LEVELS OF PREGNANCY PHYSICAL ACTIVITY AMONGST PREGNANT WOMEN WITH MUSCULOSKELETAL DISORDERS ATTENDING ANTENATAL CLINICS AT SELECTED REFERRAL HOSPITALS IN NAIROBI, KENYA

DICKSON OKUMU AGUTU

MASTER OF SCIENCE

(Physiotherapy)

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Levels of Pregnancy physical activity amongst Pregnant Women with Musculoskeletal Disorders attending Antenatal Clinics at selected Referral Hospitals in Nairobi, Kenya

Dickson Okumu Agutu

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DECLARATION

This thesis is my original work and that it has never been presented for a degree or any other University

Signature…… .Date…….

Dickson Okumu Agutu

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

Signature…….Date…….

Dr. Nassib Tawa, PhD

JKUAT, Kenya

Signature…….Date…….

Dr. Joseph Mwangi Matheri, PhD

JKUAT, Kenya

Signature…….Date…….

Prof. Evaristo Opondo. PhD

JKUAT, Kenya

DEDICATION

This thesis is dedicated to my parents Mr. Jeremiah Agutu Yiembe and Mrs. Anjelina Odhiambo Agutu for their continuous encouragement in matters pertaining to education and my loving family Josephine, Avin and Gordon for being my pillar of strength in all my endeavors.

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ABBREVIATIONS AND ACRONYMS

ACOG - American College of Obstetricians and Gynecologists

ADL - Activities of Daily Living

ANC - Antenatal Clinic

CTS - Carpal Tunnel Syndrome

ICC - Interclass Correlation Coefficient

KNH - Kenyatta National Hospital

LMIC - Low- and Middle-Income Countries

LPP - Lumbar Pelvic Pain

MDG - Millennium evelopment Goal

MDH - Mbagathi District Hospital

METs - Metabolic Equivalent of Tasks

MHS - Maternal Health Services

MPDSR - Maternal and Perinatal Death Surveillance and Response policy

MSDs - Musculoskeletal Disorders

NACOSTI - National Commission for Science, Technology and Innovation

NMQ - Nordic Musculoskeletal Questionnaire

PA - Physical Activities

PGP	-	Pelvic Girdle Pain
PPAQ	-	Pregnancy Physical Activity Questionnaire
SPSS	-	Statistical Package for the Social Sciences

DEFINITION OF TERMINOLOGIES

Active Lifestyle is a lifestyle that involves intense physical activity that involves getting up and moving parts of the body. It includes exercise such as walking or lifting weights. It also includes playing sports (Severynse, [Ed.], 2002).

Antenatal Clinic A setup involved in screening both the mother and baby for potential conditions that can affect pregnancy.

Carpal Tunnel Syndome a painful condition of the wrist, hand and fingers in pregnancy; caused by compression of the median nerve where it passes over the carpal bones through a passage (carpal tunnel) at the front of the wrist. The increased fluid retention triggered by pregnancy hormone, causes swelling in the hands which in turn pushes the median nerve in the carpal tunnel.

Gestation is defined as the time between conception and birth. A fetus grows and develops in the womb during gestation (Severynse [Ed.], 2002).

Inactive Lifestyle is a lifestyle type in which to little or no physical activity and exercise is done

Lower quadrant For this study: the upper quadrant is defended as all that part of the human body located to the anatomical inferior (downward) potion of the body from the umbilical plane (transverse plane).

Lumbar Pelvic Pain (LPP) is pain in the lowest part of your abdomen and pelvis. LPP might refer to symptoms arising from the reproductive, urinary or digestive systems, or from muscles and ligaments in the pelvis.

Miscarried is the spontaneous loss of a fetus before the 20th week of pregnancy. Pregnancy losses after the 20th week are called stillbirths. Miscarriage is a naturally occurring event, unlike medical or surgical abortions (Severynse [Ed.], 2002).

Multigravida A pregnant woman who has been pregnant one or more times previously

Multipara A woman who has had two or more pregnancies resulting in potentially viable offspring.

Musculoskeletal Disorders are conditions that affect your muscles, bones, and joints. The severity of MSDs can vary from pain in the body structures to discomforts that interferes with activities of daily living.

Parity is defined as the number of times that the woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn (Severynse, [Ed.], 2002).

Pelvic girdle pain is a collection of uncomfortable symptoms caused by a stiffness of the pelvic joints or the joints moving unevenly at either the back or front of your pelvis.

Physical Activities is a bodily activity that improves or maintains physical fitness and overall health and wellness (Severynse, [Ed.], 2002).

Primigravida is a woman first pregnancy.

Upper quadrant For this study: the upper quadrant is defended as all that part of the human body located to the anatomical superior (upwards) potion of the body from the umbilical plane (transverse plane).

ABSTRACT

Pregnancy presents itself with a myriad of both physical and physiological changes. Some of these changes may affect the levels of pregnant women activities should they be accompanied by musculoskeletal disorders hence impacting on their life styles. The aim of the study was to determine the levels of pregnancy physical activity (PPA) amongst pregnant Women with musculoskeletal disorders (MSDs) attending antenatal clinics at selected referral hospitals in Nairobi, Kenya. A cross-sectional descriptive study utilizing quantitative methods. A total of 287 participant were drawn from women attending antenatal clinics (ANC) in selected referral facilities Nairobi, Kenya. Standardized Nordic musculoskeletal Questionnaire (NMQ) and Pregnancy Physical activity Questionnaire (PPAQ). A multi-stage purposeful sampling method was used to recruit Women after approval and permission were sought from various relevant authorities. Quantitative data related to MSDs and Pregnancy Physical activities were obtained using the two standard questionnaires. Descriptive statistics were analyzed using SPSS version 25.0. Inferential statistics were also analyzed using a chi-squared test (X^2) based on alpha level of $p < 0.05$. MSDs prevalence of 78.5 % (n=225) was recorded. Regarding levels of pregnancy physical activity (PPA) of the Women 51.1% (n=115) led inactive lifestyle, while 48.89% (n=110) were active. Inactivity progressed as the gestation period advanced that is; from 4.9% (n=11) amongst Women in 1-12 weeks gestation to 9.3% (n=21) amongst those in the 12-24 weeks gestation and 36.9% (n=83) amongst those in 24-36 weeks respectively. Inactive lifestyle also increased with multiplicity of MSDs whereby; the trend moved from 11.1% (n=25) for Women with one MSD up to; - 16.9% (n= 38) and 23.1% (n=52) for Women with 2 MSDs and more than 2 MSDs respectively. There was a statistically association between gestation period (P <0.001), parity (P<0.025), Highest level of school attended (p<0.011) and employment status (P<0.001) with the level of pregnancy physical activity. The prevalence of the MSDs amongst Women was high. one-in-two women do not attain acceptable levels of PPA. The representation of the inactive Women increased with the advancement of gestation period. Parity, level of education and employment status influenced the levels pregnant physical activities amongst the individuals.

