with computer use and health effects amongst bankers in Nairobi County Kenya.

H_{02}: There are no work environmental risk factors associated with computer use and health effects amongst bankers in Nairobi County Kenya.

H_{03}: The level of knowledge on the risk factors of computer use is not associated with adverse health effects.

1.7 Scope

The study sought to assess the occupational risk factors and health effects of computer use amongst bankers in Nairobi County Kenya. Bankers are people who perform banking activities like: accepting deposits, lending money, withdrawing and exchanging money. The study was carried out in selected commercial banks in Nairobi County. The study participants were employees of the respective branches. The study used primary data and adopted across –sectional research design.

1.8 Conceptual Framework.

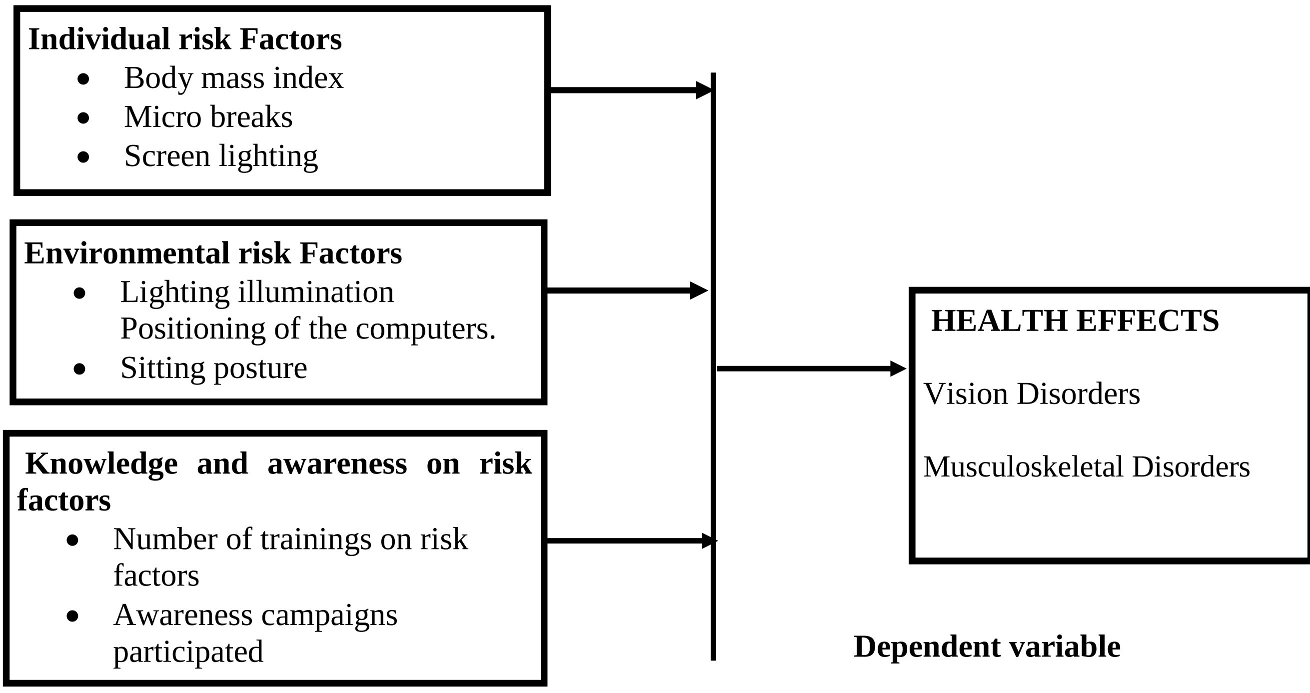


Figure 1.1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Principles

2.1.1 Theories for Individual Risk Factors

Health Brief Model is a theory which will help in informing the individual risk factors that affect the health due to computer use. Health belief model was amended by (Green et al., 2020). The model gives five constructs that predict health behavior (Anuar et al., 2020). The first construct is perceived susceptibility. The computer users are more likely to believe that risk factors exposure such as prolonged computer use, unsuitable sitting position, level of computer screen expose them to getting computer vision syndrome.

The second construct is perceived severity. The users of computers are more likely to believe that double vision, dry eye, eye fatigue, headache, irritation, redness and burning sensation are caused by computer vision syndrome. This can lead to increase in economic burden, increased error rate and minimized job satisfaction. This is likely to cause the computer users to act in a way to avoid the negative effect.

The third construct is the perceived benefit. The users of computers have a belief that the actions recommended which include refractive errors to be corrected, maintaining a proper contrast, use computer eye glasses, level of computer screen below the eye level, maintain viewing distance of not less than arm's length will successfully prevent them from acquiring computer vision syndrome. Computer users must perceive that the target behavior will offer strong positive benefits and adopting these health behaviors may likely abolish the symptoms and lessen the burden from computer use.

The fourth construct is perceived barrier. The computer users may experience inconvenience which include unpleasant activities such as wearing spectacles and which will help them to reduce the computer vision syndrome. To adopt the healthy behaviors the users of computers, have to believe that the advantage outweighs the consequences. In addition, ways to eliminate these barriers such as educating electronic device users to put computer glasses with anti-glare. The last construct is self-efficacy. For computer users to embrace suitable interventions there is a possibility that they must think about the interventions and resolve that they have the potential to put them into practice. To boost high self-efficacy, computer users must highly recognize the benefits of interventions.

2.1.2 Theories on Environmental Risk Factors

The Bio- psychosocial Model describes the possibility of WRMDs seeming in the body of a human being because of the stress levels that are rising when the workers are encountered with and hostile stimulus which can be risks that are psychosocial. In this case when the bankers were faced with work environment stress, they can experience health disorders. The capacity of such people to adjust to the unfriendly circumstance and decide their reaction to the circumstance: laborers either figure out how to adapt, which expands their capacity to keep up with stable feelings of anxiety in future antagonistic circumstances, or experience diminished wellbeing because of expanded creation of stress chemicals and their metabolites in the body's muscles and cells, which contributes to muscle strain, expanded impression of exertion and responsibility in modern exercises, expanded affectability to torment and helplessness to muscle wounds (Sterling et al., 2015). Frazier (2020) observed that casual laborers experience an undeniable degree of stress. Further, the presence of environmental risk factors such as room illumination and temperature leading to musculoskeletal health disorders (Govindu & Babski-Reeves, 2014).

The bio psychosocial model reflects the development of illness through the complex interaction of biological factors (genetic, biochemical, etc.), psychological factors (mood, personality, behavior, etc.) and social factors (cultural, familial, socioeconomic, medical, etc.). For example, a person may have a genetic predisposition for depression, but he or she must have social factors such as extreme stress at work and family life and psychological factors such as perfectionistic tendencies which all trigger this genetic code for depression. A person may have a genetic predisposition for a disease, but social and cognitive factors must trigger the illness.

2.1.3 Methods for Assessing the Levels of Illumination within the Work Place

There are several methods for assessing the level of illumination within a banking workplace: Lux meter: This is a device that measures the intensity of light in a given area, measured in lux. It can be used to measure the illumination level in different parts of the workplace to ensure that it meets the recommended guidelines.

Visual assessment: This involves visually inspecting the workplace and checking for any areas that may be too bright or too dim. This method is subjective and may not be as accurate as using a lux meter, but it can still be useful for identifying any obvious problems.

Contrast ratio: This measures the difference between the lightest and darkest areas within the workplace. A high contrast ratio can cause eye strain and may make it difficult for employees to read or work on computers.

Illuminance maps: These are diagrams that show the distribution of light within a given space. They can be useful for identifying any areas that may not be adequately lit.

Employee feedback: Asking employees about their experiences with the lighting in the workplace can provide valuable insights and help identify any issues that may not be immediately apparent.

2.1.4 Theories on Level of Knowledge

The level of knowledge was informed by learning theories. The learning theories all stress the same principle of learning, that is, consequences, which is reward or punishment. It is widely accepted that reward is the single most important principle of learning (Syawaludin & Marmoah, 2018). The student is as of now not seen as a vacant vessel, but instead as an effectively associated with entertainer developing and reproducing of information base (Metsärinne & Kallio, 2017). In this view the level of knowledge of computer risk factors will determine whether the banker will have health disorder or not.

It has been further shown that during exploratory learning of computer hazard related variables, brokers can get information through one or the other inquisitive or trainings held by the organization. Further, bankers can investigate a specific space without anyone else inspiration instead of being told. As per different investigates, all ways to deal with exploratory learning depend on four standards; students can and should control their learning, information is multidimensional, students' way to deal with assignments are assorted and it is workable for figuring out how to feel normal (Iqbal, 2012). Also, various apparatuses are utilized to improve exploratory discovering that incorporates micro worlds, games and reenactments

2.2 Legal Framework

2.2.1 Occupational Safety and Health Act

The Occupational Safety and Health Act (OSHA), 2010 (Kenya Gazette Supplement, 2010) is an act of parliament that was enacted to secure the safety, health and welfare of persons at workplace; and protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

The Occupational Safety and Health Administration (OSHA) section 92 requires workers to use face and eye protection when there is a reasonable probability of injury that could be prevented by such equipment. Individual defensive eyewear, like goggles, face safeguards, wellbeing glasses or full-face respirators should be utilized when an eye risk exists. The necessary eye protection depends upon the type of hazard, the circumstances of exposure, other protective equipment used and individual vision needs.

OSHA and regulations promulgated under it contain no reference to display screen equipment or computers. However, there are additional general regulations applicable to computer users. For example, regulation of the Environmental Regulations for workplace requires employers to prevent glare. OSHA itself also contains generally worded requirements on establishing a safe working environment for example, section 8(1)). However, these do not give detailed guidance on how a workplace for computer users should be organized. Although section 8(2)(d) provides for a risk assessment of the working environment, there are no particular minimum requirements for typical components of a computer workstation. The same is true for section 8(2)(e) dealing with training of and information to employees.

Consequently, the Act and regulations fail to give guidelines on setting up safe computer workstations. Employers concerned about avoiding work-related muscular-skeletal disorders and injuries among their computer workers, must therefore obtain information from outside experts, often at great cost.

2.2.2 International Labor Organization

International Labor Organization (ILO) and World Health Organization (WHO) share a common definition on occupational health. They define occupational health as that which focus on the advancement and support of the most significant level of physical, mental and social prosperity of laborers on the whole occupation. They define the role of occupational health services at the workplace as having preventive and advisory functions and being responsible for helping managers, laborers and their delegates in setting up and keeping a protected and solid workplace which works with ideal physical and psychological well-being at workplace.

The ILO has an order to secure laborers against ailment, sicknesses and wounds because of Workplace perils and dangers including ergonomic and work association hazard factors. One of the principle capacities for the ILO is to foster global guidelines identified with work and work. ILO principles have applied impressive impact on the laws and guidelines of part States. The ILO principles appear as worldwide Conventions and Recommendations. ILO Conventions and Recommendations pertinent to security of laborers against ergonomic danger factors at the working environment incorporate Convention No. 127 and Recommendation No.128 which determine the worldwide prerequisites concerning the manual vehicle of a heap. To help part States in applying the ILO norms, the ILO produces functional aides and instructional pamphlets on ergonomics at work and gathers and investigations public practices and laws on ergonomics at the working environment. The ILO likewise directs specialized collaboration exercises in numerous nations on ergonomics to help and reinforce the limits of its three-sided constituents in managing work environment ergonomic and work association hazards. The ILO's specialized collaboration exercises give needs on the advancement of willful, participatory and activity situated activities to work on working conditions and work associations of the little and medium measured undertakings (ILO, 2010).

2.2.3 National Institute for Occupational Safety and Health (NIOSH)

The National Institute for Occupational Safety and Health is A United States federal agency answerable for directing exploration and making suggestions for the anticipation of business-related injury and sickness. NIOSH is essential for the Centers for Disease Control and Prevention (CDC) inside the U.S. Branch of Health and Human Services. NIOSH provides national and world leadership to prevent work-related illness, injury, disability, and death by gathering information, conducting scientific research, and translating the knowledge gained into products and services. NIOSH abides by a strategic plan for meeting institutional goals and allocating resources. The Institute has seven overarching goals that include minimizing occupational musculoskeletal disorders, reducing occupational respiratory disease, improving workplace safety to reduce traumatic injuries and promoting safe and healthy work design and well-being among others. NIOSH research works to improve workplace safety and health through safe practices, policies, and procedures. The research recommendations are then submitted through OSHA.

2.3 Previous Related Studies

2.3.1 Prevalence of Health Effects on Computer Use

A study conducted by Basakci Calik et al. (2020) revealed that among individuals using desktop computers, the most commonly reported areas of pain included the upper back, neck, lower back, and shoulders. Borhany et al. (2018) conducted research to determine the frequency of musculoskeletal issues in frequent computer and internet users, identifying common symptoms such as headaches (46%) and neck pain (41.3%), with wrist pain being the least prevalent at 16%. Hasan et al. (2023) investigated the correlation between musculoskeletal pain and discomfort among resident doctors due to computer-related ergonomic concerns, finding that over 50% experienced neck and lower back pain, while more than one-third reported eye and upper back pain. Alghamdi et al. (2023) explored the risk factors for work-related musculoskeletal disorders (WMSD) among computer users post-COVID-19 pandemic at Al-Baha University, revealing high prevalence rates of WMSD symptoms, notably in the neck

(62.7%), lower back (59%), upper back (55.3%), right shoulder (46%), and right wrist (45.3%).

Musculoskeletal discomfort (MSD) associated with low back, shoulder, and neck pain are a main reason of physical discomfort in the workplace while using a computer. According to the results of a study performed by Shariat et al., (2016), among office workers using computer in Malaysia, 69.7% of the participants showed a high pain severity score in the lower back, shoulders, and/or neck. However, only 11% indicated at least one high severity score in the upper back, knees, arms, hands, wrists, forearms, thighs, and hips. Musculoskeletal symptoms are directly correlated with BMI especially in individuals with low back pain (Shariat, 2018). Study carried out with Finnish adolescents suggested that musculoskeletal symptoms that cause moderate to severe pain are common among computer users (Hakala, et al., 2012). The prevalence rates of shoulder, elbow, wrist/hand, upper and low back pain were 50.5 %, 20.3 %, 26.3 %, 44.8 %, and 56.1 %, respectively for employees using computers in in Kaunas County, Lithuania (Kaliniene, et al., 2016).

Portello, et al., (2012) the most prevalent symptom was tired eyes, which was reported by approximately 40% of subjects as occurring ‘at least half the time’. 32% and 31% of subjects reported symptoms of dry eye and eye discomfort, respectively

The Body Mass Index (BMI), a widely utilized measure of weight status, remains prevalent in assessing health risks associated with weight. It is calculated by dividing weight in kilograms by height in meters squared (BMI=weight (kg)/height (m^2)). Normal weight typically falls within the range of BMI 18.5−25.9 kg m^−2, while overweight is classified within the range of BMI 25.0−29.9 kg m^−2, and obesity is characterized by a BMI exceeding 30.0 kg m^−2 (Gallagher, et al., 2013). Among the boys with more than two hours per day of computer use, the non-Saudis had significantly lower mean BMI (Saudi = 24.52 vs. non-Saudi = 23.61, $p < 0.05$) (Alghadir, et al., 2021).

Numerous studies have highlighted the association between BMI, indicative of excessive body weight and obesity, and the heightened risk of experiencing musculoskeletal pain (MSP). Research has consistently shown that obesity and overweight status serve as risk factors for the development of nonspecific musculoskeletal pain. The cumulative effects of prolonged exposure to excessive body weight and obesity have been particularly evident in chronic pain experienced in areas such as the neck and knees (Azabagic & Pranjic, 2019). Furthermore, overweight or obese individuals have exhibited a higher likelihood of experiencing musculoskeletal pain and related symptoms, particularly in the shoulders (Moreira-Silva, et al., 2013).

Studies have also shed light on the prevalence of musculoskeletal pain among adolescents, with increased usage of digital devices correlating with higher incidences of cervical and low back pain (Kounter, 2019). Moreover, the severity of pain in the lower back has been significantly associated with BMI, indicating a direct relationship between body weight and musculoskeletal discomfort (Shariat, 2018). Notably, various musculoskeletal regions have shown a significant correlation with BMI, further emphasizing the impact of weight status on MSP (Kaliniene, et al., 2016).

Computer use has detrimental health effects on bankers that is both on the vision and musculoskeletal systems. Globally, a million new cases of computer vision syndrome occur each year. According to the Seattle Times Company, worldwide, up to 70 million workers are at risk for computer vision syndrome, and these numbers are likely to grow. The report has indicated 70 percent to 90 percent of people using computers extensively, whether for work or play, have one or more symptoms of computer vision syndrome, (Vision, 2016, Derbew et al.,2021).

A study in Ghana on the computer vision syndrome and its associated ergonomic factors among bankers (Boadi-Kusi et al., 2022) found out that 73% faced headaches, 66% eye strain, 63% itching around the eye area were the common reported symptoms and the prevalence of computer vision syndrome was 71% with a high level of poor ergonomic practices in which females were more affected.

In Ethiopia the prevalence of computer vision syndrome among computer users was 73% and it was higher among bankers 74%, the common symptoms reported were blurred vision 34%, inappropriate sitting postures (95% CI 1.76, 3.22), frequent computer use (95% CI 2.04, 3.60) were significantly associated with computer vision syndrome among bankers in Ethiopia, (Adane et al., 2022).

