Occupational factors for Low Back Pain among tea plantation workers in Kericho County

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DECLARATION

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

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DEDICATION

I dedicate this work to my beloved parents Mr. and Mrs. Samwel Ngeno, my lovely wife Gladys Langat and my siblings Kipkurui Langat, Cheruiyot Langat and Kimutai Langat for their unfailing love, moral support and encouragement during my study.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PICTURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

$: United States Dollar

BMI: Body Mass Index

CI: Confidence Interval

ERC: Ethical Review Committee

JFK: James Finlay (Kenya) Limited

JKUAT: Jomo Kenyatta University of Agriculture and Technology

KEBS Kenya Bureau of Standards

KEMRI: Kenya Medical Research Institute

KSH: Kenya Shilling

LBP: Low Back Pain

MSDs: Musculoskeletal Disorders

OSHA: Occupational Safety and Health and Act

OSHE: Occupational Safety, Health and Environment

RR: Relative Risk

SPSS: Statistical Package for Social Science

SSC: Scientific Steering Committee

TENs: Trans-cutaneous Electrical Nerve Stimulation

UK: United Kingdom

UMMC: University of Maryland Medical Center

USA : United States of America

DEFINITION OF TERMS

One-year prevalence is the percentage of people who have pain at some time during that period of the year (Waddell, 1999).

Prevalence is the proportion of people in a known population who have a symptom or symptoms over a particular period of time (Waddell, 1999).

Point prevalence is the percentage of people who have pain now, on the day of the interview (Waddell, 1999).

Musculoskeletal Disorders are conditions in which a part of the musculoskeletal system becomes injured over time. The disorder occurs when the body part is called on to work harder, stretch further, impact more directly or otherwise function at a greater level than it is prepared for.

Ergonomics is the scientific study of human work. It considers the physical and mental capabilities and limits of the worker as they interact with tools, equipment, work methods, tasks and the working environment.

Annulus it is the tough circular exterior of the intervertebral disc that surrounds the soft inner core and the nuclear pulposus

Awkward posture Is positions of the body that deviate significantly from the neutral positions while jobs are being performed.

Disc it is the soft pad positioned in between each of the vertebrae of the spine. Vertebral disc acts as a spacer,

	shock absorber and part of the cartilaginous joints that allow movement of the spine
Scoliosis	is the abnormal twisting and curvature of the spine.
Somatisation disorder	mental disorder characterized by recurring, multiple and current clinically significant complaints about somatic symptoms
Oswetry low back pain	it is an important tool used by researchers and disability evaluators to measure patient's permanent functional disability, also known as oswetry disability index.

ABSTRACT

Low back pain (LBP) is a major public health problem in the world. It is estimated that 60% of all employees experience LBP at some point in their lives. In Kenya, it is estimated that 64% of tea pickers suffer from LBP of these, 29% had a history of back pain before they started picking tea. The study aimed at determining the occupational risk factors for LBP among tea plantation workers in Kericho County. Data were collected using structured questionnaires. Pearson's chi square ($\chi 2$) test was used to measure the associations. The study was a cross-sectional survey that sampled 454 adults (335 tea pickers and 119 non-tea pickers). The prevalence of LBP was found to be 45.4% (125/335) and 39.5% (47/119) among tea pickers and non-tea pickers respectively. Age, parity and duration of work were found to be related to LBP among tea pickers and non-tea pickers ($\chi 2$=8.643; P=0.034 and $\chi 2$=6.013; P=0.049) respectively in bivariate analysis. However, the number of hours worked per day was significantly associated with LBP among tea pickers only ($\chi 2$=17.192; P<0.0001). Further, the number of kilograms of tea leaves picked and the number of kilograms carried per day was also significantly associated with LBP ($\chi 2$=16.882; P<0.0001 and $\chi 2$=15.978; P<0.0001) respectively. There was a significant association of LBP with carrying of heavy load and how one sharpened farm tools among the non tea pickers who reported to have suffered LBP ($\chi 2$=13.129; P<0.0001 and $\chi 2$=4.125; P=0.042) respectively. However, age (P<0.0001; 95% CI 0.18-0.508), hours worked per day (P<0.0001; 95% CI 4.623-42.808) and perception that occupation causes LBP (P<0.0001; 95% CI 29.152-237) was found to predict LBP among tea pickers. The prevalence of LBP was found to be high among both tea and non-tea pickers. There is need to adhere to the occupational safety and health guidelines and standards in order to minimize low back pain associated with tea picking and non-tea picking.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Low back pain (LBP) is defined as pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal folds with or without referred or radicular leg pain (sciatica) (Van der Heijden *et al.,* 1991).

Low back pain is a major public health concern throughout the world (Van Tulder *et al.,* 2006). It is estimated that approximately 60% of all employees experience LBP at some point in their life during their employment career (Anderson *et al.,* 1991). Low back pain incidences mostly occur during the working ages of 20-55 years. However, the first incidences occur between the ages of 20 to 40 years (Mirabile & Simons, 1972). Low back pain is the most prevalent musculo-skeletal condition in rural communities. Indigenous people in these communities are employed in low-skilled, manual jobs and the community service sector (Boreham *et al.*, 1993).

There is an abundance of literature reports on the risk factors of LBP in the general population (Haldeman, 2005). The risk factors for LBP could be modifiable (mutable) and non-modifiable (immutable). Modifiable risk factors include; lack of physical exercise, poor health, obesity, tobacco smoking, sedentary lifestyle and drug dependence (Vindigni *et al.,* 2005). Other mutable factors are occupational related factors such as heavy lifting, twisting, bending, stooping, awkward posture at work and prolonged sitting. Immutable factors include: age, parity, history of LBP and major scoliosis (Vindigni *et al.,* 2005). Other reported risk factors for LBP include gender (especially being female), job dissatisfaction and psychological factors such as somatisation disorder, anxiety and depression (Katz, 2006a).

In the United States of America (USA), LBP is among the top ten reasons for people to visit their physicians (Bratton, 1999). However, according to Patel & Ogle (2000), acute LBP is the fifth highest ailment causing patients to visit their physicians in the USA. A similar scenario is seen in the United Kingdom (UK) where 1.1 million people from the age of 15 years and above consult their physicians once a year due to LBP. According to Morone *et al.* (2009), UK people who are mostly affected by LBP are those doing manual jobs especially where lifting is involved.

Low back pain is mostly the cause of disabilities among those working in industries.13.2 million working man days are lost annually in the UK due to absenteeism caused by LBP, this may have a negative effect on the productivity of industries (Sparkes *et al.*, 2005).

In Africa, results of a systematic review reported that the one-year prevalence of LBP lies between 14-72% and a point prevalence between 16-59% (Louw *et al.*, 2007). For instance, in a study conducted among nurses from two selected hospitals in Nigeria and Ethiopia revealed a high one-year prevalence of 71% (Sikiru & Hanifa, 2009). Similarly, in a study conducted in Rwanda at Kanombe Hospital among 133 nurses to determine the relationship between LBP and physical activity levels revealed a year's prevalence of 78% while a week's prevalence was found to be 53% (Lela & Frantz, 2012). In a Kenyan study, the prevalence of back pain was reported to be 64% among the tea pickers. Of these, 29 % had a history of back pain before they started picking tea and found out that 35% of the workers developed back pain due to occupational exposure to tea picking (Muruka, 1997).

1.2 Government Regulation

The Occupational Safety and Health Act (OSHA), 2007 (Kenya Gazette Supplement, 2007) 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 occupier shall ensure the provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employee's welfare at work. In addition, the occupier shall adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools and process under the control of the occupier are safe and without risk to health. The act defines an occupier as an employer or owner of a work place. Failure to comply with the act is an offence and the occupier shall on conviction be liable to a fine not exceeding KSh. 500,000 or to imprisonment for a term not exceeding six (6) months or to both. This duty imposed is believed to play a big role in the prevention of occupational low back pain, MSDs and other occupational injuries in Kenya. According to Weber & Arndt (1998), most of the proposed standards have been sidetracked due to ignorance and significant controversy in the business and industry arenas.

In Kenya, the Occupational Safety, Health and Environment (OSHE) department in the Ministry of Labour and Social Protection is resourceful in the development of the ergonomic programs. It is a requirement that all organizations or institutions with more than 20 workers should have safety committees which should comprise of representatives from the management in order to safeguard the safety and health of the employees. Therefore, tea estates in Kenya including James Finlay (K) Limited are Rain Forest Alliance accredited. It has also complied with the code of practice prepared by Tea Technical Committee under the guidance of the Kenya Bureau of Standards (KEBS) Project Committee that aimed at providing guidance to all stakeholders in the value chain to conduct all activities in a manner that ensures food safety and quality; personnel safety and welfare; environmental protection and sustainability (Draft Kenya Standard, 2015).

1.3 Statement of the problem

Low back pain is a major public health problem (Deyo *et al.,* 1991; Anderson, 1998; Rapoport *et al.,* 2004; Dionne *et al.,* 2006). Low back pain is an important cause of morbidity and mortality in the general population and in many occupational groups (Waheed, 2003). It is also the leading cause of disability and absenteeism from work throughout the world and significantly restricts normal activity and occupation (Lidgren, 2003; Katz, 2006b). Low back pain is also recognized as the leading cause of occupational injury in developed countries (Battie & Bigos, 1991). Individuals suffering from chronic LBP experience huge social, mental, physical and occupational disruptions (Tavafian *et al.,* 2007). The mental impact of LBP includes: anxiety, depression and insomnia, whilst poor physical performance and deterioration in health status are the physical impacts (Samad *et al.,* 2010). Low back pain results in an inability to carry out social activities and it decreases the capability to perform occupational activities since it mostly affects adults of working age (Louw *et al.,* 2007; Samad *et al.,* 2010).

Low back pain is associated with huge financial costs and poor quality of life (Badley *et al.,* 1994; Riihimäki *et al.,* 1994; Battié & Videman, 1997; Putz-Anderson *et al.,* 1997). Moreover, the management of LBP is costly; accounting for a large and increasing proportion of health care expenditures without evidence of corresponding improvements in outcomes (Martin *et al.,* 2008). For instance, a third of all the disability costs in the USA are due to LBP disorders (Bratton, 1999). It is estimated that the direct health care cost for LBP in the USA is 20 billion$ annually. This amount is projected to increase to 50 billion $ annually including the indirect costs (Patel & Ogle, 2000). In Canada and Finland, more people are also disabled from working as a result of musculoskeletal disorders (MSDs) (Badley *et al.,* 1994; Riihimäki *et al.,* 1994; Battié & Videman, 1997; Putz-Anderson *et al.,* 1997). However, the economic burden of LBP on the individuals, communities and governments especially in low and middle income countries including Africa, is huge and continues to increase. Billions of dollars being spent annually on

managing LBP which further constrains the fragile health care system in Africa, which is already ravaged by the HIV epidemic (Louw *et al.,* 2007). The annual prevalence of LBP has been estimated at 38% in the world (Sterud & Tynes, 2013). However, the prevalence of LBP in Kenya is very high. For instance, according to Mugga *et al.* (2013), revealed that the prevalence of Musculo-skeletal Disorders (MSDs) among nurses at Kenyatta National Hospital (KNH) was 74.2%. In addition, in another study the prevalence of back pain was reported to be 64% among the tea pickers. Of these, 29 % had a history of back pain before they started picking tea and found out that 35% of the workers developed back pain due to occupational exposure to tea picking (Muruka, 1997).

1.4 Justification

Within the public health context, it is important to prevent injuries and painful conditions in work places by addressing the occupational risk factors which reduces the burden to health care systems and compensations systems (Dwyer, 1987). Low back pain resolves spontaneously within weeks, but may recur in 24-50% of cases within 1 year. Thus, the identification of risk factors for LBP is important in the prevention of recurrent or chronic LBP (Sterud & Tynes, 2013). It has been argued that by adopting a holistic approach and addressing modifiable risk factors for LBP such as smoking, physical inactivity and obesity, the clinical management of co-morbidities such as heart disease and diabetes may also be partially addressed. It is also known that once their presenting musculoskeletal condition has been effectively managed, patients are more likely to comply with their practitioner's advice to promote other aspects of their health including weight loss and increased physical activity (Pill *et al.,* 1989).

Occupational risk factors/activities such as weeding and harvesting tea leaves are performed manually and involve bending or squatting and manual lifting and carrying of heavy loads. These activities cause repetitive strain of the back muscles, predisposing to

LBP. Hence the need to assess the risk factors for LBP among the tea and non-tea pickers workers. This is due to the fact that risk factors for LBP have not been well elucidated in Kenya.

1.5 Research Questions?

1. What are the socio-demographic characteristics of the tea pickers and non-tea pickers in selected James Finlay (K) Limited (JFK) tea estates?
2. What is the prevalence of low back pain among the tea pickers and non-tea pickers in selected James Finlay (K) Limited (JFK) tea estates?
3. What are the occupational factors for low back pain among the tea pickers and the non-tea pickers in the selected James Finlay (K) Limited (JFK) tea estates?