CHAPTER ONE

INTRODUCTION

1.1 Background information

The levels of pregnancy physical activity (PPA) are noted to be falling globally, raising public concern (WHO, 2016). Pregnancy has always posed a challenge to women, although increased PPA has been associated with improved maternal health outcomes (Catov, 2018). Pregnant women experience a myriad of physiological changes. For instance, the gravid uterus shifts forward (anteriorly), resulting in strain on the back. High fluid retention can lead to the entrapment of the medium nerve over the carpal bones, causing carpal tunnel syndrome (CTS) (Kesikburun *et al.*, 2018; Schroder *et al.*, 2016; Meems *et al.*, 2015; Wahl, Labbe & Davidson, 2010). These changes present morbid conditions for women, necessitating attention and antenatal education to cope with the expected demands of activities and participation (WHO, 2016). Musculoskeletal disorders (MSDs) symptoms are a predominant manifestation of these physiological changes during pregnancy (Meems, Truijens, Spek *et al.*, 2015; Schröder, Kundt, Otte *et al.*, 2016). Although most pregnant women experience discomfort due to MSDs, they often do not report them until they start affecting their daily activities, including work (Ramachandra, 2015).

Previous studies conducted in developed countries have identified lower back pain, poor posture, carpal tunnel syndrome, lumbar pelvic pain, calf muscle pain, foot pain, and pelvic girdle pain as the main MSDs experienced by women during pregnancy (Khosrawi & Maghrouri, 2012; Meems *et al.*, 2015; Pierce, Homer, Dahlen *et al.*, 2012; Ramachandra *et al.*, 2015; Kesikburun *et al.*, 2018). Changes in musculoskeletal structures during pregnancy often lead to a reduction in their functional capacities (Norhayati *et al.*, 2016).

Existing literature indicates that physical activities (PA) during pregnancy are critical in that they reduce the risk of gestational diabetes in obese women (Russo *et al*., 2015) and improve physical fitness hence weight management in pregnancy (ACOG, 2015). In addition, PA lowers the chances of induced deliveries (Ferreira *et al*., 2018), increases the success rate of vaginal birth after a prior cesarean section (Qi, Xing, 2018), and lowers the risk of preterm delivery and caesarean (Takami, 2018), including urinary incontinence (Miquelutti, 2013). Further, there is a significant increase in weight in newly born babies (Fieril, 2015) and, to a lesser extent, an increased feeling of

psychological and physical wellbeing (Hegaard, Kjaergaard, Damm *et al*., 2010), among others. These effects are almost immediate, while others are long-term (Chiavaroli *et al*., 2018).

Studies on MSDs and pregnancy Physical activities have been conducted in developed countries such as Norway (Malmqvist *et al*., 2015; Robinson, Balasundaram, Vllestad *et al*., 2018), Portugal (Ferreira *et al*., 2018), and middle- and low-income countries (LMIC) such as India (Ramachandra *et al.,* 2015), Iran (Kazemi, Nahidi, & Kariman, 2017), and Lebanon (Mourady *et al*., 2017). Although two previous studies have been done in LMIC, one in South Africa (Watson *et al*., 2016) and another in Nigeria (Ayanniyi, 2006), there is a paucity of information on the effect of MSDs on pregnancy physical activities (PPA) in women in the region. In Sub-Saharan Africa, more specifically in Kenya, little information is available in published literature on the prevalence and patterns of musculoskeletal disorders and their effect on the levels of PPA among women. This study will help fill this gap by determining the magnitude of musculoskeletal disorders and pregnancy physical activity levels amongst women attending selected healthcare facilities in Nairobi, Kenya. Of importance, research findings form a strong basis for countries to develop programs and policies that enhance maternal health care. It is important to note that in developed countries, women are taken through thorough antenatal care programs that enhance their knowledge of per-trimester physiological changes (Pierce *et al*., 2012; Kesikburun *et al*., 2018). Although this approach is applied in developed countries, in low- and middle-income countries (LMIC), Kenya being one of them, it is not a common practice.

1.2 Statement of the problem

Musculoskeletal disorders (MSDs) are a common problem during pregnancy (Schröder, Kundt, Otte *et al*., 2016). As the woman's body adapts to pregnancy, a myriad of physiological changes are observed. These changes may present as a morbid state to pregnant women, and if neglected in the antenatal care (ANC), they may limit physical activity and hence affect the quality of life of pregnant women (Kazemi *et al*., 2017, Norhayati *et al*., 2016, WHO, 2016). Regular physical activities and activities of daily living in pregnancy are important for both maternal and fetal health and are mostly determined by discomforts resulting from musculoskeletal disorders (Ramachandra et al. 2015).

Maternal health services (MHS) are among the key agenda items in healthcare provision in the world. According to the WHO Antenatal Care Guidelines 2016 (WHO 2016), it is mandatory for

member countries to make antenatal care (ANC) a platform for health promotion, prevention, screening, and diagnosis of diseases (Tunçalp, 2017). In Kenya, several policies on monitoring and evaluation of maternal care services (provided not only in sub-county dispensaries but also in county and national referral hospitals) have been put in place (Bourbonnais, 2013). However, those policies omit musculoskeletal disorder detection and assessment of pregnancy physical activity changes, which are key to pregnant women's wellbeing. Thus, there is a paucity of information on the effects of musculoskeletal disorders on levels of physical activity among pregnant women in Kenya.

Knowledge on MSDs that mediate changes in pregnancy among the maternal health care providers remains limited, and thus the health condition of expectant women at times deteriorates. Consequently, this may have implications on the quality of maternal healthcare given to expectant women by health care providers and further expose unintended limitations in the training curricula of health care workers and/or Kenya's maternal health policy for the country (Kenya). Therefore, it is imperative to determine the levels of pregnancy physical activity among women with regional musculoskeletal disorders attending antenatal clinics.

1.3 Justification of the study

The problem of MSDs in pregnancy will continue to impact negatively on maternal pregnancy in our country should an assessment of pregnancy-specific physical activities (PPA) in pregnancy fail to be undertaken to inform appropriate intervention during antenatal care attendance by expectant women. As such, this research is meant to generate information on the magnitude of MSDs among pregnant women in Nairobi, Kenya, and the impact it has on their levels of pregnancy physical activity. In addition, it shall increase the knowledge of physiotherapists and other line healthcare professionals concerning changes in the musculoskeletal system and levels of physical activity during pregnancy. Further, it will assist in designing strategies to reverse or forestall the development of MSDs and negative changes in physical activity levels among pregnant women. Eventually, it will address gaps in policy formulation and planning for maternal care provision in Kenyan hospitals and assist healthcare providers and insurance companies in putting forth maternal health packages for efficient and effective antenatal care.

1.4 Objectives

1.4.1 General objective

To determine the levels of pregnancy physical activity amongst pregnant women with musculoskeletal disorders attending antenatal clinics at selected referral hospitals in Nairobi, Kenya

1.4.2 Specific objectives

1. To determine the prevalence and characterization of MSDs amongst pregnant Women attending ANCs at selected referral hospitals in Nairobi, Kenya
2. To establish levels of pregnancy specific physical activity amongst Women with MSDs attending ANCs at selected referral hospitals in Nairobi, Kenya
3. To determine the maternal social demographic economic factor influencing the levels of Pregnancy physical activity amongst pregnant Women with MSDs attending ANCs at selected referral hospitals in Nairobi, Kenya.

