WORK-RELATED MUSCULOSKELETAL DISORDERS, RISK LEVELS, AND "FEAR AVOIDANCE BELIEFS" AMONG WORKERS IN OSERIAN FARM NAKURU COUNTY

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JOMO KENYATTA UNIVERSITY OF

AGRICULTURE AND TECHNOLOGY

2021

Work-Related Musculoskeletal Disorders, Risk Levels, and "Fear Avoidance Beliefs" among Workers in Oserian Farm Nakuru County

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

2021

DECLARATION

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

Signature ……. Date…….

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DEDICATION

I dedicate this work to the entire Physiotherapy fraternity globally.

ACKNOWLEDGMENTS

Special thanks to my family and friends for all kind of support they accorded me during this study. Special thanks to all the members of the faculty especially Dr. Wallace Karuguti, Prof. Benita Olivier and Prof. Simon Karanja.

I appreciate my fellow Master of Science in Physiotherapy learners and all other Physiotherapy professionals. The positive criticism they made challenged me to give the best out of me. Special thanks to the Research Assistants (who were Physiotherapy students at The Kenya Medical Training College, Nakuru Campus) for the assistance they offered in data collection. Lastly, I thank the administration and all members of staff at Oserian Farm for the support they accorded me during data collection.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

CI	Confidence Interval
FAB	Fear Avoidance Beliefs
FABQ	Fear Avoidance Belief Questionnaire
LBP	Low Back Pain
NMQ	Nordic Musculoskeletal Questionnaire
REBAQ	Rapid Entire Body Assessment Questionnaire
SDC	Socio-Demographic Characteristics
SPSS	A computer statistical package for data analysis
WHO	World Health Organization
WMSD	Work-Related Musculoskeletal Disorders

DEFINITIONS AND OPERATIONAL TERMS

Ergonomics	A study of the relationship between people and their working environment, especially the equipment they use.
Fear Avoidance	Resultant avoidant behavior in a population suffering from long-term musculoskeletal pain
Low back pain	Acute or chronic pain at region at the back between the ribcage and the waist. Structures involved may be bones, nerves or muscles
Musculoskeletal Disorders	These are injuries that affect the human body's movement
SPSS	Statistical Package for the Social Sciences

ABSTRACT

Work-related Musculoskeletal Disorders (WMSD) are the most prevalent cause of disability in both developing and developed countries. They are a global public health concern to healthcare systems, social-care systems and the concerned individuals because, their overall result is reduced productivity, economic drain, work absence, physical disability and mental disorders. These are majorly caused by occupational activities. Psychological factors such as 'Fear Avoidance Beliefs' may influence the behavior of acute and chronic pain. Chronic pain manifests with catastrophizing pain that often lead to severe pain, re-injury or disability. The main objective of this study was to determine work-related musculoskeletal disorders, risk levels and 'Fear Avoidance Beliefs' among flower farm workers in Oserian farm Nakuru County. A descriptive cross-sectional study was conducted among flower farm workers in Oserian farm. A sample size of 270 respondents from a population of 897 farm workers was used. Data was collected using interviewer administered questionnaires, which included Nordic Musculoskeletal Questionnaire (NMQ) for determining the prevalence of work-related musculoskeletal disorders, the Rapid Entire Body Assessment Questionnaire (REBAQ) for occupational risk assessment and 'Fear Avoidance Belief' Questionnaire (FABQ) which determined the proportions of pain 'Fear Avoidance Beliefs'. Statistical analysis was undertaken using SPSS version 25. The difference between parameters were deemed statistically significant at $p< 0.05$. Frequency tables and percentages were used to explore trends in the data of descriptive statistics. Chi-square statistics was used to test for association between variables. A total of 184 (68.1%) respondents reported musculoskeletal discomfort within the previous 12 months. Among the 184 respondents, 178 were performing general farm work. Most of the WMSD were reported in the lower back (38.1%), followed by the wrist and hands (24.1%) and ankle and feet (24.1%). There was a strong association between job designation as a general worker and WMSD ($p=0.016$). Age ($p=0.027$) and the length of time the farm worker had worked ($p=0.041$) was also associated with WMSD. Fear Avoidance beliefs of pain existed across all 184 respondents as, 'decreased risk of persistent problems', 'increased risk of reporting no improvement', 'decreased risk for not returning to work', and 'increased risk of not returning to work' at 36.4%, 27.2%, 18.5%, and 17.9% respectively. There was medium, high and very high risk associated with developing WMSD at 26.6%, 43.5%, and 29.9% respectively. It was found out that work-related musculoskeletal disorders affect over two-thirds of flower farm workers, and the lower back is the most affected area. Specific farm job designations, the age of the worker, and the duration of time involved over the long term may predispose workers to various risks that may result in the development of WMSDs. 'Fear Avoidance Beliefs' exist and permeates across the entire flower farm work-force although at different levels of severity. Lastly, almost 75% farm workers report a higher risk to exposure of developing WMSD.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Work-related musculoskeletal disorders (WMSD) are among the most prevalent causes of disability and work-related injuries in developed and developing countries (Shuai, Yue, Li, Liu, & Wang, 2014). WMSD is also referred to as cumulative trauma disorder (CTD), repetitive motion injuries (RMI), repetitive strain injuries (RSI) or occupational overuse syndrome (OOS) (Nunes & Bush, 2011).

Work-related musculoskeletal disorders hold a significant burden on health systems, individuals, and social care systems and substantial costs for the public health system (Darwish & Al-Zuhair, 2013). Further, they are also a huge and serious high risk to workers' general health in any work-place environment (Shafti *et al.*, 2016). Work-related musculoskeletal disorders are being multi-factorial in derivation. This means that the performance of work causes WMSD and that the work environment contributes to causing and or aggravating the condition significantly. World Health Organization (WHO) further notes that personal characteristics, psychological factors, environmental factors, and socio-cultural factors may also play a role in developing musculoskeletal disorders (WHO, 1985).

Work-related musculoskeletal disorders encompasses both degenerative and inflammatory conditions, which are acute or chronic (Damayanti, Zorem & Pankaj, 2017). Damayanti *et al*. (2017) further classify WMSD as an occupational illness since they are more prevalent among the working class than the general population (Vedovato & Monteiro, 2014). Most WMSD develop over a period of time and are caused by either the work itself being repetitive in nature of either low or high-intensity loads over a period of time (Shafti *et al*., 2016). Manual lifting, acquiring awkward bad posture, prolonged static posture or contractions, and labor-intensive tasks or even the working environment such as sustaining a fracture from the work-station also lead to WMSD (Ganiyu *et al*., 2015; Azim, 2016). Other socio-demographic characteristics (SDC) such as age and the duration that an individual has worked has shown a

relationship with the development of WMSD (Health and Safety Executive, 2019; Singh & Arora, 2010; Shuai *et al*., 2014).

Among all the reported WMSD cases in Thailand in 2017, over 56% were workers in agricultural industry (Kaewdok, Sirisawasd & Taptagaporn, 2018). In a WMSD study conducted in China among medical staff, results showed that body areas mostly affected are the shoulder joint, neck, and back with a prevalence of 62%, 60.3%, and 54.3%, respectively (Wang *et al.*, 2017). In another WMSD study among farmers in Kanpur – India, findings showed that lower back involvement was common with 69% followed by knee, shoulder, and neck pain with 39%, 22%, and 10%, respectively (Gupta, 2013).

In a systematic study among the farm workers, all the 24 studies showed WMSD lifetime prevalence was 90.6%, while the 1-year prevalence was 76.9% (95% CI 69.8% - 82.7%). Low back was the most affected region with a lifetime prevalence of 75% (95% CI 67 - 81.5), while a 1-year prevalence was 47.8% (95% CI 40.2 - 55.5). The second and third most affected regions were upper extremity and lower extremity, ranging from 3.6%–71.4% and 10.4%–41%, respectively (Osborne *et al.*, 2012). In another study of work-related musculoskeletal disorders among Irish farmers, the prevalence was reported to be 9.4% (where n=103) and that low back was the most common region affected with 31% (Osborne *et al.*, 2013).

Work-related musculoskeletal disorders are known to affect several structures, either singly or in combination (Podniece & Taylor, 2008). The affected structures are the tendons, bones, nerves, ligaments, muscles, or localized blood circulation system and joint capsule (Nunes & Bush, 2011; Ganiyu *et al*., 2015; Kaewdok, *et al*., 2018). The general symptoms of WMSD vary from simple discomfort, body part-aches, and pain, thus reduced body functionality (Shafti *et al.*, 2016).

Although many tools have been developed with the sole intention to make work easier and friendlier, there still are many challenges that lead to WMSD (Shafti *et al.*, 2016). Shafti *et al*. (2016) further highlight that, other than laborious jobs, white-collar jobs such as teaching and banking professions also expose individuals to WMSD risk.

Workers in agriculture, forestry, construction, human health, transport, and storage are the most affected (Singh & Arora, 2010; Health and Safety Executive, 2019).

The concept of 'Fear Avoidance Beliefs' explains how pain results into chronicity, hence individual's avoidance of work (Leeuw *et al*., 2007; Lethem, *et al.*, 1983). Wilson, Lewandoski and Palermo (2011) and Gatchel *et al*. (2016) noted that cognitive familiarities of pain beliefs played an important part in pain perception due to the fact that the 'thought' of re-injury will automatically lead to the avoidance of work. Such avoidance of work will result in reduced levels of engaging on a task.

In agriculture, it is noted that both farm workers perceive WMSD as normal experiences and inevitable due to their kind of work. Ambiguously, the risk factors of WMSD are found within a particular job carried out by an individual. If these risk factors are not detected and addressed, they lead to severe or chronic pain or disability (Singh & Arora, 2010). If these factors are well addressed, they will maintain or enhance the quality of life among the farm workers, thus improving overall productivity. If the Fear Avoidance aspect is well understood, it will create a friendly working environment since the farm management will be well informed.

1.2 Statement of the Problem

The burden of WMSD has been snowballing steadily between the year 2000 and 2015 (Sebbag, 2019; Global Burden of Disease Study 2013; Collaborators, & Looker, 2015). As noted by March *et al*. (2014), work-related musculoskeletal disorders are ranked third cause of disability globally, and burden from these conditions were remarkably high. The ageing of the world population further increases the burden of WMSD. This category of conditions is the most expensive form of work-disability, and ascribe to approximately 40% of all costs toward the treatment of work-related injuries (Yasobant & Rajkumar, 2014). The overall results of WMSD is economic drain, work absence, reduced productivity, physical disability and mental disorders (Shafti *et al.*, 2016; Azim, 2016).

Both work environment and performing work either contribute to or aggravate WMSD. Workers in agriculture are the most affected (Singh & Arora, 2010). They also noted that both farm workers and experienced farmers perceive WMSD as a normal experience and inevitable. In Africa, little research has been done on WMSD, especially in agriculture. In Kenya, the research did not find a published WMSD study among farmers. Most farm workers work under very competitive environment and pressure to produce in large quantities, thus more exposure to WMSD risk.

1.3 Justification

There is scarcity in data from published research studies that has been done on WMSD in flower farm work environments in Kenya, yet agricultural activities dominate economic activities. Much including prevalence rate, financial costs associated with management of these conditions, the work-related risk levels are not well referenced in Kenyan context. This study's findings may inform the farm's management on the prevalence of WMSD, pain-related 'Fear Avoidance Beliefs', and the risk levels among flower farm workers. This will lead to appropriate steps being taken to mitigate on the activities informing the risk levels, thus preventing future incidence and complications.

Following such interventions, the healthcare costs may reduce while productivity and the quality of life may improve. The study may also offer a platform for future experimental studies to test the impact of the recommendations of this study.