1.6 Objectives

1.6.1 General objective

To determine the occupational factors for low back pain among tea plantation workers in James Finlay (K) Limited, Kericho County.

1.6.2 Specific Objectives

1. To determine the socio-demographic characteristics of the tea pickers and non-tea pickers in James Finlay (K) Limited (JFK) selected tea estates.
2. To determine the prevalence of low back pain among tea pickers and non-tea pickers in James Finlay (K) Limited (JFK) selected estates.
3. To determine the occupational factors for low back pain among tea pickers and the non-tea pickers in James Finlay (K) Limited (JFK) selected tea estates.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Annually, LBP affects nearly 50% of all working adults (Morris, 2006), and the risk factors that have been implicated in the development of occupational LBP include: heavy physical work, lifting and forceful movements, bending and twisting (awkward postures) and static work postures (Putz-Anderson *et al.*, 1997).

2.2 Prevalence of LBP

Globally, the annual prevalence of LBP has been estimated at 38% (Sterud & Tynes, 2013). It has been predicted that every person, once in their adult life will suffer from back pain (McKenzie, 1989). Previous studies have reported that LBP is the most common MSDs among farmers (Leigh & Sheetz, 1989; Chuprapawan, 1996; Walker-Bone & Palmer, 2002; Rosecrance *et al.,* 2006). In developed countries, the 1-year prevalence rate of LBP among farmers was 47% in Sweden (Holmberg *et al.*, 2002), 23% in Finland (Manninen *et al.,* 1995), and in the USA the prevalence of LBP ranges from 7.6% to 37% with the highest prevalence ranging between 45-60 years of age (Bratton, 1999). Ninety percent of the adults in USA suffer from LBP at least once a year (Patel *et al.,* 2000). In the recent past, Bratton (1999) reported that LBP also affect children in the USA.

In developing countries, the rate of LBP was much higher especially in South West Nigeria, 72% (Fabunmi *et al.,* 2005), China, 64% (Barrero *et al.,* 2006) and in Thailand the lifetime, 12-month period, and point prevalence rates of LBP among rice farmers were 77.4%, 56.2%, and 49.1%, respectively (Nopkesorn & Supasit Pannarunothai, 2011). In another study on Iranian women, 27.4% were found to experience LBP more

than once in a year while 12.4% had a once in a year prevalence. Of the 27.4%, of the women, 35% were farmers, 32.5% were manual workers with housewives and clerks representing 26% and 15% respectively. Women doing manual work experienced more symptoms of LBP than non-manual workers. This prevalence showed an upward trend with increase in age (Emami *et al*., 1998). In Africa not much is known about LBP since data is not available as in the developed countries (Galukande *et al*., 2005). For instance, in Senegal, Mbaye *et al.* (2002) reported a prevalence of LBP at 54% among drivers of a public transportation company. In Nigeria the one year prevalence of LBP among commercial motor drivers and private automobile drivers were 96% and 88% respectively (Odebiyi *et al*., 2007). In South Africa, LBP was found to increase notably at the ages of 15 and 17 years for the life time (Fanucchi *et al*., 2005), however, the proportion of LBP is slightly higher among males than females. It is hypothesized that reduced flexibility in boys during the puberty stage could lead to increased stress in the soft structures. Other possible causes for adolescent LBP include activity levels, psychosocial factors and smoking. In USA, a study was done to Alpine ski instructors aiming at identifying the point of prevalence and life time prevalence of LBP. The study found that the instructors had a life time prevalence of LBP of 75% and the peak prevalence at the age group 41-50 years (Peacock *et al.*, 2005).

In Kenya, Muruka, (1997) estimated that 64% of the tea pickers were suffering from back pain. However, 29 % of these had a history of back pain before they started picking tea. This study also concluded that 35 % of the workers developed back pain due to occupational exposure to tea picking. Another Kenyan study by Hassan & Mburu, (2013), established a high point prevalence of LBP at 90% with annual and lifetime prevalence of 95.5% and 98% respectively among terminal tractor drivers in the port of Mombasa.

2.3 Causes of LBP

Low back pain is not a specific diagnosis; it is merely a term given based on presenting symptoms of pain and limited function in the LBP region. In health care settings with no specialized diagnostic tests it has been difficult to diagnose the anatomical causes of LBP (Patel *et al.,* 2000). According to Bratton, (1999), LBP can result from mechanical stress or from other underlying causes referred to as secondary causes. The mechanical causes of acute LBP include dysfunction of the musculoskeletal and ligamentous structure. Pain resulting from these may originate from the disc, annulus, facet joints, muscle fibres and ligaments. Other causes of LBP include; diseases such as cancer among others. Such causes are referred to as "red flags". According to Corrigan and Maitland (1998), back pain can be caused by intra-abdominal lesions like peptic ulcers, pancreatic and gall bladder disorders. However, other causes of LBP exist; according to McKenzie (1989), concentration of chemicals to the tissues irritates nerve ending subsequently causing pain to the involved tissues.

2.4 Classification of LBP

Two types of LBP are known, specific and non-specific. Specific LBP is caused by specific patho-physiological mechanism whereas nonspecific LBP is defined as symptoms due to non-specific cause, i.e. LBP of unknown origin (Van Tulder *et al.,* 2002). Low back pain is further classified based on the duration of symptoms whereby the duration of symptoms for the acute LBP lasts for six weeks or less; Sub-acute category of LBP lasts between six and twelve weeks while symptoms lasting more than twelve weeks are categorized as chronic LBP (Bratton, 1999).

McKenzie, (1989) classified LBP into three syndromes namely postural, dysfunction and derangement. The researcher described postural syndrome as pain caused by mechanical deformation on soft tissues due to postural stress. This is caused after prolonged maintenance of certain postures or positions which subject the soft tissues to

continuous stress. The pain clears with a change of position or postural correction. The second is the dysfunction syndrome which is caused by mechanical deformation of soft tissues due to adaptive shortening. The shortening of the tissues lead to a loss of movement in some direction. Any attempt of movement elicits pain before full range of movement is achieved. This syndrome is associated with intermittent pain and partial loss of movement. Third is the derangement syndrome which is caused by mechanical deformation of the soft tissues. Any change in position of the fluid nucleus within the disc and the surrounding annulus causes discomfort in the normal resting position of the two vertebrae enclosing the involved disc. This syndrome is usually associated with constant pain. However, intermittent pain may also occur depending of the size and the location of the derangement. Movements of the affected tissues may be partially or completely blocked. In the acute stage of this syndrome kyphosis and scoliosis deformities are commonly found. The presentation of the three syndromes are different from each other hence, each syndrome require a different treatment approach.

In contrast, Corrigan & Maitland (1998) argued that there is little consensus on practical classification of LBP. This may explain why the management of the LBP is still a problem. Most of the classifications are based on the anatomical or neural structures involved and their lesions but they are of no clinical value. A practical approach clinically is to diagnose those disorders causing the LBP in which the pathology has been clearly described.

Another method of classification is based on the severity of the symptoms on functions. Delitto (1995) classified LBP into three stages and in each stage there are different treatment goals. In the first stage, the patient is expected to achieve the following goals; a reduced Oswestry LBP score of less than 40%-60%, to sit for more than 30 minutes, able to stand for more than 15 minutes and able to walk more than 0.6 kilometer. In the second stage, the patient is expected to perform activities of daily living and have a

reduced Oswestry score of less than 20%-40% and finally in the third stage the patient is expected to walk and have a reduced Oswestry score of 20% or less.

Low back pain also occurs as a result of a variety of causes and pathological conditions, and because it is sometimes difficult to diagnose, there are times when the physician has no other choice than to make a diagnosis of "low back pain", which simply describes the symptom. Therefore, LBP has been classified according to diseases it causes as it is described below (table 2.1).

2.4.1 Low back pain caused by trauma

Acute muscular LBP (sprained back) occurs when exposure to an external force, such as in a collision with a person or while lifting a heavy object, damages muscles and fascia, while lumbar intervertebral disc herniation occurs when an intervertebral disc collapses and compresses nerves anteriorly, and traumatic vertebral body fractures occur when a vertebral body collapses as a result of a fall, etc. Chronic muscular low back pain develops when repetitive muscle use is performed over and over again, and fragile vertebral body fractures associated with osteoporosis occur when bone fragility progresses and bones collapse even in the absence of exposure to major external force (Hayashi, 2004).

2.4.2. Low back pain caused by inflammation

Tuberculous spondylitis or purulent spondylitis develops when tubercle bacilli or pyogenic bacteria destroy vertebral bodies or intervertebral discs. If the vertebrae are connected like bamboo, the patient has ankylosing spondylitis, a rheumatic disease that is negative for rheumatoid factor (Hayashi, 2004).

2.4.3. Low back pain caused by tumors

Malignant tumors, such as lung cancer, stomach cancer, breast cancer, prostate cancer, etc., sometimes metastasize to the lumbar spine, and disseminated metastasis to the lumbar spine is one of the pathological pictures of multiple myeloma. When tumors such as neuromas or angiomas develop in the lumbar cord or lumbar spine, patients experience intense low back pain (Hayashi, 2004).

2.4.4. Low back pain caused by degeneration

As construction workers advance in age, their incidence of low back pain increases, and the increases are attributable to the development of lesions associated with degeneration of the lumbar spine and surrounding tissues. Degeneration leads to the development of spondylosis deformans, lumbar intervertebral disc degeneration, intervertebral articular low back pain, lumbar non-spondylolytic spondylolisthesis, ankylosing spinal hyperostosis, and lumbar spinal stenosis (Hayashi, 2004).

2.4.5. Low back pain due to other causes

In addition to diseases that arise in the structures that compose the lower back, which is the pivot of the body, pain arising from diseases of intra-abdominal organs, including the liver, gallbladder, and pancreas, and referred pain are also seen among the diseases that give rise to low back pain. Pain also arises from posterior abdominal organs, including the uterus, ovaries, and urine bladder. The existence of psychogenic pain associated with hysteria and depression must also not be forgotten (Hayashi, 2004).

Table 2.1: Diseases Associated with Low Back Pain Classified According to Etiology

Etiology	Disease
Trauma	Lumbar intervertebral disc hernia Muscular/fascial low back pain [acute muscular low back pain (sprained back), chronic muscular low back pain] Low back pain associated with fractures (traumatic vertebral body fractures, fragile vertebral body fractures associated with osteoporosis)
Inflammation	Tuberculous spondylitis Purulent spondylitis Ankylosing spondylitis
Tumours	Spinal metastasis by malignant tumors Multiple myeloma Spinal cord tumors
Degeneration	Spondylosis deformans Intervertebral disc degeneration Intervertebral articular low back pain Lumbar non-spondylolytic spondylolisthesis Ankylosing spinal hyperostosis Lumbar spinal canal stenosis
Abdominal organs	Diseases of the liver, gallbladder, pancreas, e.t.c.
Psychological	Psychogenic low back pain, in hysteria, depression, etc.

2.5 Risk factors for LBP

Risk factors have been divided into three categories and they include: individual, psychosocial and occupational or work-related risk factors. Previous studies have identified more than 100 risk factors for LBP (Pincus *et al.,* 2008). In the majority of cases, a combination of individual and work-related as well as non-work-related factors is likely to contribute to the development of LBP (Hoy *et al.,* 2010).

2.5.1 Individual risk factors

Individual factors such as age (Manga *et al.,* 1993; Bork *et al.,* 1996; Cromie *et al.,* 2000; Rugelj, 2003), gender (Waddell, 1999; Bejia *et al.,* 2005; Glover *et al.,* 2005) and Body Mass Index (BMI) (Bejia *et al.,* 2005; Vieira *et al.,* 2005), are known to be important predictive variables for LBP.

2.5.1.1 Age

The degenerative changes in the spine and disc as a result of aging are one of the major causes of LBP (Lawrence *et al.,* 2008). For instance, previous studies have reported the association between age and LBP among Asian population (Chaiwanichsiri *et al.,* 2007) as well as the western population (Lotters *et al.,* 2003; Miranda *et al.,* 2008). Manga *et al.* (1993) revealed that LBP is most common between the ages of 25 and 55 years; Papageorgious *et al.* (1995) determined that the prevalence of LBP increased with age until 45 years and then decreased until the age of 60 years where it increased once again.

In a study conducted to determine the prevalence of LBP and associated risk factors amongst 485 adult patients attending the General Outpatients' Clinic of the University College Hospital in Ibadan, Nigeria, revealed that the prevalence of LBP increased gradually with age: from 44.9% for respondents younger than 30 years to 55.6% for the age group 51-60 years. However, a reduction in the prevalence of LBP was observed

after the age of 60. However, there was no statistical association between the prevalence of LBP and age ($\chi 2 = 3.007$, $p = 0.558$) (Ogunbode *et al.,* 2013).