1.5 Research Question

1. What is the prevalence and characterization of MSDs amongst pregnant Women attending ANCs at selected referral hospitals in Nairobi, Kenya?
2. What is the level of PPAs amongst pregnant Women attending ANCs at selected referral hospitals in Nairobi, Kenya?
3. What are the maternal social demographic and economic factors influencing PPAs amongst pregnant Women attending ANCs at selected referral hospitals in

4. Nairobi, Kenya?

1.6 Conceptual Framework

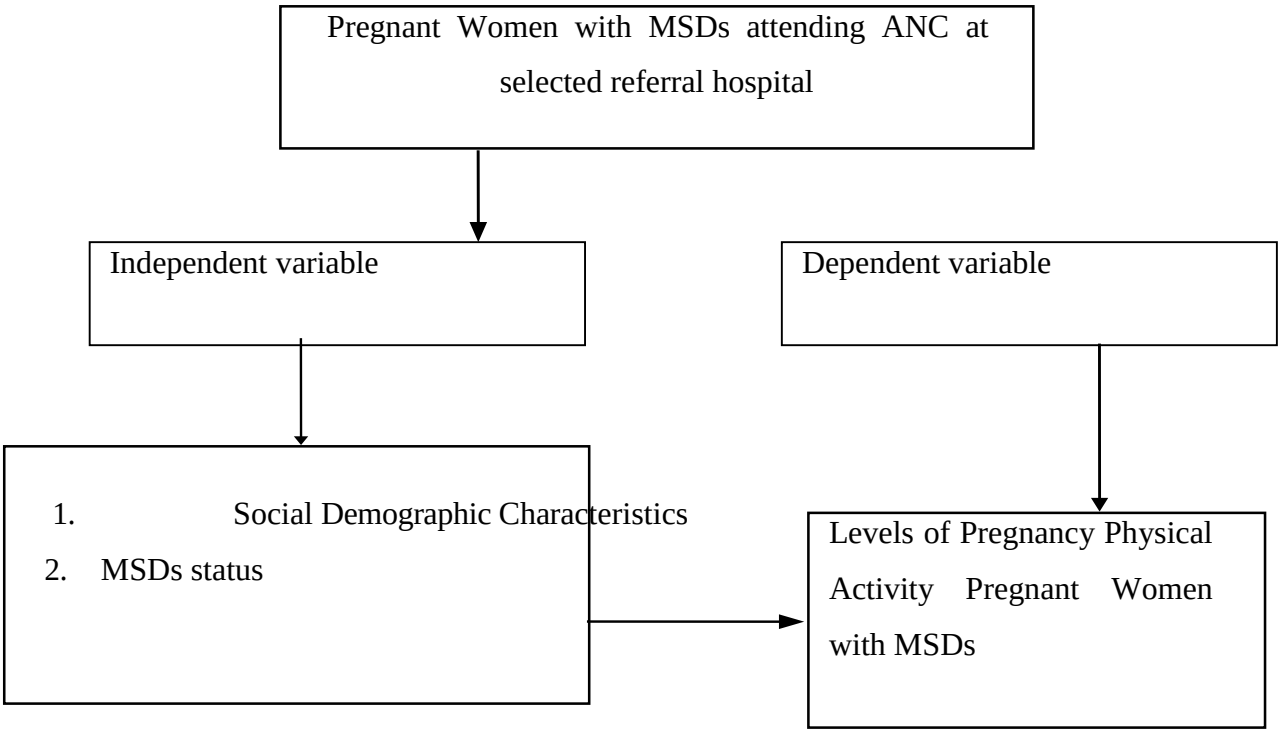

Figure 1.1 Study conceptual framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Recommended PPA and their benefit in improving health outcomes to pregnant women.

According to the American College of Obstetricians and Gynecologists (ACOG) committee opinion on obstetric practice, number 650 of 2015 (ACOG, 2015) physical activity (PA) is most important during pregnancy. WHO fact sheet (2021), advices all pregnant women (including postpartum) to limit their sedentary lifestyle and instead engage themselves in at least two and a half hours of moderate-intensity aerobic physical activity throughout the week. Though it is noted that most pregnant women acknowledge the importance of PA, few have embraced it (Watson *et al*., 2016).

Santos *et al*., (2016) attested to the fact that pregnant women remain active, spending most of their time on activities of daily living, occupation-related activities, and leisure, forgetting sporting activities. This notwithstanding, sedentary behavior may impact pregnancy outcomes for both mother and child (Fazzi, Saunders, Linton *et al*., 2017). According to Morgan *et al*., (2014), maternal physical activity influences the type of delivery. Previous studies have established the benefits of physical activity and exercise during pregnancy (Schmidt *et al*., 2017; Fazzi, Saunders, Linton *et al*., 2017; Watson *et al*., 2016; Santos *et al*., 2016; Gaston & Cramp, 2011). Exercises in water during pregnancy shortened the stages of labor (Rodrguez-Blanque, Sánchez-Garca, Sánchez-López *et al*., 2019). Additionally, exercises decrease gestational diabetes mellitus and further increase the odds of cesarean section in normal-weight women (Ming *et al*., 2018). Further, according to a systematic review on PPAs and postpartum depression (PPD), physical activities appear to reduce the chances of PPD (Nakamura *et al*., 2019). This has implication for healthcare providers and pregnant women understanding of the effects of physical activities on the musculoskeletal system and disorders in relation to activities of daily living (Moyer, Livingston, Fang *et al*., 2015).

2.2 Characterization of MSDs among expectant women

Musculoskeletal disorders (MSDs) are predominant consequences of the physiological changes in

pregnant women (Kesikburun *et al*., 2018; Schröder, Kundt, Otte *et al*., 2016; Meems, Truijens, Spek *et al*., 2015; Thabah, Thabah, & Ravindran, 2014). The consequences are more often accompanied by a reduction in functional capacities (Norhayati *et al*., 2016; WHO, 2016), which negatively impact pregnant women's health-related quality of life (Kazemi *et al*., 2017).

Previous studies have identified back pain, poor posture, carpal tunnel syndrome, lumbar pelvic pain, calf muscle pain, foot pain, and pelvic girdle pain, as well as hip pain, as common forms of MSDs experienced by women during pregnancy (Khosrawi & Maghrouri, 2012; Meems *et al*., 2015; Pierce, Homer, Dahlen *et al*., 2012; Ramachandra *et al*., 2015; Kesikburun *et al*., 2018; Pierce, Homer, 2012; Pierce, Homer, Dahlen *et al*., According to Kesikburun *et al*., (2018), most MSDs appear in the third trimester of pregnancy, with the exception of those affecting the upper quadrant. Back pain is the most commonly reported MSD, often experienced in the third trimester and attributed to strain owing to an increase in lordosis (Schroder *et al*., 2016; Kesikburun *et al*., 2018). In addition, lumbar pelvic pain (LPP) has been attributed to pressure exerted by the uterus on the pudendal nerve, while hip and adjacent area pain often originate from the low back or sacroiliac area (Thabah *et al*., 2014). Further, foot pain, tingling sensation, and numbness are also common and are characterized by reduced or increased arch height and rigid indices (Kesikburun *et al*., 2018; Thabah *et al*., 2014).

Another common cause of pain that appears in the third trimester is carpal tunnel syndrome (CTS), which is experienced in the hand and wrist. (Khosrawi & Maghrouri, 2012; Meems *et al*., 2015; Sapuan, Yam, Noorman *et al*., 2012; Thabah *et al*., 2014). The pain, which is the result of medium nerve compression, presents as numbness that affects the individuals' activities of daily living (ADL) (Sapuan, 2012). Khosrawi (2012) Most pregnant women present with bilateral symptoms, although the pain ceases as the pregnancy advances. It is however noted that levels of PA tend to decrease as pregnancy advances (Gaston & Cramp, 2011; Schmidt *et al*., 2017).