In addition, this study will therefore empirically reduce the information gaps that existed with regards to the work-related musculoskeletal risk levels and enlighten on the psychological impact depicted through Fear Avoidance of work on the affected farm workers.

1.4 Significance of the Study

The global numbers of workers developing WMSD is on a steady rise. In Kenya, there is scarcity of literature on prevalence on WMSD for referencing, although present in clinical setting. This has a negative impact on farm's productivity levels due to

increased sick-offs and absenteeism. Further, the farmworkers incur high treatment costs thus economic drain. In addition, the farmworker's overall quality-of-life is decreased.

If this occupational issue is not addressed through research, the stated negative impact may escalate thus leading to further burdens associated with WMSD. This study is therefore significant as a step towards mitigation of the risk.

1.5 Research Questions

1. What is the prevalence of musculoskeletal disorders among flower farm workers at Oserian farm in Nakuru County?
2. What is the proportion of flower farm workers exhibiting 'Fear Avoidance Beliefs' of work among workers reporting work-related musculoskeletal disorders at Oserian farm in Nakuru County?
3. What is the work-related musculoskeletal disorder risk levels associated with musculoskeletal disorders among flower farm workers at Oserian farm in Nakuru County?

1.6 Objectives

1.6.1 Broad Objective

To determine work-related musculoskeletal disorders, risk levels and "Fear Avoidance Beliefs" among flower farm workers in Oserian farm Nakuru County.

1.6.2 Specific Objectives

1. To determine the prevalence of musculoskeletal disorders among flower farm workers at Oserian farm in Nakuru County.
2. To determine the proportions of flower farm workers exhibiting 'Fear Avoidance Beliefs' of work among workers reporting work-related musculoskeletal disorders at Oserian farm in Nakuru County.

3. To determine work-related musculoskeletal disorder risk levels associated with musculoskeletal disorders among flower farm workers at Oserian farm in Nakuru County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Work-Related Musculoskeletal Disorders

There is a close relationship between specific jobs and developing work-related musculoskeletal disorders. However, little attention has been given to these disorders, yet they are painful and disabling (Azim, 2016). They are a serious health concern globally to many institutions such as insurance, workers' unions and healthcare systems (Palazzo *et al.*, 2014).

Globally, slightly more than one million workers sustain work-related injuries. These injuries are severe enough to result in lost time from work and other losses due to over-exertion or repetitive motion in one year (Nunes & Bush, 2011).

In Europe, both the healthcare system and the financial institutions are heavily concerned by the huge prevalence that leads to the high cost of insuring treatment and compensation costs (Nunes, 2009). Yassi (2000) also notes that training new staff and loss of productivity are a concern among individuals suffering from WMSD. In Norway, most disability-pension is paid to people with back pain-related disability. In Sweden, slightly over 60% of chronic pain patients or early retirement cases were attributable to WMSD (Palazzo *et al*., 2014; Hoy *et al*., 2014).

According to Yassi (2000), statistics from the United States Bureau of Labor reported that WMSD syndrome accounts for about 65% of occupational disorders and that Carpal tunnel syndrome is the leading work related condition, with approximately 2 million workers suffering from it. Whereas other socio-demographic characteristics (SDCs) are thought to contribute in the prevalence of WMSD, gender has not been statistically significant while the advance in the age of an individual was significant in developing WMSD (Health and Safety Executive, 2019; Australia Safe Work, 2016).

The European Foundation report on Working Conditions Survey conducted in 2010 reported that European labor force remain exposed to physical environmental and work-related hazards. For instance, 23% are exposed to high-frequency vibrations. In

comparison, 33% of workers carried heavy loads at least 25% of their working time (European Foundation for the Improvement of Living and Working Conditions, 2012). In China, the overall prevalence is 85.5%, with the shoulder, neck, and lower back scoring 62%, 60.3%, and 54.3%, respectively, as the most affected body regions (Wang *et al.*, 2017). A prevalence study by Abdulmonem *et al.* (2014) reported that low back was the most affected at 38.1% followed by knee, heel, and shoulder at 26.3%, 24.1%, and 20.6%.

In Africa, WMSD is a big problem in many countries (Wanyonyi and Frantz, 2015). This is probably because of little research on the subject. In addition, just a few occupations such as health-staff, agricultural workers, domestic workers, industrial workers, and administrative workers were investigated. Wanyonyi & Frantz (2015) further noted that the prevalence of any musculoskeletal condition in Africa ranges between 15% and 93.6%. In addition, the research showed that WMSD was highest in prevalence among health care professions with 24% while the agricultural sector followed closely with 22%. By virtue of body region, Wanyonyi and Frantz (2015) reported that back pain was most reported with a prevalence of 13% in South Africa's office workers to a range of 92% in Ghanaian's agro-processing individuals. In a WMSD study on butchers in Kano metropolis in Nigeria, point and one-year prevalence were 74.5% and 88.2%, respectively (Kaka *et al.*, 2016). In Ibadan-Nigeria, a one-year prevalence rate of WMSD among occupational drivers was 89.3% (Akinpelu *et al.*, 2011).

A study on musculoskeletal discomfort on women working in small-scale in South Africa showed a one-year prevalence range of 63.9% to 73.3% (Naidoo *et al.*, 2009). In a study done in Uganda on Apparel Assembly Plant, 68.9% complained of WMSD in three different body locations (Tebyetekerwa, Akankwasa and Marriam, 2017).

Work-related musculoskeletal disorders are equally expensive to treat compared to other pathologies due to their progressive and long-term nature of their presentation (Fathallah, Miller and Miles, 2008). In 2015, The United States Bureau of Labor reported that at least a third of time-labor losses occurred due to WMSD (Wang *et al.*, 2017). The overall results of WMSD lead to reduced productivity, economic drain,

work absence, physical disability (Shafti *et al*., 2016) and mental disorders more severely than any other safety and occupational health problem both during the remainder of their working years and quality of their balance lives (Singh & Arora, 2010).

2.2 Work-Related Musculoskeletal Disorders Risk Levels

World Health Organization classifies WMSD as multi-factorial due to numerous risk factors that contribute and progresses these disorders. Risk factors are potential causative of a musculoskeletal disorder. The level of complexity and variety of the risk factors associated with WMSD clearly explains the challenges faced while trying to address the ergonomic prescription, intervention, and management of WMSD (Nunes & Bush, 2011).

The risk factors that predispose workers to WMSD are broadly categorized into three sets, namely: 'Individual factors' such as sports activity level, previous WMSD, recreational activities, age, professional activities and length of service, education levels, gender, BMI, smoking or alcohol behaviours, marital status, social class, monthly income. The second set is 'Physical factors': hand-arm vibration, mechanical compression, forceful exertions, sustained posture, awkward posture, and repetitive activities. Lastly, 'Psychosocial factors' such as support from team or boss at work, autonomy, lack of job control, job uncertainty, work pace, monotony, work-rest cycles, time pressure, and overall social support (Nunes, 2009; Ekpenyong & Inyang, 2014; Costa & Vieira, 2010; Ganiyu *et al*., 2015; Wang *et al*., 2017). This is probably due to the chances of developing WMSD associated with the gap between the individuals' working capacity and the demands of work (Nunes & Bush, 2011).

Africa faces several challenges in combating WMSD. This is because no one standardized method of reporting WMSD complains hence no good and precise prevalence rates. In addition, Africa has inadequate or lack of quality assessment protocol and guidelines of WMSD that would otherwise have improved the ergonomic prevention measures (Wanyonyi & Frantz, 2015).

Work-related musculoskeletal disorders are mostly reported in the upper limbs, neck, low back, and the lower extremities. This is probably because of their position on the body and their exposure to pivoting load or weight (Myhre *et al.*, 2013; Riccò, Cattani, Gualerzi, & Signorelli, 2016).

An occupational study by Tinubu *et al.* (2010) further revealed that the longer individuals were exposed to an occupation, the more likely they were to suffer WMSD. Occupational risk factors in farming include prolonged forward bending, kneeling, heavy lifting and carrying, repetitive vibration, static positioning (Singh & Arora, 2010).

The workers' age is a musculoskeletal risk factor and differs significantly in various age groups designated in different work-place positions. (Zoer, Frings-Dresen, & Sluiter, 2014). A study by, Zoer, Frings-Dresen, & Sluiter, (2014), workers in the age group of 46 -55 years were the most affected. Most patients who reported WMSD had a link between the duration they had worked, age, the specialty of work, and weight (Pastre *et al*., 2007; Alghadir *et al*., 2015).

This WMSD is mostly characterized by aching stiffness, numbness or tingling sensation, discomfort, pain, and fatigue (Shafti *et al*., 2016). At advanced stages, they present with decreased and or impaired function and or mobility (Riccò, Cattani, Gualerzi, & Signorelli, 2016; Kathy, Cheng, & Ju, 2015). These increased levels of discomfort may lead to more serious medical, surgical, or social conditions and, as noted earlier, WMSD may advance to chronic severe phases, treatment and recovery are often unsatisfactory among most subjects, thus disability and even loss of employment (Darwish & Al-Zuhair, 2013; Shafti *et al*., 2016).

To mitigate this high WMSD, every worker needs to be aware of their job demands. A worker needs to understand work techniques such as utilizing forklifts and carts that will lead to enhanced work performance. Further to this, they should also practice periodical stretch and flex programs before and during their activities. Similarly, the workers should be provided for and utilize proper personal protective equipment such as knee pads, gloves, helmets, elbow-supports that are well fitting among others so as they reduce the risk of injury. Utilizing wrong fitting tools or body gears may origin

enormous uneasiness. Lastly, firm's management should conduct periodical ergonomic lessons and assessment to reduce development of new cases and reduction in severity of existing cases (Cambre, 2016).

An agricultural safety report by the National Institute for Occupational Safety and Health reported that agricultural activities rank among the highest occupational hazards globally and that, farmers and farm workers are at very high risk for both fatal and nonfatal injuries. With the current high industrialization levels in agriculture, new farming equipment has been introduced, such as load-transfer devices (Fathallah, 2010), but limited attention has been paid to the overall ergonomic design. Besides, prolonged working duration during all weather conditions, and high working pace as risk factors have been brought about by increased work demands especially during peak seasons and competition to produce large quantities. The failure or improper use of personal protection equipment, and using old and possibly poorly-maintained equipment has also played a role in developing WMSD. For instance, the most common farming health-related conditions reported by farmers was due to heavy lifting, prolonged bending posture, and repetitive movements in that order (Byad, 2017).

Advances in worker-based approaches such as load transfer, if well utilized, give a great promise in curbing the prevalent culture of prolonged stooping while working on the farm. However, even in the advent of these new technologies in farming, reliance on human labor, especially in the production of vegetables and fruits, are still expected (Osborne *et al*., 2013). It is worth to note that advancement in research in agriculture and farming is taking new and better heights among various professionals such as epidemiologists, Occupation and Health professionals, social scientists among others globally are committed to the sole role of reducing WMSD and other health issues among farmers (Fathallah, 2010). In a study of work-related Musculoskeletal Disorders among Irish farmers by Osborne *et al*., (2013), the conclusion was that the overall prevalence of WMSD could be significantly reduced if proper technical advancements are adopted.

Work-related musculoskeletal disorders have continually presented a management challenge to the clinicians concerned with managing the disorders (Yassi, 2000). This is probably because it develops casually among these professional subjects (Stack, Ostrom & Wilhelmsen, 2016). Even though farmers have always reported musculoskeletal signs and symptoms regarding farming activities, generally, there has been minimal research related to musculoskeletal disorders and ergonomics.