According to Birabi *et al.* (2012), LBP was more prevalent in the 31-40 years age group (49.04%), and least in the subjects in the 51-60 years group (7.70%). However, the association of age with LBP was statistically significant (P <0.001). SBFM Keriri, (2013), reported that there was no statistical significant differences between those complaining of low back pain and those who do not complain regarding age (P>0.05).

2.5.1.2 Gender

The association between gender and LBP has been reported by previous studies (Gilgil *et al.,* 2004; Nagasu *et al.,* 2004). According to Pope *et al.* (1991), however, LBP is as common in males as it is in females, until the work situation is taken into account. For instance, Nopkesorn & Supasit Pannarunothai, (2011) revealed that women had a significantly higher prevalence rate than men (P< 0.10). However, in a Nigerian Hospital based study, the point prevalence of LBP was found to be higher amongst men compared to women (50.3% vs. 44.4%), but without statistical significance ($\chi 2 = 1.586$, P=0.208) (Ogunbode *et al.,* 2013).

Birabi *et al.* (2012), found that there was significant association between gender and LBP (P<0.001) with the prevalence higher among females than males (50.96%).

In another study that was conducted among 126 healthcare workers in Saudi Arabia, revealed that female participants complaining of LBP were significantly more than male participants (P=0.002) (SBFM Keriri, 2013).

Researchers have suggested that females who are generally smaller in stature are at a physical disadvantage when it comes to manual activities such as lifting or transferring

large patients; in addition manual manipulative techniques may strain their backs and shoulders (Mior & Diakow, 1987; Bork e*t al.*, 1996; Glover, 2005).

2.5.1.3 Race/ethnicity

Vlok (2005) reported that LBP prevalence was highest in the Indian (92.3%) and Coloured participants (91.7%), followed by White participants (69.4%) and was lowest amongst the Black participants (53.9%). However, no other studies have reported the association between race/ethnicity and LBP.

2.5.1.4 Anthropometric measurements

A BMI >25 indicates overweight and a BMI > 30 indicates obesity (Bickley & Szilagyi, 2003). The causal link between obesity and LBP could be explained by the fact that additional weight would put strain on load-bearing spinal elements, resulting in altered biomechanics leading to excessive wear and early degeneration.

According to Birabi *et al.* (2012),who conducted a study among peasant farmers in Nigeria, found that height was significantly associated with LBP (P<0.001): majority of the participants with LBP (73.2%) were less than 1.6 m in height (RR=1.213, 95% CI=1.008-1.489). Majority (82.21%) of the respondents were of desirable weight, and the association between BMI and LBP was not statistically significant (p=0.164) while those with desirable weight were more likely to have LBP (RR=1.155, 95% CI=0.935-1.497).

Ogunbode *et al.* (2013) reported that the highest proportion of LBP (48.6%) was found in those who were overweight, but there was no significant association between LBP and BMI ($\chi 2 = 0.739$, $p = 0.864$). In addition, a higher prevalence of men (70%) with a waist circumference of 102 cm or more reported LBP than those with a waist circumference less than 102 cm (49.2%). However, this difference was not statistically

significant ($\chi 2$ = 1.643, P=0.200). Among females, the prevalence of LBP was significantly higher in those with a waist circumference of 88 cm or more than in those whose waist circumference was less than 88 cm (61.8% vs. 38.2%), where $\chi 2$ = 12.656 and P< 0.0001. However, according to Bejia *et al.* (2005), nurses with a high BMI had an increased risk of LBP and Vieira *et al.* (2005) also concluded that nurses who were overweight were 1.38 times more likely to have had LBP during their working life.

2.5.1.5 Parity

Women may experience pain around the pelvic area and or low back pain during and after pregnancy (Bastiaanssen *et al.,* 2005). According to Bullock *et al.* (1987), 82% of women experience unspecified LBP at some stage during their pregnancy. Van der Meulen (1997) revealed that the prevalence of LBP was lowest (34.4%) in nulliparous women, was higher (59.3%) in women with a history of one to four live births and was highest (77.8%) in those who had had five or more live births. This was also echoed by Waddell (1999) who concluded that multiple pregnancies increased the risk for a higher prevalence of unspecified low back pain in the future.

According to Ogunbode *et al.* (2013), a higher prevalence of LBP was reported among respondents, who had had more than five children (52.3%) and were self-supporting (49.6%).

However, since LBP only occurred after birth for some women, Polden & Mantle (1990) proposed that the type of delivery might also play an important role in the development of LBP. The extreme ligamentous stretching and laxity of joints that is required for the passage of the foetus through the pelvis during a natural delivery, as opposed to a caesarian section, could be instrumental in causing LBP.

Polden & Mantle (1990) also stated that LBP could be experienced by 49% to 65% of women at some stage in their post-natal recovery period and that some could suffer from

LBP for up to a year after birth. The work involved in caring for infants and toddlers such as daily lifting and carrying, changing nappies and breastfeeding as well the effects of sleep deprivation, tiredness, fatigue and mood changes (e.g. postnatal depression) may cause recurrence or exacerbation of existing LBP (Polden & Mantle, 1990 and Conway, 1995) and may explain the progression of LBP in the postnatal period and in mothers with young children (Bejia *et al.,* 2005).

2.5.1.6 Previous surgery

Many patients have reported post-operative unspecified LBP with or without leg pain after spinal surgery (Brox *et al.,* 2006) and cognitive-behavioural factors such as fear avoidance or pain-related fear of movement or re-injury may also lead to continued disability and pain after lumbar disc surgery (den Boer *et al.,* 2006).

According to Ericksen *et al.* (2006), who documented a systematic literature review and discussion that LBP was associated with surgery involving an abdominal incision to access the bladder and urethra, hysterectomy, abortion, dilatation and curettage and child birth. Ericksen *et al.* (2006) also stated that it is the potential injury and de-conditioning of the abdominal or pelvic floor muscles that may occur during gynaecologic surgery, that leads to altered muscle function and core muscle dysfunction that may predispose women to the development of low back pain later in life.

2.5.1.7 Previous Trauma

The ankles, knees, hips and low back are all connected through the lower limb kinematic chain (Seymour, 2002). Any acute or repetitive trauma occurring at these sites would result in an injury which may lead to compensatory, altered or faulty biomechanics that would have far reaching effects on the musculoskeletal system (e.g. on muscles, tendons and ligaments) and may have a domino effect of abnormal stresses and strains on many joints of the body. Low back pain is thus often associated with some prior/pre-existing

or subsequent ramification in the form of mechanical dysfunction lower down in the musculoskeletal system (Stoxen, 2008).

2.5.1.8 Previous injury

Having a history of previous injury increases the risk of subsequent injury or re-injury (Schneider *et al.*, 2000; Bahr *et al.*, 2004; Steffen *et al.*, 2008). Some of the general risk factors for injuries include: increasing age, muscle imbalances, decreased range of motion, joint laxity, inadequate rehabilitation (Steffen *et al.*, 2008), continued exposure to the risks that resulted in the initial injury (Schneider *et al.*, 2000), structural changes, scar tissue formation and persistent mechanical instability (Bahr *et al.*, 2004).

In a study by Ogunbode *et al.* (2013), the prevalence of LBP was significantly higher among participants who had previous back injury (91.3%) compared with those who did not (44.8%), where $\chi 2 = 14.64$ and $P < 0.0001$.

2.5.2 Occupational risk factors

A number of work-related mechanical risk factors for LBP have been reported in prospective studies. They include: bending or twisting (Hugendoorn *et al.*, 2000; van den Heuvel *et al.*, 2004), kneeling or squatting (Harkness *et al.*, 2003), prolonged standing (Bahr *et al.*, 2004), heavy physical or manual work (Macfarlane *et al.*, 1997; Sorensen *et al.*, 2011), and nursing tasks (e.g., manually moving patients) (Smedley *et al.*, 1997; Eriksen *et al.*, 2004).

2.5.2.1 Work activities

Heavy manual work or labour, physically demanding or stressful work, repetitious work and work that requires staying in one position for long periods of time has been associated with the development of LBP (Morris, 2006).

For instance, Ogunbode *et al.* (2013) found out that the highest prevalence of LBP (63.6%) was found amongst respondents who commonly adopted the stooping position during their daily activities, whilst the lowest proportion (48.5%) was found in those who commonly adopted the standing position.

According to Khan *et al.* (2014), LBP was associated with bending and twisting movements of the body (ODDS ratio 4.6 with 95% CI=1.1 to 18.9), Therefore, there was statistically significant association of LBP with bending and twisting movements (P=0.041).

According to Pope *et al.* (1991), performing work in a predominantly sitting posture for long periods of time without adequate lumbar support, may increase the risk of low back pain. This was supported by Bejia *et al.* (2005) who noted in their literature review that several studies linked low back pain in administrative hospital staff to their predominantly seated position and sedentary nature of their activities. In addition, awkward posture was associated with the presence of low back pain and / or sciatica, so, sitting for more than half of a workday or the combination of sitting with an awkward posture leads to the greatest increase in low back pain (Black *et al.*, 2007).

Ogunbode *et al.* (2013), revealed that LBP was significantly higher amongst respondents who were currently engaged in occupational activities than those who were not (49.9% vs. 37.7%), where $\chi 2 = 5.421$ and $P = 0.020$.

According to a study by Emami *et al*. (1998) on Iranian women, working in a stooping posture and sitting for more than four hours a day have been associated with increased chances of suffering from LBP in all age groups. According to the UMMC (2002), sitting for too long puts most of the pressure to the back and that can result to back pain. The UMMC recommended that people who drive for a long period of time need to move the seat as far forward as possible to prevent bending of the spine. McKenzie (1989) indicated that when one sits on a chair for some time, there is a reduction in lumbar

lordosis resulting in the spine going into a flexion position. The spinal muscles tend to relax and the vertical weight bearing strains are left to the ligamentous structures and if the situation continues for too long it causes LBP. The reduction of lumbar extension is responsible for the recurrence of the LBP in 75-85% of the LBP cases are as a result of this. The reduced lumbar extension tends to influence the patient's sitting and standing posture which results in slightly stooping walking posture. Poor sitting posture especially when the spine moves into kyphosis, intradiscal pressure increases and decreases when the spine moves into lordosis. Patients have been found to experience pain on sitting when the lumbar spine moves into kyphosis and decreases when the spine moves toward the lordosis. This suggests that there may be correlation between intradiscal pressure and pain pattern where the intervertebral disc may be contributing to the onset of LBP. McKenzie (1989) described good sitting posture as that which maintains the spinal curves present and in the upright position, namely cervical lordosis, thoracic kyphosis and the lumbar lordosis.

Occupational risk factors are difficult to define because exposures to specific causative influences are unclear, mechanisms of injury may be confusing, and the research supporting these findings is variable and conflicting for most environmental risks. Furthermore, job dissatisfaction, work conditions, legal and social factors, financial stressors, and emotional circumstances heavily influence back disability. Although many experts agree that heavy physical work, lifting, prolonged static work postures, simultaneous bending and twisting, and exposure to vibration for a period of 2 years consistently may contribute to back injuries, the medical literature provides conflicting support for most of these proposed risk factors (Wheeler *et al.,* 2005*).* LBP can result from mechanical stress. The mechanical causes of acute LBP include dysfunction of the musculoskeletal and ligamentous structure, people mostly affected by LBP are those doing manual work especially where lifting is involved and in these tea farms, workers are usually subjected to manual work like lifting, carrying heavy loads on their backs or their heads high repetition rates, excessive forces, and awkward postures. Tea plucking

is a tough job, and can be physically debilitating. According to UMMC (2002) and Corrigan & Maitland (2003), some occupations or sport activities which involve prolonged excessive bending, twisting, standing or sitting may result in disc degeneration.

2.5.2.2 Number of years in practice/experience

According to Birabi *et al.* (2012), LBP was found to be most prevalent in those who had practiced farming for 5 to 10 years (20.19%). There was a significant association between years of farming practice and LBP ($P<0.001$).

2.5.3 Psychosocial or non-work related factors

Psychosocial risk factors play an important role in the etiology and perpetuation of work-related MSDs (Campo, 2008). These include: smoking (Gilgil *et al.,* 2004; Nagasu *et al.,* 2004), life style, physical inactivity (Miranda *et al.,* 2008) and short sleep hours (Mizoue *et al.,* 1996) also increases the risk of LBP.