2.3 Method of measuring the levels of PPAs and their associated health outcomes in women with MSDs

Physical activities and activities of daily living in pregnancy are mostly determined by discomforts resulting from musculoskeletal disorders (Ramachandra *et al*., 2015). In a study by Kazemi *et al*., (2017) on factors affecting pregnant women's quality of life, MSDs were found to be among the

major problems experienced during pregnancy and often impact negatively on the health-quality of life in pregnancy. Pelvic girdle pain (PGP) had a significantly decreased ability to perform daily physical activities. Additionally, women with pelvic girdle pain (PGP) had a significantly decreased ability to perform daily physical activities (Elden *et al*., 2016).

In other related studies, Malmqvist *et al*., (2015) found that contentment with the workplace, lifting, the inability to get sound sleep, and pain appeared to be reasons for going on sick leave for pregnant women in employment. Further, gait alteration was reported among some women who reported their worries of pain radiating in the upper leg while ambulating (Thabah *et al*., 2015).

2.4 MSDs related to pregnancy.

As pregnancy advances, women experience discomforts that are physiological in nature. The most common of these physiologic changes are musculoskeletal in nature (Ramachandra *et al*., 2015; Thabah, Thabah, & Ravindran, 2015). Research evidence has shown that the commonest MSDs experienced include but are not limited to back pain, carpal tunnel syndrome, lumbar pelvic pain, hip pain, calf muscle pain, foot pain, and pelvic girdle pain (Khosrawi & Maghrouri, 2012; Meems *et al*., 2015; Pierce *et al*., 2012; Ramachandra *et al*., 2015; Kesikburun *et al*., 2018);

Previous research indicated that back pain related to increased lordosis was the most common MSD (Schroder *et al*., 2016; Kesikburun *et al*., 2018). The mechanism of strain in the back is explained by the gravid uterus shifting forward (anteriorly) and the consequential shift of the body's center of gravity, causing hyperlordosis (Schroder *et al*., 2016; Kesikburun *et al*., 2018). The multiple shifts increase the risk of vascular compression, pelvic ligamentous laxity, and spondylolisthesis (Thabah *et al*., 2015).

Another common cause of pain experienced in the hand and wrist is carpal tunnel syndrome (CTS) (Khosrawi & Maghrouri, 2012; Meems *et al*., 2015; Sapuan, Yam, Noorman *et al*., 2012; Thabah *et al*., 2014). Researchers have linked CTS to higher fluid retention scores during pregnancy (Meems *et al.*, 2015). The fluid retention entraps the medium nerve over the carpal bones and overlying transverse carpal ligament (Kesikburun *et al*., 2018; Thabah *et al*., 2014). This mechanism results in pain and numbness, hence affecting the activities of daily living (ADL) (Sapuan, 2012). Khosrawi (2012) noted that most women present with bilateral symptoms, although the pain ceases as the pregnancy advances.

Other MSDs, such as lumbar pelvic pain (LPP) and lower quadrant-related pain, pose health issues during pregnancy. LPP has been attributed to pressure exerted by the uterus on the pudendal nerve, while the back or sacroiliac area refers pain to the hip and adjacent areas (Thabah *et al*., 2015). Further, foot pains are also more common and are characterized by arch height and rigidity indices, which result in tingling and numbness (Kesikburun *et al*., 2018; Thabah *et al*., 2014).

2.5 Other factors influencing pregnancy physical activities participation

A study done by Gaston (2011) indicated that the level of education, financial status, parity, race, and activity lifestyle prior to conception acted as a predictor of maternal physical activity participation. In addition, pregnancy complications, namely miscarriage, were cited as among the reason's women avoided moderate to vigorous physical activities (Zhang *et al*., 2014). Other studies mention frequent urination, backache, fetal movements, and physical discomforts as reasons for deterring physical activity in pregnancy (Robinson, Balasundaram, Vllestad *et al*., 2018). Further, individual beliefs and culture modeled the adherence of exercises to the physical activity patterns of an individual (Guelfi *et al*., 2015).

Therefore, the aim of our study was to close the knowledge gap by determining the prevalence of musculoskeletal disorders and their effect on the levels of pregnancy physical activity amongst women attending selected healthcare facilities in Nairobi, Kenya. Of importance, research findings will form a strong basis for developing programs that enable pregnant women to cope with pregnancy-related changes within this region.

CHAPTER THREE

METHODOLOGY

3.1 Study setting

The study was carried out in Nairobi County in the following selected referral hospital; Kenyatta National teaching and referral Hospital, Mbagathi District hospital, Mama Lucy Kibaki hospital and Pumwani maternity hospital. The hospitals were selected because of the following: Kenyatta National Hospital (KNH) is the largest national referral and teaching hospital in Kenya, with a bed capacity of 2000. It has a busy antenatal clinic and maternity unit that receives patients from all over the country, making it a representative sample for the study. Its large ANC has a high volume, proving an adequate sample size for the study. Additionally, it has a well-established pool of trained health workers offering a wide range of services for maternal health. Further, its location in Nairobi makes it easily accessible with good transportation networks.

Mbagathi District Hospital (MDH) is situated in Dagoretti Sub-County of Nairobi County. It is a 200-bed hospital. MDH, which is a government-run facility, is one of the two county referral hospitals in Nairobi City County, Kenya. Its main catchment population is the inhabitants of Kibera slums, which are among the largest urban slums in Africa, providing a representative sample for the study. The hospital has good transportation networks, making it easily accessible to pregnant women with MSDs living in the surrounding communities. Further, conducting the study at Mbagathi District Hospital helped identify any disparities in physical activity levels among pregnant women with MSDs attending antenatal clinics in referral hospitals with different levels of resources.

Mama Lucy Kibaki Hospital is also a government-run county referral hospital serving the residents of Nairobi's densely populated Eastland area. By having the study done in the facility, it provided insights into physical activity levels among pregnant women with MSDs attending antenatal clinics in under-resourced settings. Additionally, because of its location in the eastern part of Nairobi, in the Embakasi Division, it provided a large and diverse patient population for the study. Further, the good transportation network in the area made it ideal for the study.

Pumwani Maternity Hospital is the largest maternity hospital in East and Central Africa. It is run

by the Nairobi County Government and located in Pumwani Division. By having the study done in the facility, the study captured the low-income earners from Bahati, Eastleigh North, Eastleigh South, Kamukunji, and Pumwani estates and their environs. The large and diverse population, coupled with the good transport network to the facility, was also a plus for the study to be done there. Further, the facility offers both antenatal and postnatal clinics.

3.3 Study design

This is a descriptive cross-sectional study design utilizing quantitative methods. According to Süt (2014) cross-sectional study reflects the situation of a disease or clinical out-come at a particular moment in a particular population. The study provides a "snapshot" of the proportion of pregnant Women with MSDs and their pregnancy physical activity level at a particular point in time (Howick, 2002) hence identifies and describes problems that need to be addressed by health professionals. Therefore, a cross- sectional study design was the most appropriate design to determine the prevalence of musculoskeletal disorders and physical activity levels amongst pregnant Women.

3.4 Study Population

The target populations were expectant Women attending their routine prenatal clinic in National and selected county referral clinics in Nairobi County: That is Kenyatta National Hospital, Mbagathi Level 4 Hospital, Mama Lucy Kibaki Level 4 hospital, and Pumwani maternity hospital.

3.5 Sample Size determination

The sample size was determined by Yamane formula (Israel 1992).