It is common that healthcare workers such as Doctors and Physiotherapists might overlook this WMSD in the agriculture population. This is probably due to first: the assumption that WMSD is normal, unavoidable in farm work activities, and second: the assumption that the farmer's signs and symptoms are due to the mere effects of chemicals used such as fertilizer pesticides (Fenske & Simcox, 2000). Lastly, WMSD in this group of occupations is non-specific in nature (Singh & Arora, 2010) and with undifferentiated clinical diagnosis (National Research Council and Institute of Medicine, 2001). This, therefore, makes it difficult to classify this particular WMSD in epidemiologic studies using conventional medical screening tools (Singh & Arora, 2010).

It is no doubt that most professional clinicians who manage WMSD agree that prompt intervention improves the overall prognosis of these occupational disorders since this minimizes their occurrence (Tinubu *et al*., 2010; Yassi, 2000). Intervention of WMSD need a multi-interventions since as noted before, WMSD are multi-etiological in occurrence (Ekpenyong and Inyang, 2014). But, even as much as health care professionals have increased their priority in dealing with agricultural WMSD, they have under-recognized and diagnosed, prevented, and mainly controlled in farming safety programs (Singh & Arora, 2010).

Besides addressing the exposure and the effect of poor ergonomics at work-places when developing and implementing ergonomic interventions in the WMSD exposed-population, the farmer is a very integral contributor since other associated factors such as physical factors, individual factors, and psychosocial factors might have a role in the presentation or even in the development of what seems to be WMSD (Fathallah, 2010).

Chronic musculoskeletal pain is a global public health concern for healthcare systems and concerned individuals (Zale and Ditre, 2015). Biologically, pain is a significant signal of a bodily threat. This threat urges various protective mechanisms, including avoidance behaviors. Fear is an anticipatory psychological response to a threat, and it can be learned from observation, verbal instructions, or direct experience (Vlaeyen, Crombez, & Linton, 2016).

2.3 Fear Avoidance Beliefs

'Fear Avoidance Beliefs' is a model that describes how fear results in avoidance of work behavior in a population suffering from long-term musculoskeletal discomfort (Leeuw *et al*., 2007; Lethem, *et al*., 1983). Cognitive experiences such as pain beliefs, play an essential part in the perception of pain (Wilson, Lewandowski & Palermo, 2011). Fear of pain is adaptive since it cautions us not to proceed with activities that are potentially harmful (Myhre *et al.*, 2013). The thought or anticipation to re-injure oneself will lead to avoidance of work or physical activity, thus low levels of activity and even disability. This is because the projected danger of pain will habitually lead to continual caution and monitoring of pain perceptions. In turn, this can precipitate even very low-intensity pain sensations to become intolerable to oneself (Gatchel *et al.*, 2016).

Avoidance behavior pattern is either postpone or prevents an encounter with an unpleasant stimulus (Vlaeyen *et al*., 2016). For instance, when one experiences a catastrophizing thought about joint pain, it is more likely that the pain will worsen for a longer period. This catastrophizing pain will lead to longer periods of job absenteeism and might even lead to a disability (Wilson, Lewandowski & Palermo, 2011; Myhre *et al.*, 2013). This is because Fear Avoidance patterns might spread into other activities, leading to a sedentary lifestyle, characterized by the fear that any activity is undertaken might lead to more pain or re-injury (Georgoudis, Papathanasiou, Spiropoulos, & Katsoulakis, 2007; Myhre *et al*., 2013). Respondents reporting 'increased risk of not returning to work' group is most likely to have a poor therapeutic outcome. On the contrary, the group categorized as 'decreased risk of

persistent problems' was more likely to respond positively to therapeutic interventions and report back to work.

Due to the pain and body aches experienced by persons experiencing WMSDs, these persons' overall standard of health, comfort, and happiness are compromised. A decrease in quality-of-life results in complications such as reduced productivity and Fear Avoidance. The concept of Fear Avoidance leads to a maladaptive perception of pain. Thus, more extended periods of hospitalization, increased medical bills, job-absenteeism, and even disability (Myhre *et al*., 2013; Wilson *et al*., 2011).

In a study done by Myhre *et al*. (2013) on Fear Avoidance beliefs associated with perceived psychological and social factors at work among patients with neck and back pain, the findings were that work-related factors such as social and perceived psychosocial by far outweighed pain, and that this factors positively correlated to fear avoidance of work in patients with WMSD. In a study to determine Fear Avoidance's role among female computer workers with shoulder and neck pain by Huis-Veld, Vollenbroek-Hutten, Groothuis-Oudshoorn, and Hermens (2007), findings showed that Fear Avoidance behavior patterns directly influenced the levels of disability.

Simon, Strykerimon and George (2011) compared musculoskeletal pain with Fear Avoidance behavior across multiple bodily locations, they found out that the Fear Avoidance pattern was similar in all patients suffering WMSD. The similarity of Fear Avoidance was regardless of the body region affected. Also, they found out that all individuals somehow experienced a Fear Avoidance behavior pattern resulting from chronic musculoskeletal pain. Though, they clarified that the prognosis might differ in respect of the bodily part affected.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

Oserian Development Company Limited runs Oserian Farm. The flower farm sits on 5000 acres in Naivasha Sub- County within Nakuru County in Kenya. The farm has 1301 employees in various functional departments. A total of 897 employees carry out direct farm work related activities across multiple working shifts that range from operating forklifts to loading the transportation lorries, flower picking, and crop management such as spraying, weeding and nursery management. Generally, the farm activities manual and laborious in nature (Staff, 2021).

3.2 Study Design

The study employed a descriptive cross-sectional design. A descriptive cross-sectional study entailed related factors being measured at a specific point in time for all the farmworkers.

3.3 Study Variables

3.3.1 Independent Variables

Work-related musculoskeletal disorders

3.3.2 Dependent Variables

- Prevalence of work-related musculoskeletal disorders
- Proportions of ‘Fear Avoidance’
- Work-related musculoskeletal disorders risk levels

3.4 Study Population

The study population was 897 flower farm workers in Oserian Farm in Nakuru County.

3.5 Sample Size Determination

The sample size was determined using the formula by Cochran (1977) $n=Z^2pq/d^2$.

n = the sample size (respondents that were interviewed);

Z =1.96 (Z score corresponding to 95%confidence interval);

P=0.5 (prevalence of work-related musculoskeletal disorders);

q = 0.5 (1-P);

d = 0.05 (sampling error the margin error (5%) that was accepted in this study).

Thus; - $n=1.96^2*0.5*0.5/ 0.05^2$

n =384.16

n =385

BUT, now that the sample size of the study population is less than 10,000

Then, nf = n/1+ {(n-1)/ (N)}

nf = desired sample size when study population <10,000

n = desired sample size when the study population >10,000

N = estimates of the population size (897)

nf = 385/ 1+ (385-1)/897 =269.59

nf = 270

3.6 Sampling Design

Systematic sampling method was used to select the individual farm workers. A list of farm workers was generated through the assistance of the office of The Director of Human Resource and Administration. Since the farm workers' population was 897 and the sample size was 270, the quotient was 3.3. The skip interval was, therefore, every 3rd farmer till sample size, n= 270 was reached.

3.7 Selection Criteria

3.7.1 Inclusion Criteria

- Farm workers aged 18 years and above
- Farm workers newly employed in the Oserian farm who have worked at least four or more months in horticulture farming elsewhere.

3.7.2 Exclusion Criteria

- A female farm worker who was expectant
- A farm worker who had joined the horticulture farming industry with previous musculoskeletal disorders
- A farm worker who was undergoing active WMSD treatment of any form or any other medical condition. This was to avoid undue influences on the feedback given by the respondents

3.8 Data Collection Tools

This study used the Nordic Musculoskeletal Questionnaire (NMQ (Crawford, 2007)) (Appendix 1) as a data collecting tool. It has three sections: the first section is meant to be answered by all participants. The second and third sections are designed to be completed by only those who have recorded pain in the last12 months and seven days, respectively. This is a 'YES' or 'NO' tool used mainly to determine the prevalence of WMSD. Socio-demographic characteristics captured by this tool were job designation, gender, age, weight, and duration time worked.

In addition, the Fear Avoidance Belief Questionnaire (FABQ) (Appendix 2) was used to collect data in this study. This questionnaire is based on the biopsychosocial model of Fear Avoidance. This is the model of exaggerated pain perception that denotes that, instead of the usual expectation that acute painful conditions will heal, individuals perceive (belief) the pain in a catastrophizing manner (Waddell *et al.*, 1993). It evaluated and categorized participants into various groups concerning Fear Avoidance beliefs (Gatchel *et al*., 2016). The tool assessed the consequent avoidance of work due to the fear of pain using the seven items scored from a Likert scale of 0-6, ranging from 'completely agree' end to 'completely disagree' end. Scores closer to 42 indicate poor prognosis, and shows a high chance of chronicity (Wilson, Lewandowski & Palermo, 2011).

Lastly, the Rapid Entire Body Assessment Questionnaire (REBAQ) (Appendix 3) was used to collect descriptive data. It is an observational ergonomic assessment tool based on the likelihood of musculoskeletal risks. It focused on the individual's range of motion, direction of joints motion, the amount of force exerted, the load grip condition, and the activity. It is scored by assigning numbers to body areas for summing, analysis, and interpretation (Middlesworth, 2015; Moradi *et al*., 2017).

3.9 Reliability and Validity

3.9.1 Reliability

Crawford (2007) established that the sensitivity and specificity of NMQ ranged from 66 and 92%, and 71 and 88% respectively. A test- retest reliability of FABQ was established by Waddell *et al*. (1993) to be 0.97. Lastly, Hignett and McAtamney (2000) gave an evidence of validation of REBAQ tool where inter-observer reliability between the 14 participants for coding was found to be between 62 and 85%.

3.9.2 Content Validity

The entire questionnaire was shared among a group of ten Physiotherapists holding a Bachelor's Degree in Physiotherapy who played a role of content experts. The

Physiotherapists certified that the content within the questionnaire highly measured all the constructs.

3.10 Procedure for Collecting Data

Permission to carry out the study was sought from the farm Directors in writing. All the farm workers present during that particular working day shift were briefed about the study. An information sheet (Appendix 5) was given to each farm worker for more information; this sheet contained all relevant information for the prospective participants to understand regarding this study.

Farm workers, who met the inclusion criteria filled and signed the consent form (Appendix 4). Only the duly filled and signed consent forms were collected and kept in safe custody. Each participant was taken through the Nordic Musculoskeletal Questionnaire (NMQ). The research assistants filled NMQ. This spent up to 3-5 minutes. There and then, a quick completion analysis of NMQ was done by the principal researcher. This spent at most one minute per every NMQ. Those who filled the NMQ indicating absence of musculoskeletal disorder were allowed not to continue with the rest of the questions. However, their filled NMQ were collected for safekeeping and analysis.

Those who will filled the NMQ to indicate that there was a presence of musculoskeletal disorder were assisted to fill the Fear Avoidance Belief Questionnaire (FABQ) and Rapid Entire Body Assessment Questionnaire (REBAQ). This spent up to 3-5 minutes to fill FABQ and up to 6 minutes to fill REBAQ. The filled questionnaires were then collected and kept safe for further computation away from the study area.

3.11 Data Analysis and Management

Data from all the questionnaires was keyed in SPSS version 25 and secured using passwords known only to the principal researcher. Descriptive statistics were run to identify any errors in data entry. This were corrected as per the questionnaires.

SPSS was further used to determine frequencies and percentages and presented in tables. Inferential statistics to test the association between prevalence, Fear Avoidance

beliefs, musculoskeletal work-related risk levels and the socio-demographic characteristics were analyzed using Chi-square (X^2) statistics. Statistical significance was set at $p< 0.05$.