2.5.3.1 Exercise

Wai *et al.* (2008) revealed that the relationship between LBP and physical inactivity is complex, as there is evidence suggesting either too much or too little physical activity may be associated with LBP. Van der Meulen (1997) showed that in a general Black population, the prevalence of LBP was 16.9% lower among subjects who exercised regularly as opposed to those who did not exercise. Similarly, Sjolie (2004) proposed that exercise and LBP have an inverse association. On the other hand however, Kovacs *et al.* (2003) showed that the practice of sports two or more times per week was moderately associated with the development of LBP pain but Pope *et al.* (1991) in contrast, found no link between these factors. A sedentary lifestyle may result in

musculoskeletal tissue atrophy due to lack of exercises, a similar result may be obtained from those people in sedentary occupations.

2.5.3.2 Smoking

Smoking is associated with an increased prevalence of LBP (Kirkaldy-Willis *et al.,* 1992; Leboeuf-Yde *et al.,* 1996) and an increased risk of LBP among both current and ex-smokers (Fogelholm & Alho, 2001). The following theories may explain this relationship:

Smoking is frequently accompanied by a chronic cough and is thus a risk factor for development of prolapsed intervertebral discs in the lumbar spine (Kirkaldy-Willis *et al.,* 1992). Smoking has been positively linked to diminished mineral content of bone, reduces vertebral body blood flow and impairs fibrinolytic activity (Kirkaldy-Willis *et al.,* 1992). Smoking causes increased serum proteolytic activity that accelerates disc degeneration and may attack other connective tissue structures of the spine as well, weakening spinal ligaments and resulting in spinal instability (Fogelholm & Alho, 2001).

No significant association between smoking and increased risk of LBP has been established in the general population (Van der Meulen, 1997; Docrat, 1999; Kovacs *et al.,* 2003). However, according to Ogunbode *et al.* (2013), the prevalence of LBP was significantly higher in respondents who smoked tobacco than those who did not (91.7% vs. 45.7%), where $\chi 2 = 9.946$ and $P = 0.002$.

People who suffer from LBP and smoke have shown low isometric lumbar extensor strength compared to non-smoking LBP sufferers. This may explain why the LBP sufferers who smoke experience more pain than the non-smokers with LBP (Al-Obaidi *et al*., 2003). The nicotine levels especially for those who smoke thirty cigarettes daily have been associated with the necrosis of the nucleus pulposus as well as hypertrophy,

cracking and detachment of the annulus. Further, the metabolic and solute exchange process within the disc has also been reported to be affected by cigarette smoking (Porter, 1993).

2.5.3.3 Alcohol uptake

Excessive alcohol consumption is a lifestyle factor that is generally known to contribute to disease (e.g. cardiovascular and liver disease), and although it may be linked to social and psychological problems which could lead to the development of chronic LBP, a systematic literature review conducted to determine the relationship between alcohol consumption and LBP, showed no positive association between the two (Leboeuf-Yde, 2000). Ogunbode *et al.* (2013) also found no association between the prevalence of LBP and alcohol consumption.

However, according to Smith *et al.* (2006), psychosocial factors including alcohol consumption was significantly associated with the development of musculoskeletal disorders in nurses.

2.5.3.4 Marital status

According to Ogunbode *et al*. (2013), majority (47.6%) of patients who suffered from LBP were married. However, there was no association between LBP and marital status. According to Keriri (2013) there was no association between LBP and marital status marital status ($P > 0.05$).

Khan *et al.* (2014) reported that nearly all 94% back pain patients were married, 3% were single and 3% had other marital status.

2.5.3.5 Stress and depression

According to Bogduk (2006), psychological and social factors such as depression, anxiety and distress may be considered risk factors or prognostic factors (increasing the likelihood that an individual's LBP will progress to chronic pain and disability), for low back pain.

Research has shown that depression is a strong and independent predictor for the onset of an episode of intense and or disabling LBP (Carroll *et al.*, 2004).

According to Smith (2004), in a general population of students, those who were suffering from depression were 1.949 times more likely to have LBP although definitive causality could not be established.

2.6 Management of LBP

Low back pain is a costly quality of life-related health problem (Selkowitz, 2006), and globally its management has remained a formidable challenge in medical practice (Feurstain & Battie, 1995). It is also a complex multivariate problem that has been known to be resistant to simple solutions (The Back Letter, 2001) and its management has remained an unending task for health care and service providers especially because quite a sizeable proportion of the population will attend the clinic at some point in their lifetime due to LBP. Physiotherapy is probably the treatment that is most widely used for back complaints of mechanical origin especially in the sub-acute and chronic states. Spinal manipulation for patients who are failing to return to normal activities have however been suggested among patients with LBP. Several methods/approaches of managing non-specific LBP have been used with varying degrees of success. Drugs have been widely accepted in managing acute LBP (van Tulder *et al.*, 2009)..

Physiotherapy management of long term LBP favours active low back treatment programmes involving improving aerobic fitness, increasing the strength and flexibility of the lumbar musculature and ensuring lumbar stability (Shiple, 1997).

Physiotherapy modalities including cryotherapy, Trans-cutaneous Electrical Nerve Stimulation (TENS) and heat therapy, back care education, back school, biofeedback, and functional restoration are used as adjunct to physiotherapy regimens including massage, heat, traction, ultrasound, short wave diathermy, back care education. It also involves the use of physical agents and modalities in physiotherapy to manage LBP. These include rest using supports e.g lumbar corsets, heat therapy, cold therapy, spinal manipulation and electro analgesia (Low & Reed, 1994; Foster *et al.,* 1999; Li & Bombardier, 2001; Gracey *et al.,* 2002). These rehabilitative and physical treatments can be helpful and with the aim of combating relapse, however when LBP become complex, the psychological components become an important part of the treatment. Pain management programme/pain clinics are used in managing psychological aspect of pain. Work hardening is also introduced to restore physical, behavioural and vocational functions facilitating return to work. Often, surgery is offered as an ultimately desperate last measure, but almost always it is unjustifiable and usually fails to provide permanent relief, (Khot, *et al* 2004).

2.6.1 Good habits to keep a healthy back

When standing for a long period of time in one position you may start to feel pressure/pain in your back. To relieve these symptoms, stand with one foot on a stool and alternate your foot at least every five to ten minutes. This will take the pressure off your spine. Tighten your stomach muscles. Wearing low heels, if possible, helps your back too (O'Sullivan, 2006).

Picture 2.1: A man demonstrating a good standing posture.

While sitting, always sit straight and have your back supported with a well padded seat. Do not sit in a slouch position. Have your knees level with or higher than your hips (O'Sullivan, 2006).

Picture 2.2: A man demonstrating a good sitting posture.

When lifting an object, make sure you are facing the object you intend to pick up. Never lift objects from your back. Have your knees slightly bent and apart. Hold the object close to your body, keeping your back straight and let your legs do the lifting. Do not twist your body to set down or pick up the object, turn your whole body to do so. If the object you are to pick up is too big, always get help. This may save your back. If the

object is light enough to pick up with one hand, you can bend over to reach it and pick it up, using a motion that mimics a golfer getting his golf ball out of the hole. Reach with one hand and lift the opposite leg, keeping it in line with your back (O'Sullivan, 2006).

Picture 2.3: A man demontrating on how to lift an object on the ground.

2.7 Treatment strategies

Several treatment strategies have been suggested, they include: joint mobilization and manipulation, soft tissue massage techniques, electrotherapy, acupuncture, and traction, are utilized in clinical practice to treat LBP, with varying degrees of effectiveness. Exercises are commonly prescribed for LBP by physiotherapists, but only seem to be supported as an intervention by evidence for patients with chronic LBP. Furthermore conclusions from systematic reviews show that exercises are effective in managing chronic LBP. (Hayden, 2005; Liddle, 2004; Lewis *et al.,* 2008) in their systematic review also reaffirmed that exercises were effective in reducing pain in people with Chronic LBP. Most studies concluded that active exercises were a valuable therapeutic approach in managing LBP, despite the lack of consensus on the optimal exercise techniques, intensity or active intervention (Abenhaim, 2000).

Exercise therapy is the most often used physical therapy intervention in treating individuals with back pain (Nachemson, 1990). It aims at abolishing pain, restoring and

maintaining full range of motion, improving the strength and endurance of lumbar and abdominal muscles, thereby contributing to early restoration of normal function (Nachemson, 1990; Brukner *et al.,* 1996). Additionally mechanical support to the low back which helps to obtain recovery with minimal chance of relapse is provided. Exercise training is often used to improve function in low back rehabilitation and to prevent de-conditioning of lumbar musculature, to prevent persistent LBP (Shiple, 1997; Chok *et al.,* 1999). Jackson & Brown (1983) opined that exercises will decrease pain, strengthen muscles, decrease mechanical stress to spinal structures, improve fitness level, prevent injury, and improve posture and mobility in patients with LBP. The exercise modes used by physiotherapists managing LBP patients include aerobic exercise, range of motion and stretching exercises and strengthening exercises for the trunk musculature (Brukner *et al.,* 1996). Also balance training for better trunk and abdominal control, stabilization exercise and endurance exercises (Biering Sorenson, 1984; Foster & Fulton, 1991; Panjabi, 1992). In a study by Franca *et al.* (2010) segmental stabilization and strengthening exercises effectively reduced pain and functional disability in individuals with chronic LBP. Additionally segmental stabilization further improved transversus abdominus muscle activation capacity.

The role of exercise in back pain transcends all the phases of medical or health management namely preventive, curative and rehabilitative phases. It is probably the cheapest physiotherapeutic intervention and which gives the patient some measure of direct control over her treatment (Brukner *et al.,* 1996). Exercise and movements cause alternate compression and relaxation of the articular cartilage, and ensure the movement of the synovial fluid into the articular cartilage as the area of pressure changes over the surface (Twomey, 1992). This allows for good health and optimal functioning of the articular cartilage. It also results in thicker, stronger ligaments that maintain their compliance and flexibility and that also become stronger at the bone-ligament-bone complex. The nutrition and health of the intervertebral discs is equally enhanced by exercises. Exercise also reduces the risk of developing osteoarthritis and osteoarthritic

changes have been shown to begin only in areas where collagen is not often stressed by movement and pressure (Twomey, 1992). Exercises are done as mainstay of treatment to improve trunk stabilization. Exercises which results in proper muscle function will compensate for structural damages in spinal structure (Barr *et al.*, 2005); nevertheless the deficits that have been defined in lumbar stabilization in patients with LBP seem to be mostly related to muscular and neurologic function.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Introduction

This chapter describes the research methodology: research design, study site, sampling procedures, data collection and statistical analysis methods utilized.

3.2 Study site

This study was conducted at selected tea estates of James Finlay (K) Limited (JFK) in Kericho County. James Finlay (K) Limited is a multinational company that has the largest number of tea estates and number of workers. James Finlay was founded in 1750. As a wholly owned subsidiary of the Swire Group, the company has extensive tea and horticultural interests in Kenya, South Africa, Sri Lanka and China, complemented by global trading, packaging and extraction activities. Its primary markets are in the UK, USA, Asia and increasingly continental Europe. The company produces over 40 million kilos of black tea every year from tea estates in Sri Lanka and Kenya. The company employs over 50,000 people globally; of this, 16,000 are local people who live in their estates. These workers and their families are provided with housing, schooling and medical services. This amounts to more than 11,000 houses, one 106 bed hospital, 25 medical dispensaries, 14 primary schools, 17 nursery schools and one secondary school. The company has seven factories, five process black tea while two process instant tea. Kericho County is located to the South West of the Republic of Kenya and lies within the highlands of Rift Valley. The headquarters of the County is Kericho town (Figure 3.1).