Table 3.1: Number of pregnant Women attended at ANC in 2018/2019 according to months

	Number of new cases treated at the arious facilities				
	KNH	**Mbagathi**	**Mama Lucy**	**Pumwani**	**Total**
October (2018)	294	178	-	350	
November (2018)	261	152	200	300	
December (2018)	227	178	189	215	
January (2019)	-	-	215	-	
TOTAL	782	446	604	900	
Average Per month	**261**	**150**	**200**	**300**	**911**

The Yamane formula:

Where;

n = is the sample size;

$$n = \frac{N}{1 + N\,(e)^2}$$

N = estimated proportion of the population that presents the characteristic; e = level of precision

In this study population N=911, Margin of error is 0.05

$$n = \frac{911 = 278}{1 + 911(.05)^2}$$

Thus, a sample size of 278 Women attending ANC was recruited. To get the proportionate sample for each facility the researcher recruited 80, 46, 61 and 92 Women from KNH, Mbagathi, Mama Lucy and Pumwani hospitals respectively. The researcher added 10% to take care of those who incomplete data or withdrew

from the study after gaining consent for personal or clinical reasons.

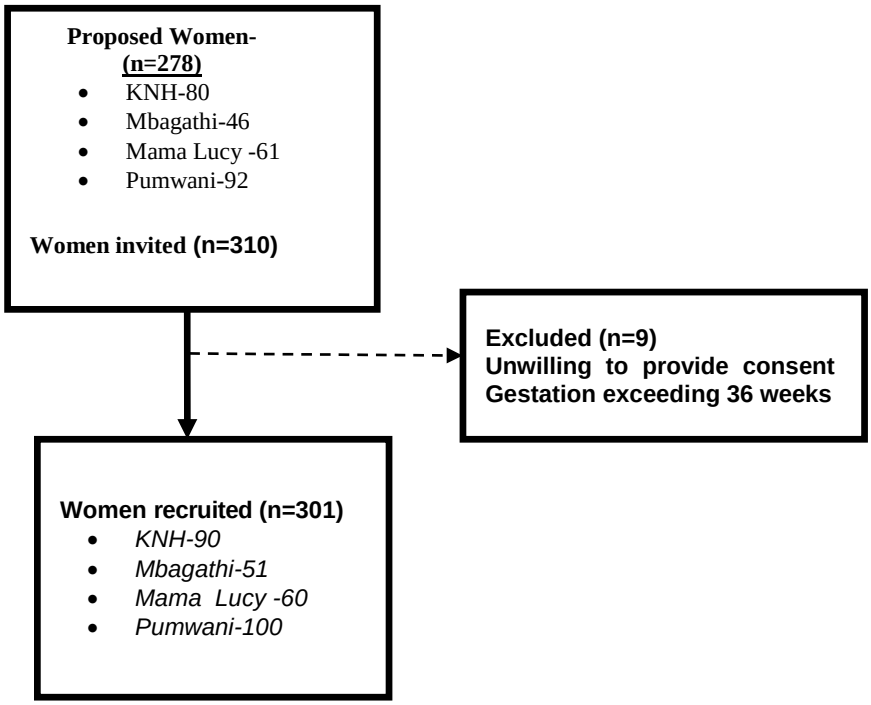

Figure 3.1; Illustration of the process of Women recruitment and data collection

3.6 Sampling method

In this study a multi-stage sampling method was used. According to Onwuegbuzie (2007), this method involves choosing settings, groups, and /or individuals representing samples in stages. The present study mapped hospitals from the clusters of hospitals in Nairobi County sub-Counties that offered antenatal services. Nairobi County has 5 sub-Counties namely Ruaraka, Roysambu, Kasarani, Lang'ata, Embakasi Central, Dagoretti South, Dagoretti North, Westlands, Embakasi South, Embakasi North, Kibra, Embakasi West, Makadara, Kamukunji, Starehe, Mathare, and Embakasi East. Consideration was made concerning level of services. For the present study only, level 4,5 and 6 were eligible for inclusion. The hospital include KNH located in Dagoretti sub-County, Mbagathi Hospital in Kibra sub-County,Mama Lucy in Ruaraka sub-County and Pumwani Maternity Embakasi East respectively.

In the selected hospital all the women attending ANC were recruited into the study voluntarily (census). This method was the most appropriate for the study (Al-Subaihi, 2003).

It is most commonly used in clinical research where patients who meet the inclusion criteria are recruited in the study (Acharya *et al*., 2013). In addition, the process is less expensive and no need for a list of all the population elements. In this multi-stage sampling method, the researcher first made a list of hospitals. The listing of the hospital was based on their function within the Nairobi County. According to Universal Health 2030 East African News (2019), Kenyatta National Hospital is a National referral hospital (level 6) and the rest are County referral hospitals (level 5).In the second stage, a census of all women was conducted and placed in their stratum/ cluster, in this case trimesters.

3.7 Selection Criteria

It was imperative that appropriate inclusion and exclusion criteria be established for a study. According to Patino (2018), a proper criterion impacts the external validity of the study. In addition, it prevented the common error of selecting variables as inclusion criteria that were not related to answering the research question.

3.7.1 Inclusion Criteria

1. Pregnant women attending antenatal clinics at the selected referral hospitals in Nairobi, Kenya.
2. Pregnant women aged 18 years and above.
3. Pregnant women who provide written informed consent to participate in the study.

3.7.2 Exclusion Criteria

1 Patients who were unable comprehend the study languages (English or Swahili).
2 Pregnant Women whose gestation exceeds 36 weeks
3 All Women with physical disability prior to conception,
4 Mentally incapacitated Women

3.8 Instrumentation and Outcome Measures

In this study, two outcome measures were used. These were the Nordic musculoskeletal Questionnaire (NMQ) and Pregnancy Physical activity Questionnaire (PPAQ). The NMQ was developed in 1987 for use in epidemiological studies and not for clinical diagnosis (Crawford, 2007). However, in a further review, López-Aragón *et al*., (2017) found NMQ the most preferred outcome measure in several sectors namely: livestock, fishing and forestry among others.

The second tool, the Pregnancy Physical Activity Questionnaire (PPAQ) is a self-administered questionnaire designed by Chasan-Taber *et al*., (2004) and has proven to adequately measure Physical activities in pregnant women (Santos *et al*., 2016; Sattler, Jaunig, Watson, Poppel, & Mokkink, 2018).

In addition, the PPAQ assesses physical activity by evaluating Women engagement in activities of daily living, occupation, sports activities and transportation among other lifestyle activities(Mourady *et al*., 2017).It classifies the activities according to their intensity(Santos et al., 2016).According to Krzepota and Sadowska(2018),sedentary activity are less than 1.5 Metabolic Equivalent of Tasks (METs).The light intensity activity ranges between1.5< 3.0 METs, moderate intensity 3.0-6.0 METs, and vigorous-intensity activity assessed at more than 6.0 METs respectively.

3.9 Reliability and Validity of measurement instruments

The Nordic musculoskeletal disorder questionnaire has good reliability (its Cronbach is greater than 0.78; Mom *et al*., 2015)). A Cronbach's alpha coefficient of >0.7 is regarded as indicative of acceptable internal consistency for the items in the scale (Gliem & Gliem, 2003). Further, its sensitivity ranges between 66% and 92%, along with its specificity between 71% and 88%, when comparing the pain in the last one week of clinical examination (Crawford, 2007).

The Pregnancy Physical Activity Questionnaire (PPAQ) has a good intraclass correlation coefficient (ICC) ranging from 0.78 and 0.93 for total activity, moderate activity, vigorous activity, sports/exercise, and occupational activity, respectively (Chasan-Taber et al., 2004). It is worth noting that the PPAQ translated versions, namely Vietnamese, Turkish, French, and Japanese, showed good ICCs ranging from 0.87 and 0.94; 0.92 and 0.99; 0.81 and 0.9; and 0.56,

respectively (Ota *et al*., 2008; Cirak *et al*., 2015; Chandonnet *et al*., 2012; and Matsuzaki *et al*., 2014).