A study in Kenya found the prevalence of computer vision syndrome was 60.4% and there were more females 51.3% affected than male 48.7% this was due to low level of awareness and reduces uptake of preventive measures among the university students. Nearly three quarter of the participants perceived computer vision syndrome as a global public health issue that should be addressed, (Muma et al., 2019).

The primary ocular causes for computer vision syndrome are oculomotor anomalies, that is, difficulties with eye movements or focus, extra ocular (ergonomic) etiologies, and dry eye. Dry eye is the most significant contributor computer vision syndrome symptoms (Aghaei & Abdolalizadeh, 2023). Computer users who experience computer vision syndrome may experience visual symptoms such eyestrain headaches, eye discomfort, dry eye, diplopia and blurred vision either at near or when looking into the distance after extended period of computer use. Asthenopia or eye strain is the most common symptom according to the previous studies, (Munshi et al., 2017).

Previous epidemiological studies have shown the prevalence of computer vision syndrome symptoms to be high, with nearly 90% (ninety) of computer users who spend more than 3 hours a day in front of the computer screen experiencing visual symptoms such as headaches, eyestrain, eye discomfort, dry eye, and blurred vision at some point, (Tauste Frances et al.,2014). According to a study conducted at the Commercial Bank of Ethiopia on bank employees to evaluate the prevalence of computer vision syndrome, it was reported that three fourths of employees were at risk of suffering from the disease (Derbew et al., 2021). A similar trend was observed in a study done on bank workers in Gondar City, northwest Ethiopia, where nearly three-fourths of bankers who used computers in their work suffered from computer vision syndrome, with the majority experiencing symptoms of blurred vision, headache, and redness of the eyes (Assefa et al., 2017). These findings demonstrate the severity of the issue and emphasize the need to evaluate the prevalence of computer vision syndrome among Kenyan bankers in Nairobi County, Kenya**.**

In United states the musculoskeletal disorders account for 56% to 65% of all occupational injuries, in Europe about 40million workers more than 30% of workers suffer from these disorders and this affects the country's GDP (Soroush et al.,2018). The global prevalence of musculoskeletal disorders is about 75% in men and 74%-77% in women (Rabiei et al., 2021) and these are the largest occupational related diseases in both USA and Japan.

The prevalence of musculoskeletal disorders and work station evaluation in bank employees in Pakistan found out that the effect was higher in females 43% than in males 21% and 40% had neck pains, 39% had shoulder pains, 37% faced lower back pains hence most individuals were at a risk of ergonomic hazardous, (Umar et al.,2019).

A study in Turkey on the effects of risk factors related to computer use on musculoskeletal pain in office workers (Basakci Calik et al., 2020) found that more female 50.8% were at a risk than male 49.2%. The common symptoms experienced were upper back pain 70%, neck pain 65%, lower back pain 64% and a majority of the workers reported these symptoms started after work 61%.

(Alamina F.E, 2019) found out in Nigeria port that most of the bankers 83% reported to have at least one musculoskeletal symptom, most common symptoms reported were neck pain 63%, upper back pain 57% and lower back pain 45%. This was reported in the past twelve months and ergonomic interventions avoidance of prolonged sitting and good working practices would reduce their musculoskeletal work-related disorders.

In Kenya, with the rapid embrace of computers across all occupations have emerged health disorders that are believed to affect the musculoskeletal structure of the human body. Most workers in Kenya are likely to get work-related musculoskeletal disorders due to long working hours with heavy objects lifting, wrong postures and repetitive movement. The most common musculoskeletal disorder includes low back, the neck, shoulder and ankle/feet (Tanui, 2016).

2.3.2 Individual Risk Factors and Health Effects of Computer Use

Common social demographic risk factors that are linked with computer use are age, gender, monthly income, employment status and pre-existing eye conditions according to multiple studies (Alemayehu et al., 2014; Dessie et al., 2018). In a study done among secretaries and data processors who are working at the University of Gondar, Ethiopia, to investigate the factors associated with computer vision syndrome, it was found that age and working hours were contributors to computer vision syndrome (Alemayehu et al., 2014). Studies show that younger people are more up-to-date with information as compared to older people, so they are presumed to be more knowledgeable about computer vision syndrome. In a study of digital device users at a medical college to assess their level of knowledge and awareness of computer vision syndrome, it was found that the younger people had a significantly higher level of knowledge of computer vision syndrome than the older people (Chauhan et al., 2018).

Dagne et al., (2020) did a study on work related musculoskeletal disorders and factors associated among bankers in Ethiopia. This study is based on an institutional based cross sectional study design. A final logistic model was run to identify factors associated with WMSDs. out of 307 bankers, the annual prevalence rate of WMSDs was 65.5%. Significant predictors were being 30–39 years old and above 40 years old, low educational level, working > 5 years, not doing physical exercises, poor posture and ergonomics. The pervasiveness of WMSDs among bankers was high. The significant related components answerable for the event of business-related musculoskeletal problems incorporate longer working experience, being over 30 years of age, low instructive status, actual exercise, work pressure, helpless stance and nonattendance of breaks during working hours.

Personal or behavioral factors such as level of a computer screen and taking breaks during computer use have been found to be linked with computer vision syndrome in studies carried out in Nigeria and Ethiopia (Dessie et al., 2018). Other personal factors like the duration of computer, hours of computer use per day, level of knowledge and awareness about computer vision syndrome, use of electronic devices out of work and customization of screen brightness have been discovered to be associated with computer vision syndrome (Nwankwo et al., 2021). Toomingas et al., (2012) did a study on occurrence and risk factors amongst professional computer users. This was a questionnaire based prospective study. The study found that the incidence rate of symptoms persisting minimum three days was 0.38/person-year. A multivariate Hazard-ratio model showed significant associations with extended continuous computer work, tasks with high demands on eye-hand coordination, low level of control, visual discomfort, female sex and nicotine use. Eye-symptoms at baseline was a strong risk factor for new symptoms. Regular breaks were identified as the major individual risk factor affecting the health of computer users. The study concluded that organization of computer work should secure frequent breaks from near-work at the computer screen. The severity of vision-related problems could in field studies be quantified by asking for the persistence of symptoms.

Maduagwu et al., (2014) did a study on prevalence and patterns of business-related musculoskeletal problems among financiers in Maiduguri, upper east Nigeria. A cross-sectional review was directed in the financial local area of Hayatabad Peshawar. The best recurrence of WRMDs was more normal among chief activity, which was trailed by Teller, followed by manager, followed by cashier, then followed by officer grade1 and others. The study concluded that MSDs happens because of individual danger factors like redundant undertakings, working in strange position, same stance for longer timeframe, brief rest timing during work and no actual preparing. The study was done in Nigeria while the current study was done in Kenya.

Assefa et al., (2017) did a cross-sectional study on factors associated with computer vision syndrome among bank workers in Gondar City, northwest Ethiopia. Data collection instruments included structured observations and checklists. Results indicated that prevalence of computer vision syndrome was very high amongst the bank workers. Symptoms of computer vision syndrome included blurred vision headache and redness. these symptoms were mostly associated with inappropriate sitting position and working with computer without break. The study used questionnaire, checklists and observations as the data collection instrument. The current study will use questionnaire only

In South Africa Mashige et al. (2013) did a study of individual factors leading to computer vision syndrome among computer users. The study was descriptive in nature. Individual risk factors identified included lack of break during computer use. Eye strain and visual fatigue, headaches, neck and back pains were the most severe and frequently reported symptoms among the participants. In general, the computer workstations were not ergonomically designed and users were not aware that they were not adhering to ergonomic requirements for computer use.

Andersen, Winding & Biering (2015) did a review on computer use and body mass index among teenagers and youthful grown-ups in Danish. Information were gathered from three rushes of surveys in 2004, 2007 and 2010 in a Danish birth companion investigation of kids brought into the world in 1989. Data on stature, weight, relaxation time active work and time spent on every day PC exercises were gotten from self-reports. Latency for instance additional time with a PC and additional time spent before the TV was related with an expansion in BMI. For each expanding every day hour went through with the PC the BMI expanded with 0.06 kg/m2 and 0.08 after change for expected confounders. Besides low parental schooling was unequivocally connected with expansion in BMI, while no impact was seen of family pay. The study was done in Danish thus presenting a scope gap. The current study was done in Kenya.

Mohan et al., (2020) did a study on work-related musculoskeletal injury risk assessment and its relevance to body mass index for computer professionals. This study was a correlational study design whereas two major variables such as REBA score and BMI were compared for possible association to find out the existing relationship one on another. Height and weight of the subjects were recorded and the body mass index (BMI) was calculated. The study found a positive correlation existed between BMI and REBA scores and were significant. Results from current study suggest that body mass index influences the risk of developing work-related musculoskeletal injury for computer professionals. The study focused on musculoskeletal disorders only thus presenting a conceptual gap. The current study will focus on both musculoskeletal and visual disorders.

Lale & Korhan (2013) did a study on anthropometric computer workstation configuration to decrease apparent musculoskeletal distress. Anthropometric estimations were gathered to plan the most appropriate PC workstation to lessen the apparent musculoskeletal distress. The meaning of this review was to give direction to tackling issues related with expensive medical issues and lost usefulness because of saw musculoskeletal inconvenience, and calming the forced monetary weight. The study focused on musculoskeletal disorders only thus presenting a conceptual gap. The current study will focus on both musculoskeletal and visual disorders.

In a study by Ding et al. (2020), it was demonstrated that individuals should take breaks after 40 minutes of sedentary work, with the most effective break type being SS5. The muscles were observed to return to their pre-intervention state after approximately 30 minutes. Interestingly, while several studies recommended breaks every 30, 20, or 40 minutes, or even at 60-minute intervals (Sheahan et al., 2018), the rationale behind these specific time intervals remained unspecified.

Furthermore, the daily duration of computer use was reported to be, on average, 30 minutes longer for workers. Additionally, the number of short computer breaks, typically lasting between 30 seconds to 5 minutes, was highlighted in the study by Eijckelhof et al. (2014).

The duration of working with a computer was identified as a significant factor contributing to shoulder pain by Kaliniene et al. (2016). Moreover, prolonged use of computers and mobile phones has been associated with various musculoskeletal issues, such as neck and back pain, and altered body posture, including forward head posture, across all age groups. These findings further corroborate the existing body of research on the relationship between prolonged sitting and musculoskeletal symptoms (Ding et al., 2020).

Baker et al. (2018) observed a clinically meaningful increase in lower back discomfort at the end of 120 minutes of prolonged sitting. Notably, participants in their study had autonomy over their tasks, potentially leading to differences in posture or movements, such as mouse usage or typing on a keyboard.

Furthermore, a review by Waongenngarm et al. (2018) provided additional support for the efficacy of active breaks, particularly those involving postural changes and stretching, in mitigating the effects of sedentary work.

In the study by Al Tawil et al. (2020), prolonged use of electronic devices exceeding 5 hours was linked to the manifestation of symptoms associated with computer vision syndrome. Factors such as duration of usage, screen proximity, brightness, and ambient lighting exhibited notable disparities between the compared groups in terms of computer vision syndrome prevention.

The utilization of computers and display gadgets with screens has been correlated with a decrease in the frequency of eye blinks, resulting in incomplete blinking, the evaporation of tears, and subsequently contributing to the onset of dry eye disease (Akkaya et al., 2018). Described as digital eye fatigue, computer vision syndrome is characterized by eye and vision issues commonly observed in individuals engaged in prolonged usage of computers, tablets, and cell phones, as noted by the American Optometry Association (Randolph, 2017). Predominant symptoms include eye fatigue, headaches, blurred vision, and dry eyes, with additional complaints such as double vision, head, and neck pain reported (Munshi et al., 2017).

Prolonged computer use has also been found to impair accommodation and vergence functions, in addition to dry eye symptoms (Parajuli et al., 2021). Studies indicate that individuals engaged in computer usage for over 4 hours display symptoms of convergence insufficiency, exosphoria, reduced fusional convergence, and diminished accommodation range (van Tilborg et al., 2017). The escalating prevalence of screen-based device usage across all age groups is escalating the significance of computer vision syndrome as a pressing public health concern.

Scores for tired eyes, dry eyes, and eye strain consistently exceeded 2.0. After just one hour of tablet viewing, significant increases were observed in scores for five specific symptoms (tired eye, sore/aching eye, irritated eye, watery eye, and hot/burning eye), leading to an overall elevation in asthenopia scores (Kim et al., 2017).

The American Optometry Association (2020) advises positioning the center of the computer monitor approximately 15–20 degrees (equivalent to about 10–12.5 cm) below eye level, with a distance of 50–70 cm from the eyes. Adequate lighting should be ensured in the surrounding environment, ideally with daylight coming from one side to minimize glare.

Tamenti (2017) conducted a study revealing that the distance from the eye to the center of the display screen varied from 36.33 to 104.33 cm, with an average of 75.11 cm (± 9.89 cm). Similarly, Bartha et al. (202) found an average distance of 71 cm (±8.4 cm) to the screen's center.

In another study, Tamenti (2017) discovered that participants experiencing symptoms associated with computer vision syndrome, such as tiredness, strained eyes, increased light sensitivity, burning, and itching, typically maintained a viewing distance of 71 to 90 cm from the computer screen. Those working at this distance for 9 to 12 hours reported more computer vision syndrome-related symptoms compared to those with a distance of 50 to 70 cm. Additionally, the majority of participants preferred a viewing distance of 71 to 90 cm, with tired and strained eye symptoms being prevalent at this distance. Tamenti, (2017) study in in South Africa The measured room luminance was between 19 and 388 lux, with a mean of 94.02 lux (± 64.48 lux). The display screen luminance was between 19.67 and 225.67 lux, with a mean of 78.88 lux (± 37.67 lux) (

Room illumination in two call centres was not conducive for computer work. The room illumination varied from 19 lux, which is dim, to 388 lux, which is acceptable. Anshel (2005) and Ankrum, (1999) reported the recommended light levels for normal computer environments as 200to 500 lux. An average of at least 350 lux is actually required. Good lighting is important for the visual comfort of computer users. It is also worth noting that light requirements may vary with tasks. For example, there may be a need for increased light for reference documents. There have been limited research on lighting within call centre environments. The screen brightness in one call centre was dim (19.67 24 lux) compared to the recommended screen brightness which ranges between 80 and 120 lux, with an average of 100 lux for computer workstation environments (Anshel, 2005). The imbalance between the computer screen and the room brightness may be the cause of increased light sensitivity and tired, strained eyes reported by call centre agents. It is also important to note that there are different light requirements for younger and older workers. Thus, the provision of adequate light for tasks may be necessary to accommodate the visual needs of the older workforce (Sheedy & ShawMcMinn, 2003). The majority of call centre agents had adequate knowledge about the importance of eye tests and most of them have had eye examinations.

Adjusting screen brightness and contrast to achieve a balance with ambient light sources or employing anti-glare measures can enhance screen visibility by minimizing reflections on the monitor. Research indicates that reducing screen brightness and mitigating light reflections from computer screens can generally alleviate the impacts of computer vision syndrome (gondol et al., 2020).

Al-Mohtaseb et al. (2021) propose a widely accepted hypothesis regarding the correlation between digital screen use and dry eye disease, suggesting that prolonged use of digital screens alters blinking dynamics, leading to ocular dryness. This review presents evidence linking digital screen use with dry eye disease, highlighting the changes in blinking patterns associated with digital device use, and underscoring the impact of dry eye on mental health and work productivity among digital screen users.

In a meta-analysis conducted by Courtin et al. (2016), the estimated prevalence of Dry Eye Disease (DED) among workers who extensively use digital screens ranged from 9.5% to 87.5%. Additionally, Gondol et al. (2020) identified computer brightness, anti-glare measures, and screen adjustment as potential variables influencing dry eye symptoms. Furthermore, Abudawood et al. (2020) found that higher screen brightness levels and increased reflections from monitors significantly elevate sensitivity to light, thus predisposing individuals to a higher risk of developing computer vision syndrome. Moreover, a study by Choi et al. (2019) investigated the impact of screen brightness and blue light exposure on eye fatigue in smartphone users, suggesting that reducing screen brightness and blue light emission can alleviate eye fatigue symptoms.

Similarly, Kim et al. (2018) explored the effects of screen glare on visual discomfort and found that anti-glare filters effectively reduced glare-related symptoms in computer users. the literature suggests that adjusting screen settings, employing anti-glare measures, and being mindful of screen brightness can play crucial roles in mitigating the adverse effects of prolonged digital screen use on eye health, particularly in reducing the incidence of dry eye disease and computer vision syndrome (Choi et al., 2019; Kim et al., 2018).

2.3.3 Environmental Risk Factors and Health Effects of Computer Use

Tint et al., (2012) did a review on users of computers, hazards brought about by the synchronous impact of lacking good indoor environment and dull. This review pointed toward further developing the work environment ergonomics of computer laborers. A scrutinizing of laborers was completed to explain the assessment of laborers about the work climate at the working environment. The oddity of the review is that the natural work conditions (indoor environment, lighting, commotion) are firmly associated with the tedium of the work. The consequences of examination of redundant work (ART device) show that the force of work for laborers completely occupied with information innovation is high, however somehow or another dull, along these lines medical conditions like musculoskeletal issues are extremely normal administrations.