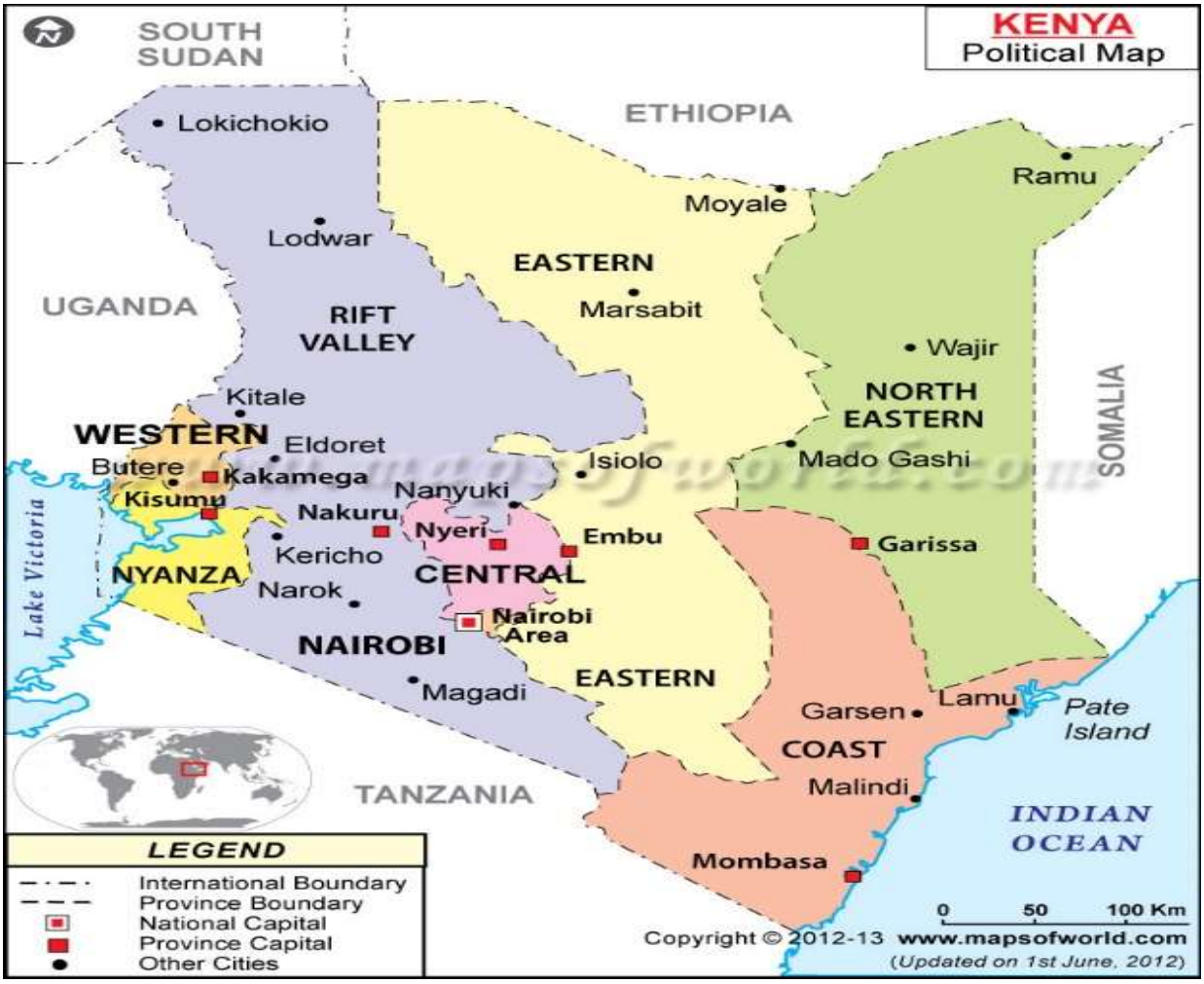

Figure 3.1: Map of Kenya showing Kericho County location.

3.3 Study design

This study was conducted using a cross-sectional survey that utilized quantitative data collection techniques.

3.3 Study population

Study population included tea pickers and non-tea pickers working in selected JFK tea estates.

3.3.1 Inclusion criteria

- Tea pickers who were exclusively picking tea for the last 2 years or longer.
- All tea and non-tea pickers who consented to participate in the study.
- All tea and non-tea pickers aged 18 years and above.
- The non-tea pickers included those doing other manual jobs and had never participated in picking tea for the last 2 years or longer and should be having the same characteristics as the tea pickers.

3.3.2 Exclusion criteria

- Tea pickers and non-tea pickers who declined to consent.
- Tea pickers who had picked tea for less than 2 years.
- Tea and non-tea pickers aged below 18 yrs.
- Non-tea pickers who had participated in tea picking in the last 2 years preceding the study.
- Tea and non-tea pickers with preexisting LBP prior to employment/ 2 year prior to the study

3.4 Sampling procedure

James Finlay (K) Limited was purposively selected. Stratified sampling procedure was used whereby each estate was divided into strata, followed by random sampling of individuals in each stratum to achieve the desired sample size. Written informed consents (Appendix I) were obtained to make sure that the participants understood everything about the study by a trained enumerator. Trained enumerators then administered the structured questionnaires.

3.4.1 Sample size determination

Prior to this study, there was no study that had been carried out to determine the prevalence and occupational risk factors of LBP among tea pickers and non-tea pickers. Therefore the prevalence was assumed to be 50%. Using the Formula for testing hypothesis of a population proportion, the sample size was achieved as follows:

$$N = \left[Z_{1-\alpha}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}\right]^2 \div (P_1 - P_2)^2$$

Where:

P= $(P_1\text{-}P_2) \div 2$

N= the sample size estimate

$Z_{1-\alpha}$=Z critical value for alpha (.05 alpha has a $Z_{1-\alpha}$ of 1.96)

$Z_{1-\beta}$ =Z value for 1-beta (.90 power has a Z of 1.28)

P1=expected proportion for sample 1

P2=expected proportion for sample 2

P1= 0.35

P2= 0.50

N= {1.96*0.6991+ (1.28*0.69101}2/0.0225

N=225.9 = 226

Therefore, the minimum sample size is 226

3.5 Data Collection

A structured researcher developed questionnaire was translated to Swahili language. Data was collected using structured questionnaires that were administered by trained interviewers. The questionnaire contained information such as socio-demographic characteristics, medical history and questions regarding the work ergonomics.

Data collected was stored in personal computer (PC) backed up by flash disks and they were treated with confidentiality and only accessed by the Principal Investigator (PI).

3.6 Data management

Data from structured questionnaires were all coded for anonymity purposes and entered into Excel spread sheet as they returned from the field everyday by the Principal Investigator (PI). A back up of these data was done regularly to avoid any loss using flash disks and compact disks. Data cleaning and validation were performed to achieve a clean set. The records were locked up in cabinet and could only be accessed by the PI since the respondents were assured that information provided would be kept confidential.

3.7 Data analysis

Data entered into excel was then exported as a Statistical Package for Social Sciences (SPSS) file and then analyzed using SPSS version 19.0. Descriptive statistics were used in analysis to give proportions and frequencies. Bivariate analysis, Pearson's chi square (χ^2) test was used to determine the association between diagnosis of LBP and socio-demographic characteristics and risk factors. Multivariate analysis was done on variables that were significant at bivariate level in order to determine the variables that independently contribute to LBP suffering. Levels of significance at $P \leq 0.05$ were considered.

3.8 Ethical considerations

Approval was granted by Kenya Medical Research Institute (KEMRI) Scientific Steering Committee (Appendix 6) (SSC NO 2564) and Ethical Review Committee (ERC) (Appendix 5) respectively prior to the implementation of the study. Approval to conduct the study was also sought from JFK head office (Chepkembe) in Kericho. 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 understood everything prior to the study. This was then 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 were kept under lock and key in the cabinet and could only be accessed by authorized personnel for confidentiality purposes. No individual identification details were used in any presentations or publications resulting from the study. There were no physical risks resulting from participating in this study as it was only about responding to the questionnaire questions.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results of the study with particular emphasis on the statistically significant and relevant findings.

4.2 Summary of the socio-demographic characteristics of tea pickers and non-tea pickers.

A total of 454 participants (mean age ± SD 36.6±0.9 years) enrolled were aged 18-49 years. Of this 73.8% (335/454) were tea pickers with a mean age±SD of 36.4±1.03 years while 26.2% (119/454) did not pick tea (mean age± SD was 37.3±1.8). Majority, 38.5% of tea pickers were aged 26-33 years while slightly half of non-tea pickers 52.1% were aged 34-41 years. Most of tea pickers were males 65.4% while 54.6% of males were non-tea pickers. Majority of both tea pickers and non-tea pickers were married at 85.7% and 91.6% respectively. In terms of parity, most had more than two children between the two study populations groups at 56.1% for tea pickers and 64.7% for the non tea pickers (Table 4.2).

Table 4.2: Socio-demographic characteristics of tea pickers and non-tea pickers in JFK

	Tea pickers		Non-tea pickers		
Variable	**Frequency(n=335)**	**100%**	**Frequency(n=119)**	**100%**	**Total**
Age in yrs					
18-25	16	4.8	8	6.7	24
26-33	129	38.5	18	15.1	147
34-41	76	22.7	62	52.1	138
42-49	114	34.0	31	26.1	145
Gender					
Male	219	65.4	65	54.6	284
Female	116	34.6	54	45.4	170
Marital status					
Married	287	85.7	109	91.6	396
Single	36	10.7	1	0.8	37
Widowed	9	2.7	8	6.7	17
Separated	3	0.9	1	0.8	4
Pari-ty					
One	20	6.0	14	11.8	34
Two	105	31.3	28	23.5	133
> two	188	56.1	77	64.7	265
None	22	6.6	0	0	22

4.3 Prevalence of LBP among tea pickers and non-tea pickers.

The overall prevalence of LBP was 45.4% (n=152) among tea pickers and 39.5% (n=47) among non-tea pickers (Table 4.3). The number of individuals suffering from LBP is high between the two study populations irrespective of their work ergonomics.

Table 4.3: Prevalence of Low back pain among tea pickers and non-tea pickers in JFK

	Tea pickers n=335		Non- tea pickers n=119	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Yes	152	45.4	47	39.5
No	183	54.6	72	60.5
Total	335	100%	119	100%

4.4 Association between LBP and socio-demographic characteristics of tea pickers and non-tea pickers in JFK.

Majority of those who reported to have suffered from LBP were aged 42-49 years among tea pickers 50% (n=76) and non-tea pickers 48.9% (n=23). Most males were tea pickers (61.2%) and non-tea pickers (61.7%). More than half of the tea pickers (86.8%) and non-tea pickers (91.5%) were married. Majority of both tea pickers and non-tea pickers reported to have had more than two children at 68.5% and 83% respectively. There was a significant association between age group category and LBP status among the tea pickers ($\chi 2=64.025$; $P<0.0001$; df=3) and non-tea pickers ($\chi 2=25.887$; $P<0.001$; df=3) respectively. Moreover, there was a significant association between parity and LBP status among the tea pickers ($\chi 2=8.548$; $P=0.014$; df=2) and non-tea pickers ($\chi 2=12.154$; $P=0.002$; df=2) respectively (Table 4.4).

Table 4.4: Association between Low back pain and socio-demographic characteristics of tea and non-tea pickers in JFK

	Low back pain status of the respondents						
	Tea pickers (n=335)			Non- tea pickers (n=119)			
Variable	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Total**
Age			**0.001**			**0.001**	
18-25	2 (1.3%)	14(7.7%)		0(0%)	8(11.1%)		24
26-33	28(18.4%)	101(55.2%)		8(17%)	10(13.9%)		147
34-41	46(30.3%)	30(16.4%)		16(34%)	46(63.9%)		138
42-49	76(50%)	38(20.8%)		23(48.9%)	8(11.1%)		145
Gender			0.142			0.210	
Male	93(61.2%)	126(68.9%)		29(61.7%)	36(50%)		284
Female	59(38.8%)	57(31.1%)		18(38.3%)	36(50%)		170
Marital status			0.188			0.288	
Married	132(86.8%)	155(84.7%)		43(91.5%)	66(91.7%)		396
Single	14(9.2%)	22(12%)		1(2.1%)	0(0%)		37
Widow(er)	3(2%)	6(3.3%)		2(4.3%)	6(8.3%)		17
Separated	3(2%)	0(0%)		1(2.1%)	0(0%)		4
Parity			**0.014**			**0.002**	
One	6(4.1%)	14(8.4%)		4(8.5%)	10(13.9%)		34
Two	40(27.4%)	65(38.9%)		4(8.5%)	24(33.3%)		133
>two	100(68.5%)	88(52.7%)		39(83%)	38(52.8%)		265
None	22(13.1%)	0(0%)		0(0%)	0(0%)		22

* *Significant p≤0.05*

4.5 Factors for Low back pain among tea pickers and non-tea pickers in JFK.

There was no significant relationship between LBP suffering and LBP as a result of injury between the two study populations. However, most of both tea and non-tea pickers thought that LBP was not as a result of injury at 97.4% (148/152) and 95.7% (45/47) respectively. Smoking was significantly associated with LBP between the two study groups ($\chi 2=10.914$; $P<0.0001$ tea pickers and $\chi 2=36.510$; $P<0.0001$ non-tea

pickers). However, majority of both tea pickers and non-tea pickers reported to have suffered LBP and yet they were not smoking, at 71.1% (108) and 51.1% (24) respectively. There was also significant association between LBP and alcohol uptake between tea and non-tea pickers (($\chi2$=9.061; P=0.003 and $\chi2$=36.510; P<0.0001) respectively. However, both the tea and non-tea pickers who reported to have not been drinking and had suffered LBP formed the highest proportion at 65.8% (100) and 51.1% (24) respectively. How long an individual had worked in each of the occupation was found to be related to LBP between tea pickers and non-tea pickers ($\chi2$=8.643; P=0.034 and $\chi2$=6.013; p=0.049) respectively. However, majority, 68.4% (104) of tea pickers who reported to have suffered LBP had worked for more than 2 years while majority, 55.3% (26) of non-tea pickers who reported to have suffered LBP had worked for 1-2 years. The number of hours an individual worked per day showed significant association with LBP among tea pickers only ($\chi2$=17.192; P<0.0001). However, majority of both tea pickers and non-tea pickers who reported to have suffered LBP had worked 6-8 hours per day at 88.2% (134) and 83% (39) respectively. There was a significant association between LBP and whether one thought that occupation status had caused him/her to suffer LBP between both tea pickers and non-tea pickers ($\chi2$=210.290; P<0.0001 and $\chi2$=100.949; P<0.0001) respectively. However, majority of both tea pickers and non-tea pickers reported to have suffered LBP and thought that their occupation had caused them to suffer LBP at 93.1% (134) and 95.7% (45) respectively (Table 4.5).