3.10 Pretesting of the study tool

A pretest of the study tool was conducted on 15 respondents with similar characteristics at Kenyatta National Hospital. Those 15 respondents were not included in the main study. A pretest of the study tool checked whether the respondents understood the questions, and any corrections to the tool were made.

3.11 Data collection procedure

Upon explanation from the researcher and research assistants, written consents were filled out and the women were guided through filling out the questionnaire. After completion, the questionnaire was collected and forwarded for analysis.

3.12 Data management and analysis

Data was entered into two Micro-Soft Excel sheets which were then imported into the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were calculated for each data set and comparison made. Any errors identified were corrected by re-entering data from the questionnaires. Once correct data entry was completed descriptive statistics were calculated and the results presented in summary tables and charts. Chi Square test of association between independent variables (age, gestation, income, status of MSDs) and the dependent variable (Pregnancy physical activity) were also calculated.

3.13 Ethical Consideration

Ethical clearance was sought from NACOSTI, and approval to collect data was obtained from the KNH/UON Research and Ethics Committee prior to the commencement of data collection. Permission to collect data was also sought from the various selected hospitals. Participation in the research project was voluntary after a written consent was obtained, with anonymity and confidentiality maintained.

CHAPTER FOUR

RESULTS

4.1 Introduction

This study targeted a sample of 301 women. Initially, a total of 301 women were voluntarily recruited for the study; however, only 287 of them participated fully. Four women partially completed the questionnaires, and 10 had scanty information, leading to their exclusion from the analysis. Therefore, this chapter presents the results from the 287 women who fully completed the questionnaires. Figure 4.1 below illustrates the process of women's recruitment and data collection.

4.2 Socio-Demographic Characteristics of the Women

Of the 287 women who participated in the study, the majority (84%, n=241) were in the age bracket of 18 to 34 years. Their age distribution was as follows: 31.4% (n=90) for 18-22 years, 31.7% (n=91) for 29-34 years, and 20.9% (n=60) for the age bracket of 23-28 years. Among the women, the majority (51.6%, n=148) were in the 24-36 weeks gestation, while a few (28.2%, n=81) were in the 12-24 weeks gestation, and the least (20.2%, n=58) were in the 1-12 weeks gestation. In terms of marital status, the majority (84.0%, n=241) were married, compared to 15.3% (n=44) who were single. A majority of the women (59.2%, n=170) had more than one child, while 40.1% (n=115) were at zero parity.

Regarding their level of education, the majority (46.0%, n=132) had college/university education, while slightly over one-third (36.6%, n=105) had secondary school education. In terms of employment status, the majority (56.8%, n=163) of the women were unemployed, compared to 43.2% (n=124) who were employed. Concerning their health status, only a few (16%, n=46) women had existing medical conditions, while the majority (84%, n=241) reported none. Furthermore, almost one in three women (32.4%, n=93) had pregnancy-related conditions during their previous pregnancy (See Table 4.1).

Table 4.1: Socio-Demographic Characteristics of the study Women

Socio-demographic characteristics		Frequency(n)	Percentage (%)
Age-range (years)	18-22	90	31.4
	23-28	60	20.9
	29-34	91	31.7
	>35 years	46	16
Gestation age/week	1-12 weeks	58	20.2
	12-24 weeks	81	28.2
	24-36 weeks	148	51.6
Marital status	Single	44	15.3
	Married	241	84.0
	Divorced	2	0.7
Parity	0	115	40.1
	≥ 1	170	59.2
Number of children	One	80	27.9
	Two	66	23.0
	Three	20	7.0
	Four	6	2.1
	Five and above	1	0.3
Miscarried	Yes	78	27.2
	No	207	72.1
	Specify (No of miscarriages)	2	0.7
Level of Education	Primary & below	50	17.4
	Secondary	105	36.6
	College/Graduate	132	46.0
Employment status	Yes	124	43.2
	No	163	56.8
Medical conditions	Yes	46	16.0
	No	241	84.0
Pregnancy related condition in previous pregnancy (Diabetes, Miscarriage)	Yes	93	32.4
	No	193	67.2

4.3 Prevalence of MSDs

Of the 287 women who participated in the study, a prevalence of 78.4% (n=225) for musculoskeletal disorders (MSDs) was recorded among those attending antenatal care (ANC). Among the women, over a third (38.2%, n=86) had more than two MSDs, while at least 31.6% (n=71) had two MSDs, and 30.2% (n=68) reported only one. Women in the 29-34 and 18-22 age categories represented the largest proportions reporting MSDs. Furthermore, there was a statistical association between the gestation period and the presence of MSDs ($P<0.001$). (See Table 4.2).

Table 4.2: Women 'MSD Status by selected socio-demographic characteristics

Demographic Characteristics(N=287)		Without MSD (N= 62)		Total with MSD (N=225)		1 MSD		2 MSDs		>2 MSDs		P-Value
		N	%	N	%	n	%	n	%	n	%	
Age category	18-22 years	**21**	**33.87**	**69**	**30.67**	16	7.11	27	12	26	11.56	0.18
	23-28 years	**15**	**24.19**	**45**	**20**	18	8	8	3.56	19	8.4	X^2=12.627a,
	29-34 years	**18**	**29.03**	**73**	**32.44**	26	11.56	19	8.44	28	12.44	df= 9
	>35 years	**8**	**12.90**	**38**	**16.89**	8	3.56	17	7.56	13	5.78	
	Total	**62**	**100**	**225**	**100**	68	30.23	71	31.56	86	38.18	
Gestation age	1-12 weeks	**19**	**30.65**	**39**	**17.33**	26	11.56	9	4	4	1.78	**0.**001*****
	12-24 weeks	**19**	**30.65**	**62**	**27.56**	16	7.11	23	10.22	23	10.22	X^2=37.061a,
	24-36 weeks	**24**	**38.70**	**124**	**55.11**	26	11.56	39	17.33	59	26.22	df= 6
	Total	**62**	**100**	**225**	**100**	68	30.23	71	31.55	86	38.22	
Marital staus	Single	**12**	**19.35**	**32**	**14.22**	10	4.44	13	5.78	9	4	
	Married	**50**	**79.03**	**192**	**85.33**	57	25.78	57	25.33	75	34.22	Fisher exact 4.420
	Divorced	**0**	**1.61**	**1**	**0.44**	1	0.0	1	0.44	0	0.0	P-Value 0.4219
	Total	**62**	**100**	**225**	**100**	68	30.22	71	31.55	86	38.22	
Parity	0	**28**	**45.16**	**87**	**38.67**	29	12.89	29	12.89	29	12.89	0.486
	≥ 1	**34**	**54.83**	**138**	**61.33**	39	17.33	42	18.66	57	25.33	X2= 2.440a,
	Total	**62**	**100**	**225**	**100**	68	30.22	71	31.55	86	38.22	df= 3
Miscarried	Yes	**14**	**22.58**	**64**	**28.44**	18	8	18	8	28	12.44	
	No	**48**	**77.42**	**159**	**70.67**	49	21.78	53	3.11	57	25.78	Fisher exact 2.174
	Specify (No)	**0**	**0.0**	**2**	**0.89**	1	0.44	0	0.44	0	0.0	P-Value 0.226
	Total	**62**	**100**	**225**	**100**	68	30.22	71	31.55	86	38.22	
Level of education	Primary & below	**11**	**17.74**	**39**	**17.33**	12	5.33	11	4.89	16	7.11	
	Secondary	**23**	**37.10**	**82**	**36.44**	17	7.56	26	11.56	39	17.33	0.141
	College/Graduate	**28**	**45.16**	**104**	**46.22**	39	17.33	34	15.11	31	13.78	X2=13.508a,
	Total	**62**	**100**	**225**	**100**	**68**	**30.22**	**71**	**31.56**	**86**	**38.22**	df= 9
Employment status	Yes	**35**	**56.45**	**97**	**43.11**	32	14.22	33	14.67	32	14.22	
	No	**27**	**45.54**	**128**	**56.89**	36	16	38	16.89	54	24	0.576
	Total	**62**	**100**	**225**	**100**	68	30.22	71	31.56	86	38.22	X2=1.985a, df= 3