Blagojevic, Petrovic & Blagojevic (2012) did a study on risk factors for health disorders in computer operators in telecom Serbia. The study assessed the occupational risk factors for computer-related health disorders and evaluated health conditions of 939 Serbian computer operators. Environmental risk factors for health disorders, in both male and female populations, were age; overtime work; negative working atmosphere; the presence of vibrations, noise, dust and chemical pollution in the workplace. The study showed high prevalence of musculoskeletal and ocular disorders in Serbian computer operators. More effective preventive measures are necessary to improve computer operators' health.

Noreen et al., (2016) did a study on prevalence of computer vision syndrome and its associated risk factors in Karachi. The environmental risk factors identified included room illumination, noise, work load as well as temperature of the room. Results indicated that most Karachi students experienced eye weariness, burning sensation, eye disturbance, neck pain identified with Computer vision condition. Extra ocular complaints include neck shoulder pain to headache problems. The study focused on computer vision syndrome as the dependent variable while the current study will focus on musculosketal disorder and visual disorders as the health effects.

Al Tawil et al., (2020) did a study on self-reported computer vision syndrome symptoms and the factors associated with it amongst university students in Saudi Arabia. The study was cross sectional in nature. The common symptoms found in the study included shoulder or neck pain, headache and dry eyes. In addition, use of electronic devices was strongly associated with computer vision syndrome. The environmental factors that were associated with the computer vision syndrome included room illumination as well as temperature of the room. This study was done in Saudi Arabia thus presenting a scope gap. The current study was done in Kenya.

Khan et al., (2020) did a study on work related musculoskeletal disorders among bankers in Hayat Abad Peshawar. The environmental work-related work factors that were investigated included room illumination and work load. The study was Cross Sectional in nature. The research showed that important percentage of the bankers described WMSDs in at least one region of the body in the previous one year. The study focused on bankers in Hayat Abad Peshawar while the current study will focus on bankers in Nairobi Kenya.

According to Paterson (2023), static work attitude potentially accelerates the onset of fatigue and pain in muscles involved. If these conditions take place every day and for a long time (chronic) pain can cause permanent damage to the muscles, joints, tendons, ligaments and other tissues. In addition, working with pain can reduce the productivity and efficiency of work and when working with this pain is continued then it will result in a disability, which ultimately eliminates the job for the worker. There are more than a third of all working time lost (lost time injuries) because of this condition.

Omondi (2014) did a study on risk Factors for upper body musculoskeletal distresses among computer users in Kenya. Data was collected by administering a modified Nordic questionnaire to 108 respondents of professional work groups from selected workplaces in Kenya. Binary logistic regression was used to identify the associations between risk factors and outcome variables. Prevalence rates of the discomforts were: neck, shoulder, upper back, hands/wrists and elbows. Neck discomfort and shoulder discomfort were most prevalent among the administration group, whereas wrists/hands discomfort and upper back discomfort were prevalent among bankers. The study revealed significant associations between the upper body musculoskeletal discomforts and some of the potential risk factors. The potential environmental risk factors included room illumination, dust, noise, room temperature as well as work pressure. The study used binary logistic regression while the current study will use multiple regressions.

A standard computer chair typically encourages a straight sitting posture, conforming to right angles at the ankles, knees, hips, and elbows, although some studies suggest preferences for reclined or declined postures (Lima & Coelho, 2011). It is advised that the chair's seat height allows feet to rest flat on a footrest, with knees bent at least to 90° and feet slightly forward. Chairs with adjustable height and rounded edges on the seat front can notably reduce pressure on the backs of the legs (Smith et al., 2007).

The recommended adjustable seat height ranges from 38 to 56 cm, with a depth adjustable between 33 and 48 cm to accommodate various users (Wood et al., 2014; Çobanyıldızı, 2021). Effective lighting systems, particularly lensed-indirect up lighting, can alleviate eyestrain and focusing issues among computer users, with optimal lighting levels between 300 and 500 lux (Kumar & Kumar, 2017).

Office modifications such as adjustable seats or footstools can elevate the knees above the hips, safeguarding the lower back during computer use (Odebiyi & Okafor, 2023). Workplace constraints in computer work, including seating systems, repetitive keyboard/mouse use, and chair-desk configurations, are interconnected factors (Nag & Nag, 2019). Novel seat cushions have shown promise in improving posture and reducing lower back pain (Sae-Lee et al., 2021).

However, the correlation between ergonomic mismatches and musculoskeletal complaints is not always apparent (Lima & Coelho, 2018). Nonetheless, musculoskeletal disorders may be linked to inappropriate furniture dimensions (Kibria & Rafiquzzaman, 2019).

Humidity levels play a crucial role in maintaining a comfortable and conducive environment, particularly in office settings. Moore et al. (2015) recommended an ambient relative low humidity range of 40-60% for office buildings, while the INSST (2019) considered humidity levels between 45–65% as normal throughout the year. This underscores the importance of maintaining optimal humidity levels to promote comfort and well-being among office workers.

Research has highlighted the detrimental effects of low humidity and temperature conditions on eye health, particularly in triggering Dry Eye Disease (Courtin et al., 2016). Munshi et al. (2017) found that relative low humidity and constant air flow in modern air-conditioned office environments were significant contributing factors to dry eye symptoms and visual disturbances experienced by office workers. Additionally, Çobanyıldızı (2021) identified low ambient humidity as one of the environmental factors leading to corneal drying, further emphasizing the adverse effects of inadequate humidity levels on ocular health.

Gondol et al. (2020) conducted a study demonstrating that individuals reported significantly less eye irritation during low-humidity exposure after using dexamethasone compared to artificial tears, highlighting the potential impact of humidity levels on alleviating eye discomfort. Moreover, a randomized crossover study involving 44 computer users revealed that one hour of computer use with a desktop humidifier was associated with improvements in tear breakup time and subjective comfort compared to computer use without the humidifier, underscoring the beneficial effects of maintaining adequate humidity levels during prolonged screen time.

2.3.4 Level of Knowledge and Awareness and Health Effects of Computer Use

Occupational risk factors that are associated with computer use are broad. They are sociodemographic, personal or behavioural, environmental, and visual display characteristics (Tesfaye et al., 2022). Each of these contributes differently to the risk profile and knowledge awareness among the computer users. It is important for eye care professionals to raise patients' awareness of the link between DED and digital screen use and of possible prevention strategies (Al-Mohtaseb et al., 2021). Good knowledge regarding various aspects of computer vision syndrome was observed in 22.46% individuals, while 53.99% and 23.56% had average and poor knowledge, respectively (Patil, et al., 2019). There is high prevalence but low level of awareness and knowledge about computer vision syndrome among medical students (Munshi, et al., 2017). According to Cardoso, et al., (2025) there is need to increase the ergonomic awareness among workers and corrective measures need to be implemented to reduce the impact of computer related symptoms of computer vision syndrome.

In a study done in Ethiopia, there was no significant relationship between age, gender, educational status and spectacles users with knowledge on computer vision syndrome, (Mersha et al., 2020). However, the work experience had a significant relationship with knowledge on computer vision syndrome since bank employees who had experience had attended some conferences and trainings on occupational hazards of electronics.

In previous studies, environmental factors such as illumination level, glare, antiglare filter and window curtains were discovered to predicator variables associated with computer vision syndrome (Ranasinghe et al., 2016). Computer vision syndrome characterises itself similarly to other eye conditions. As a result, most symptoms progress slowly and go unnoticed because they are not addressed in a timely manner with appropriate interventions. In Kenya, the level of knowledge and awareness of the occupational risk factors and health effects related to computer use is currently unknown across multiple sectors. In a study conducted among Kenyan university students to assess the level of awareness and perception on computer vision syndrome, it was found that the level of the awareness was low and computer vision syndrome was present in about two out of every five students (Muma et al., 2019). It is critical to investigate bankers' level of knowledge and awareness of occupational risk factors and health effects associated with computer use that exposes them to computer vision syndrome. This was vital in establishing effective preventive and corrective actions that will address computer vision syndrome and lead to behavioural changes that will reduce the prevalence rate of the disease.

Tafese et al., (2018) did a study on assessment of knowledge and practice of computer ergonomics among secretaries and data processing workers in Gondar University, Ethiopia. An institutional based cross-sectional review was led. Among the absolute respondents of the members were females. Most respondents had data about PC ergonomics with the mean information and practice 51.9% and 48.1% separately. The review presumed that despite the fact that the laborers had decent information their practices were underneath the mean score. So the concerned body ought to be mindful to work on the attention to the specialists on PC ergonomics practice through office ergonomics procedures. The study was done in Ethiopia while the current study was done in Kenya.

Sukums et al., (2014) did a study on wellbeing laborers' information on and mentalities towards PC computer applications in rural African health facilities. A cross-sectional review was directed. Instructive level, age, and long periods of work experience were altogether connected with PC information. Most respondents had inspirational perspectives towards PCs. Females had essentially lower scores than guys. Meetings and gathering conversations showed that albeit most were deficient with regards to PC information and experience, they were hopeful about defeating difficulties related with the presentation of computers in their work environment. The study was done in Ghana and Tanzania while the current study was done in Kenya.

A study on knowledge and practices of ergonomics in computer users (Khan et al., 2012). It was an observational cross-sectional study conducted over a two-week timeframe. Responses were analyzed using SPSS version 15 and considered significant at p value<0.05. The study population comprised 210 males and 134 females. Of the total, 52% said they had heard about ergonomics, while 92% were aware of its importance. Knowledge about the importance of arm-rest (24%) and backrest inclination at 120 degrees (32%) was there, but practiced by 21% and 31% respectively (p = <0.02). Straight placement of wrist in line with elbow was known to 194 (56.39%) and practiced by 138 (40%), while 186 (54.06%) respondents had knowledge about the ideal height of the chair, but it was adjusted only by 112 (32%). Disproportion was observed between the knowledge and practices of correct viewing distance from the computer screen, maintaining print at eye level, keeping computer screen free of glare and moving the chair for better keyboard use. Almost half of the respondents were not aware of the principles behind safe ergonomic practices. Even those who had the knowledge were not able to carefully and entirely apply this for prevention from health hazards.

Bisht & Bakhshi (2018) indicated that most students in India worked for 3-4 hours day by day and they used to sit in bed while chipping away at computer. Furthermore, the vast majority knew about the significance of work conduct while utilizing computer. A large portion of the complete respondents felt major annoyance, lower back, mid back and upper back while chipping away at laptop. Generally real weakness or sluggishness, shoulder or back torment/solidness and migraine during or subsequent to chipping away at the PC were the significant side effects as announced by respondents.

(Tafese et al., 2018) assessed information and practice towards PC ergonomics among work area clients of secretaries and information handling laborers who are working in various offices or staffs in college of Gondar. The review showed that despite the fact that the specialists had decent information their practices were underneath the mean score. In this manner the concerned body ought to be mindful to work on the familiarity with the laborers on PC ergonomics practice through office ergonomics procedures.

A study on awareness and knowledge of ergonomics among Medical Laboratory Scientists in Nigeria (Oladeinde et al., 2015). This study adopted cross-sectional descriptive design. Awareness was significantly associated with gender. However, awareness of ergonomics was not significantly affected by affiliation, area of specialization, post-qualification experience and educational qualification of the study participants. Awareness of ergonomics and knowledge of gains of its right application was poor among the study participants. The study was conducted amongst Medical Laboratory Scientists in Nigeria while the recent study was done amongst bankers in Kenya.

In Kenya Muma, (2021) indicated that almost half of Maseno University students had never heard of computer vision syndrome with only a few who knew more about computer vision syndrome. However, a relatively high proportion of the students had a low level of awareness with a few having high level of awareness. Student’s level of awareness on risk factors and preventive measures was generally low. The study was done amongst university students while the current study was done amongst bankers in Kenya.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Design

An analytical cross-section design study was conducted to determine occupational risk factors and health effects of computer use amongst bankers in Nairobi County Kenya.

3.2 Study Area and Population

This study was conducted in Nairobi Kenya. Study respondents were drawn from the various commercial banks.

There are approximately 31,605 bank employees in Kenya. There are a total of 39 different banks in Nairobi City County. The total number of bank branches Nairobi is 597, (Central Bank of Kenya, 2021). Therefore, the study population was drawn from the 597 banks in Nairobi City County. The approximate target population was all the 8000 employees working in these banks.

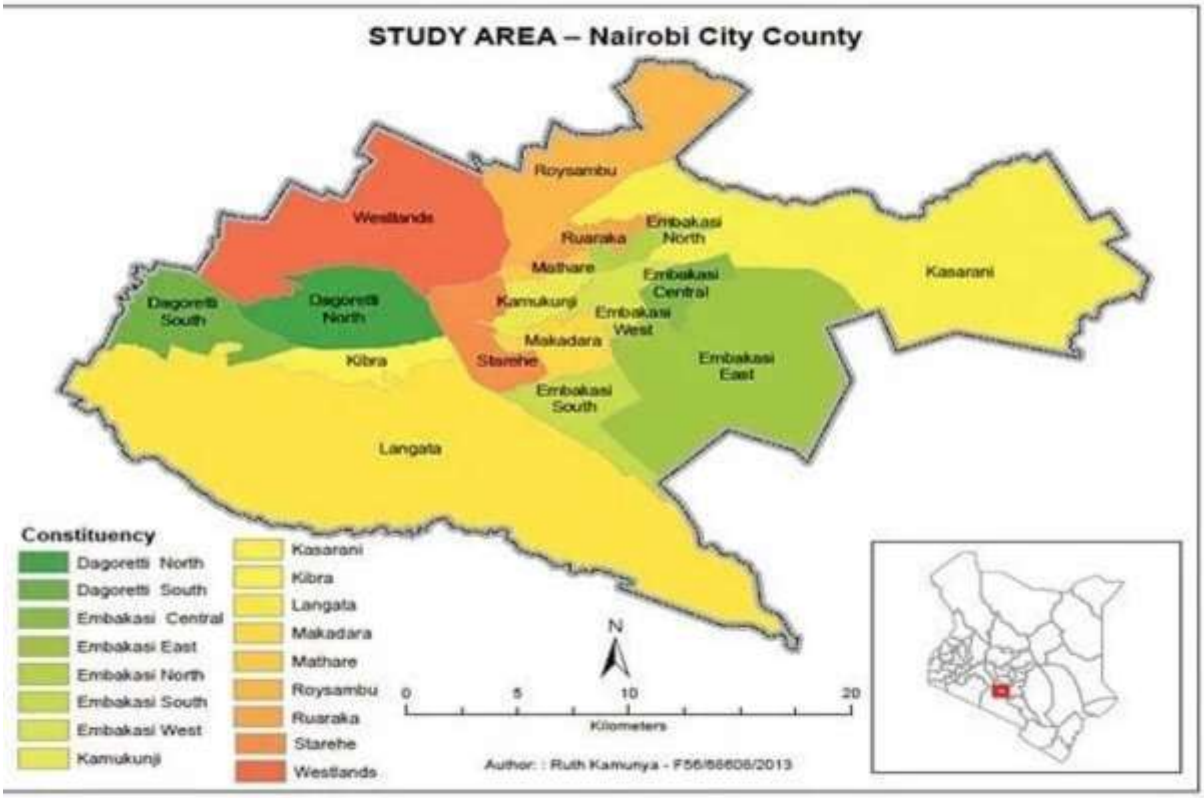


Figure 3.1: Map showing Nairobi County, Kenya

Table 3.1: Population Size

Banks	Number of Bank branches	Total Employees
A	30	456
B	13	158
C	5	70
D	12	144
E	8	92
F	5	56
G	3	42
H	10	123
I	72	964
J	8	104
K	2	25
L	15	205
M	5	80
N	10	134
O	70	940
P	40	523
Q	14	156
R	4	45
S	8	83
T	9	92
U	4	57
V	15	180
W	3	29
X	60	820
Y	8	98
Z	6	87
A1	4	50
B1	8	95
C1	32	513

D1	21	400
E1	4	50
F1	10	120
G1	18	201
H1	16	189
I1	7	80
J1	15	204
K1	15	235
L1	3	40
M1	5	60
Total	**597**	**8000**

Source: Central Bank Report, (2020)

3.2.1 Inclusion Criteria

Adults aged 18 years and above

Workers who use computers for more than 3 hours continuously every day.

Workers who have spent more than 6 months on current job

3.2.2 Exclusion Criteria

Workers with preexisting medically diagnosed chronic diseases e.g. diabetes and hypertension.

Workers who do not use computers.

Those who do not consent for the study.

3.3 Sampling Method

The sampling frame consisted of all employees working in licensed commercial bank branches located within Nairobi County. A list of licensed commercial banks and their respective branches was obtained from the Central Bank of Kenya. Employee registers provided by the selected bank branches constituted the sampling frame from which study participants were selected.

Nairobi County was first stratified into its 17 sub-counties. Commercial bank branches within each sub-county formed individual strata. The number of respondents selected from each stratum was determined using proportionate allocation based on the number of eligible employees. Within each selected bank branch, systematic random sampling was employed to select study participants from employee lists by choosing every kth employee after randomly selecting the first participant.