Table 4.5: Occupational factors for Low Back pain among tea and non-tea pickers in JFK.

	Factors for LBP						
	Tea pickers (n=335)			Non- tea pickers (n=119)			
Variable	**Yes (%)**	**No (%)**	**p-value**	**Yes (%)**	**No (%)**	**p-value**	**Total**
LBP due to injury			0.609			0.078	
Yes	4(2.6)	6(3.6)		2(4.3)	0(0)		12
No	148(97.4)	159(96.4)		45(95.7)	72(100)		424
History of LBP			0.175			0.078	
Yes	12(7.9)	8(4.4)		2(4.3)	0(0)		12
No	140(92.1)	175(95.6)		45(95.7)	72(100)		424
Smoking			0.001			0.001	
Yes	44(28.9)	26(14.2)		23(48.9)	2(2.8)		95
No	108(71.1)	157(85.8)		24(51.1)	70(97.2)		359
Alcohol uptake			0.003			0.001	
Yes	52(34.2)	36(19.7)		23(48.9)	2(2.8)		113
No	100(65.8)	147(80.3)		24(51.1)	70(97.2)		341
Work duration			0.034			0.049	
<6 months	2(1.3)	0(0)		0(0)	0(0)		2
6-12 months	2(1.3%)	12(6.6)		0(0)	4(5.6)		18
1-2 yrs	44(28.9)	58(31.7)		26(55.3)	26(36.1)		154
>2 yrs	104(68.4)	113(61.7)		21(44.7)	42(58.3)		280
Hours work/day			0.001			0.150	
5 hours	2(1.3)	4(2.2)		0(0)	0(0)		6
6-8 hrs	134(88.2)	127(69.4)		39(83)	66(91.7)		366
>8 hrs	16(10.5)	52(28.4)		8(17)	6(8.3)		82
Occupation caused LBP suffering			0.001			0.001	
Yes	134(93.1)	22(12.2)		45(95.7)	2(2.9)		203
No	10(6.9)	159(87.8)		2(4.3%)	68(97.1)		239

Significant p≤0.05

4.6 Work ergonomics as factors for low back pain among tea and non-tea pickers

The number of kilograms of tea leaves picked and the number of kilos carried per day was also significantly associated with LBP ($\chi2$=16.882; P<0.0001 and $\chi2$=15.978; P<0.0001) respectively. However, majority reported to have harvested between 20-50kgs and carried approximately 12kgs of green leaves per basket at 55.9% (85) and 68.4% (104) respectively. In regards to how one carried tea leaves to the nearest collection point, majority of whom reported to have suffered from LBP carried packed bags of green leaves to the weighing bays on their backs. However, there was no significant association between LBP and how the baskets were carried. There was a significant association of LBP with carrying of heavy load and how one sharpened farm tools among the non tea pickers who reported to have suffered LBP ($\chi2$=13.129; P<0.0001 and $\chi2$=4.125; P=0.042) respectively (Table 4.6).

Table 4.6: Work ergonomics as factors for low back pain among tea and non-tea pickers in JFK.

	Factors for LBP						
	Tea pickers (n=335)			Non- tea pickers (n=119)			
Variable	**Yes (%)**	**No (%)**	**P-value**	**Yes (%)**	**No (%)**	**P-value**	**Total**
Kgs of leaves/day			0.001			-	
12-20kg	4(2.6)	6(3.3)		-	-		10
20-50kg	85(55.9)	139(76)		-	-		224
>50kgs	63(41.4)	38(20.8)		-	-		101
Kgs carried			0.001			-	
<12 kg	2(1.3)	0(0)		-	-		2
12kgs	104(68.4)	149(82.3)		-	-		253
12-20kg	46(30.3)	28(15.5)		-	-		74
>20 kg	0(0)	4(2.2)		-	-		4
Basket carriage			0.252			-	
Head	2(1.3)	4(2.2)		-	-		6
Trolley	2(1.3)	0 (0)		-	-		2
Back	148(97.4)	179(97.8)		-	-		327
Collection distance			0.184			-	
100 m	32(21.1)	50(27.3)		-	-		82
>100m	120(78.9)	133(72.7)		-	-		253
Carry heavy load			-			0.001	
Yes	-	-		41(87.2)	40(55.6)		81
No	-	-		6(12.8)	32(44.4)		38
If yes, how is carried			-			0.736	
Trolley	-	-		2(4.9)	4(9.1)		6
Shoulder	-	-		30(73.2)	30(68.2)		60
Back	-	-		9(22)	10(22.7)		19
Sharpen tools			-			0.042	
Yes	-	-		47(100)	66(91.7)		113
No	-	-		0(0)	6(8.3)		6

Significant p≤0.05

4.7 Multivariate analyses

Binary logistic regression was done on variables that were found to be significant at bivariate level, to determine the factors that predict LBP among tea pickers and non-tea pickers (Table 4.7). Age (P<0.0001; 95% CI 0.18-0.508), hours worked per day (P<0.0001; 95% CI 4.623-42.808) and perception that occupation causes LBP (P<0.0001; 95% CI 29.152-237) was found to independently contribute to LBP suffering among tea pickers only.

Table 4.7: Predictors of LBP among tea pickers and non-tea pickers in JFK.

	Tea pickers		**Non-tea pickers**	
Variable	**P value**	**95% CI**	**P value**	**95% CI**
1. 1.Age in years	P<0.0001*	0.18-0.508	-	-
2. 3.Hours worked per day	P<0.0001*	4.623-42.808	-	-
3. 4.Occupation status has caused LBP suffering	P<0.0001*	29.152-237.0	-	-

* *Significant p≤0.05*

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the results of this study in comparison with previous studies with particular emphasis on the significant findings as depicted in chapter four.

5.2 Discussion

Few studies to assess the risk factors for LBP among tea pickers and non-tea pickers in developing countries including Kenya have been documented. Therefore, there is not much literature information regarding the prevalence/epidemiology of LBP among tea and non-tea pickers in developing countries as it has not been well documented. However, other studies have been carried out in other populations/subjects.

5.3 Socio-demographic characteristics of tea plantation workers

In a study conducted in Rwanda at Kanombe Hospital among 133 nurses to determine the relationship between LBP and physical activity levels revealed that majority of nurses were married (74.6%) and reported a higher prevalence of LBP (84%) (Lela & Frantz, 2012). These study findings are in agreement with the current study that reported that more than half of both tea pickers and non-tea pickers were married at 85.7% and 91.6% respectively. Lela & Frantz, (2012), also reported that the participants' ages ranged between 24-54 years, with a mean age of 34.5 years (SD = 6.8) while the present study revealed that a total of 454 participants with a mean age ± SD 36.6±0.9 years) were enrolled and aged 18-49 years. This discrepancy is due to different study populations studied, different cadres and different geographical setting.

The present study that investigated the general characteristics of the respondents showed that majority, 38.5% of tea pickers were aged between 26-33 years while slightly half of non-tea pickers 52.1% were aged 34-41 years. These results were not in agreement with the previous study (Tomita *et al.,* 2010) which reported that most of the Thai workers who were interviewed were aged ≥ 40 years making 41.2% (n=35) whereas majority of Myanmar workers were aged < 30 years representing 80% (n=64).

5.4 Prevalence of LBP among tea plantation workers in JFK.

In a study conducted in Rwanda at Kanombe Hospital among 133 nurses to determine the relationship between LBP and physical activity levels found a one year prevalence of 78% and a week's prevalence of 53% (Lela & Frantz, 2012). These study findings are not in agreement with the current study that reported a point prevalence of 45.4% and 39.5% among tea pickers and non-tea pickers respectively. The difference was as a result of different methods that were used between the two studies.

In a Nigerian study, Birabi *et al.* (2012), the prevalence of LBP among peasant farmers was found to be high (67.1%). LBP was prevalent in the 31-40 years age bracket (49.04%) and least in the 51-60 years age group (7.70%). This result is not in agreement with the present study that found a point prevalence of 45.4% and 39.5% among tea pickers and non-tea pickers respectively while LBP was prevalent in the age bracket of 42 years and above among tea pickers and non-tea pickers at 50% and 48.9% respectively. The prevalence variation could be attributed to a lack of uniformity in the descriptions of LBP by the researchers, sampling techniques or sample size. This may also be attributed to personal factors related to work, such as high work stress, low job satisfaction, financial constraints, health-related problems, low social class and worries about the future, all of which have been linked with LBP in a previous study (Shehab *et al.,* 2003). The prevalence variation may also be due to the differences in the study

populations, farming methods or the relative presence of physical, psychosocial and individual risk factors for LBP (Childs *et al.,* 2004; Solecki, 2011).

In another study by Mirbod *et al.* (1997) who reported LBP among different groups of subjects exposed to hand arm transmitted vibration. The former study revealed the prevalence of LBP was high among female strawberry farmers (84.0%, 95% CI=73.8-94.2%), followed by the female green tea farmers (63.0%, 95% CI=44.8-81.2%). The prevalence of LBP in the female strawberry farmers was even higher than the males doing the same job, but the figure among the female green tea farmers was lower than the male farmers engaged in green tea production. In the present study the most affected gender in terms of prevalence were males between the two study populations (tea pickers and non-tea pickers) at 61.2% and 61.7% respectively as compared to females at 38.8% and 38.3% respectively. The results of the former study are inconsistent with the present study that recorded a point prevalence of 45.4% and 39.5% among tea pickers and non-tea pickers respectively. The discrepancy may be due to different sample size sampled and different study populations in different geographical areas among the two study groups.

Moreover, LBP was more prevalent among males at 61.2% (93) and 61.7% (29) among tea pickers and non-tea pickers respectively in this study as compared to a study by Birabi *et al.,* 2012, who reported LBP among peasant farmers in a rural community in South Nigeria and found out that LBP was prevalent among females (50.96%). This is consistent with reports that female sex increases the risk of LBP (Shehab *et al.,* 2003). However other studies have found no such association (Gilgil *et al.,* 2005).

In this study, point prevalence was investigated between tea pickers and non-tea pickers hence the prevalence of LBP was found to be high. The point prevalence was 45.4% and 39.5% among tea pickers and non-tea pickers respectively. However, this study was not in agreement with a Kenyan study that reported the prevalence of back pain at 64%

among the tea pickers. Moreover, of these, 29 % had a history of back pain before they started picking tea. Furthermore, they found out that 35 % of the workers developed back pain due to occupational exposure to tea picking (Muruka, 1997).

In Brazil, (Ferreira *et al.,* 2011) reported a 63.1% (95%CI 59.9 to 66.1) period prevalence of back pain at least once in the 12 months prior to the interview among adults. These results are in discrepancy with this study that found a 45.4% (152/454) and 39.5% (47/119) point prevalence among tea pickers and non-tea pickers respectively. The discrepancy is due to different populations in different occupation studied and the differences in prevalence's that were being investigated at the time. In a previous study (Tomita *et al.,* 2010) that assessed the prevalence and risk factors of LBP among Thai and Myanmar sea food processing factory workers, investigated both point and period prevalence. The point prevalence, 7-d prevalence, and 12-months prevalence were 28.5% (47/165), 32.1% (53/165) and 44.8% (74/165) respectively among the general population. However, the point prevalence, 7-d prevalence, and 12-months prevalence were 42.4% (36/85), 47.1% (40/85) and 68.2% (58/85) respectively among Thai workers whereas the point prevalence, 7-d prevalence, and 12-months prevalence were 13.8% (11/80), 16.3% (13/80) and 20% (16/80) respectively among Myanmar workers. These results are inconsistent with this study due to different study populations of different nationality. Furthermore, there was disagreement between the two studies due to different occupational settings.

5.5 Factors associated with Low Back Pain among tea plantation workers

Risk factors that have been found to biologically predispose women to LBP include: pregnancy, young maternal age at first birth, duration of oral contraceptive use and use of estrogens during menopause, all of which result in hormonal changes responsible for a global laxity in the muscles and ligaments of the back, compromising the stability of the spine (Wijnhoven *et al.,* 2006). Socio-cultural factors also play some part in the high

prevalence of LBP among female farmers and other workers since they are mostly involved in doing domestic chores.