Regarding the distribution of MSDs, the majority of the women (79.11%, n=178) reported lower quadrant problems, while a few (20%, n=45) reported problems in both upper and lower quadrants. Among the 287 women, the largest proportion (27.56%, n=62) reporting lower quadrant problems were in the age bracket of 18-22 years, followed by those in the 29-34 years category (23.11%, n=52). The results also indicate that the majority of women with lower quadrant problems (41.78%, n=94) and those with MSD problems in both quadrants (12.89%, n=29) were in the third trimester (24-36 weeks gestation period). Interestingly, a higher percentage of women (41.33%, n=102) reporting lower quadrant MSDs had given birth to one or more children, compared to a lower percentage of women (32.89%, n=74) who had never given birth. Furthermore, a higher proportion of unemployed women reported lower quadrant MSDs (41.33%, n=102) compared to their employed counterparts (33.78%, n=76). There was a statistically significant association between having a pre-existing medical condition and the MSDs status of the women (p=0.018). (see Table 4.3)).

Table 4.3: Women' MSDs Status into body Quadrants by selected socio-demographic characteristics

Demographic Characteristics(N=287)		No MSDs (N=62)		Upper quadrant MSDs only		Lower quadrant MSDs only		Both quadrants' MSDs		P=Value
		n	%	n	%	n	%	n	%	
Age category	18-22 years	20	32.26	0	0.0	62	27.56	8	3.56	0.42 X^2= 9.192a, df=9
	23-28 years	15	24.19	0	0.0	36	16	9	4	
	29-34 years	19	30.65	1	0.44	52	23.11	19	8.44	
	>35 years	8	12.90	1	0.44	28	12.44	9	4	
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.11**	**45**	**20**	
Gestation age	1-12 weeks	18	29.03	1	0.44	33	14.67	6	2.67	0.144 X^2= 9.562a, df=6
	12-24 weeks	20	32.26	0	0.0	51	22.67	10	4.44	
	24-36 weeks	24	38.71	1	0.44	94	41.78	29	12.89	
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.12**	**45**	**20**	
Marital Status	Single	12	19.35	0	0.0	31	13.78	1	0.44	0.175 X^2= 8.974a, df=6
	Married	49	79.03	2	0.89	146	64.89	44	19.56	
	Divorced	1	1.61	0	0.0	1	0.44	0	0	
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.11**	**45**	**20**	
Parity	0	29	46.77	0	0.0	74	32.89	12	5.33	
	≥ 1	33	53.23	2	0.89	102	45.33	33	14.67	0.106
	Total	**62**	**100**	**2**	**0.89**	**176**	**78.22**	**45**	**20**	X^2= 6.127a,df=3
Miscarried	Yes	15	24.19	0	0.0	49	21.78	14	6.22	
	No	47	75.81	2	0.89	127	56.44	31	13.78	0.852
	Specify (No)	0	0	0	0.0	2	0.89	0	0	X^2 = 2.648
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.11**	**45**	**20**	df =6
Level of school	Primary & below	11	17.74	0	0.0	30	13.33	9	4	0.944
	Secondary	23	37.1	1	0.44	64	28.44	17	7.56	$X^{2 = 3.454}$
	College/Graduate	28	45.16	1	0.44	84	37.33	19	8.44	df =9
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.1**	**45**	**20**	
Employment status	Yes	28	45.16	1	0.44	76	33.78	19	8.44	0.982
	No	34	54.84	1	0.44	102	45.33	26	11.56	$X^{2 - 0.171a}$
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.11**	**45**	**20**	**df = 3**
Medical condition	Yes	6	9.68	0	0.0	26	11.56	14	6.22	
	No	56	90.32	2	0.89	152	67.56	31	13.78	**0.018***
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.12**	**45**	**20**	X^2= 10.113a, df=3
Pregnancy related condition in previous pregnancy	Yes	16	25.81	1	0.44	56	24.89	20	8.89	0.172
	No	46	74.2	1	0.44	122	54.22	24	10.67	X^2= 4.998a,
	Total	**62**	**100**	**2**	**0.89**	**178**	**79.11**	**44**	**19.56**	df=3

Concerning the distribution of MSDs according to body parts, lower back MSDs (Lower back pain) was the most prevalent complaint (54%; n=155) amongst the Women followed by pain in hips/thigh/buttocks (49.5%; n=142), ankles/feet (41.5%; n= 119) and wrists and hands pains (11.85%, n= 34) in reducing order (See Figure 4.1).

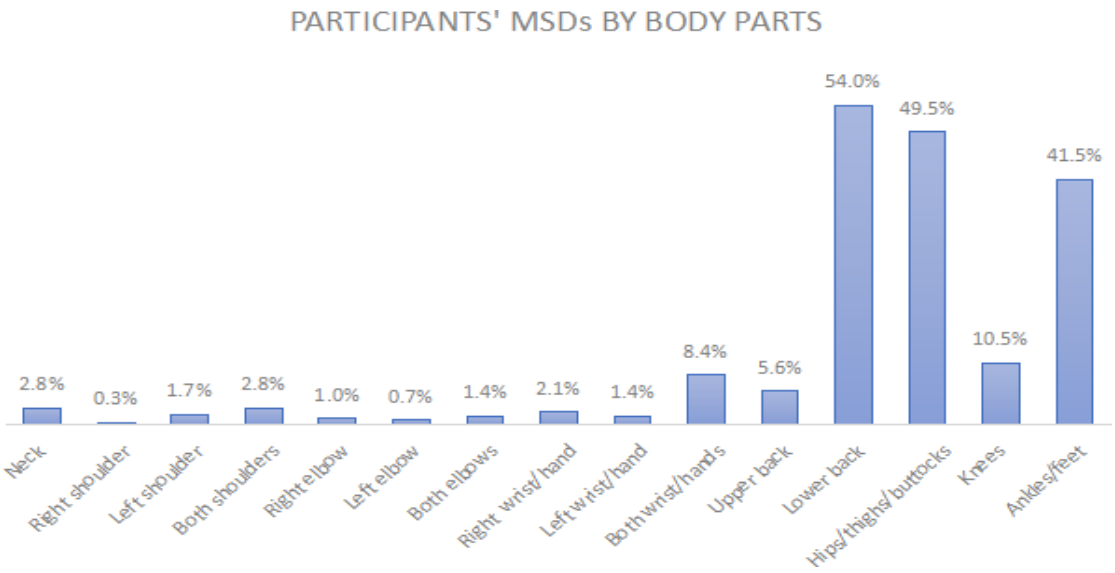

Figure 4.1: Women MSD Status by body parts

Regarding the MSDs status of women based on the gestation period, the results indicate an exponential increase in the proportion of women reporting musculoskeletal conditions as their pregnancy progresses. A significant majority of women (55.11%, n=124) reporting MSDs were in the third trimester (24-36 weeks gestation period), while a smaller proportion (27.56%, n=62) were in the second trimester, and even fewer (17.33%, n=39) were in the first trimester (refer to Table 4.2).