3.4 Sample size Determination

Since the study involved estimating the prevalence of occupational health effects among bankers in Nairobi County, Fisher's formula (Fisher, 2013) for determining sample size in cross-sectional studies was adopted. A similar study had been conducted by Muma in 2021 and found out a prevalence of 60.4% among participants. Hence the adoption of Fisher (2013) formula,

$$n = \frac{z^2 p\,(1-p)}{d^2}$$

Where;

n= is the sample size

z = is the confidence level,

d= is the margin error for the confidence interval

p= is the proportion to be estimated (Prevalence =60.4% of the population)

Sample size is reached at as shown below:

$$n = \frac{(1.96^2)(0.604)(1-0.604)}{(0.05)^2}$$

$$n = 368$$

3.4.1 Sample Size Distribution

The calculated sample size was proportionately allocated to each stratum using the following formula:

ni = $\frac{Ni}{N}$ * n   where

ni = sample size from the stratum

Ni = population size of the stratum

N = total population size

n = total desired sample size

Table 3.2: Sample Size Distribution

Banks	Number of Bank branches	Total Employees	Sample Size	Percentage
A	30	456	21	5.7
B	13	158	7	1.9
C	5	70	3	0.8
D	12	144	7	1.9
E	8	92	4	1.1
F	5	56	3	0.8
G	3	42	2	0.5
H	10	123	6	1.6
I	72	964	44	12.0
J	8	104	5	1.4
K	2	25	1	0.3
L	15	205	9	2.4
M	5	80	4	1.1
N	10	134	6	1.6
O	70	940	43	11.7
P	40	523	24	6.5
Q	14	156	7	1.9
R	4	45	2	0.5
S	8	83	4	1.1
T	9	92	4	1.1
U	4	57	3	0.8
V	15	180	8	2.2
W	3	29	1	0.3
X	60	820	38	10.3
Y	8	98	5	1.4
Z	6	87	4	1.1
A1	4	50	2	0.5
B1	8	95	4	1.1
C1	32	513	24	6.5
D1	21	400	18	4.9
E1	4	50	2	0.5

F1	10	120	6	1.6
G1	18	201	9	2.4
H1	16	189	9	2.4
I1	7	80	4	1.1
J1	15	204	9	2.4
K1	15	235	11	3.0
L1	3	40	2	0.5
M1	5	60	3	0.8
Total	**597**	**8000**	**368**	**100**

3.5 Research Instruments for Data Collection

The researcher used semi structured questionnaires and observation checklists to collect primary data. In addition, calibrated instruments such as lux meter, weighing scale and tape measures was also used to collect data on various measurements.

3.5.1 Individual Risk Factors

Data on individual risk factors was collected through observation methods, structured questionnaire that focuses on duration of exposure as well as performing actual measurement. Respondents were assessed for the following: social demographic data, habits of taking breaks, habits of screen brightness and contrast adjustment, habit of using electronic devices away from work. The formula to calculate BMI is:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

After calculations the results are interpreted using the table below.

Table 3.3 BMI Classification

BMI (kg/m^2)	Classification
Below 18.5	Underweight
18.5 – 24.9	Normal (Healthy) weight
25.0 – 29.9	Overweight

BMI (kg/m^2)	Classification
30.0 – 34.9	Obesity Class I
35.0 – 39.9	Obesity Class II
40.0 and above	Obesity Class III (Severe or Morbid Obesity)

Plate 3.1: Weighing Scale with Height

The viewing distance between the workers eyes and the centre of the screen was measured –normal viewing distance was considered to be between 45-75cm or alpha <60 degrees and alpha <40 degrees. Breaks were measured by ascertaining the duration of time the workers work before they go for break. Computer viewing distance was measured by the number of inches between the person and the computer.

The screen light was measured using the Lumen formula- which is used in illumination engineering to estimate the average illuminance on a working plane within an indoor space.

Illuminance (E) = F x UF x MF / A -

Where F is average lumens value from a light source F, UF is coefficient of utilization UF, MF is light source maintenance factor MF while A is area per lamp A.

3.5.2 Environmental Risk Factors

Data on environmental risk factors which included light illumination, working environment, sitting posture, were collected using semi-structured questionnaires and performing actual measurements within the work environment.

Lighting was measured using luxmeter (ISO-TECH ILM1337) in 3 positions: left, centre and right of the working area with distance between extreme positions not exceeding 117cm.lighting between 500-1000 lux (considering high /very high visual requirement) was considered normal. Position of computers relative to the windows was also measured.

Plate 3.2: Luximeter

3.5.3 Knowledge Level and Health Effects of Computer Use

The respondents were subjected to expert validated self-administered questionnaires to evaluate their knowledge and awareness of ergonomics. The extent to which they are able to apply these principles of ergonomics at work place to mitigate work related adverse health effects associated with computer use was also evaluated

A set of pictorial questions was also administered to evaluate participants knowledge on correct postures and equipment positioning, duration of exposure, angle of gaze, illumination, signs and symptoms of digital visual disorder and as well as signs and symptoms of musculoskeletal disorders associated with use of computer. Each correct response was given one mark. A checklist was also used to evaluate the number of trainings that had been conducted amongst the workers

3.5.3 Health effects of Computer Use

A Nordic musculoskeletal questionnaire was used to assess the health effects of computers to the musculoskeletal system. The body was divided into five anatomical areas of the body: shoulders, elbow, wrists, /hands as well as upper and lower back. Respondents were then asked to respond as to whether they experienced pain or discomfort on these anatomical landmarks.

To assess symptoms related to the vision, respondents were asked to respond as to whether they perceived, watery eyes, double vision, dry eye, eye fatigue and burning sensation.

To determine the level of visual, acquit respondents were subjected to Snellen chart test by an optometrist.

3.6 Data Analysis

Data from semi-structured questionnaires was coded and entered automatically daily using the Monkey survey method. Data entered into excel was then exported as a Statistical Package for Social Sciences (SPSS) file and then analyzed using SPSS version 23.0. Descriptive statistics of frequency, percentages and chi square was used to organize, describe and summarize data.

Frequency counts were carried out to determine the prevalence of the health disorders due to computer use amongst bankers in Kenya. The scores were presented in a frequency table and also in percentages. The health disorders were shown by; mild symptoms- less than 3 health disorders symptoms, 3-6 symptoms – moderate health disorders, more than 6 symptoms-severe health disorders. To achieve each of the study objectives, chi squares were used. A two tailed p value of less than 0.05 was considered to be significant.

Data was presented in the form of frequencies, tables, charts and graphs

3.7 Ethical Considerations

Approval was granted by JKUAT Ethical Review Committee (ERC) respectively prior to the implementation of the study as shown in appendix iv. A research permit was also obtained from NACOSTI as indicated in appendix iii.

An introductory letter was also obtained from JKUAT University. The purpose of the study was explained to the participants in detail and each one of them was free to ask questions about the study to make sure that they understand everything prior to the study. This was followed by the signing of written informed consents by the respondents.

Moreover, the participants were informed that the study was not for profit as there were no direct benefits and they were at liberty to withdraw from the study at any time without victimization or coercion. Unique codes were assigned to the questionnaires for anonymity and the records kept under lock and key for confidentiality purposes. No individual identification details were used in any presentations or publications resulting from the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Response Rate

A total of 368 questionnaires were distributed to the study respondents. Out of the 368 questionnaires distributed, 316 questionnaires were duly completed. This represented 86% response rate. The pie chart below presents the response rate.

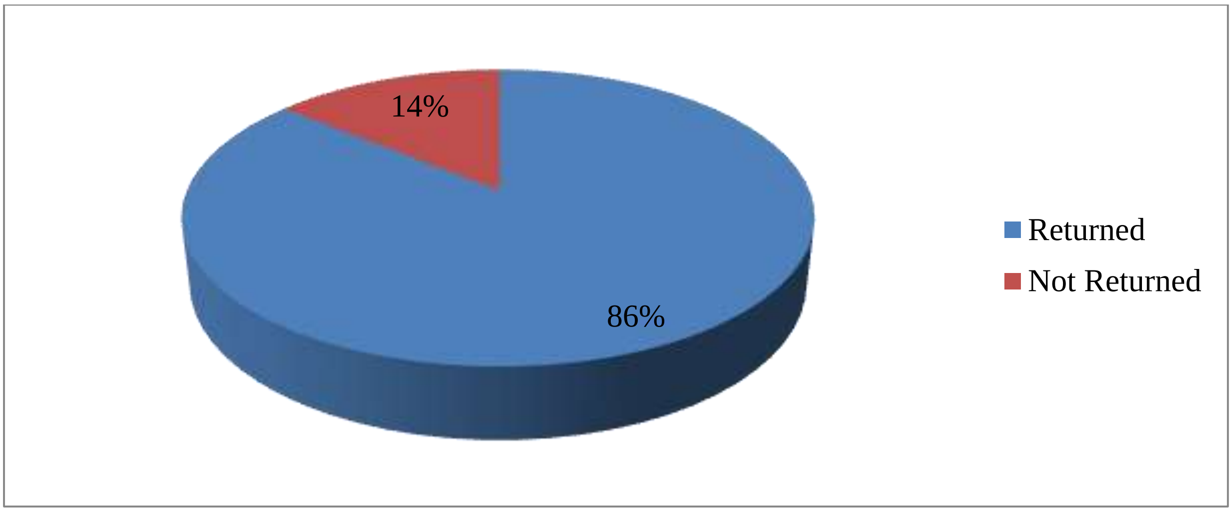


Figure 4.1: Response Rate

4.2 Socio-demographic Characteristics

The presented data provides insights into the demographic and professional characteristics of individuals working in a bank, categorizing them based on gender, years worked in the bank, age, position, years of experience in the bank, and the highest level of education. The table below presents the findings.

Table 4.1: Socio Demographic Characteristics of the Bank Workers

		Frequency	Percent
Gender	Male	146	46.2
	Female	170	53.8
Years worked in the bank	Below 5 years	132	41.8
	5 to 10 years	115	36.4
	More than 10 years	69	21.8
Age	20 – 26	95	30.1
	26 – 34	122	38.6
	35 – 45	54	17.1
	46 and above	45	14.2
Position in this bank	Senior Manager	47	14.9
	Manager	115	36.4
	Staff	154	48.7
Years worked in the Organization	Below 2 years	95	30.2
	2 to 5 years	134	42.7
	More than 5 years	87	27.2
Highest level of education	Certificate	4	1.3
	Diploma	70	22.2
	Degree	177	56.0
	Masters	54	17.1
	PhD	11	3.5
	Total	316	100

The data revealed a relatively balanced gender distribution among bank employees, with 46.2% identified as male and 53.8% as female. This representation indicated that nearly an equal proportion of male and female employees were exposed to similar working conditions related to computer use. This balance was essential in evaluating potential gender-specific health effects, ensuring that findings were applicable to around half of the workforce.

Results indicated that 41.8% of employees had worked in the bank for 5 to 10 years while 36.4% of the employees had less than 5 years of working experience in the bank.21.8% had more than 10 years of experience working in the banking industry. This distribution suggested a workforce with a mix of experienced staff and newer recruits, contributing to a potentially dynamic and collaborative work environment. According to Muchemi (2013), perception, thinking, experience, and performance varied depending on age.

The age distribution among bank employees revealed a diverse workforce, with the largest percentage of workers (38.6%) falling in the 26 to 34 age brackets. This was followed by the 20 to 26 age group accounting for 30.1% 17.1% of the bankers fell within the 35 to 45 years age bracket while 14.2% were over 46 years of age. The broad age range indicated a multigenerational workforce, fostering an exchange of ideas and experiences within the organization.

In terms of hierarchy within the banks, the majority of employees (48.7%) worked in junior staff positions entailing operations and customer services. Middle level managers accounted for 36.4% of the study respondents.14.9%of those interviewed were senior managers within the banking establishment. This distribution highlighted a hierarchical structure within the organization, showcasing a mix of leadership and supporting roles that contributed to the overall functionality of the bank.

Majority of bankers 58.2% were degree holders, 22.2% had qualification of diplomas while those with master's qualification accounted for 22.2% of the study respondent. Ph.D. holders among the employees had a representation of 3.5% and those with a certificate had the least representation with 1.6%. This diverse educational background showcased a workforce with varied expertise, enriching the intellectual capital within the organization.

4.3 Individual Risk Factors

4.3.1 Sitting Posture

The study sought to understand the sitting posture of the respondents. The results are presented in the table below.

Table 4.2: Sitting Posture of the Respondents

	Frequency	**Percentage (%)**
	Yes	
Shoulders relaxed with hands on keyboards	204	64.6
Computer positioned directly in front of user	203	64.2
Hands/wrists free from desk edges	171	54.1
Feet rest firmly on floor with back supported	189	59.8

Results indicated that 64.6% of the study respondent sat with shoulders relaxed and with their hands on the keyboards while 34.4% didn't adopt that while using a computer. Previous studies have associated incorrect body posture with occurrence of musculoskeletal pain amongst employees working with computers. A study by Basakci calik et al (2020), found out that shoulder pain was a common complaint among individuals using desktop computers. This study used observation design to assess the postures assumed by employees while evaluating the severity of symptoms using analog scale. More than half of the population (64.2%) had computers positioned directly in front of them while 34.8% had computers positioned incorrectly. Borhany et al. (2018), identified neck pain as a prevalent symptom among frequent computer users who had computers positioned incorrectly. 54.1% of the employees ascertained that they had their wrists/hands free from desk edges. 45.9% of bank employees had their hand and wrist rested on the edges of the desks which predisposed them to tendon and nerve injuries. This is in line with the findings of Hasan et al. (2023), who observed high rates of lower back pain among resident doctors due to computer-related ergonomic concerns.

The study also observed that 59.8% of the respondent had their feet firmly rested on the floor with optimal back support. A Significant 40.2% did not assume the recommended ergonomic guidelines of back support predisposing them to back pains.

4.3.2 Body Mass Index

Study respondent underwent assessment of weight height and hence body mass index. The findings are represented in table 4.3 below.

Table 4.3: Body Mass Indexes of the Respondents

BMI	Frequency	Percent
less than 18.5 (underweight)	21	6.6
18.5 - 24.9 (normal)	141	44.6
25.0 - 29.9 (overweight)	120	38.0
More than 30.0 (obese)	34	10.8
Total	316	100.0

Findings from the study indicated that close to half of the bankers (44.6%) were within the normal weight category as shown in the above table. Individuals classified as overweight constituted 38% of the study respondents. A smaller proportion of employees were categorized as obese, constituting 10.8% of the sample, while 6.6% are classified as underweight. These results suggest that a considerable proportion of bank employees using computers fell within the healthy weight range, as defined by BMI standards. However, it is noteworthy that a significant percentage of individuals were classified as overweight or obese, indicating potential health risks associated with excess weight. According to Gallagher et al. (2013), normal weight typically falls within the range of BMI 18.5−25.9 kg m^−2.

In interpreting these findings, it is essential to consider relevant literature on BMI and computer use. Previous research suggests potential associations between abnormal weight and height for BMI and occurrence of musculoskeletal pains. For instance, a study by Alghadir et al. (2021) found that persistent musculoskeletal pain is a significant problem in obese patients.

4.3.3 Breaks during Computer Use

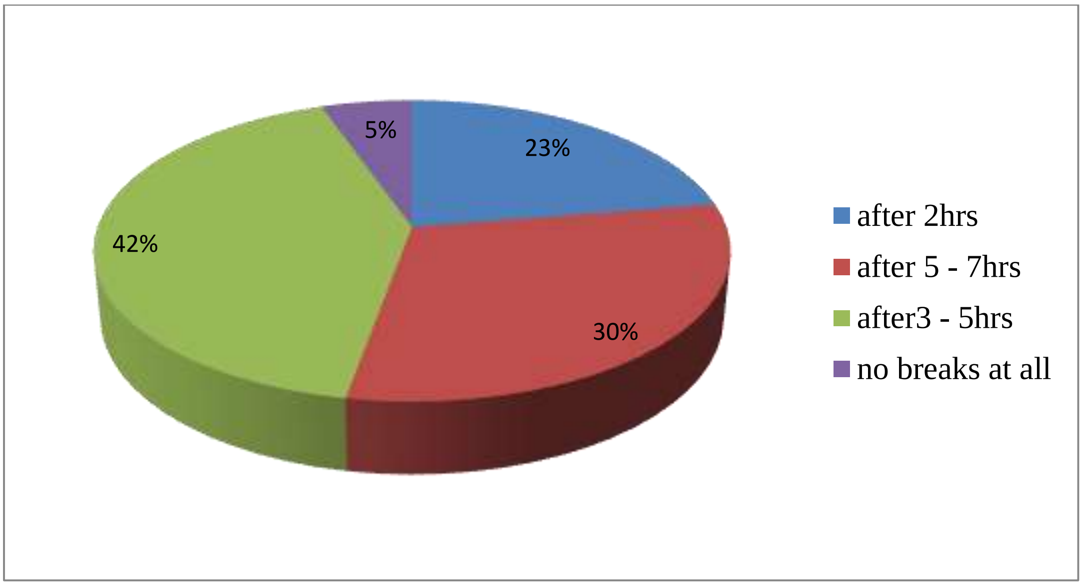


Figure 4.2: Breaks from Computer Use

According to the data, 23% of respondents reported taking breaks after 2 hours of computer usage, while 42% reported taking breaks after 3 to 5 hours. 30% of the respondents reported taking breaks after 5 to 7 hours and while 5% of respondents reported not taking any breaks at all during their computer usage sessions.