In a Nigerian hospital based study, the point prevalence of LBP was found to be higher amongst men compared to women (50.3% vs. 44.4%), but without statistical significance ($\chi 2=1.586$, P= 0.208) (Ogunbode *et al.,* 2013). These study findings were in agreement with the present study.

In this study there was a gradual increase in prevalence of LBP with age for both the tea pickers and non tea pickers with the highest prevalence reported at the age bracket of 42-49 years for both groups. Furthermore, the present study showed that there was a statistical significance of LBP with age ($\chi 2=64.025$; P<0.0001). However, the above findings contradict the findings of Ogunbode *et al.* (2013) who recorded the prevalence of LBP gradually increases with age: from 44.9% for respondents younger than 30 years to 55.6% for the age group 51-60 years. The same study findings concluded that there was no statistical association between the prevalence of LBP and age ($\chi 2 = 3.007$, P=0.558).

Lela & Frantz, (2012), demonstrated that there was significant relationship between LBP and gender (P<0.0001) and marital status (P=0.020). This result is not in tandem with the present study revealed that age among tea pickers was statistically significant (P<0.0001; 95% CI 18-0.508).

Birabi *et al.* (2012), reported that age and years of farming practice was significantly associated with LBP respectively (P< 0.0001; P< 0.0001). This result is consistent with the present study that found age among tea pickers to be statistically significant (P<0.0001; 95% CI 18-0.508) despite different study populations studied.

In addition, this study was not consistent with the previous study conducted by Tomita *et al.* (2010) that found out that LBP was independently associated with older age of ≥ 40

years, perception of health status, history of back injury, twisting posture at work, and slipping on wet floor. The discrepancy between the two studies was as a result of differences in study populations studied, different geographical locations, different variables investigated and different cadres of the two populations.

The study was carried within some limitations: the study relied on self reported low back pain, the participants may not have reported all the incidences; the prevalence and occupational risk factors for low back pain among tea plantation workers was assessed at particular point in time regardless of what may have preceded.

5.6 Conclusion

1. The socio-demographics factors that were found to be statistically significant include: age and parity among both tea and non-tea pickers.
2. The prevalence of LBP was found to be high among tea pickers and non-tea pickers, 45.4% and 39.5% respectively as compared to the global annual prevalence of 38%.
3. Age; number hours worked per day; perception that occupation causes LBP suffering and the quantity of green tea leaves carried were found to be statistically significant among tea pickers while among non-tea pickers no variable was found to predict LBP.

5.7 Recommendations

1. The result of the present study should provide substantial information that lead to the adherence of Occupational Safety and Health Act of 2007 and standards (code of practice) in the tea industry by the Kenya Bureau of Standards (2015) in order to minimise LBP suffering among tea and non-tea pickers.
2. There is need for more studies that involves the elucidation of risk factor analysis of LBP and prevalence of LBP. Future prospective studies should also consider

expanding the sample size to include the entire tea sector in the country especially the multinational companies and small scale sector.

3. The number of hours an individual works per day had shown to be significant among the tea pickers and the non tea pickers, hence there is need to reduce the number of hours an individual works per day in this tea farms. For the tea pickers the green tea collection baskets that weighs around 12kgs when full should not be carried on their backs instead they should use trolleys to transport them if not so the should used baskets that carries less than 12kg of picked green tea leaves. For the non tea pickers they should be advised to sharpen their farm tools.
4. Tea pickers and the non-tea pickers should be enlightened on the risk factors for low back pain among both tea pickers and the no-tea pickers. This can be done through organization of trainings and seminars.
5. The study design was a cross-sectional survey, thus giving prevalence of low back pain at a point in time without a sequence of events. Therefore, there is need for a longitudinal study which will investigate low back pain among tea plantation workers over a period of time.
6. Most of the data reported mainly relied on self-reported surveys (self reported questionnaires). Self-reported data, despite being valid it may underestimate the prevalence of low back pain. Future research should focus on the inclusion of measurements and observations are required so that period prevalence can be reported.

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APPENDICES

APPENDIX 1: Informed Consenting Form

Title of the study: Occupational factors for low back pain among tea plantation workers of James Finlay (K) Limited in Kericho County.

List of investigators

Langat Charles Kiprotich- Principal Investigator

Prof. Charles Mbakaya- Co-investigator

Dr. Christine Bii- Co-investigator

Dr. Evaristus Opondo- Co-investigator.

Introduction

Hallo. I am Langat Charles, from Jomo Kenyatta University of Agriculture and Technology. This information form seeks informed consent for your participation in a study that seeks to determine occupational risks factors for low back pain among tea pickers and non-tea pickers in JFK tea estates, Kericho County.

Purpose

This study is being done to:

1. To determine the socio-demographic characteristics of the tea pickers and non-tea pickers in James Finlay (K) Limited (JFK) in Kericho County.
2. To determine the prevalence of low back pain among the tea pickers and the non-tea pickers in James Finlay (K) Limited (JFK) in Kericho County.

3. To determine the occupational factors for low back pain among tea pickers and the non-tea pickers in James Finlay (K) Limited (JFK) in Kericho County.

Procedure

If you agree to participate in this study, you will receive an identification number. A trained interviewer will ask you several questions on risks concerning your occupation. The questions will be about your work environment, medical history and socio-demographic characteristics.

Risks/ Discomforts

This study does not have any physical risks though there could be a minor invasion to your privacy when sensitive questions are being asked.

Benefits

You will benefit from the study by learning more on the occupational risk factors of Low Back Pain and the information you give will help in understanding the occupational risks in your work places so that you can get the best advice on addressing this occupational risk and more so on how to minimize this risks.

Alternatives to participation

If you decide not to take part in this study no one will force you to, so you will be free to make your own decision. You can also choose to take part in any other studies in future.

Confidentiality

Any information you provide during the study will be kept strictly confidential. Your name will not appear on any study document and instead, you will be given an identification number.

Voluntariness

Your participation in this study, which may be in the form of an interview or group discussion, is completely voluntary. You are free to choose whether or not to participate in this study. You are also free to withdraw from the study at any time you wish to do so.

Who to contact

You are encouraged to ask any questions to clarify any issues at any time during your participation in the study. If you need more information on the study, you will contact the following persons:

Name	**Contacts**	**Institution**	**Email address**
Charles Langat	0729232524	Jkuat	langcha201@gmail.com
Dr. Opondo	0722475767	Jkuat	dropondo@yahoo.co.uk
Dr. Christine Bii	0721224351	Kemri	biichristine@gmail.com
Prof. Charles Mbakaya	0722846964	Rongo	cmbakaya@hotmail.com

You can also contact KEMRI Ethical Review Committee office using the landline number which is 0202722541 or through the email address ercadmin@kemri.org

Participant's declaration

I have read and understood the study information. I have been given the opportunity to ask questions about the study. I understand that my taking part is voluntary; I can withdraw from the study at any time and I will not be asked any questions about why I no longer want to take part. I understand my personal details will be kept private. I hereby consent to participate in the study as has been explained and as I have understood.

Participants' name: .....

Participants' signature: .....

Date: .....

Researcher's name: .....

Researcher's signature: .....

Date: .....

APPENDIX 2: Fomu ya Kuomba Ridhaa

Kichwa cha utafiti: Kiwango cha maambukizi ya hatari na taaluma ya ugonjwa wa kuumwa na mgongo miongoni mwa wafanyi kazi wa majani chai katika kampuni ya James Finlay (K) Limited ambalo liko Kaunti ya Kericho.

Orodha ya watafiti

Mr. Langat Charles Kiprotich- Mtafiti mkuu

Prof. Charles Mbakaya- Mtafiti Mzaidizi

Dr. Christine Bii- Mtafiti Mzaidizi

Dr. Evaristus Opondo- Mtafiti Mzaidizi

Utangulizi

Hujambo, kwa majina ni Langat Charles, kutoka chuo Kikuu cha Jomo Kenyatta Kilimo na Teknolojia.Fomu hii ina habari inayoomba ridhaa yako ili ushiriki kwenye utafiti utakaofanywa ili kuamua kiwango cha maambukizi ya hatari na taaluma ya ugonjwa wa kuumwa na mgongo miongoni mwa wachuma majani chai na wasiochuma majani chai katika mashamba makubwa ya majani chai ya JFK Kericho.

Madhumuni

Utafiti huu utafanywa ili:

1. Kuamua mambo ya kijamii kidemografia ya wachuma majani chai na wasiochuma majani chai katika mashamba makubwa ya majani chai ya JFK Kericho.

2. Kuamua kiwango cha maambukizi ya ugonjwa wa kuumwa na mgongo miongoni mwa wachuma majani chai na wasiochuma majani chai katika mashamba makubwa ya majani chai ya JFK Kericho.
3. Kuanzisha taaluma ya hatari ya ugonjwa wa kuumwa na mgongo miongoni mwa wachuma majani chai na wasio chuma majani chai katika mashamba makubwa ya majani chai ya JFK Kericho.

Utaratibu

Ukikubali kushiriki kwenye utafiti huu utapata namba yako ya kitambulizi halafu mtu ambaye amehitimu atakuuliza maswali kadhaa juu ya hatari kuhusu kazi yako. Maswali itakuwa juu ya mazingira ya kazi yako, historia ya matibabu na tabia za kijamii kidemografia na sifa kuhusiana na kuumwa kwa mgongo.

Madhara au changamoto

Utafiti huu hauna hatari zozote za kimwili, ila tu kutakuwa na uvamizi wa mambo madogo ya kibinafsi wakati wa kuulizwa maswali magumu.

Manufaa

Utanufaika kushiriki utafiti huu kwa kujifunza mengi kuhusu mambo ya taaluma ya hatari ya kuumwa na mgongo na habari utakayotupatia itasaidia katika kuelewa hatari ya kazi katika maeneo ya kazi yako ili uweze kupata ushauri bora katika kushughulikia hatari hii ya kazi na zaidi ya hivyo juu ya jinsi ya kupunguza hatari hizi.

Njia mbadala za kushiriki

Ukiamua kutoshiriki utafiti huu hakuna mtu yeyote ambaye atakulazimisha kufanya hivyo, kwa hivyo utakuwa huru kufanya uamuzi wako mwenyewe na pia utajichagulia kushiriki kwenye utafiti mwingine wa siku zijazo.

Usiri

Habari yoyote ile utakayotupatia wakati wa utafiti huu utawekwa kwa siri kikamilifu. Jina lako halitajulikana popote bali tu utapatiwa namba yako ya kitambulizi.

Hiari

Ushirikiano wako kwenye utafiti huu ambao utakuwa kwa njia ya mahojiano ya moja kwa moja ni kujitolea kwa hiari yako. Utakuwa huru kuchagua kama utashiriki au kutoshiriki utafiti huu pia, utakuwa huru kujiondoa kwenye utafiti huu wakati wowote utakaotaka.

Nani wa kuwasiliana naye.

Unashauriwa kuuliza maswali yoyote ilikubaini maswala yote yanayoibuka wakati wa kushiriki kwenye utafiti. Kama utahitaji habari au mambo mengine kuhusu utafiti huu utawasaliana na watu wafutayo:

Majina	**Mawasiliano**	**Taasisi**
Bwana Charles Langat	0729232524	Jkuat
Dr. Opondi	0722475767	Jkuat
Dr. Christine bii	0721224351	Kemri
Prof. Charles Mbakaya	0722846964	Rongo University

Pia unaweza wasiliana na Ofisi ya taasisi ya utafiti KEMRI kupitia nambari ya simu ambayo ni 0202722541 au barua pepe ercadmin@kemri.org

Mkataba

Nimesoma na nimeelewa habari inayohusiana na utafiti huu. Nimepatiwa nafasi kuuliza maswali yanayohusiana na utafiti huu. Nimeelewa kwamba kushiriki kwangu ni wa kujitolea kwa hiari na ninaweza kujiondoa kwenye utafiti wakati wowote na sitaulizwa maswali kama vile mbona haushiriki tena kwenye utafiti. Ninaelewa kuwa mambo yanayonihusu yatawekwa kwa siri kikamilifu kwa hivyo nimekubali kushiriki kwenye utafiti huu kama vile nimeelezwa na kuelewa.

Jina la mshiriki: .....

Sahihi ya mshiriki: .....

Tarehe: .....

Jina la mtafiti: .....

Sahihi ya mtafiti: .....

Tarehe: .....

APPENDIX 3: Questionnaire

Interview guide: to determine the occupational factors for low back pain among tea plantation workers in James Finlay (K) Limited, Kericho County.

Respondent No ……

Social demographic characteristics (Both tea pickers and non Tea pickers) *(Tick where appropriate).*

1. Age in yrs……...

2. Gender: Male (1) Female (2)

3. Marital status: Married (1) Single (2) Widowed (3) Separated/ Divorced (4)

4. How many children do you have within the family?

One (1) Two (2) more than 2 (3)

Medical history (Both tea pickers and non-tea pickers)

5. Have you ever been diagnosed with low back pain? Yes (1) No (2)

6. If yes, for how long have you been suffering from low back pain?

Less than 3 months (1) 6-12 months (2)

12months and above (3) others (specify)……..