3.12 Ethical Consideration

The researcher acquired a clearance to carry out research from Jomo Kenyatta University of Agriculture and Technology Institutional Ethics and Research Committee and the Farm Director through Human Resources and Administration. Permission was also sought from the National Commission for Science, Technology, and Innovation (NACOSTI) and Nakuru County Department of Health sciences. Further permission in signing was sought from the farm workers after reading and synthesizing the information on the Information Sheet. There was no coercion of whichever kind to participate or including unwilling participants into the study. In addition, those participants wishing to withdraw during the study were let free without victimization or disciplinary action being taken to them.

The information acquired was treated with high confidentiality levels. Study results were disseminated to relevant authorities of the institutions including Jomo Kenyatta University of Agriculture and Technology and Nakuru County Department of Health. Also, results were copied to Oserian Farm management to improve the ergonomic environment.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic Characteristics

Results indicated that out of 270 respondents, 136 (50.4%) were females. Majority (n=255, 94.4%) of the respondents were general workers while respondents aged 40 to 49 years were the majority (n=127, 47.8%), as shown in Table 4.1.

Table 4.1: Respondents Distribution by Socio-demographic Characteristics (n=270)

	Frequency (n)	Percent (%)
Gender		
Male	134	49.6
Female	136	50.4
Age (years)		
<30	23	8.50
30-39	98	36.30
40-49	129	47.80
≥50	20	7.40
Weight (Kgs)		
40-60	84	31.1
61-80	172	63.7
81-100	12	4.4
>100	2	0.7
Job position		
Sprayer	15	5.6
General Worker	255	94.4
Length of time in Work (Years)		
≤5	58	21.5
6-10	113	41.9
11-15	66	24.4
16-20	21	7.8
21-25	10	3.7
>25	2	0.7

4.2 Prevalence of Musculoskeletal Disorders

A total of 270 farm workers - 30% of the total population - participated in this study. The majority of the respondents, namely 184 (68.1%), reported having experienced discomfort in either one or more of their body areas over the previous one year. Most of these WMSDs were reported in the lower back (38.1%), followed by the wrist and hands (24.1%) and the ankle and feet (24.1%), as shown in Table 4.2.

Table 4.2: Respondents Prevalence of Musculoskeletal Disorders (n=270)

	Frequency	Percent (%)
Prevalence of Work-related Musculoskeletal Disorders		
Yes	184	68.1
No	86	31.9
Prevalence According to Body Areas		
Neck Discomfort		
Yes	51	18.9
No	219	81.1
Shoulder Discomfort		
Yes	57	21.1
No	213	78.9
Elbow Discomfort		
Yes	49	18.1
No	221	81.9
Wrist and Hands Discomfort		
Yes	65	24.1
No	205	75.9
Upper Back Discomfort		
Yes	58	21.5
No	212	78.5
Lower Back Discomfort		
Yes	103	38.1
No	167	61.9
Hip/ Thigh Discomfort		
Yes	52	19.3
No	218	80.7
Knee Discomfort		
Yes	51	18.9
No	219	81.1
Ankle/ Feet Discomfort		
Yes	65	24.1
No	205	75.9

4.3 Relationship between Musculoskeletal Disorders and Socio-Demographic Characteristics

Respondents designated as General Workers were the most affected (n=178, 94.4%). In addition, a p-value of 0.016, 0027, and 0.041 indicated a high association between developing a work-related discomfort and the respondent's job position, age, and the length of time they have worked respectively, as shown in Table 4.3.

Table 4.3: Relationship between Work-Related Musculoskeletal Disorders and Socio-Demographic Characteristics (n=270)

Socio-demographic Characteristics	**WMSDs n (%) n=184**	**No WMSDs n (%) n=86**	**Total n (%) n=270**	**P-value**		
				Chi-squared		
				Value	DF	p-value
Gender						
Male	86 (64%)	48 (36%)	134 (49.6%)	1.931	1	0.165
Female	98 (72%)	38 (28%)	136 (50.4%)			
Age (Years)						
<30	11 (48%)	12 (52%)	23 (9%)	9.179	3	*0.027
30-39	62 (63%)	36 (37%)	98 (36%)			
40-49	98 (76%)	31 (24%)	129 (48%)			
≥50	13 (65%)	7 (35%)	20 (7%)			
Weight (Kg)						
40-60	62 (74%)	22 (26%)	84 (31%)	2.353	3	0.502
61-80	114 (66%)	58 (34%)	172 (64%)			
81-100	7 (58%)	5 (42%)	12 (4%)			
>100	1 (50%)	1 (50%)	2 (1%)			
Job Position						
General Worker	178 (70%)	77 (30%)	255 (94%)	5.797	1	*0.016
Sprayer	6 (40%)	9 (60%)	15 (6%)			
Length of Time in Worked (Years)						
≤5	31 (53%)	27 (47%)	58 (21%)	11.568	5	*0.041
6-10	78 (69%)	35 (31%)	113 (42%)			
11-15	53 (80%)	13 (20%)	66 (24%)			
16-20	14 (67%)	7 (33%)	21 (8%)			
21-25	6 (60%)	4 (40%)	10 (4%)			
≥26	2 (100%)	0 (0%))	2 (1%)			

*DF = Degrees of Freedom

4.4 Proportions of Respondents Exhibiting 'Fear Avoidance Beliefs' of work

Most of the respondents (n=67, 36.4%) among the 184 respondents who reported WMSD, reported lower levels of Fear Avoidance beliefs of work than the rest of the respondents. This is as shown in Table 4.4.

Table 4.4: Proportions of Respondents Exhibiting 'Fear Avoidance Beliefs' of work (n=184)

Fear Avoidance Beliefs About Work	Frequency	Percent (%)
Decreased Risk of persistent Problems	67	36.4
Increased Risk of Reporting No Improvement	50	27.2
Decreased Risk for Not Returning To work	34	18.5
Increased Risk of Not Returning To Work	33	17.9
Total	**184**	**100**

4.5 Relationship between 'Fear Avoidance Beliefs' of work and Socio-demographic Characteristics

The study further tested the relationship between Fear Avoidance beliefs and the socio-demographics characteristics. There was no correlation between exhibiting Fear Avoidance and socio-demographic characteristics, as shown in Table 4.5.

Table 4.5: Relationship between 'Fear Avoidance Beliefs' of work and Socio-demographic Characteristics (n=184)

SDC	Decreased Risk of Persistent Problems (n=67)	Increased Risk of Reporting No Improvement (n=50)	Decreased Risk For Not Returning To Work (n=34)	Increased Risk of Not Returning To Work (n=33)	Total	Test		
						Chi-squared Value	DF	p-value
Gender								
Male	32 (37.2%)	26 (30.2%)	19 (22.1%)	9 (10.5%)	86	8.652	4	0.07
Female	35 (35.7%)	24 (24.5%)	15 (15.3%)	24 (24.5%)	98			
Age (Years)								
<30	4 (36.4%)	5 (45.5%)	2 (18.1%)	0 (0%)	11	19.67	12	0.74
30 - 39	27 (43.6%)	15 (24.2%)	11 (17.7%)	9 (14.5%)	62			
40 – 49	34 (34.7%)	28 (28.6%)	16 (16.3%)	20 (20.4%)	98			
≥50	2 (15.4%)	2 (15.4%)	5 (38.4%)	4 (30.8%)	13			
Weight (Kgs)								
≤ 60	18 (29.0%)	20 (32.3%)	10 (16.1%)	14 (22.6%)	62	8.98	12	0.705
61 – 80	47 (41.2%)	27 (23.7%)	22 (19.3%)	18 (15.8%)	114			
81 – 100	2 (28.6%)	2 (28.6%)	2 (28.6%)	1 (14.2%)	7			
>100	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1			
Job Designation								
General Worker	64 36.0%)	49 (27.5%)	34 (19.1%)	31 (17.4%)	178	7.320	4	0.120
Sprayer	3 (50.0%)	1 (16.7%)	0 (0%)	2 (33.3%)	6			
Length of Time in Worked (Years)								
≤ 5	11 (35.5%)	10 (32.3%)	6 (19.3%)	4 (12.9%)	31	26.937	20	0.137
6 – 10	32 (41.0%)	22 (28.2%)	13 (16.7%)	11 (14.1%)	78			
11 – 15	18 (34.0%)	15 (28.3%)	9 (17.0%)	11 (20.8)	53			
16 – 20	4 (28.6%)	1 (7.1%)	5 (35.7%)	4 (28.6%)	14			
21 – 25	1 (16.7%)	2 (33.3%)	0 (0%)	3 (50.0%)	6			
≥ 26	1 (50.0%)	0 (0%)	1 (50.0%)	0 (0%)	2			

*DF = Degrees of Freedom

4.6 The Risk Levels for Development of Musculoskeletal Disorders

The Rapid Entire Body Assessment Questionnaire (REBAQ) score tool was used to determine risk. Respondents were classified as having Medium, High, and Very High risk. Most of the respondents (n=80, 43.5%) were in the High-risk category, as shown in Table 4.6.

Table 4.6: Work-Related Risk Score Levels of Respondents with Musculoskeletal Disorders (n=184)

Risk Score	Frequency	Percent
Medium Risk	49	26.6
High Risk	80	43.5
Very High Risk	55	29.9
Total	184	100.0

4.7 Relationship between Work-Related Risk Levels and Socio-demographic Characteristics

The study sought to establish whether there was any statistically significant difference between work-related risk and socio-demographic characteristics. There was no statistically significant association between the two variables, as shown in Table 4.7.

Table 4.7: Relationship between Work-Related Risk Levels and Socio-demographic Characteristics (n=184)

Socio-demographic Characteristics	Level of Risk			Total	Test		
	Medium (n=49)	High (n=80)	Very High (n=55)		Pearson Chi-squared		
					Value	DF	p-value
Gender							
Male	25 (29.1%)	32 (37.2%)	29 (33.7%)	86	2.613	2	0.271
Female	24 (24.5%)	48 (49.0%)	26 (26.5%)	98			
Age (Years)							
<30	7 (63.6%)	3 (27.3%)	1 (9.1%)	11	12.482	6	0.052
30 - 39	10 (16.1%)	32 (51.6%)	20 (32.3%)	62			
40 – 49	29 (29.6%)	40 (40.8%)	29 (29.6%)	98			
≥50	3 (23.0%)	5 (38.5%)	5 (38.5%)	13			
Weight (Kgs)							
≤ 60	18 (29.0%)	27 (43.6%)	17 (27.4%)	62	2.803	6	0.833
61 – 80	29 (25.4%)	48 (42.1%)	37 (32.5%)	114			
81 – 100	2 (28.6%)	4 (57.1%)	1 (14.3%)	7			
>100	0 (0%))	1 (100%)	0 (0%)	1			
Job Designation							
General Worker	45 (25.3%)	79 (44.4%)	54 (30.3%)	178	5.122	2	0.077
Sprayer	4 (66.7%)	1 (16.7%)	1 (16.7%)	6			
Length of Time in Worked (Years)							
≤ 5	8 (25.8%)	14 (45.2%)	9 (29.0%)	31			0.904
6 – 10	17 (21.8%)	35 (44.9%)	26 (33.3%)	78			
11 – 15	17 (32.1%)	23 (43.4%)	13 (24.5%)	53			
16 – 20	5 (35.7%)	4 (28.6%)	5 (35.7%)	14			
21 – 25	1 (16.7%)	3 (50.0%)	2 (33.3%)	6			
≥ 26	1 (50.0%)	1 (50.0%)	0 (0%)	2			

*DF = Degrees of Freedom

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 The Prevalence of Musculoskeletal Disorders

The one-year prevalence of WMSD was 68.1%. This was probably due to the laborious nature of work that the farm workers are exposed to. Flower farming is labour intensive in nature and the product is perishable so demands both a high pace of work and often working overtime. The overall duties involve repeated manual activities undertaken in a poor posture.