Ding et al. (2020), suggested that individuals should take breaks after 40 minutes of computer usage. The findings indicated a significant departure from the recommended break intervals and the actual break-taking behavior of individuals in the study sample. While Ding et al. emphasized the importance of breaks every 40 minutes, several other studies recommended breaks every 30, 20, or 40 minutes, or even at 60-minute intervals (Sheahan et al., 2018). However, the majority of respondents in this sample reported taking breaks only after much longer durations, with a portion not taking breaks at all during computer working sessions.

This non conformity may have implications for musculoskeletal health and vision and overall well-being of workers. These findings also suggest knowledge gaps or none adherence to ergonomic guidelines for maintaining optimal health and productivity during computer usage.

4.3.4 Viewing Distance between the Workers Eyes and the Centre of the Screen

The study also presented an analysis of the distance between the eyes of workers and the center of their computer screens. The results are shown in table 4.4 below

Table 4.4: Viewing Distance between the Workers Eyes and the Centre of the Screen

Distance	Frequency	Percent
less than 39cm	46	14.6
40cm - 75cm	113	35.8
76cm - 110cm	106	33.5
more than 110cm	51	16.1
Total	316	100.0

Results from table 4.5 above indicated that among bank employees, the distribution of the distance between their eyes and the center of the screen varied significantly. The findings indicated that 35.8% of employees had their eyes positioned between 40 cm and 75 cm from the screen, which fell within the recommended range suggested by the American Optometry Association (AOA) of 50–70 cm. This suggested that a considerable portion of the employees maintained an appropriate viewing distance according to AOA guidelines. However, 33.5% had their eyes positioned between 76 cm and 110 cm from the screen, slightly beyond the recommended range. Additionally, 14.6% of employees had their eyes positioned less than 39 cm from the screen, indicating that they were sitting too close to the screen, potentially leading to eye strain and discomfort.

On the other hand, 16.1% of employees had their eyes positioned more than 110 cm from the screen, which could indicate that they were sitting too far away, possibly resulting in decreased visual acuity and potential difficulty in reading the screen. Tamenti (2017) and Bartha et al. (2002) found average distances to the screen's center of 75.11 cm and 71 cm, respectively, which aligned closely with the recommended range. This suggested that a significant portion of the bank employees in the study were positioned within the optimal viewing distance, as recommended by these studies. Results from this study highlighted the importance of ensuring that employees maintained an appropriate distance from their computer screens to minimize the risk of developing symptoms associated with computer vision syndrome.

4.3.5 Number of Working Hours with Computer in a Day

The study sought to find out how long the bank employees worked with a computer in a day. The responses are presented in the figure 4.3 below

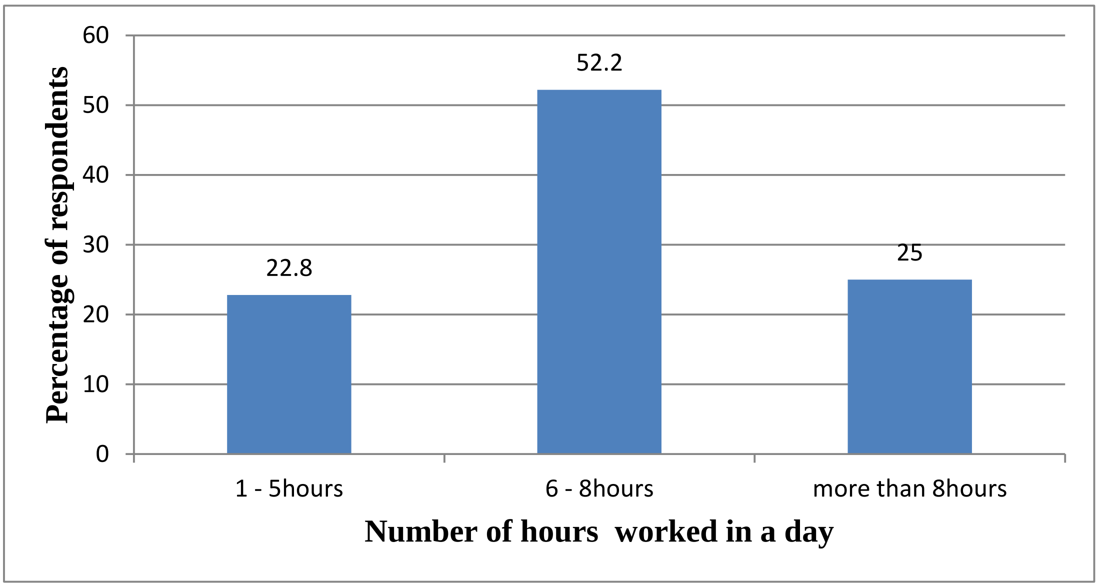


Figure 4.3: Number of Working Hours with Computer in a Day

Results indicated that more than half of the bank employees (52.2%), spent 6 to 8 hours working on a computer. 22.8% of the spent 1 to 5 hours working on a computer while 25% worked on a computer for more than 8 hours. The recommended number of hours to use a computer in a day can vary depending on factors such as age, purpose of use, and individual health considerations. The American Optometric Association (AOA) suggests taking regular breaks to avoid digital eye strain, recommending the 20-20-20 rule: every 20 minutes, take a 20-second break and look at something 20 feet away. The World Health Organization (WHO) advises adults to balance screen time with physical activity and sleep, though it does not specify exact limits for computer use.

4.3.6 Number of Hours Sitting in a Day

The study also sought to find out how long employees spend sitting down in a day.

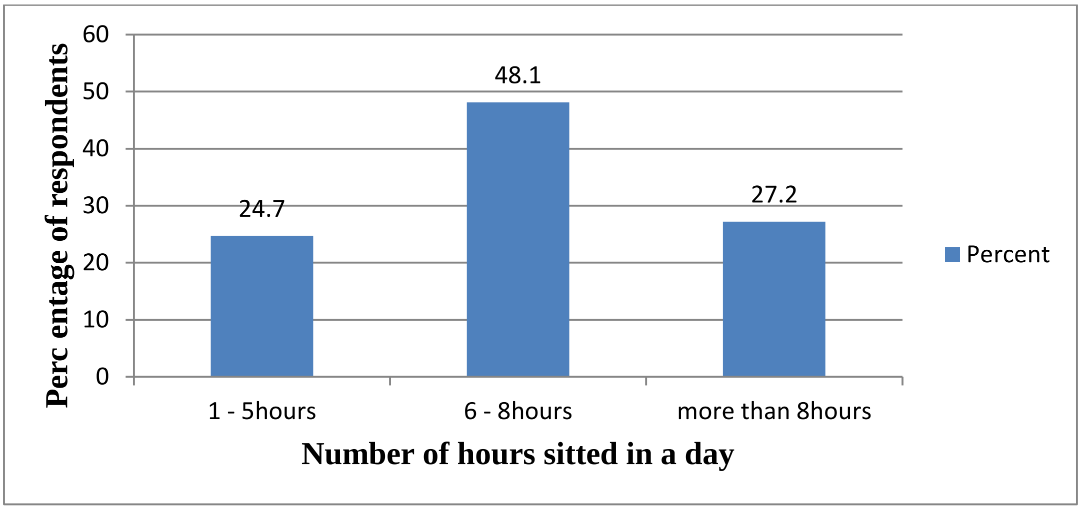


Figure 4.4: Number of Hours Sitting in a Day

Results indicated that 48.1% of the bank employees sit for a period of between 6 to 8 hours in a day, 24.7% sit for a period of between 1 and 5 hours while 27.2% sit for more than 8 hours in a day. The results indicate a significant amount of time spent by bank employees sitting in a day. The Occupational Safety and Health Administration (OSHA) recommend a mix of sitting, standing, and moving throughout the workday.

4.3.8 Screen Light

The study investigated the screen light settings utilized by computer users in banks, as illustrated in Figure 4.6

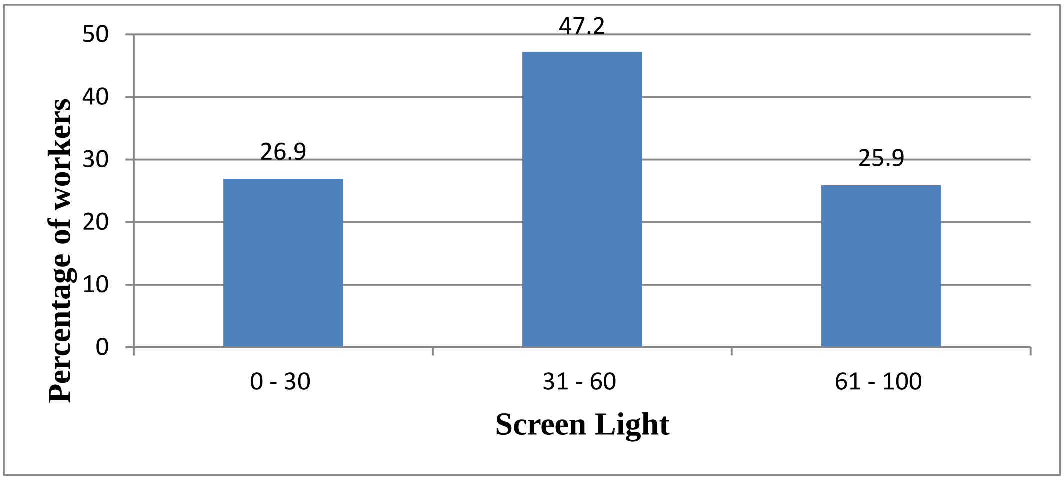


Figure 4.6: Screen Light and Contrast

The study found out that 47.2% of the bank employees used a screen light adjusted to between 31 to 60 percent, while 25.9% use screen light adjusted to between 61 and 100 percent 26.9% of respondents adjusted their computer screen to a contrast of between 10 and 30 percent. The recommended screen brightness for computer use varies depending on the ambient lighting conditions and the user's comfort. However, a general guideline is to set the screen brightness to a level that is roughly the same as the brightness of the surrounding environment. According to the American Optometric Association, the screen brightness should be adjusted to match the brightness of your surroundings to prevent eye strain. They also recommend adjusting the display settings and taking regular breaks to maintain eye health while using a computer.

4.4 Work Environmental Risk Factors

The second objective of the study was to determine environmental risk factors of computer use and their health effects amongst bankers. The study aimed to investigate the impact of various environmental factors on the health and well-being of individuals engaged in prolonged computer use. The study scrutinized the adjustable seat height, the use of chairs cushioned with a rounded front edge and the importance of a well-lit room as presented in Table below.

4.4.1 Work Environment Ergonomics

The study sought to evaluate the work environment within the banking establishment.

Table 4.5: Work Environment Ergonomics

		Frequency	Percentage
Adjustable Seat Height			
	Yes	253	19.9
	No	63	80.1
Chair Cushioned with Rounded Front Edge			
	Yes	213	67.4
	No	103	32.6
A Well-Lit Room			
	Yes	231	73.1
	No	85	26.9
	TOTAL	**316**	**100**

Results indicated that 80.1% of the employees sat on chairs that could adjust seat height while 19.9% of the employees had seats that were not adjustable. This positive trend towards ergonomic seating arrangements allows individuals to customize their seating position based on their height and comfort preferences, aligning with recommendations from ergonomic experts (Grand jean, 2001; Smith et al., 2007). Adjustable seats are crucial for maintaining proper posture and reducing the risk of musculoskeletal discomfort or injuries associated with prolonged sitting. 67.4% of the employees had chairs cushioned with rounded front edge while 32.6% sat on ergonomically unsound seats. In respect to lighting, 73.1% of the employees operated in well-lit spaces while 26.9% of the employees worked in areas with sub optimal lighting. Adequate lighting is crucial for maintaining optimal visual comfort and reducing eye strain, especially during tasks involving prolonged screen use (Kumar & Kumar, 2017; Çobanyıldızı, 2021). A well-lit workspace not only enhances visual clarity but also contributes to improved mood, alertness, and productivity among workers.

4.4.2 Light Illumination

The study delved into examining the lighting levels across various positions within the workspace. Light illumination was measured on the right left, right and centre point of each employees work space. The findings are as recorded in table 4.10.

Table 4.6: Light Illumination

		Frequency	Percent
Left	Below 500 lux	94	29.7
	Between 500-1000 lux	171	54.1
	Above 1000 Lux	51	16.1
Right	Below 500 lux	93	29.4
	Between 500-1000 lux	170	53.8
	Above 1000 Lux	53	16.8
Center	Below 500 lux	81	25.6
	Between 500-1000 lux	187	59.2
	Above 1000 Lux	48	15.2
	Total	**316**	**100**

The findings presented in table 4.8 give insightful observations regarding lighting illumination in different positions within the working area, accompanied by percentages for clarity. Across the left, right, and center positions, the majority of measurements fell within the range of 500-1000 lux, indicating a moderate level of illumination. Specifically, in the left position, 54.1% of measurements were within this range, while in the right position, 53.8% fell within this category. Similarly, in the center position, 59.2% of measurements were recorded within the 500-1000 lux range. However, a notable proportion of measurements were below 500 lux, particularly in the center position, with 25.6% falling within this category. These results align with Tamenti's (2017) study in South Africa, which found room luminance levels ranging from 19 to 388 lux, with an average of 94.02 lux. In the South African study, the illumination levels suggested that the call center environment was unconducive for computer work as it fell below the recommended range of 200 to 500 lux as reported by Anshel (2005) and Ankrum (1999).

4.4.3 Position of Computers Relative to the Windows

The study also investigated the position of computers to the windows. The table below shows the results.

Table 4.7: Position of Computers Relative to the Windows

	Frequency	Percent
Less than 500	80	25.5
500 - 1000cm	163	51.6
above 1000cm	73	23.1
Total	**316**	**100**

Results indicated that more than half of the employees had the position of computers relative to the window at a distance of 500 and 1000centimetres. This comprised 51.6%, while 25.3% were positioned less than 500 centimeters to the window and lastly only 23.1% were positioned at a distance of more than 1000 centimeters. Occupational Safety and Health Administration (OSHA) recommends positioning computer workstations to avoid glare from windows and lights, emphasizing the importance of good lighting control and screen positioning. Lastly The Mayo Clinic advises setting up computer workstations to minimize glare and reflections from windows, recommending the use of window coverings and proper monitor positioning to enhance comfort and reduce eye strain. The American Optometric Association (2018) suggests placing computer screens in positions where they do not face windows directly, to prevent glare and reflections which can contribute to eye strain and discomfort. The report suggests positioning your desk such that the screen is about 50-70 cm away from the window. This helps to leverage natural light without excessive glare on your screen. If direct sunlight hits the screen, consider using blinds or curtains to diffuse the light.

4.5 Level of Knowledge

In the pursuit of the study's third objective, this subsection focuses on evaluating the extent of knowledge and awareness among bankers in Nairobi County, Kenya, concerning the risk factors and health effects associated with computer use. The investigation centers on key aspects such as the awareness initiatives undertaken by banks, including room illumination, screen viewing distance, eye angle, screen light, seating posture, and breaks. Additionally, the subsection explores the training programs provided by banks, specifically delving into the level of knowledge imparted on temperature-related consideration.

The table presents the level of knowledge among employees using computers regarding various factors related to their workspace environment. These factors include temperature, room illumination, position of computers relative to windows, screen viewing distance, eye angle, screen light, seating posture, and breaks.

Table 4.8: Level of Knowledge among Employees

		No, I don't Know	**Yes, I know**	**Total**
Temperature	Frequency	57	261	316
	Percent	18.0	82.0	100
Room illumination	Frequency	45	271	316
	Percent	14.2	85.8	100
Position of computers relative to the windows	Frequency	64	252	316
	Percent	20.3	79.7	100
Screen viewing distance	Frequency	54	262	316
	Percent	17	83	100
Eye angle	Frequency	66	250	316
	Percent	20.9	79.1	100
Screen light	Frequency	33	283	316
	Percent	18.2	81.8	100
Seating posture	Frequency	50	266	316
	Percent	15.8	84.2	100
Breaks	Frequency	58	258	316
	Percent	18.4	81.6	100

Finding from the study indicated that majority of workers exhibited good knowledge and awareness level of the various risk factors and health effects of computer use. In respect to the environmental risk factors 85.5% had good knowledge level of proper illumination acknowledging its important and its effect on visual comfort. Research by Jones and Lee (2019) suggested that proper lighting in the workplace was crucial for reducing eye strain and fatigue.

A total of 252 respondents (79.7%) understood the importance of computer placement relative to windows, most respondents (262, 83%) were aware of appropriate screen viewing distances. This demonstrated a strong understanding of the need for proper viewing distance to reduce strain. Studies by Chen and colleagues (2020) emphasized the importance of maintaining an optimal viewing distance to reduce eye strain and fatigue.

Majority of the workers (81.8%) recognized the importance of appropriate screen lighting. This showed good awareness but also room for improvement in understanding screen light's impact. Similar findings by Lee and Johnson (2018) emphasized the importance of adjustable lighting to accommodate individual preferences and minimize glare-related discomfort. 84.2% of the bankers were aware of the importance. This indicated a high level of understanding of posture's role in ergonomic health. This echoed the findings of research by Davis et al. (2019), which emphasized the importance of ergonomic chairs and proper posture to prevent musculoskeletal issues. Most employees (81.6%) were aware of the importance of taking breaks during computer working sessions so as to minimize adverse visual and musculoskeletal effects. This showed strong awareness but highlights the importance of emphasizing regular breaks further. However significant 18.4% lacked this knowledge. This underscored the need for promoting regular breaks to reduce the risk of musculoskeletal pain and discomfort (Kumar & Kumar, 2017).