7. Are you under Treatment? Yes (1) No (2)

8. If yes for how long have you been taking the Treatment……...?

9. Have you absented yourself from work due to low back pain? Yes (1) No (2)

10. Do you think you current lower back pain could be a result of an injury/ fall?

Yes (1) No (2)

11. Do you or your family members have arthritis or other diseases that might affect the spine? Yes (1) No (2)

12 Have you ever had back surgery before? Yes (1) No (2)

13. Do you smoke? Yes (1) No (2)

14. If yes, for how long have you been smoking?

Rarely (1) (2) Regularly Sometimes (3)

15. Do you drink alcohol? Yes (1) No (2)

16. If yes, for how long have you been drinking?

Frequently (1) Once in a while (2)

17. How far is the nearest health facility?

Less than one km (1) 2-3 Km (2) 4-5 Km (3) More than 5 Km (4)

18. How much do you pay to get to the nearest health facility?

Ksh 10- 20 (1) Ksh 30- 50 (2) Ksh 60 and above (3)

Work environment (both tea pickers and non-tea pickers)

19. Do you normally pick tea in this tea estate? Yes (1) No (2)

20. If yes, how do you normally pick tea? Hand picking (1) Machine picking (2)

21. If no, what type of manual work do you do?

Spraying (1) Weeding (2) others (3) (specify)……

22. How long have you been in the above occupation?

6-12 months (1) 1-2 years (2) 2 years and above (3)

Others (4) (specify)……

23. How many hours do you work per day?

3hours (1) 5hours (2) 6-8 hours (3) 8hours and above (4)

24. Do you take a break in your work place? Yes (1) No (2)

25. When not working what do you normally do?

Fetching water (1) cooking (2) Fetching firewood (3) washing (4)

26. Where do you fetch water?

Nearby river (1) tap water (2) Well (3) others (4)……

27. In your own opinion do you think your occupation has caused you to suffer from Low back pain? Yes (1) No (2)

(Tea pickers only-tick where appropriate)

28. How many kilograms in total of green leaves do you pick per day?

12-20kg (1) 20 -50kg (2) 50kg and above (3)

29. Approximate how many kg of green picked tea do you carry in this basket?

10kg (1) 12-20kg (2) 20kg and above (3) others (specify) ……

30. How do you carry this picked tea to the weighing bays?

Head (1) Trolley (2) Back (3)

31. If on the head or back how do you lift these heavy bags to your head or your back?

Lifting by yourselves (1) assisted by a friend (2)

32. How far are the weighing bays?

100 Metres away (1) 200-500 Metres away (2) 500 and above (3)

Others (specify)…….

(Only non-tea pickers-tick where appropriate)

33. Do you normally carry heavy load? Yes (1) No (2)

34. How do you carry such heavy load?

Pushing trolley (1) pulling the trolley (2) carrying it on your shoulder (3) carrying it on your back (4) carrying it on your head (5)

35. Apart from carrying heavy loads what other duties do you perform?

Uprooting/ clearing weeds (1) digging up of stumps (2)

36. Do you normally sharpen your farm tools e.g. jembes and pangas?

Yes (1) No (2)

37. What posture do you normally work from? Stooping (1) working while standing (2) sitting down (3) both standing and bending (4)

38. Are you sometimes forced to do any of the above for a long period of time?

Yes (1) No (2)

39. If yes approximately how long can you stay in that position without changing?

30 minutes(1) 30-60 minutes(2) more than one hour(3) others specify……...

APPENDIX 4: Kidadisi

Mahojiano ya moja kwa moja ili Kuchunguza hatari zinazohusishwa na ugonjwa wa kuumwa na mgongo miongoni mwa wafanyi kazi was majani chai katika mashamba makubwa ya James Finlay (K) Limited katika Kaunti ya Kericho.

Nambari ya mshiriki ……

Mambo ya kijamii kidemografia (wachuma na wasiochuma majani chai)

1. Umri kwa miaka…….

2. Jinsia: Mume (1) Kike (2)

3. Hadhi ya ndoa: ako kwenye ndoa (1) Kapera (2)mjane (3) aliyetengana/ taliki (4)

4. Je uko na watoto wangapi katika familia yako:

Moja (1) wawili (2) zaidi ya wawili (3)

Historia ya matibabu

5. Je, umewahi tibiwa kutokana na ugonjwa wa kuumwa na mgongo?

Ndio (1) La (2)

6. Kama ndio, je umekuwa ukiugua kwa muda gani?

Chini ya miezi 3 (1) miezi 6-12 (2) Miezi 12 au zaidi (3)

Mengine (elezea)……

7. Je unatumia dawa ya maumivu ya mgongo? Ndio (1) La (2)

8. Kama jibu lako ni ndio, kwa muda gani umekuwa ukitumia dawa……?

9. Je umewahi kosa/ kutoka kwa kazi kutokana na maumivu ya mgongo?

Ndio (1) La (2)

10. Unafikiri maumivu yako ya mgongo inaweza kuwa ni matokeo ya kuumia ama kuanguka?

Ndio (1) La (2)

11. Je, wewe au familia yako huwa na historia ya arthritis au magonjwa mengine ambayo yanaweza kusababisha kuumwa kwa mgongo?
Ndio (1) La(2)

12.Umewahi fanyiwa upasuaji wa mgongo kabla? Ndio (1) La (2)

13. Je unavuta sigara? Ndio (1) La (2)

14. Kama ndio,kwa muda gani umekuwa ukivuta sigara?

Kila mara (1) mara nyingi (2) mara moja kwa wakati (3)

15. Je unakunywa pombe? Ndio (1) La (2)

16. Kama ndio ni kwa muda gani umekuwa ukinywa pombe?

Mara nyingi (1) Mara moja kwa wakati (2)

17. Kituo cha afya iliyo karibu iko umbali gani?

Chini ya kilomita 1 (1) 2-3 Kilomita (2) 4-5 Kilomita (3) Zaidi ya kilomita 5 (4)

18. Je unalipa nauli kiasi gani kufika kituo cha afya ya karibu?

shillingi 10- 20 (1) Shilingi 30- 50 (2) Shilingi 60 na zaidi (3)

Mazingira ya Kazi (wachuma na wasiochuma majani chai)

19. Je kwa kawaida we huchuma majani chai kwa hii kampuni? Ndio (1) La (2)

20. Kama ndio ni jinsi gani kwa kawaida hutumia kuchuma majani chai kwa hii kampuni? Kuchuma kwa kutumia mikono (1) kutumia mashine kuchuma (2)

21. Kama La ni kazi kani unafanya kwa hii kampuni?

Kunyunyisa dawa(1) kupalilia (2) mengine elezea……(3)

22. Je kazi yenye umetaja hapo juu umekuwa ukifanya kwa muda gani?

Miezi 6-12 (1) Miaka 1-2 (2) Miaka 2 kwenda juu (3) Mengine (elezea)……

23. Ni masaa mangapi huwa unafanya kazi kwa siku?

Masaa 3 (1) Masaa 5 (2) Masaa 6-8 (3) Masaa 8 na zaidi (4)

24. Je, huwa kuna mapumziko katika mahali pa kazi yako? Ndio (1) La (2)

25. Wakati unapumzika kwa kazi yako ya kawaida huwa kwa kawaida unafanya?

Kuchota maji (1) kupikia (2) Kuchanja kuni (3) kuosha (4)

26. Unachota maji wapi ya kutumia chumbani kuchota maji?
Mto iliyo karibu (1) maji ya bomba (2)

27. Kwa maono yako unafikiria kuumwa kwa mgongo kwako kunasababishwa na kazi unaofanya Ndio (1) La (2)

Wachuma majani chai

28. Ni takriban kilo ngapi ya majani chai huwa kwa kawaida hubepwa kwa kikabu?

Kilo 12 (1) kilo 12-20 (2) Kilo 20 na zaidi (3)Mengine (elezea) …….

29. Kwa jumla ni kilo ngapi ya majani chai unaweza chuma kwa siku?

Kilo 12-20 (1) kilo 20 -50 (2) Kilo 50 na zaidi (3)

30. Jinsi gani unaweza beba majani chai ambayo umechuma mpaka mahali unaweza pima? Kwa kichwa (1) kitoroli (2) Kwa mgongo (3)

31. Kama juu ya kichwa ama kwa mgongo ni jinsi gani unaweza kuinua mifuko hizi nzito kwa kichwa ama mgongo?

Kuinua kwa wenyewe (1) ukisaidiwa na rafiki (2)

32. Ni jinsi wa umbali wa kilomita ngapi unaweza enda kupima majani chai?

Mita 100 mbali (1) mita 200-500 mbali (2) Mita 500 na zaidi (3)

Mengine (elezea)……

Wasiochuma majani chai

33. Je, wewe kawaida unabeba mzigo mzito? Ndio (1) La (2)

34. Jinsi gani unaweza beba mzigo nzito?
Kusukuma kitoroli (1) kuvuta kitoroli (2) kubeba begani wako (3) kubeba kwa mgongo (4) kubeba kwa kichwa chako (5)

35. Mbali na kubeba mizigo mizito nini majukumu mengine huwa kwa kawaida hufanya wewe?

Kung'oa magugu (1) kuchimba hadi ya mashina (2)

36. Je, wewe kawaida huwa unaimarisha zana za kilimo kwa mfano jembe na panga?

Ndio (1) La (2)

37. Je, kwa kawaida unafanya kazi ukiwa na mkao gani?

Kuinama (1) kufanya kazi wakati umesimama (2) kuketi chini (3) yote (4)

38. Je, wakati mwingine unalazimika kufanya kazi kwa mkao yoyote ya hapo juu kwa kipindi cha muda mrefu? Ndio (1) La (2)

39. Kama ndiyo takriban muda gani unaweza kukaa kwa mkao hiyo bila ya kubadilisha?

Dakika 30 (1) 30-60 dakika (2) zaidi ya saa moja (3) mengine elezea kwa bayana .....

APPENDIX 5: Ethical Review Committee Approval

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel (254) (020) 2722541, 2713349, 0722-205901, 0733-400003; Fax: (254) (020) 2720030
E-mail: director@kemri.org info@kemri.org Website:www.kemri.org

KEMRI/RES/7/3/1 **August 27, 2013**

TO: **LANGAT CHARLES KIPROTICH (PRINCIPAL INVESTIGATOR)**

THROUGH : **DR CHARLES MBAKAYA**
ACTING DIRECTOR, CPHR
NAIROBI

Forwarded 30/08/2013

Dear Sir,

RE: **SSC PROTOCOL NO. 2564 (*RESUBMISSION*): PREVALENCE OF AND OCCUPATIONAL RISK FACTORS OF LOW BACK PAIN AMONG TEA PICKERS AND NON-TEA PICKERS IN TEA ESTATES OF JAMES FINLAY (K) LTD IN KERICHO COUNTY**

Reference is made to your letter dated 20th August, 2013. The ERC Secretariat acknowledges receipt of the revised proposal on August 22, 2013.

This is to inform you that the Ethics Review Committee (ERC) reviewed the document listed above and is satisfied that the issues raised at the 217th meeting held on 23rd July, 2013 have been adequately addressed.

The study is granted approval for implementation effective this **27th day of August 2013**. Please note that authorization to conduct this study will automatically expire on **August 26, 2014**. If you plan to continue with data collection or analysis beyond this date, please submit an application for continuing approval to the ERC Secretariat by **July 15, 2014**.

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

You may embark on the study.

Yours faithfully,

Dr. ELIZABETH BUKUSI,
ACTING SECRETARY,
KEMRI ETHICS REVIEW COMMITTEE

APPENDIX 6: Scientific Steering Committee Approval

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
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ESACIPAC/SSC/101837

2nd July, 2013

Charles Lang'at

Thro'
Director, CPHR
NAIROBI

forwarded 4/7/13

REF: SSC No. 2564 (Revised) – Occupational risk of low back pain among tea pickers and non-tea pickers in James Finlay (K) Ltd tea estates in Kericho, 2013

Thank you for your letter dated 28th June, 2013 responding to the comments raised by the KEMRI SSC.

I am pleased to inform you that your protocol now has formal scientific approval from SSC.

The SSC however, advises that work on the proposed study can only start after ERC approval.

Sammy Njenga, PhD
SECRETARY, SSC

Encl(s)

In Search of Better Health

APPENDIX 7: Publication

Charles K. Langat, Christine Bii, Evaristus Opondo and Charles F. Mbakaya. Occupational risk factors of Low Back Pain among tea pickers and non-tea pickers in James Finlay (K) Limited, Kericho County, Kenya.