In South Africa, a cross-sectional study on musculoskeletal pain in 911 women involved in small-scale agricultural activities with the same study design had similar results with a 67% (n=574) one-year prevalence of chronic musculoskeletal pain (Naidoo *et al*., 2009). Both studies focused on farm workers even though Naidoo *et al* (2009) only included female population.

In Uganda, even though the study focused on a sector of the economy that differed from farming, a cross-sectional study on 103 workers in the Apparel Assembly Plant reported a one-year prevalence rate of 68.9% (Tebyetekerwa *et al*., 2017); the data were also collected using the NMQ. Similarities in the findings suggest that WMSDs generally occur at a higher frequency level in a working population. The prevalence in our study was lower than that for a study in Ibadan, Nigeria, where a one-year prevalence rate of WMSD among occupational drivers was 89.3% (Akinpelu *et al*., 2011), while a WMSD study on butchers in Kano metropolis, in Nigeria, reported a point prevalence of 74.5% (Kaka *et al*., 2016). The difference between the prevalence found in our study (68.1%) from that found by Kaka *et al*., (2016) indicate that the nature of the work environment may play a role in the prevalence of WMSDs.

Most of the WMSD cases were reported in the low back, this was most likely because of the occupational strain that the low back is subjected to, during the day-to-day work tasks. In addition, the low back in this case acted as a leverage in transition of the body

weight across these postures. The second-and third-most affected body areas were the wrists and hands and then the ankles and feet, probably because farm workers are involved in activities that are repetitive and manual in nature such as planting, spraying, sweeping, transporting flowers, general farm maintenance and picking of flowers in stooped or prolonged standing positions.

A systematic review of 24 studies on the prevalence of WMSD among farmers reported that the lower back was the most affected region, with a one-year prevalence of 47.8%, followed by the upper limb in a range of 3.6–71.4% (Osborne *et al*., 2012). In a WMSD study in China among medical staff (n=1017), results showed that the most severely affected body areas are the shoulder joint, neck and back, with a prevalence of 62%, 60.3% and 54.3% respectively (Wang *et al*., 2017). In a WMSD study among farmers in Kanpur, India, low backache was common, with 69%, followed by the knee, shoulder and neck pain, with a prevalence of 39%, 22% and 10% respectively (Gupta, 2013). In Irish farmers (n=103), low back pain was the most common region affected, with a 31% prevalence (Osborne *et al*., 2013).

The farm workers designated as general workers were the most severely affected. This is because of the nature of their work that is repetitive and entails prolonged working hours in static standing postures or stooping postures, and their lifting of loads. The general workers were not trained to carry out their work, probably because of the assumption that it is a general duty that needs less training input. It is important to note that even though the general workers had a higher prevalence of WMSDs compared to the sprayers, the results should be interpreted with caution since the group of sprayers was smaller in number.

The higher number of females who suffered from WMSDs compared to males may be as a result of their overall reduced physical capacities. These findings are similar to those of Tebyetekerwa *et al*. (2017) and Xiao *et al*., (2013).

There was an association between increased age and the development of WMSD. This probably suggests prolonged exposure to a hazardous physical environment, and laborious and repetitive body movements. Our results are similar to those reported by

Annual Statistics in Great Britain on WMSDs (2019) and by Statistics on WMSDs in Australia (2016).

The period which a farm worker had worked emerged as a significant factor associated with the development of WMSDs. This may have been due to the lengthy day-to-day exposure to forceful physical stresses. These findings are similar to those of Australia Safe Work (2016).

5.1.2 Proportions of Respondents Exhibiting 'Fear Avoidance Beliefs' of work

The classified Fear Avoidance beliefs as 'decreased risk of persistent problems', 'increased risk of reporting no improvement', 'decreased risk for not returning to work', and 'increased risk of not returning to work' at 36.4%, 27.2%, 18.5%, and 17.9% respectively. This classification was as discussed by the Clinical Protocol at The College of Chiropractic at the University of Western States, as cited by Liebenson (2000). A low Fear Avoidance beliefs score indicated 'decreased risk of persistent problems' while a high Fear Avoidance beliefs score indicated 'increased risk of not returning to work', high score indicated that it is work that caused their severe levels of chronic pain.

In the current study, a higher majority (n=67) scored 'decreased risk of persistent problems'. Despite farm work being laborious, physically and psychologically demanding, the farm workers had no choice but to psychologically toughen so as they are not distracted by the fear of pain. This can be arguably be as a result of the bigger fear of job losses, unpaid sick leaves and being perceived as being unfit for the work. The lowest number of farm workers reported 'increased risk of not returning to work' (17.9%). Although they were the least in number, this was a huge number of respondents to report catastrophization of pain in a farm. Pain catastrophization was probably due to development of chronicity among those who may have worked for longer. This cohort of workers warrants further research in order to establish their pain-processing mechanism over the period of time spent in the farm.

The farm workers designated as sprayers, as compared to the general workers, reported a high number (33.3%) of 'increased risk of not returning to work'. This was probably

due to the factors that are attached to various designations at a workplace such as the conditioning that pesticides and herbicides consist of chemicals that are a threat to their overall skin and cardio-respiratory health. Presence of discrepancies of Fear Avoidance scores between or among job designations has been reported in previous studies by Nunes and Bush (2011); Ekpenyong and Inyang (2014); Costa and Vieira (2010); Ganiyu *et al*. (2015); Wang *et al*. (2017).

By a huge margin, the female gender reported high cases (24.5%) of 'increased risk of not returning to work' as compared to their male counterparts. This was more likely due to the less control of self that the female gender has. In addition, the female gender is predisposed to a lot of anticipatory and peak anxiety, psychosocial stress, family management, and gender violence cases at work. A study by McLean and Hope (2010) on Gender Role and Behavioral Avoidance reported female gender to experience higher scores as compared to their male counterparts. Vambheim and Øien (2017) in their study on "Sex differences in fear of pain: item-level analysis of the Fear of Pain Questionnaire III", they reported a higher fear of pain in females as compared to men as reported in this present study. They alluded their results to both emotional responses and psychosocial mechanisms of anxiety and fear.

Participants aged over 50 years reported the highest number (30.8%) as having 'increased risk of not returning to work'. This can be explained from the point that these participants had an advanced age in such laborious jobs that included but not limited to heavy lifting, prolonged stooped-working posture, and repetitive movements. These had caused them a relatively low self-control and psychosocial stress leading to a high Fear Avoidance scores. Also, such an age group and the long duration they have worked have assumed that WMSDs is a 'normal' encounter as long as they are working. They also assume that WMSDs are unavoidable and that any WMSDs' signs and symptoms are due to the mere effects of chemicals used and hard labor and hence they are still present at work. This study's results were in tandem with a study by Zoer *et al*. (2014), who noted that individuals around and about this age-group suffered a 'higher risk of not returning to work 'which in turn, led to catastrophization of pain. Although, Larsson *et al*. (2016) study focused on Fear Avoidance beliefs on physical activity but not work, the findings were that the levels

of physical activity were considerably lower among the respondents reporting chronic discomfort, and the most probable reason was due to age-related kinesphobia.

5.1.3 The Work-Related Risk Levels Associated with Musculoskeletal Disorders

This present study reported that the farmers had ‘medium risk’ (n=49, 26.6%), ‘high risk’ (n=80, 43.5%), and 'very high risk' (n=55, 29.9%) of sustaining WMSDs. The present study reported presence of some risk across all respondents, as there were no ‘negligible risk’ and ‘low risk’ respondents as slotted on REBAQ. By these results, they indicate that carrying out farm work predisposed respondents to WMSD risk. This reported levels of risk is probably due to numerous reaching and twisting activities especially when picking ready flowers. The process of picking ready flowers involved repetitive motions of the wrist and hand joints over longer periods. Further, picking of ready flowers is a delicate task. It involves a lot of attention, which involves adoption and maintenance of awkward positions such as stooping and neck flexion. These tasks become more intensive during peak seasons since there is an increased demand of production. In addition, tasks such as transportation that included lifting and bending of the picked-flowers from the farm, transporting fertilizer to the farm, and even the routine farm nursery maintenance tasks exposed the farm workers to WMSDs risk. Lastly, the spraying activity involves loading the back with a knapsack sprayer containing pesticides or herbicides. On average, the knapsack is 18 to 20 kg in weight, this loading activity coupled with working for longer durations in a repetitive manner while twisting and reaching to all the areas of the farm predisposed the farm workers to WMSD risk. The situation is worse when the flowers are still short and when they are in the nursery because, besides the loaded back with a knapsack sprayer and far-reaching maneuvers, the sprayers have to adopt a stooping position.

A systematic study by Costa and Vieira (2010) concurred to this present study that farming had a causal relationship with scoring a high work-related risk level. Similarly, a study among Chinese Obstetricians and Gynecologists showed that though there was a difference in risk level across workers, every worker had an absolute risk of developing WMSDs due to their various working environments, psychosocial, individual, and postural factors (Wang *et al.*, 2017). Choi and Brings (2016) from their

study on nurses' handling and transferring patients, reported that the level of work-related risk increased when the nurses manually moved or lifted a patient – mostly if the patient were overweight or obese. In a study by Oakman and Chan (2015) that studied participants in eight work-station jobs, six institutions and three different industries reported various work-related risk levels across all eight work-stations.

Though a WMSD study among dairy farmers in Iran did not report risk in percentages as this study did, they reported being unacceptably high risk since it was stratified as both 'high risk' and 'very high risk' (Taghavi *et al.*, 2017). This WMSD risk stratification was almost similar to that of this study since in both populations, a lot of manual work was involved, assuming poor postural positions and carrying out of repetitive movements.

The Moradi *et al*. (2017) study reported, that the workers were stratified as 'low', 'medium', 'high risk', and 'very high risk' at 5%, 13.2%, 24.2%, 31.3%, respectively. This was unlike in our study, because they were no ‘low risk’ workers reported. Mahdavi *et al*. (2013) study among hairdressers only reported ‘high risk’ (46%) and ‘very high risk’ (14.9%). An ergonomic study on the assessment of WMSD risk among agriculture workers of Uttarakhand- India by Ojha and Kwatra (2014) precisely classified all respondents to be at high risk.

Even though all the five socio-demographic characteristics studied in this present study did not have a statistically significant relationship with WMSD risk. This could have been due the fact that REBAQ only assessed physical factors such as forceful exertions and sustained posture, and no other others factors as psychosocial factors such as work-rest cycles, time pressure, and overall social support, and individual factors such as education levels which are considered as predisposing factors to WMSD.

More general workers (74.7%) were classified as high and very high risk compared to the sprayers. This is attributed to the daily lifting and transporting of fertilizers, seedlings and the already-picked flowers tasks that they carry-out while on duty. They also stoop for prolonged durations while carrying out nursery and greenhouse activities. This clearly shows that, various job demands at work-stations predispose workers to different levels of WMSDs risk. These high levels of risk scores may also

have been due to the little or no information on proper ergonomic guidelines, poor or no utilization of semi-mechanized tools, the need to work and produce in large volumes and so, increased working pace. The variation in levels of risk among designations and even industries and work stations was also noted in a study by Oakman and Chan (2015), Pastre *et al*. (2007) and Alghadir *et al*. (2015).