4.5.1 Frequency on Bank Training on Computer Health Effects

The study aimed to gather information on how often the employee banks held trainings on health effects of computers. The responses are presented by the pie chart below

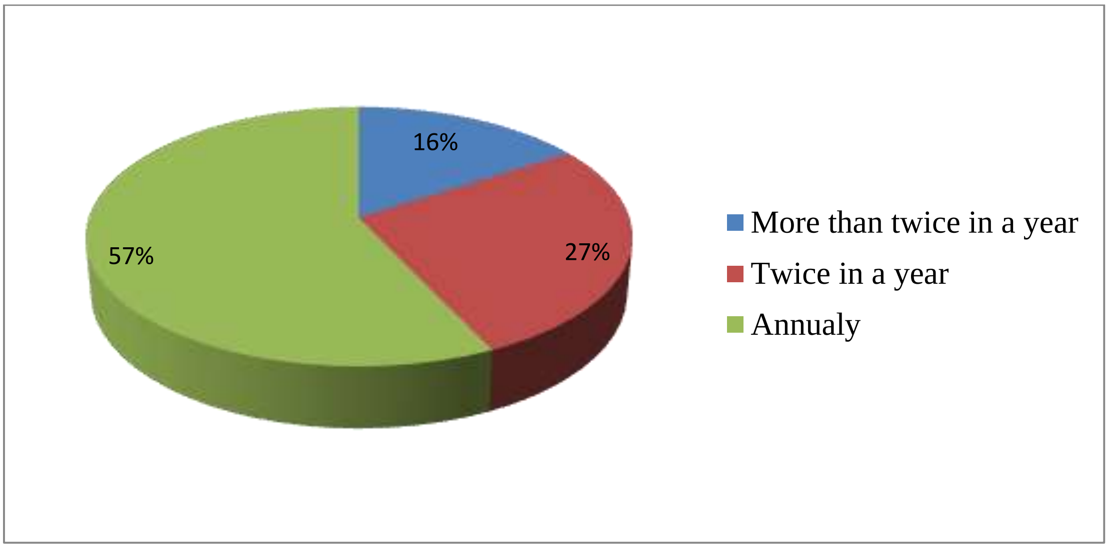


Figure 4.9: Pie Chart Representing how often Bank Hold Trainings on Health Effects of Computers

Most banks held (57%) held training on awareness levels of risk factors and health effects of computers at least once a year, 27% twice a year and 16 % frequently in a year.

A study conducted by CTD [Computer Terminals Division] Research Group (2010) explored various health problems associated with prolonged computer use, including musculoskeletal and eye strain and recommended training on ergonomics and healthy computer habits.

4.6 Health Effects of Computer Use

4.6.1 Musculoskeletal Pain

The study investigated musculoskeletal pain experienced by employees using computers in banking environments, assessing discomfort across various body regions including shoulders, neck, low back, wrists/hands, upper back, elbows, and hips/thighs. The findings are presented in Table 4.13, which provides insight into the prevalence of musculoskeletal discomfort among individuals engaged in computer-related tasks within the banking sector.

Table 4.9: Musculoskeletal Pain

	Frequency	Percent
Ankles/ Feet	5	1.6
Elbows	43	13.6
Hips/Thighs	16	5.1
Knees	12	3.8
Lower Back	34	10.8
Neck	63	19.9
Shoulders	60	19.0
Upper Back	38	12.0
Wrist/ Hands	45	14.2
Total	**316**	**100.0**

The study assessed musculoskeletal health outcomes among bank employees using a combination of two complementary approaches. The first approach was the Nordic Musculoskeletal Questionnaire (NMQ), a standardized self-report instrument used to capture respondents' perceived musculoskeletal symptoms across different body regions. The NMQ is widely applied in occupational health research to determine the prevalence and distribution of musculoskeletal discomfort in epidemiological studies. In this study, the NMQ was used to identify whether respondents experienced pain or discomfort in nine anatomical regions, namely the neck, shoulders, upper back, lower back, elbows, wrists/hands, hips/thighs, knees, and ankles/feet. Respondents indicated whether they had experienced symptoms associated with computer use, allowing the study to determine the pattern and prevalence of self-reported musculoskeletal disorders.

The second approach involved the use of researcher-administered ergonomic and anthropometric measurements, which provided objective assessment of physical risk exposure in the workplace. These measurements included observation of sitting posture (including shoulder relaxation, back support, hand and wrist positioning, and foot placement), measurement of computer viewing distance using a standard measuring tape, assessment of sitting duration and working hours through structured questionnaires, and calculation of Body Mass Index (BMI) using measured weight and height. In addition, workstation ergonomics such as chair adjustability, desk setup, and screen positioning were assessed through structured observation checklists. These instruments were used to determine the extent to which employees were exposed to physical risk factors associated with musculoskeletal disorders.

Findings from the NMQ revealed that musculoskeletal pain was highly prevalent among bank employees. The most affected body regions were the neck, reported by 19.9% (n = 63) of respondents, and the shoulders, reported by 19.0% (n = 60). Other commonly affected areas included the wrists/hands (14.2%, n = 45), upper back (12.0%, n = 38), and lower back (10.8%, n = 34). Less frequently affected regions included the elbows (13.6%, n = 43), hips/thighs (5.1%, n = 16), knees (3.8%, n = 12), and ankles/feet (1.6%, n = 5). Overall, these findings indicate that upper body regions, particularly the neck and shoulders, are the most vulnerable to computer-related musculoskeletal strain among banking employees.

When these subjective findings are compared with the researcher's ergonomic measurements, a clear pattern of exposure becomes evident. Only 64.6% (n = 204) of employees maintained relaxed shoulder posture while using computers, while 35.4% (n = 112) demonstrated poor shoulder positioning. Similarly, only 59.8% (n = 189) had proper back support and foot placement, leaving 40.2% (n = 127) exposed to poor spinal alignment. These posture-related deficiencies directly correspond to the high prevalence of neck and shoulder pain reported in the NMQ results.

In addition, prolonged sedentary exposure was observed among a large proportion of employees. The study found that 75.3% of respondents sat for more than 6 hours per day, with 27.2% (n ≈ 86) sitting for more than 8 hours daily. Furthermore, 77% of employees exceeded recommended computer usage thresholds, with only a small proportion taking breaks at recommended intervals. These findings provide objective evidence of prolonged static posture, which is a known risk factor for musculoskeletal disorders, particularly in the neck, shoulders, and lower back regions.

Body Mass Index measurements further supported the presence of physical risk exposure. Only 44.6% (n = 141) of respondents had a normal BMI, while 38.0% (n =

120) were overweight and 10.8% (n = 34) were obese. Excess body weight increases mechanical load on the musculoskeletal system, particularly in weight-bearing regions such as the lower back and hips, and contributes to postural fatigue during prolonged sitting. This provides an additional explanatory factor for the lower back pain reported by 10.8% of respondents in the NMQ findings.

Ergonomic workstation assessment also revealed moderate environmental support but notable gaps. Although 64.2% (n = 203) of employees had computers correctly positioned directly in front of them, a substantial 35.8% (n = 113) worked in misaligned setups. Furthermore, 64.2% of respondents were outside the recommended viewing distance range, indicating suboptimal ergonomic positioning that may contribute indirectly to upper body strain due to forward head posture and sustained visual effort.

Statistical analysis confirmed the relationship between these objectively measured ergonomic factors and musculoskeletal outcomes. Significant associations were found between BMI and musculoskeletal pain ($\chi^2 = 5.412$, $p = 0.028$), break duration and musculoskeletal disorders ($\chi^2 = 1.791$, $p = 0.048$), working hours and musculoskeletal disorders ($\chi^2 = 8.402$, $p = 0.038$), and seating posture with musculoskeletal outcomes ($\chi^2 = 5.341$, $p = 0.009$). These results reinforce the consistency between self-reported NMQ findings and objectively measured ergonomic risk factors.

4.6.2 Visual Disorders

The study gathered information on the prevalence of various visual disorders experienced by computer users employed in banks, as depicted in Table 4.16.

Table 4.10: Visual Disorders

		Never	Sometimes	Always	Total
Watering Eyes	Frequency	-	145	171	316
	Percent	0	45.9	54.1	100
Dry Eyes	Frequency	45	149	122	316
	Percent	14.2	47.2	38.6	100
Eye Fatigue	Frequency	70	96	150	316
	Percent	22.2	30.4	47.5	100
Burning Sensation	Frequency	105	159	52	316
	Percent	33.2	50.3	16.5	100
Double Vision	Frequency	118	150	48	316
	Percent	37.3	47.5	15.2	100
Eye Irritation	Frequency	99	160	57	316
	Percent	31.3	50.6	18.1	100

From the study all employees reported having experienced watery eyes at one point of their computer use sessions .A significant 54.1% of bank workers reported experiencing watery eyes every time they were using computers to perform their tasks.38.6% of bank employees reported experiencing dry eyes every time they used computers while 14.2% never developed dry eye symptoms during computer working sessions. Most of the employees (47.5%) reported eye fatigue every time they were on computer working sessions. Majority of the workers (50.3%) reported experiencing burning sensation sometimes when using computers .47.5% of employees sometimes experienced double vision while 15.2% experienced it every time during computer working sessions. Previous studies have also highlighted significant prevalence of visual symptoms amongst workers using computers. The research by Samuel B. et al. (2022) highlighted that itching around the eye area was reported by 63% of computer users, with a higher prevalence among bankers at 74%. Additionally, blurred vision was reported by 34% of individuals. Camelia M. et al. (2017) identified dry eye as a significant contributor to computer vision syndrome symptoms, echoing the findings of Sunil Munshi (2017), who noted that individuals with computer vision syndrome may experience symptoms such as dry eye and blurred vision.

Tauste Frances (2014) found that prolonged computer use could lead to eyestrain, eye discomfort, dry eye, and blurred vision. Moreover, Portello et al. (2012) reported that eye fatigue was the most prevalent symptom among computer users, occurring in approximately 40% of subjects. These findings underscored the significant occurrence of eye-related discomfort among employees, emphasizing the importance of mitigation measures centering on visual wellbeing program.

The respondents also responded on the number of the symptoms of health problems they were experiencing. The number of symptoms was dependent on how many the respondent ticked. The results are shown in the pie chart below.

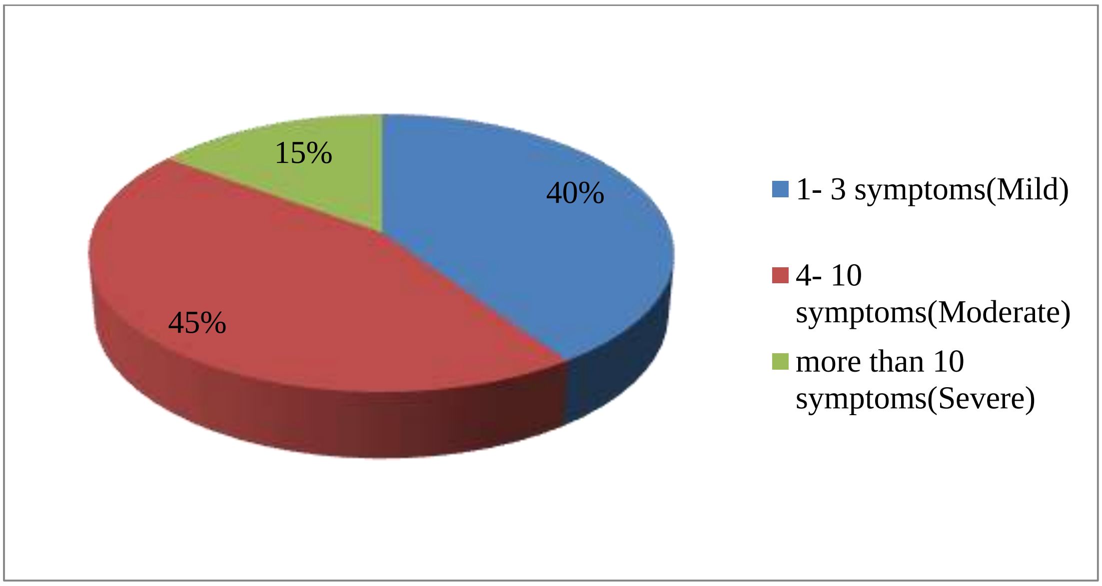


Figure 4.7: Pie Chart Representing Number of Symptoms

The results showed that 40% of the employees had mild symptoms, 45% had moderate symptoms and only 15% had severe symptoms which were more than 10 symptoms.

4.6.3 Visual Acuity

The study also sought to assess the visual acuity of the study respondent and categorizing the degree of visual impairment. Results are summarized in table 4.17

Table 4.11: Visual Acuity

	Frequency	Percent
6/12 - 6/24 (mild visual impairment)	149	47.2
6/24- 6/ 36 (moderate visual impairment)	59	18.7
6/36 - 6/60 (severe visual impairment)	10	3.2
6/6 - 6/9 (normal visual acuity)	98	31.0
Total	**316**	**100.0**

The visual acuity measurements among the participants revealed a range of impairment levels. The majority, comprising 47.2% of the sample, demonstrated mild visual acuity. Moderate visual impairment was observed in 18.7% of participants while smaller proportion, accounting for 3.2% of the sample, exhibited severe visual impairment. Normal visual impairment, represented by measurements falling within the 6/6 to 6/9 range, was observed in 31.0% of participants. These findings highlight the prevalence of varying degrees of visual impairment among the participants, suggesting the importance of visual acuity assessments and interventions to address visual health concerns in the population.

4.7 Relationship between Independent Variables and Health Effects

4.7.1 Relationship between Socio Demographic Characteristics and Health Effects

Table 4.12: Relationship between Socio Demographic Characteristics and Health Effects

Socio-demographic Factor	Health Effect	χ^2	p-value
Gender	Number of symptoms	10.851	0.004
Gender	Lower back pain	10.104	0.006
Gender	Severity of symptoms	6.543	0.038
Age	Watering eyes	12.958	0.044
Years worked in the bank	Double vision	9.574	0.048
Position in the bank	Neck pain	11.599	0.021
Highest level of education	Neck pain	16.763	0.033

Table 4.2 presents the relationship between selected socio-demographic characteristics and the health effects associated with computer use among bankers in Nairobi County. Pearson's Chi-square test was used to determine whether there was a statistically significant association between socio-demographic variables and various health effects. Statistical significance was determined at $p < 0.05$.

The findings indicate that gender was significantly associated with the number of symptoms experienced ($\chi^2 = 10.851$, $p = 0.004$), lower back pain ($\chi^2 = 10.104$, $p = 0.006$), and the severity of health disorder symptoms ($\chi^2 = 6.543$, $p = 0.038$). These findings suggest that the occurrence and severity of computer-related health effects differ between male and female bankers. The observed differences may be attributed to variations in body dimensions, ergonomic workstation fit, work habits, muscle strength, and physiological differences between men and women. Previous occupational health research has consistently reported that female computer users tend to report a higher prevalence of musculoskeletal disorders than their male counterparts, particularly involving the neck, shoulders, and lower back (Punnett & Bergqvist, 1997; Waersted et al., 2010). Similarly, the systematic review by Janwantanakul et al. (2008) identified female gender as an important predictor of work-related musculoskeletal symptoms among office employees.

The analysis further revealed a statistically significant association between age and watering eyes ($\chi^2 = 12.958$, $p = 0.044$). This finding suggests that visual discomfort associated with prolonged computer use varies across different age groups. Increasing age has been associated with physiological changes affecting tear film stability, accommodative ability, and visual endurance, thereby predisposing older workers to symptoms of digital eye strain. Similar observations have been reported by Rosenfield (2016), who noted that advancing age contributes to increased susceptibility to computer vision syndrome due to reduced accommodative flexibility and decreased tear production. Sheppard and Wolffsohn (2018) further reported that visual symptoms become more pronounced with increasing age among frequent users of digital devices.

The results also demonstrated a statistically significant association between years worked in the bank and the occurrence of double vision ($\chi^2 = 9.574$, $p = 0.048$). This finding implies that cumulative occupational exposure to prolonged computer work may increase the likelihood of experiencing visual disturbances over time. Employees with longer durations of employment are likely to have accumulated greater exposure to repetitive visual tasks, prolonged screen viewing, and sustained near work, which may contribute to binocular vision stress. Similar findings have been documented by Ranasinghe et al. (2016), who reported that longer occupational exposure to computers was associated with an increased prevalence of computer vision syndrome among office workers.

Another significant finding was observed between position in the bank and neck pain ($\chi^2 = 11.599$, $p = 0.021$). The results suggest that job designation influences the occurrence of musculoskeletal symptoms. Different job positions within banking institutions involve varying workloads, computer usage durations, workstation arrangements, and administrative responsibilities, all of which may affect ergonomic exposure. Employees occupying managerial or supervisory positions may spend longer uninterrupted periods using computers compared with staff whose duties require more movement throughout the workplace. This observation is consistent with findings reported by Gerr et al. (2002), who demonstrated that occupational roles characterized by prolonged computer work significantly increased the risk of neck and upper extremity musculoskeletal disorders.

The study further established a statistically significant association between the highest level of education and neck pain ($\chi^2 = 16.763$, $p = 0.033$). Individuals with higher educational attainment may occupy positions involving greater administrative responsibilities and increased reliance on computer-based tasks, thereby increasing exposure to prolonged static postures. Although education itself may not directly cause musculoskeletal disorders, it often influences occupational responsibilities and work organization, which in turn affect ergonomic risk exposure. Similar observations have been reported in occupational epidemiological studies where educational level indirectly influenced musculoskeletal symptoms through job category and intensity of computer use (Cho et al., 2012).

Overall, the findings demonstrate that socio-demographic characteristics play an important role in determining the occurrence of selected health effects associated with computer use among bankers. Gender emerged as the socio-demographic factor most consistently associated with adverse health outcomes, while age, years worked in the bank, job position, and educational attainment each showed significant associations with specific health effects. These findings suggest that interventions aimed at reducing computer-related occupational health problems should not adopt a one-size-fits-all approach but should instead consider demographic and occupational differences when designing ergonomic programmes, health education initiatives, and workplace interventions.

The findings partially support the rejection of the null hypothesis that socio-demographic characteristics are unrelated to computer-related health effects, since statistically significant associations were observed between several socio-demographic variables and selected musculoskeletal and visual disorders.

4.7.2 Relationship between Individual Risk Factors and Health Effects

The study aimed to find out the relationship between the individual risk factors and the health effects caused by each individual risk factor. The results are recorded in the table below:

Table 4.13: Relationship between Individual Risk Factors and Health Effects

IF	Disorder	Chi-Square Tests	p value
BMI	Musculoskeletal	5.412a	0.028
Duration Before Break	Musculoskeletal	1.791a	0.048
	Visual	3.991a	0.035
Viewing Distance	Musculoskeletal	2.791a	0.493
	Visual	4.275a	0.025
Working Hours with Computer	Musculoskeletal	8.402a	0.038
	Visual	3.019a	0.047
Number of Hours Sitting	Musculoskeletal	7.199a	0.037
	Visual	3.719a	0.057
Screen Light	Musculoskeletal	.248a	0.741
	Visual	6.248a	0.041

The findings in the table revealed a significant association between BMI and musculoskeletal pain ($\chi^2 = 5.412$, $p = 0.028$). This implies that individuals with different BMI categories may experience varying levels of musculoskeletal pain in the elbow region. This finding is supported by previous studies indicating that obesity and overweight status serve as risk factors for the development of musculoskeletal pain in various body regions, including the elbows (Azabagic & Pranjic, 2019). The study also showed significant association between duration taken before break and occurrence of both musculoskeletal and visual disorder respectively Test (χ^2 = 1.791, p = 0.048), (χ^2 = 3.991, p = 0.035). This suggests that individuals with different duration between breaks may have experienced varying levels of musculoskeletal pain in the hips and thighs. This finding is consistent with prior research highlighting the relationship between BMI and musculoskeletal pain, particularly in weight-bearing areas such as the hips and thighs (Azabagic & Pranjic, 2019; Moreira-Silva et al., 2013).

The viewing distance of the workers from the computer also indicated significant association with occurrence of visual disorders (χ^2 =4.275, p = 0.025). Working hours with computer on musculoskeletal disorder (χ^2 = 8.402, p = 0.038) indicated a significant association between working hours and on the occurrence both musculoskeletal (χ^2 = 7.199, p = 0.037) and visual disorders (χ^2 =3.719, p = 0.057).

4.7.3 Relationship between Work Environmental Risk Factors and Health Effects

The study aimed to find out the relationship between the environmental risk factors and the health Effects on the musculoskeletal and visual systems. The results are recorded in the table below:

Table 4.14: Relationship between Work Environmental Risk Factors and Health Effects

EF	Disorder	Chi-Square Tests	p value
Adjustable Seat Height	Musculoskeletal	2.516a	0.003
	Visual	.018a	0.894
Chair cushioned With Rounded front edge	Musculoskeletal	1.505a	0.002
	Visual	0.201a	0.0654
Well Lit Room	Musculoskeletal	.148a	0.741
	Visual	3.108a	0.017
Illumination	Musculoskeletal	.017a	0.895
	Visual	4.898a	0.001
Position of Computers Relative to the Windows	Musculoskeletal	.023a	0.881
	Visual	3.256a	0.026

The analysis demonstrated a significant association between the use of an adjustable seat height and occurrence of musculoskeletal disorders, (Chi-Square = 2.516, p = 0.003). This result suggests that the ability to customize seat height may play a role in addressing or exacerbating discomfort in the musculoskeletal order, emphasizing the importance of ergonomic considerations in chair design. The study didn’t find a significant association between adjustable seat height and visual disorders, (Chi-Square = 0.018, p = 0.894). The study found a notable association between chairs cushioned with a rounded front edge and reported discomfort in the musculoskeletal system (Chi-Square = 1.505, p = 0.002). This outcome underscores the importance of chair design, indicating that the cushioning and shape of the chair's front edge may influence musculoskeletal health. The environmental factor of a well-lit room showed significant associations with visual disorders (Chi-Square = 3.108, p = 0.017) and no relationship with a musculoskeletal disorder (Chi-Square = 0.148, p = 0.7410). Participants working in sub optimally lit rooms were more likely to report discomfort in the eyes. These findings highlight the potential impact of lighting conditions on different body regions, indicating that a well-lit environment may contribute to or mitigate musculoskeletal pain in specific areas.

Results revealed a significant association between lighting illumination and visual discomfort ($\chi^2 = 4.898$, $p = 0.001$). These findings align with Tamenti, (2017), who in his study highlighted the importance of adequate lighting for visual comfort in computer work environments, with recommended light levels ranging from 200 to 500 lux. In his study he also noted that the imbalance between computer screen brightness and room brightness may contribute to increased light sensitivity and tired, strained eyes, as observed in call center environments. Moreover, considering different light requirements for younger and older workers, providing adequate light for tasks is crucial to accommodate the visual needs of the workforce (Sheedy & Shaw McMinn, 2003)

The study also established a significant relationship between position of computers relative to the windows and visual disorders ($\chi^2 = 3.256$, $p = 0.026$).

4.7.4 Relationship between level of Knowledge and Health Effects

The provided table illustrates the relationship between employees' level of knowledge and health Effects.

Table 4.15: Relationship between Level of Knowledge and Health Effects

Knowledge on	Disorder	Chi-Square Tests	p value
Room Illumination	Visual	6.529a	
Position of Computers Relative to the Windows	Musculoskeletal	.243a	0.518
	Visual	7.184a	0.026
Screen Viewing Distance	Musculoskeletal	3.017a	0.045
	Visual	10.798a	0.001
Screen Light	Musculoskeletal	.039a	0.551
	Visual	3.625a	0.029
Sitting Posture	Musculoskeletal	5.341a	0.009
	Visual	.191a	0.787
Breaks	Musculoskeletal	3.031a	0.004
	Visual	6.731a	0.002

Research showed significant association between employees' level of knowledge on room illumination and occurrence of visual disorders ($\chi^2 = 6.529$, $p = 0.013$). These results support existing research highlighting the impact of proper lighting on reducing eye fatigue and strain, emphasizing the importance of adequate illumination in the workplace (Smith et al., 2007).

Results indicated that the position of computer related to the window had a significant relationship with visual disorder ($\chi^2 = 7.184$, $p = 0.026$). Results from the table revealed that knowledge on screen viewing distance had a significant association with visual disorders ($\chi^2 = 10.798$, $p = 0.001$), aligning with previous research emphasizing the importance of ergonomic factors, including screen distance and window positioning, in mitigating ocular discomfort (Sheedy & Shaw-McMinn, 2003). Proper screen viewing distance and minimizing glare from windows have been shown to reduce eye strain and watering eyes among computer users (Anshel, 2005).

The findings showed significant associations between knowledge on screen light and visual disorders ($\chi^2 = 3.625$, $p = 0.029$). This suggests that employees with varying levels of knowledge about screen light reported significantly different frequencies of these symptoms. Proper screen light management has been highlighted in the literature as crucial for reducing visual disturbances such as double vision and eye irritation (Tamenti, 2017). Ensuring appropriate screen brightness and minimizing glare can help alleviate these issues and improve overall visual comfort (Anshel, 2005). Results showed a significant association between seating posture and musculoskeletal pain ($\chi^2 = 5.341$, $p = 0.009$). This suggests that employees with varying levels of knowledge about seating posture reported significantly different frequencies of neck and upper back pain, indicating that knowledge of proper seating posture may influence the occurrence of these symptoms. Previous research has highlighted the importance of ergonomic seating arrangements in reducing neck and upper back pain among office workers (Wood et al., 2014). Proper ergonomic interventions such as adjustable chairs and posture training programs have been shown to alleviate discomfort in these areas (Çobanyıldızı, 2021). Proper seating posture, including appropriate chair height and leg support, can help reduce strain on the knees and lower back, thus mitigating the risk of musculoskeletal pain (Odebiyi & Okafor, 2023).

Results also showed a significant association between knowledge concerning importance of taking regular breaks and occurrence of musculoskeletal pain ($\chi^2 = 3.031$, $p = 0.004$).

This suggests that employees with different levels of breaks knowledge reported significantly different frequencies of musculoskeletal pain. This finding aligns with previous research highlighting the importance of taking regular breaks to reduce the risk of repetitive strain injuries in the wrists and hands (Sønderstrup-Andersen et al., 2019). Regular breaks have been shown to alleviate muscle tension and discomfort in the upper back region, particularly among individuals engaged in sedentary work tasks

(Callaghan & McGill, 2001). Similarly, a significant association between knowledge concerning importance of taking regular breaks and occurrence of visual disorders ($\chi^2 = 6.731$, $p = 0.002$), indicating that employees with varying levels of breaks knowledge reported significantly different frequencies of visual disorders.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 Individual Risk Factors and Health Effects

Statistical analysis confirmed significant relationships between individual risk factors and health effect. BMI was significantly associated with musculoskeletal pain (χ^2 = 5.412, p = 0.028), break duration was associated with both musculoskeletal (χ^2 = 1.791, p = 0.048) and visual disorders (χ^2 = 3.991, p = 0.035), while working hours were associated with musculoskeletal (χ^2 = 8.402, p = 0.038) and visual disorders (χ^2 = 3.019, p = 0.047). Viewing distance was significantly associated with visual disorders (χ^2 = 4.275, p = 0.025).

5.1.2 Work Environment Risk Factors and Health Effects

Environmental factors were significantly associated with health effects. Adjustable seat height was associated with musculoskeletal disorders (χ^2 = 2.516, p = 0.003), illumination was associated with visual disorders (χ^2 = 4.898, p = 0.001), and computer position relative to windows was associated with visual disorders (χ^2 = 3.256, p = 0.026).

5.1.3 Level of Knowledge and Health Effects

The study found out that knowledge did not consistently translate into practice. Significant associations were found between knowledge and health effects, including room illumination and visual disorders (χ^2 = 6.529, p = 0.013), screen viewing distance and visual disorders (χ^2 = 10.798, p = 0.001), seating posture and musculoskeletal pain (χ^2 = 5.341, p = 0.009), and breaks and musculoskeletal pain (χ^2 = 3.031, p = 0.004).

The study concludes that computer use among bank employees in Nairobi County is strongly associated with musculoskeletal and visual health effects, with a combined burden affecting a majority of workers. The prevalence of neck pain (19.9%), shoulder pain (19.0%), eye watering (54.1%), and eye fatigue (47.5%) indicates that computer-related disorders are widespread in the banking environment.

5.2 Recommendations

1. The study recommends banking institutions to implement guidelines that promote adherence to recommended break intervals, screen brightness, correct sitting posture and physical activities.
2. The study also recommends banking institutions to prioritize ergonomic sitting arrangements while optimizing lighting conditions in the work spaces as per the OSHA standards for computer work
3. Bank are further advised to scale up awareness campaigns and trainings on the various risk factors and healthy habits conducive to long term well-being in the computer intensive work environment.

5.3 Areas for Further Research

The present study focused on the occupational risk factors and health effects associated with computer use among bank employees in Nairobi County. While the findings provide evidence on the prevalence of musculoskeletal and visual disorders and their associated risk factors, several areas require further investigation.

1. Future studies should consider conducting longitudinal research to establish causal relationships between prolonged computer use and the development of musculoskeletal and visual disorders. Since the current study employed a cross-sectional design, it was only able to establish associations at a single point in time and could not determine temporal changes in health outcomes.
2. Further research should evaluate the effectiveness of ergonomic intervention programs such as workstation redesign, posture correction training, scheduled work breaks and ergonomic education in reducing computer related health problems among office workers.
3. Lastly similar studies should be conducted in other occupational settings where computer use is intensive such as government offices, universities and telecommunication firms. Such studies would facilitate comparisons across

different work environments and enhance the generalizability of finding beyond the banking sector.

REFERENCES

Adane, F., Alamneh, Y. M., & Desta, M. (2022). Computer vision syndrome and predictors among computer users in Ethiopia: a systematic review and meta-analysis. *Tropical medicine and health*, *50*(1), 26.

Aghaei, H., & Abdolalizadeh, P. (2023). Computer vision syndrome. In *Recent Advances in Dry Eye Disease*. IntechOpen.

Akinbinu, T. R., & Mashalla, Y. J. (2013). Knowledge of computer vision syndrome among computer users in the workplace in Abuja, Nigeria.

Alamina F.E, D. K. (2019). Musculoskeletal symptoms among computer users: A comparison between bankers and Administrative civil servants in pory harcourt. *7*.

Aljaradin, M., Almekhlafi, A., & Alkaabi, A. (2024). Enhancing Ergonomics in Digital Learning Environments: Addressing Health, Safety, and Environmental Sustainability. *Universal Journal of Public Health*, *12*(5), 1007-1014.

Al Tawil, L., Aldokhayel, S., Zeitouni, L., Qadoumi, T., Hussein, S., & Ahamed, S. S. (2020). Prevalence of self-reported computer vision syndrome symptoms and its associated factors among university students. *European journal of ophthalmology*, *30*(1), 189-195.

Alemayehu Mekuriaw, A. N. (2014). Prevalence of self-reported computer vision syndrome and associated factors among secretaries and data processors who are working in University of Gondar. *Journal of biology, agriculture and healthcare*.

Andersen, J. H., Winding, T. N., & Biering, K. (2015). Computer use and body mass index amongst adolescents and young adults in a Danish cohort study. *The European Journal of Public Health*, *25*, 176-297.

Bisht, D., & Bakhshi, R. (2018). Knowledge of computer ergonomics and incidence of musculoskeletal disorders among students of Punjab Agricultural University, Ludhiana, India. *Journal of Applied and Natural Science*, *10*(1), 323-329.

Blagojević, L., Petrović, B., & Blagojević, J. (2012). Risk factors for health disorders in computer operators in telecom Serbia. *International Journal of Occupational Safety and Ergonomics*, *18*(3), 321-327.

Boadi-Kusi, S. B., Adueming, P. O. W., Hammond, F. A., & Antiri, E. O. (2022). Computer vision syndrome and its associated ergonomic factors among bank workers. *International Journal of Occupational Safety and Ergonomics*, *28*(2), 1219-1226.

Calenzani, G., Santos, F. F. D., Wittmer, V. L., Freitas, G. K. F., & Paro, F. M. (2017). Prevalence of musculoskeletal symptoms in obese patients' candidates for bariatric surgery and its impact on health-related quality of life. *Archives of endocrinology and metabolism*, *61*(4), 319-325.

Camelia Margareta, D. E. (2017). Eyesight quality and computer vision syndrome. *Romanian journal of ophthalmology*.

Cardoso, B., Mateus, C., Magalhães, R., & Rodrigues, M. A. (2025). Ergonomic intervention program for office workers: a case study about its effect in computer vision syndrome and musculoskeletal discomfort. *Ergonomics*, *68*(1), 51-62.

Central Bank of Kenya (CBK), (2021). *Bank Supervision Annual Report. Annual Report, Nairobi*.

Çobanyıldızı, M. (2021). *The Role of Office Furniture Design in Occupational Health and Ergonomically Feasible Office Chair Solutions.* Unpublished MSc Thesis, Izmir: İzmir Ekonomi Üniversitesi.

Cooper, D. R., & Schindler, P. S. (2014). Business Research Methods. New York: The McGraw− Hill Companies.

Dagne, D., Abebe, S. M., & Getachew, A. (2020). Work-related musculoskeletal disorders and associated factors among bank workers in Addis Ababa, Ethiopia: a cross-sectional study. *Environmental health and preventive medicine*, *25*, 1-8.

David H.,Sepideh Modrek, Linda F., & Mark R. Cullen. (2017). Social, Psychological and Physical aspects of the work environment could contribute to hypertension prevalence. *Journal on health affairs and work/health relationship, 36(2), 258-263.*

Derbew, H., Nega, A., Tefera, W., Zafu, T., Tsehaye, K., Haile, K., & Temesgen, B. (2021). Assessment of computer vision syndrome and personal risk factors among employees of commercial bank of Ethiopia in Addis Ababa, Ethiopia. *Journal of Environmental and Public Health*, *2021*(1), 6636907.