Farm workers who were over 50 years of age (n=5, 38.5%) was quite small, they reported 'very high risk'. This is because of the perennial heavy lifting, prolonged bending posture, and repetitive movements done over a longer period worked negatively on the neural, skeletal and muscular system thus, decreased and or impaired function and or mobility. Even though this was a small number to draw conclusions from, the findings from this present study were also supported by studies by Riccò *et al*. (2016) and Kathy *et al*. (2015) which in their case, age group aged between 46 to 55 years was the most affected. Although a study by Zoer, *et al*. (2014) used different age grouping from this present study, they found out the age group of 40-55 years had the most significant WMSD risk. Their results were thereby almost similar to the results of this study. Shuai *et al*., (2014) and Okunribido, Wynn and Lewis (2011) also noted a correlation between an older age and WMSD risk.

Participants (n=8) who weighed more than 80 kg reported a 'high risk' in developing WMSDs than any other age cohorts. A higher weight among other reasons may cause a low self-control arising from psychosocial factors. Again, this is a small number to draw conclusions from. However, the results from the present study were similar with Alghadir, *et al*. (2015) on WMSDs among dental professionals in Saudi Arabia who reported that weight was one of the socio-demographic characteristics that increased the risk of developing WMSDs. Similarly, Pastre *et al*. (2007) study on WMSDs by women in a social rehabilitation center reported that subjects who required sick-leave showed a higher mean age, duration of working and weight.

Although our study did not find a link between the duration one has worked with work-related musculoskeletal risk, other studies such an occupational study by Tinubu *et al*. (2010) and Shuai *et al*. (2014) reported that, among many other factors, the longer

individuals were exposed to an occupation, the more likely they were exposed to WMSD risk.

5.2 Conclusions

This study concludes that:

1. Work-related musculoskeletal disorders affect over two-thirds of flower farm workers, and the lower back is the most affected area. Specific farm job designations, the age of the worker, and the duration of time involved over the long term may predispose workers to various risks that may result in the development of WMSDs.
2. ‘Fear Avoidance Beliefs’ exist and permeates across the entire flower farm work-force although at different levels of severity.
3. Almost 75% farm workers report a higher risk to exposure of developing WMSD.

5.3 Recommendations

This study recommends that:

1. The farm management should organize a continuous ergonomic health promotion activity and adherence to mitigate on the recorded high risk.
2. Periodical work-environment risk assessment should be frequently be conducted.
3. The human resource department need to match work to the worker, so as individuals with advanced chronological age or who have worked for longer period be designated to positions with a lower risk level.
4. Further research covering psychosocial risk assessment should be conducted.

5.4 Limitations of the Study

A number of limitations were identified and are listed below:

1. This study captured very few of the sprayers (n=15) as opposed to the general workers (n=255). As such, the sprayers might not have been represented well for the sub-group analysis.
2. This study assessed work-related risk by Rapid Entire Body Assessment Questionnaire (REBAQ) only. REBAQ only assesses physical factors. Other factors such as individual and psychosocial factors were not assessed. Further studies should, therefore consider the use of more comprehensive tools that can capture these two factors.

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APPENDICES

Appendix I: Nordic Musculoskeletal Questionnaire

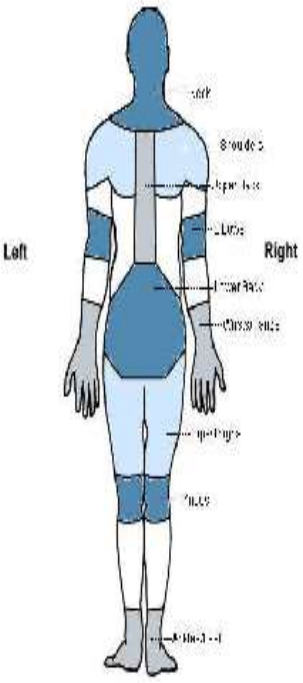
Employee ID:_____

Job/Position: _____ Gender: M F Age: ____(years) Height: ___(cm) Weight: _____(kg)

How long have you been doing this job? __years __months How many hours do you work each week? ____

How to answer the questionnaire:

***Picture*:** In this picture you can see the approximate position of the parts of the body referred to in the table. Limits are not sharply defined, and certain parts overlap. You should decide for yourself in which part you have or have had your trouble (if any).



Back View

***Table*:** Please answer by putting an "X" in the appropriate box - one "X" for each question. You may be in doubt as to how to answer, but please do your best anyway. Note that column 1 of the questionnaire is to be answered even if you have never had trouble in any part of your body; columns 2 and 3 are to be answered if you answered yes in column 1.

To be answered by everyone		To be answered by those who have had trouble			
Have you at any time during **the last 12 months** had trouble (ache, pain, discomfort, numbness) in:		Have you at any time during the **last 12 months been prevented from doing your normal work** (at home or away from home) because of the trouble?		Have you had trouble at any time during **the last 7 days?**	
Neck					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes
Shoulders					
☐No	☐Yes, right shoulder ☐Yes, left shoulder ☐Yes, both shoulders	☐No	☐Yes	☐No	☐Yes
Elbows					
☐No	☐Yes, right elbow ☐Yes, left elbow ☐Yes, both elbows	☐No	☐Yes	☐No	☐Yes
Wrists/Hands					
☐No	☐Yes, right wrist/hand ☐Yes, left wrist/hand ☐Yes, both wrists/hands	☐No	☐Yes	☐No	☐Yes
Upper Back					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes
Lower Back (small of back)					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes
One or Both Hips/Thighs					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes
One or Both Knees					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes
One or Both Ankles/Feet					
☐No	☐Yes	☐No	☐Yes	☐No	☐Yes

Appendix II: Fear Avoidance Belief Questionnaire

Fear-Avoidance Beliefs Questionnaire (FABQ)

Here are some of the things which other patients have told us about their pain.

For each statement, please circle any number from 0 to 6 to say how much physical activities such as bending, lifting, walking or driving affect or would affect bodily pain.

	Completely disagree			Unsure			Completely agree
1. My pain was caused by physical activity……	0	1	2	3	4	5	6
2. Physical activity makes my pain worse……	0	1	2	3	4	5	6
3. Physical activity might harm my back……	0	1	2	3	4	5	6
4. I should not do physical activities which (might) make my pain worse……	0	1	2	3	4	5	6
5. I cannot do physical activities which (might) make my pain worse….....	0	1	2	3	4	5	6

The following statements are about how your normal work affects or would affect your back pain

	Completely disagree			Unsure			Completely agree
6. My pain was caused by my work or by an accident at work…	0	1	2	3	4	5	6
7. My work aggravated my pain……	0	1	2	3	4	5	6
8. I have a claim for compensation for my pain……	0	1	2	3	4	5	6
9. My work is too heavy for me……	0	1	2	3	4	5	6
10. My work makes or would make my pain worse……	0	1	2	3	4	5	6
11. My work might harm my back……	0	1	2	3	4	5	6
12. I should not do my normal work with my present pain……	0	1	2	3	4	5	6
13. I cannot do my normal work with my present pain……	0	1	2	3	4	5	6
14. I cannot do my normal work till my pain is treated……	0	1	2	3	4	5	6
15. I do not think that I will be back to my normal work within 3 months…….	0	1	2	3	4	5	6

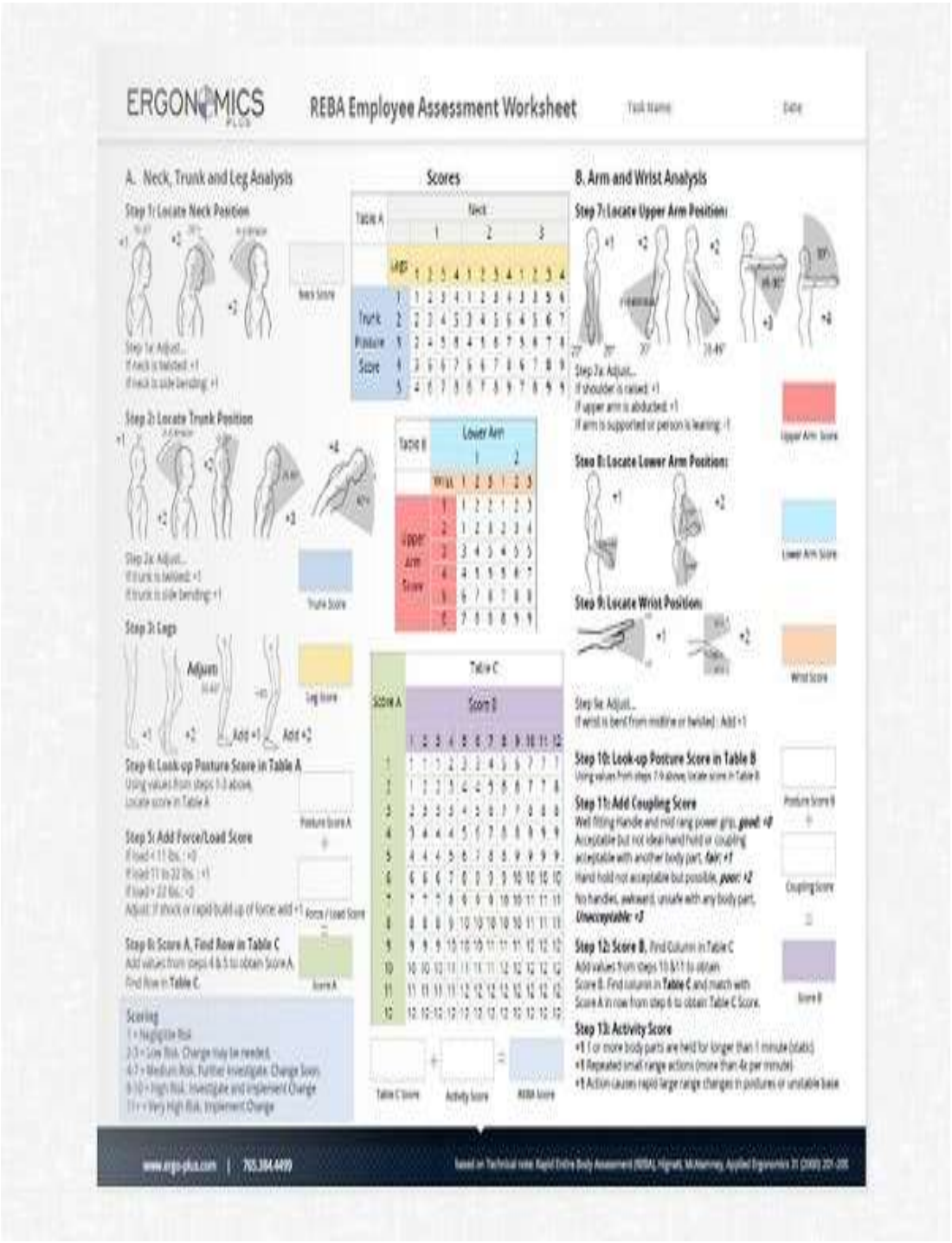
16. I do not think that I will ever be able to go back to that work….. 0 1 2 3 4 5 6

Scoring

Scale 1: fear-avoidance beliefs about work – items 6, 7, 9, 10, 11, 12, 15.

Scale 2: fear-avoidance beliefs about physical activity – items 2, 3, 4, 5.

Appendix III: Rapid Entire Body Assessment Questionnaire



Appendix IV: Consent Form

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

P.O BOX 62000 - 00200, NAIROBI

Tel: (067) 52711, MOBILE NO. +254 708-602 225, Fax: (067) 52446, THIKA

CONSENT FORM

Title of Research Project: **Work-related musculoskeletal disorders, risk levels and "Fear Avoidance Beliefs" among flower farm workers in Oserian farm Nakuru County.**

The study has been described to me in language that I understand. I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason(s) at any time and this will not negatively affect me in any way.

Participant's name……...

Participant's signature…….

Date……

Note: Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please do so via contacts on this Consent Form.

Thank you.

Appendix V Information Sheet

INFORMATION SHEET

Project Title: To determine work-related musculoskeletal disorders, risk levels and "Fear Avoidance Beliefs" among flower farm workers in Oserian farm Nakuru County.

What is this study about?

This is a research project being conducted by **Jotham Miyawa Munala**, a master's student at the Jomo Kenyatta University of Agriculture and Technology (JKUAT). We are inviting you to participate in this research project because you are a farm worker at Oserian Flower Farm and the information you provide to us will be of great importance in this study. The main purpose of this research project is to find out work-related risk factors associated with musculoskeletal disorders and Fear Avoidance of work among Flower Farm workers in Oserian Farm**.**

What will I be asked to do if I agree to participate?

You will be asked to cooperate as the researcher fills three (3) questionnaires. (The first one is mandatory and the other 2 will be filled depending on the outcome of the first one). This will take you a maximum of 15-20 minutes to answer the questions in all the sections. The questionnaires will be distributed to you at your place of work and will be collected at the same place.

Would my participation in this study be kept confidential?

We will do our best to keep your personal information confidential. To help protect your confidentiality, our questionnaire will not require you to put your identity neither shall we require any information that identifies you in person.

If we write a report or article about this research project, your identity will be protected to the maximum extent possible.

What are the risks of this research?

There are no known risks associated with participating in this research project.

What are the benefits of this research?

The benefit to you is the findings that will result from this research study. The Farm's policy makers will now be aware of the work-related risk factors associated with musculoskeletal disorders that might be affecting you as a farm worker. From this informed perspective, they will be able to adjust your working environment accordingly.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized/victimized or lose any benefits to which you otherwise qualify.

What if I have questions?

Your questions and concerns will be addressed now or at any time during this research study.

This research is being conducted by *Jotham Miyawa Munala*, a Masters Physiotherapy student at the Jomo Kenyatta University of Agriculture and Technology (JKUAT). If you have any questions about the research study itself, please contact: -

Mr. Jotham Miyawa Munala

Box 62000-00200 Nairobi, Cell phone +254725486421 E-mail: jothampt@gmail.com

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

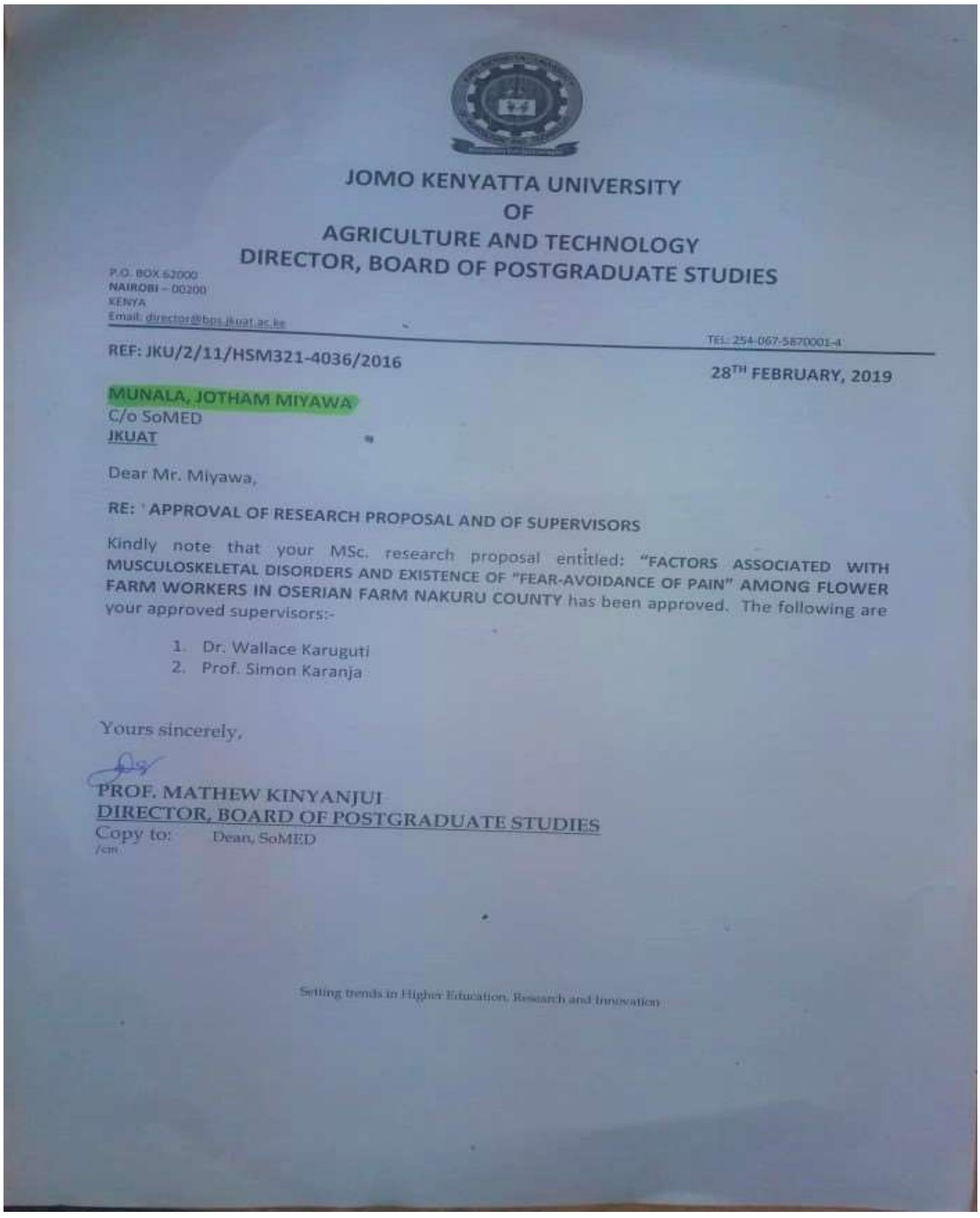
Head of Department:

Dr. Joseph Mwangi Matheri (PhD)

Chairperson, Physiotherapy Department -JKUAT

Box 62000-00200 Nairobi, Cell phone +254 725 761 845, E-mail: mmatheri@jkuat.ac.ke

Appendix VI: Approval of Research Proposal and Supervisors



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OF
AGRICULTURE AND TECHNOLOGY
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

P.O. BOX 62000
NAIROBI – 00200
KENYA
Email: director@bps.jkuat.ac.ke
TEL: 254-067-5870001-4

REF: JKU/2/11/HSM321-4036/2016

28TH FEBRUARY, 2019

MUNALA, JOTHAM MIYAWA
C/o SoMED
JKUAT

Dear Mr. Miyawa,

RE: APPROVAL OF RESEARCH PROPOSAL AND OF SUPERVISORS

Kindly note that your MSc. research proposal entitled: "FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDERS AND EXISTENCE OF "FEAR-AVOIDANCE OF PAIN" AMONG FLOWER FARM WORKERS IN OSERIAN FARM NAKURU COUNTY has been approved. The following are your approved supervisors:-

1. Dr. Wallace Karuguti
2. Prof. Simon Karanja

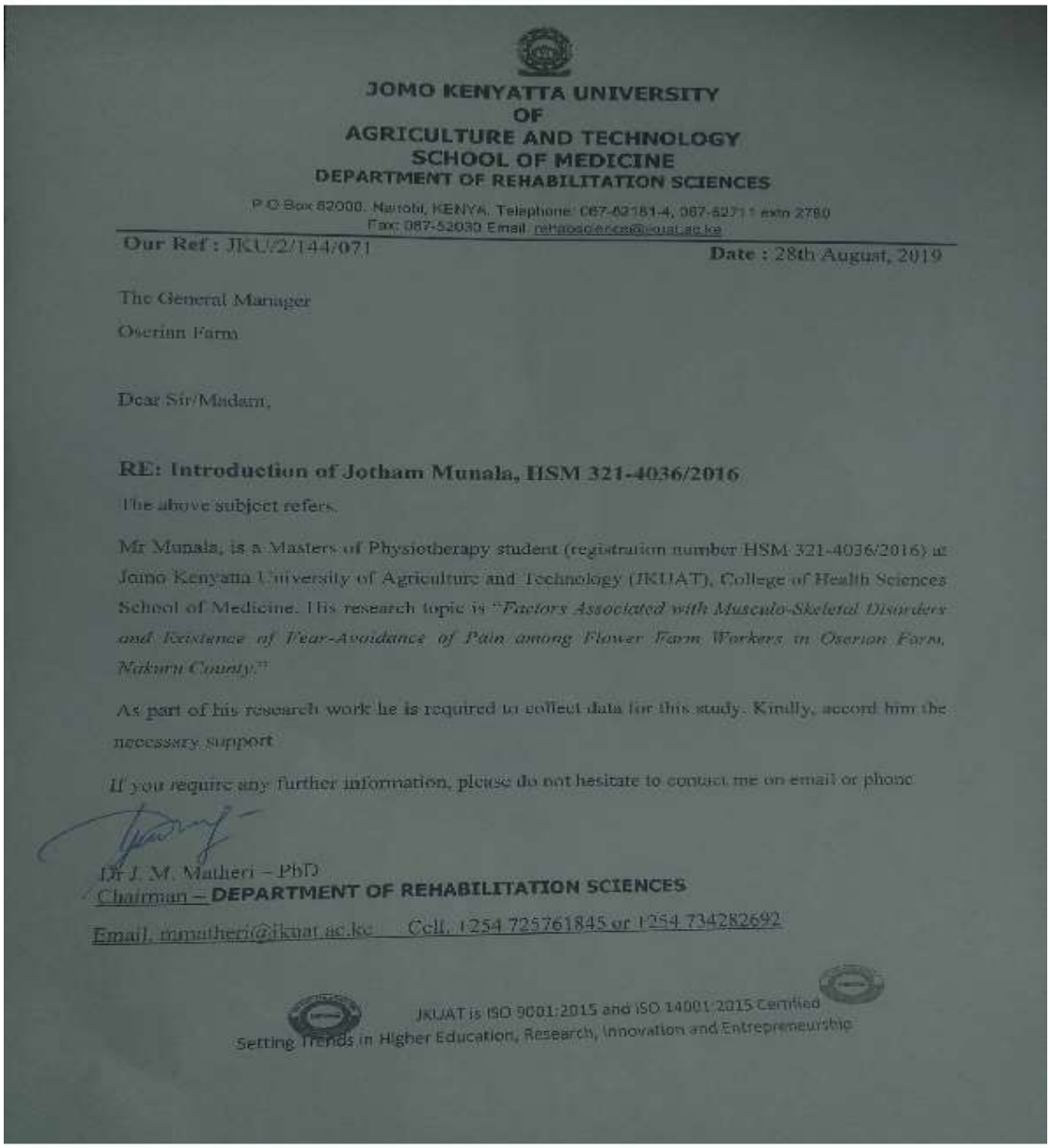
Yours sincerely,

PROF. MATHEW KINYANJUI
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

Copy to: Dean, SoMED
/cm

Setting trends in Higher Education, Research and Innovation

Appendix VII: Letter of Introduction from Jomo Kenyatta University of Agriculture and Technology



JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
SCHOOL OF MEDICINE
DEPARTMENT OF REHABILITATION SCIENCES

P.O Box 62000, Nairobi, KENYA. Telephone: 067-52181-4, 067-52711 exin 2780
Fax: 067-52030 Email: rehabsciences@jkuat.ac.ke

Our Ref : JKU/2/144/071 Date : 28th August, 2019

The General Manager
Oserian Farm

Dear Sir/Madam,

RE: Introduction of Jotham Munala, HSM 321-4036/2016

The above subject refers.