Dessie, A., Adane, F., Nega, A., Wami, S. D., & Chercos, D. H. (2018). Computer vision syndrome and associated factors among computer users in Debre Tabor Town, Northwest Ethiopia. *Journal of environmental and public health*, *2018*.

Edward C. Green, E. M. (2020, September 2). Thr health belief model. Retrieved from doi:10.1002/9781119057840.ch68

Frazier, L. D. (2020). The past, present, and future of the biopsychosocial model: A review of The Biopsychosocial Model of Health and Disease. *New Ideas in Psychology*, *57*, 100755.

Gentles, S. J., Charles, C., Ploeg, J., & McKibbon, K. A. (2015). Sampling in qualitative research: Insights from an overview of the methods literature. The qualitative report, 20(11), 1772-1789.

Govindu, N. K., & Babski-Reeves, K. (2014). Effects of personal, psychosocial and occupational factors on low back pain severity in workers. *International Journal of Industrial Ergonomics*, *44*(2), 335-341.

Hadiseh Rabie, M. M. (2020). The prevalence of musculoskeletal disorders among miners around the world : A systemic review and meta analysis. *Iran journal of public health, IV*, 676-688.

Hasan, A. S. M. M., Hasan, M. I., Emran, M., Islam, M. M. M., Saha, T. C., & Al Mamun, M. A. (2023). Risk factors for the musculoskeletal pain based on the computer ergonomics related practices among medical professionals. *KYAMC Journal*, *14*(01), 19-24.

Haryati. A, S. S. (2020). Usage of health belief model in health behavior: A systemic review. *Malaysia journal of Medicine and health sciences, II*, 201-209.

Hoy, D. G., Smith, E., Cross, M., & March, L. M. (2015). Reflecting on the global burden of musculoskeletal conditions: lessons learnt from the global burden of disease 2010 study and the next steps forward. *Annals of the rheumatic diseases*, *74*(1), 4-7.

Vision, B. (2016). Tear your eyes away from the computer. *The New York Times Journal, 21 (1).*

Kasaw Kibret, A., Fisseha Gebremeskel, B., Embaye Gezae, K., & Solomon Tsegay, G. (2020). Work-Related Musculoskeletal Disorders and Associated Factors among Bankers in Ethiopia, 2018. *Pain Research and Management, 2020*.

Khan, M. I., Bilal, U. U., Shahzad, A., & Darain, H. (2020). Frequency of Work-Related Musculoskeletal Disorders among Bankers in Hayat Abad Peshawar through Cross Sectional Study.

Khan, R., Surti, A., Rehman, R., & Ali, U. (2012). Knowledge and practices of ergonomics in computer users. *JPMA-Journal of the Pakistan Medical Association*, *62*(3), 213.

Kounter, T. (2019). The prevalence and consequences of poor posture in children and adolescents.

Kumar, S. R., & Kumar, C. N. (2017). Design of workstations for computer users: a review. *Iconic Res Eng J, 1*(4), 24-34.

Lale, K., & Korhan, O. (2013,). Anthropometric computer workstation design to reduce perceived musculoskeletal discomfort. In *International Conference on Industrial Engineering and Operations Management istanbul*.

Logaraj M, Madhupriya V, Hegde SK. (2014). Computer Vision Syndrome and associated factors among medical and engineering students in Chennai. *Ann Med Health Sci Res*, 4(2), 179–185.

Maduagwu, S. M., Maijindadi, R. D., Duniya, K. I., Oyeyemi, A. A., Saidu, I. A., & Aremu, B. J. (2014). Prevalence and patterns of work-related musculoskeletal disorders among bankers in maiduguri, northeast Nigeria. *Occupational Medicine & Health Affairs*, 1-6.

Masele, J. J. (2019). Access to and use of computer ergonomics related information among PhD students in East Africa: a case of University of Dares Salaam-Tanzania and Makerere University-Uganda. *University of Dar es Salaam Library Journal*, *14*(1), 4-22.

Mashige, K. P., Rampersad, N., & Oduntan, O. A. (2013). A study of ergonomic factors leading to computer vision syndrome among computer users. *Ergonomics SA: Journal of the Ergonomics Society of South Africa*, *25*(1), 3-12.

Mohan, P., Sudhan, S. G., Dhasaradharaman, K., & Suresh, A. (2020). Work-Related Musculoskeletal Injury Risk Assessment and its Relevance to Body Mass Index for Computer Professionals. *Biomedical and Pharmacology Journal*, *13*(2), 843-848.

Mowatt, L., Gordon, C., Santosh, A. B. R., & Jones, T. (2018). Computer vision syndrome and ergonomic practices among undergraduate university students. *International journal of clinical practice*, *72*(1), e13035.

Mugenda, O. (2013). Research Method-Quantitative and Qualitative approaches Nairobi.

Muma, S., Aduda, D. O., & Onyango, P. (2019). Level of Awareness, Perception and Uptake of Interventions for Computer Vision Syndrome among University Students, Maseno, Western Kenya.

Munabi, I. G., Buwembo, W., Kitara, D. L., Ochieng, J., & Mwaka, E. S. (2014). Musculoskeletal disorder risk factors among nursing professionals in low resource settings: a cross-sectional study in Uganda. *BMC nursing*, *13*(1), 1-8.

Nesrin Yagci, B. B. (2022). Effects of risk factors related to computer use on musculoskeletal pain in office workers. *International journal of Occupational Safety and Ergonomics*, 269-274.

Noreen, K., Batool, Z., Fatima, T., & Zamir, T. (2016). Prevalence of Computer Vision Syndrome and Its Associated Risk Factors among Under Graduate Medical Students of Urban Karachi. *Pakistan Journal of Ophthalmology*, *32*(3).

Oha, K., Animägi, L., Pääsuke, M., Coggon, D., & Merisalu, E. (2014). Individual and work-related risk factors for musculoskeletal pain: a cross-sectional study among Estonian computer users. *BMC musculoskeletal disorders*, *15*(1), 1-5.

Oladeinde, B. H., Ekejindu, I. M., Omoregie, R., & Aguh, O. D. (2015). Awareness and knowledge of ergonomics among Medical Laboratory Scientists in Nigeria. *Annals of medical and health sciences research*, *5*(6), 423-427.

Omondi, S. (2014). Risk Factors for upper body musculoskeletal discomforts among computer users in Kenya. In *Scientific Conference Proceedings 2014-journals.jkuatac.ke*.

Paterson, M. (2023). Fatigue as a physiological problem: Experiments in the observation and quantification of movement and industrial labor, 1873-1947. *History and Technology*, *39*(1), 65-90.

Ranganatha, S. C., & Jailkhani, S. (2019). Prevalence and Associated Risk Factors of Computer Vision Syndrome among the Computer Science Students of an Engineering College of Bengaluru-A Cross-Sectional Study. *Galore international journal of health science 4 (3), 10-5.*

Smith, M. J., Carayon, P., & Cohen, W. J. (2007). Design of computer workstations. In *The human-computer interaction handbook* (pp. 339-352). CRC Press.

Soroush A, Shamsi M, Izadi N, et al (2018). Musculoskeletal disorders as common problems among Iranian nurses: A systemic review and meta-analysis study. *International journal of public health and medicine, 9:27.*

Sukums, F., Mensah, N., Mpembeni, R., Kaltschmidt, J., Haefeli, W. E., & Blank, A. (2014). Health workers' knowledge of and attitudes towards computer applications in rural African health facilities. *Global Health Action*, *7*(1), 24534.

Sunil Munshi, A. V. (2017). Computer vision syndrome - A common cause of unexplained visual symptoms in the modern era. *International Journal of Clinical practice*. doi:10.1111/ijcp.12962

Tafese, A., Nega, A., Getasew, D., & Erku, G. (2018). Assessment of Knowledge and Practice of Computer Ergonomics among Secretaries and Data Processing Workers in University of Gondar, Northwest Ethiopia, 2016. *J Community Med Health Educ*, *8*(583), 2161-0711.

Tanui, B. C. (2016). *Assessment of Work-Related Musculoskeletal Disorders among Nurses in Mombasa County, Kenya.* Unpublished PhD Thesis, Juja: JKUAT

Tauste Frances, E. R. (2014). Occular and visual alteration in people who work with computera and wear contact lenses: a bibliographical review. *Spanish journal of public health*, 203-215.

Tavafian, S. S., Jamshidi, A., Mohammad, K., & Montazeri, A. (2014). Low back pain education and short-term quality of life: a randomized trial. *BMC musculoskeletal disorders*, 8(1), 1.

Tawiah, A. K., Oppong-Yeboah, B., & Bello, A. I. (2015). Work-related musculoskeletal disorders among workers at gold mine industry in Ghana: prevalence and patterns of occurrence. *Journal of Advances in Medicine and Medical Research*, 1-9.

Tesfaye Hailu, M. A. (2022). Prevalence and associated factors of computer vision syndrome among academic staff in the University pf Godor: An institution-based cross-sectional study. *Sage journals, environmental health insight*.

Tint, P., Traumann, A., Pille, V., Tuulik-Leisi, V. R., & Tuulik, V. (2015). The comparison study of office workers workplace health hazard in different type of building. *Agronomy Research*, *10*(1), 261-268.

Tint, P., Tuulik, V., Karai, D., & Meigas, K. (2014). Health Risks to Computer Workers in Various Indoor Facilities. *Safety of Technogenic Environment*, *5*, 47-50.

Toomingas, A., Hagberg, M., Heiden, M., Richter, H., Westergren, K. E., & Wigaeus Tornqvist, E. (2012). Incidence and risk factors for symptoms from the eyes among professional computer users. *Work*, *41*(Supplement 1), 3560-3562.

Waiganjo, L. B., Mwisukha, A., & Onywera, V. O. (2016). Work-related musculoskeletal injuries and conditions suffered by computer-user employees in the banking institutions in Nairobi, Kenya.

Wood, J., Buell, J., Merchant, M., Oeser, M., Smith, J., Spilka, J., & Wydysh, J. (2014). Descriptive analysis of seat ergonomics among Utica College population. Utica College.

APPENDICES

Appendix I: Introduction Letter

<u>REF: REQUEST FOR PERMISSION FOR DATA COLLECTION.</u>

I am a master's student at Jomo Kenyatta University of Agriculture And Technology, doing a master's degree in Occupational Safety and Health. As part of my fulfillment to the requirements of the said program, Am currently undertaking a research field work for the purpose of writing my thesis. In regard to data collected, I hereby and committedly declare that the information given was strictly limited to educational motive only. Participation is voluntary and a respondent can terminate the level of his/her participation at any point without giving any reasons.

Your assistance is highly appreciated.

Yours faithfully,

Anthony Njiru

Appendix II: Questionnaire

Kindly take your time to provide the requested information to the best of your knowledge. The information requested will be strictly utilized in completion of academic research paper. The information will be handled with strict confidentiality.

SECTION A: Socio Demographic Information.

Name of the bank (Optional) ____

1. Kindly indicate your Gender

   Male ( )   Female ( )

2. How many years have you been working in the banking sector?

   Below 5 years ( )   5 to 10 years ( )

   More than 10 years ( )

3. What is your position in this bank?

   Senior Manager ( )   Manager ( )   Junior Staff ( )

   Other (Please Specify) __________________

4. How many years have you worked in this organization?

   Below 2 years ( )   2 to 5 years ( )

   More than 10 years ( )

5. What is your highest level of education?

   Certificate ( )   Diploma ( )   Degree ( )

   Masters ( )   PhD ( )

   Other (please specify)____

Section B: Individual Risk Factors

6. Anthropometrical measurements.

Measurement	Reading
Weight in kilograms (KGs)	
Height in meters squared (m^2)	
Body mass index = weight in kilograms/ height in meters squared	

7. After what duration of computer use do you go for break?

After 2 hours ( ) After 3 – 5 hours ( ) After 5 – 7 hours ( ) No Break at all ( )

How many hours do you use a computer while working in a day?

1 - 5 hours ( ) 6 - 8 hours ( ) More than 8 hours ( )

9. How many hours do you sit within a day?

1 - 5 hours ( ) 6 - 8 hours ( ) More than 8 hours ( )

10. The screen light adjustment.

Screen Light (%)	Tick Appropriately
0 - 30	
31 - 60	
61 - 100	

12. What is the viewing distance between the workers eyes and the centre of the screen?

Distance	**Tick Appropriately**
less than 39cm	
40cm - 75cm	
76cm - 110cm	
more than 110cm	

<u>SCETION B: Work Environment Risk Factors</u>

13 .Tick where appropriate

	Yes	**No**
Adjustable seat height		
Chair cushioned with rounded front edge		
A well lit room		

14. What is the lighting illumination in the following position of the working area?

Light Illumination		**Tick**
Left	Below 500 lux	
	Between 500-1000 lux	
	Above 1000 Lux	
Right	Below 500 lux	
	Between 500-1000 lux	
	Above 1000 Lux	
Center	Below 500 lux	
	Between 500-1000 lux	
	Above 1000 Lux	

15 .What is the position of computers relative to the windows?

Position	**Tick**
Less than 500cm	
500-1000cm	
Above 1000cm	

SECTION C: Level of knowledge and awareness

16. What is your level of awareness on each of the following risks of computer use and their health effects?

	Yes I know	No I don't know
Room illumination		
Position of computers relative to the windows		
Screen viewing distance		
Screen light		
Seating posture		
Breaks		

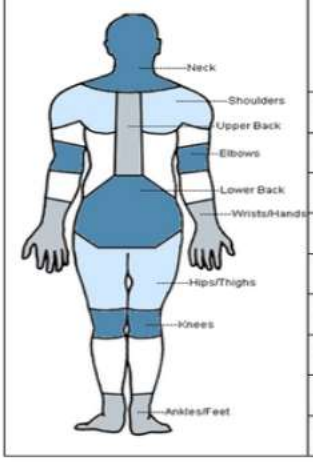
17.How often does your bank hold trainings on risk factors and health effects of computers use

Once a year ( ) Twice in one year ( ) More than twice in a year ()

SECTION E: Health Effects of Computer Use

18. Which part of your body is affected by computer use?

TROUBLE WITH THE LOCOMOTIVE ORGANS



	Have you at any time during the last **12 months** had trouble in:		***To be answered only by those who have had trouble*** Have you at any time during the **last 12 months been prevented from doing your normal work** because of the trouble?		Have you had trouble at any time during the **last 7 days?**		Have you ever hurt your body part in an **accident?**		What is the **total length of time** that you have had trouble during the last 12 months? 1-7 days	8-30 days	More than 30 days	Everyday	Have you been **seen by a doctor** because of trouble during the last 12 months?	
Neck	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Shoulders	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Elbows	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Wrists/Hands	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Upper back	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Low back	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Hips/Thighs	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Knees	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO
Ankles/Feet	YES	NO	YES	NO	YES	NO	YES	NO					YES	NO

19. How often do you face the following health problems?

	Never	**sometimes**	**Always**
watering eyes			
Dry eyes			
Eye fatigue			
burning sensation			
Double vision			

Eye irritation			
Arm pain			
Lower Back Pain			
Leg Pain			
Neck Pain			

20. What is your visual acquity measurements range?

Visual Acquity	**Tick**
6/12 - 6/24 (mild visual impairment)	
6/24- 6/ 36 (moderate visual impairment)	
6/36 - 6/60 (severe visual impairment)	
6/6 - 6/9 (normal visual acuity)	

Appendix III: NACOSTI Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **682506**

Date of Issue: **14/July/2023**

RESEARCH LICENSE

This is to Certify that Mr.. anthony njiru nyaga of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: ASSESSMENT OF OCCUPATIONAL RISK FACTORS AND HEALTH EFFECTS OF COMPUTER USE AMONGST BANKERS IN NAIROBI COUNTY KENYA. **for the period ending : 14/July/2024.**

License No: **NACOSTI/P/23/26898**

682506

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix IV: ERC Approval

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
P.O BOX 62000(00200) NAIROBI, Tel:(067) 58700001-4
(Office of the Deputy Vice Chancellor, Research Production and Extension Division)
JKUAT INSTITUTIONAL SCIENTIFIC AND ETHICS REVIEW COMMITTEE

REF: JKU/2/4/896B

Date: 4th May, 2023

ANTHONY NJIRU NYAGA
INSTITUTE OF ENERGY AND ENVIRONMENTAL TECHNOLOGY (IEET), JKUAT

Dear Mr Nyaga,

RE: ASSESSMENT OF OCCUPATIONAL RISK FACTORS AND HEALTH EFFECTS OF COMPUTER USE AMONGST BANKERS IN NAIROBI COUNTY KENYA.

This is to inform you that JKUAT Institutional Scientific and Ethics Review Committee has reviewed and approved your above research proposal. Your application approval number is **JKU/ISERC/02316/0894.** The approval period is **4th May 2023 to 3rd May 2024.**

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by JKUAT ISERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to JKUAT ISERC within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to JKUAT ISERC within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to JKUAT ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely

Dr Patrick Mburugu
CHAIR, JKUAT ISERC

INSTITUTIONAL ETHICS REVIEW COMMITTEE
04 MAY 2023
APPROVED
J K U A T

JKUAT is ISO 9001:2015 and ISO 14001:2015 *certified*
Setting Trends in Higher Education, Research, Innovation and Entrepreneurship