Mr Munala, is a Masters of Physiotherapy student (registration number HSM 321-4036/2016) at Jomo Kenyatta University of Agriculture and Technology (JKUAT), College of Health Sciences School of Medicine. His research topic is "*Factors Associated with Musculo-Skeletal Disorders and Existence of Fear-Avoidance of Pain among Flower Farm Workers in Oserian Farm, Nakuru County.*"

As part of his research work he is required to collect data for this study. Kindly, accord him the necessary support

If you require any further information, please do not hesitate to contact me on email or phone

Dr J. M. Matheri – PhD
Chairman – DEPARTMENT OF REHABILITATION SCIENCES
Email: mmatheri@jkuat.ac.ke Cell: +254 725761845 or +254 734282692

JKUAT is ISO 9001:2015 and ISO 14001:2015 Certified
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Appendix VIII: National Commission for Science Technology and Innovation Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **416798**

Date of Issue: **12/September/2019**

RESEARCH LICENSE

This is to Certify that Mr.. Jotham Munala of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Nakuru on the topic: Factors Associated With Musculoskeletal Disorders and Existence of "Fear-Avoidance of Pain" Among Flower Farm Workers in Oserian Farm Nakuru County for the period ending : 12/September/2020.

License No: **NACOSTI/P/19/1168**

416798

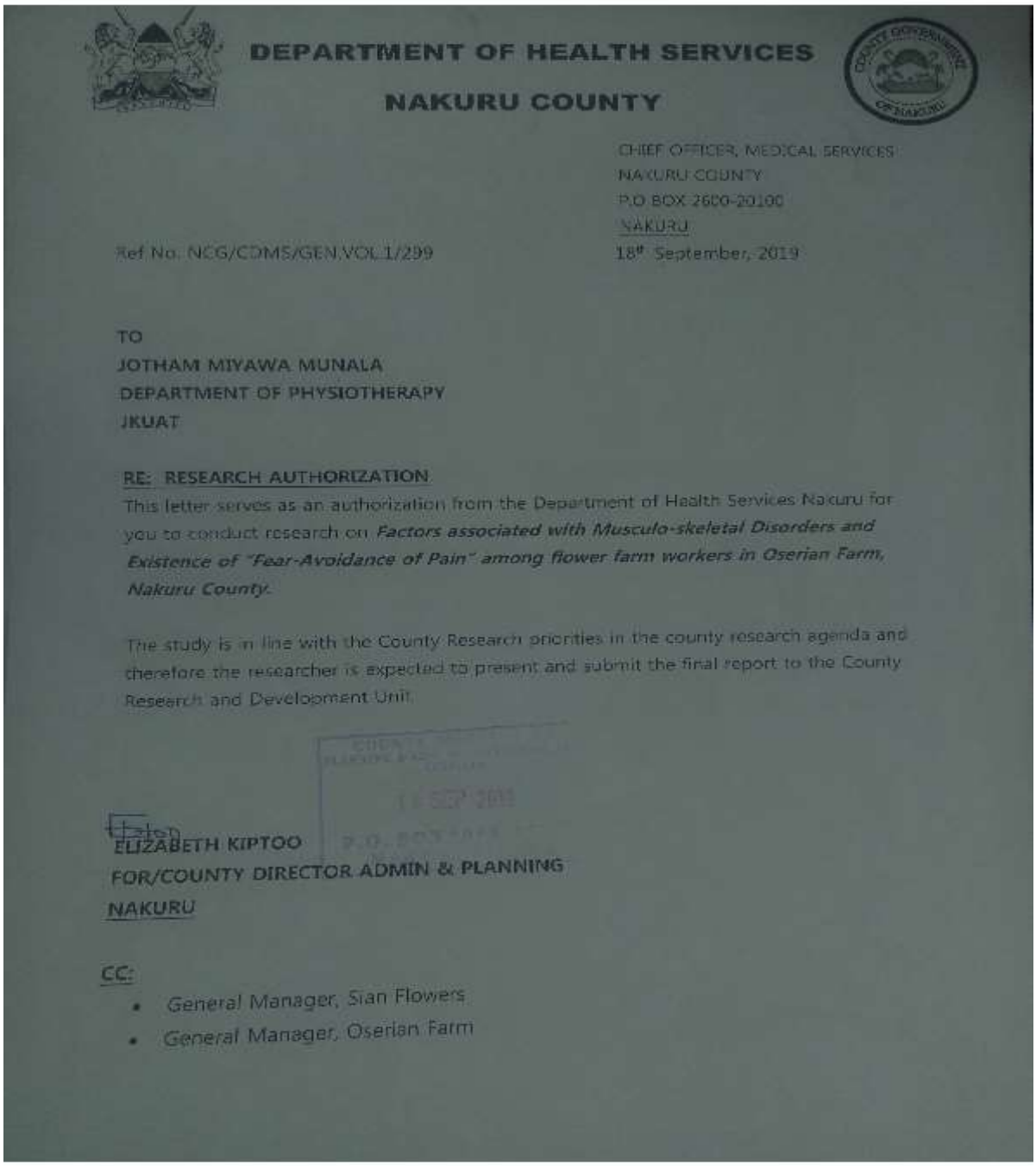
Applicant Identification Number

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.

Appendix IX: Research Authorization from Nakuru County



DEPARTMENT OF HEALTH SERVICES

NAKURU COUNTY

CHIEF OFFICER, MEDICAL SERVICES
NAKURU COUNTY
P.O BOX 2600-20100
NAKURU

Ref No. NCG/CDMS/GEN.VOL.1/299

18th September, 2019

TO
JOTHAM MIYAWA MUNALA
DEPARTMENT OF PHYSIOTHERAPY
JKUAT

RE: RESEARCH AUTHORIZATION

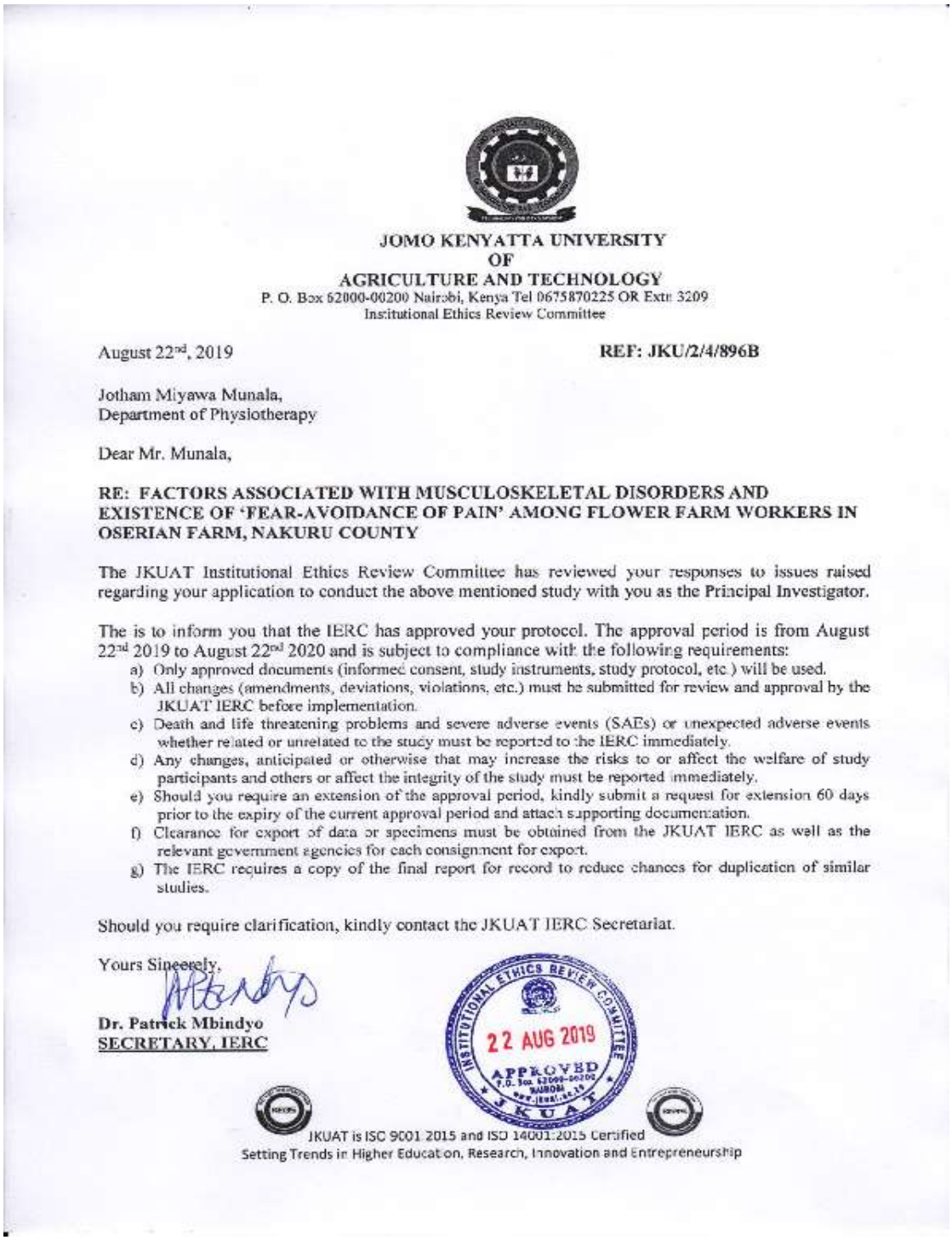
This letter serves as an authorization from the Department of Health Services Nakuru for you to conduct research on ***Factors associated with Musculo-skeletal Disorders and Existence of "Fear-Avoidance of Pain" among flower farm workers in Oserian Farm, Nakuru County.***

The study is in line with the County Research priorities in the county research agenda and therefore the researcher is expected to present and submit the final report to the County Research and Development Unit.

ELIZABETH KIPTOO
FOR/COUNTY DIRECTOR ADMIN & PLANNING
NAKURU

CC:
- General Manager, Sian Flowers
- General Manager, Oserian Farm

Appendix X: Institutional Review and Ethics Committee



JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
P. O. Box 62000-00200 Nairobi, Kenya Tel 0675870225 OR Extn 3209
Institutional Ethics Review Committee

August 22nd, 2019 **REF: JKU/2/4/896B**

Jotham Miyawa Munala,
Department of Physiotherapy

Dear Mr. Munala,

RE: FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDERS AND EXISTENCE OF 'FEAR-AVOIDANCE OF PAIN' AMONG FLOWER FARM WORKERS IN OSERIAN FARM, NAKURU COUNTY

The JKUAT Institutional Ethics Review Committee has reviewed your responses to issues raised regarding your application to conduct the above mentioned study with you as the Principal Investigator.

The is to inform you that the IERC has approved your protocol. The approval period is from August 22nd 2019 to August 22nd 2020 and is subject to compliance with the following requirements:

a) Only approved documents (informed consent, study instruments, study protocol, etc.) will be used.
b) All changes (amendments, deviations, violations, etc.) must be submitted for review and approval by the JKUAT IERC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the IERC immediately.
d) Any changes, anticipated or otherwise that may increase the risks to or affect the welfare of study participants and others or affect the integrity of the study must be reported immediately.
e) Should you require an extension of the approval period, kindly submit a request for extension 60 days prior to the expiry of the current approval period and attach supporting documentation.
f) Clearance for export of data or specimens must be obtained from the JKUAT IERC as well as the relevant government agencies for each consignment for export.
g) The IERC requires a copy of the final report for record to reduce chances for duplication of similar studies.

Should you require clarification, kindly contact the JKUAT IERC Secretariat.

Yours Sincerely,

Dr. Patrick Mbindyo
SECRETARY, IERC

INSTITUTIONAL ETHICS REVIEW COMMITTEE
22 AUG 2019
APPROVED
P.O. Box 62000-00200 NAIROBI
www.jkuat.ac.ke
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