Furthermore, the results demonstrate an upward trend in the prevalence of specific MSDs, such as lower back pain, hip/thigh/buttock pain, and ankle/feet pain, as the gestation period advances. For instance, in the case of lower back pain, there were 11 cases (3.8%) recorded among those in the 1-12 weeks gestation, which increased to 49 cases (17.1%) in the 12-24 weeks gestation, and finally, 95 cases (33.1%) in the 24-36 weeks gestation. Similarly, for hip/thigh/buttock MSDs, the cases were 15 (5.2%), 41 (14.3%), and 86 (30%) in the first, second, and third trimesters,

respectively. Additionally, the number of women with ankle complaints increased from 23 (8%), to 27 (9.4%), and 69 (24%) in the first, second, and third trimesters, respectively.

Significantly, there was a statistically significant association between having low back pain and hip/thigh/buttock MSDs and the stages of gestation ($P<0.001$), as well as between having upper back MSDs and gestation ($P=0.049$).(see Table 4.4).

Table 4.4: Women' MSD status by Trimester (Gestation) Period

Body Part	MSD status	First Trimester		Second Trimester		Third Trimester		P- Value
		1-12		12-24		24-36		
		(n)	(%)	(n)	(%)	(n)	(%)	
Neck	No	55	19.5	80	27.9	144	49.6	*Fisher exact 1.891*
	Yes	3	0.7	1	0.3	4	1.7	*P-Value* 0.605
	Sub-total	**58**	**20**	**81**	**28**	**148**	**52**	
Shoulder	No	56	19.5	80	27.9	137	47.7	
	Yes, in the right shoulder	0	0.0	0	0.0	1	0.3	*Fisher exact 4.432*
	Yes, in the left shoulder	0	0.0	1	0.3	4	1.4	*P-Value* 0.392
	Yes, in both shoulders	2	0.7	0	0.0	6	2.1	
	Sub-total	**58**	**20**	**81**	**28**	**148**	**52**	
Elbow	No	55	19.2	80	27.9	143	49.8	
	Yes, in the right elbow	1	0.3	0	0.0	2	0.7	*Fisher exact 7.203*
	Yes, in the left elbow	0	0.0	1	0.3	1	0.3	*P-Value* 0.554
	Yes, in both elbows	2	0.7	0	0.0	2	0.7	
	Sub-total	**58**	**20**	**81**	**28**	**148**	**51.5**	
Wrists/hands	No	56	21.3	0	0.0	137	0.0	
	Yes, in the right wrist/hand	0	0.0	2	0.7	3	1.4	*Fisher exact 2.015*
	Yes, in the left wrist/hand	0	0.0	1	0.3	1	1.0	*P-Value* 0.745
	Yes, in both wrist/hands	2	0.0	6	2.1	7	4.9	
	Sub-total	**58**	20.2	**81**	28.2	**148**	51.6	
Upper back	No	57	19.9	79	27.5	135	47.0	
	Yes	1	0.3	2	0.7	13	4.5	*Fisher exact 0.836*
	Sub-total	**58**	20.2	**81**	28.2	**148**	51.6	*P-Value* **0.049***
Lower back	No	47	16.4	32	11.1	53	18.5	

	Yes	11	3.8	49	17.1	95	33.1	**0.001***
	Total	**58**	20.2	**81**	28.2	**148**	51.6	X^2=36.221a, df= 2
Hips/thighs/	No	43	15.0	40	13.9	62	21.6	
buttocks	Yes	15	5.2	41	14.3	86	30.0	**0.001***
	Sub-total	**58**	**20**	**81**	**28**	**148**	**51.6**	X^2=17.392a, df= 2
Knees	No	54	18.8	75	26.1	128	44.6	
	Yes	4	1.4	6	2.1	20	7.0	*Fisher exact 2.143*
	Sub-total	**58**	**20**	**81**	**28**	**148**	**52**	*P-Value* **0.216**
Ankles/feet	No	35	12.2	54	18.8	79	27.1	
	Yes	23	8.0	27	9.4	69	24.0	0.142
	Sub-total	**58**	**20**	**81**	**28**	**148**	52.1	X^2= 3.906a, df= 3

4.4 Women' Level of Pregnancy Physical Activity

The categorization of women based on their level of pregnancy physical activity reveals that slightly over half of them, 51.1% (n=115), led an inactive lifestyle characterized by sedentary or light physical activities. On the other hand, just under half, 48.89% (n=110), were classified as active, engaging in moderate to vigorous physical activities. The activities encompassed within the "inactive lifestyle" category, as determined by the Pregnancy Physical Activities Questionnaire (PPAQ), include watching TV, using phones, sitting at the workplace, dressing, preparing meals, shopping, and cleaning. Conversely, the activities considered part of the "active lifestyle" encompassed taking care of children, playing with them, walking to the workplace, walking as a form of exercise, engaging in prenatal exercise, and leisurely jogging or dancing.

Interestingly, the prevalence of inactivity among women appears to be influenced by the progression of gestation. The lowest proportion of inactive women, 4.9% (n=11), was observed in the 1-12 weeks gestation category, which increased to 9.3% (n=21) in the 12-24 weeks gestation category. The majority of inactive women, 36.9% (n=83), were found in the 24-36 weeks gestation category (refer to Table 4.5). Expressively, there was a statistically significant association between the gestation period and the level of pregnancy physical activity ($P<0.001$). Additionally, statistically significant associations were also observed between parity ($P<0.025$), highest level of education ($P<0.011$), employment status ($P<0.001$), and the level of pregnancy physical activity (see Table 4.5).

Table 4.5: Analysis of Women' Levels of Pregnancy-Specific Physical Activity (PPA)

Demographic Characteristics (n=225)		PPA(n=225)						
		Active		Inactive		Total		P-Value
		n	%	n	%	n	%	
Age category	18-22 years	31	13.8	38	16.9	69.0	30.7	0.185
	23-28 years	18	8.0	27	12.0	45.0	20.0	X^2=4.822a,
	29-34 years	43	19.1	30	13.3	73.0	32.4	df= 3
	>35 years	18	8.0	20	8.9	38.0	16.9	
	Total	**110**	**48.9**	**115**	**51.1**	**225**	**100**	
Gestation age/week	1-12 weeks	28	12.4	11	4.9	39.0	17.3	
	12-24 weeks	41	18.2	21	9.3	62.0	27.6	**0.001***
	24-36 weeks	41	18.2	83	36.9	124.0	55.1	X^2=27.990a,
	Total	**110**	**48.9**	**115**	**51.1**	**225**	**100.0**	df=2
Marital status	Single	18	8.0	14	6.2	32.0	14.2	
	Married	91	40.4	101	44.9	192.0	85.3	*Fisher exact 4.432*
	Divorced	1	0.4	0	0.0	1.0	0.4	*P-Value 0.385*
	Total	**110**	**48.9**	**115**	**51.1**	**225**	**100.0**	
Parity	0	35	15.6	54	24.0	89.0	39.6	**0.025***
	>1	75	33.3	62	27.6	137.0	60.9	X^2=4.993a,
	Total	**110**	**48.9**	**115**	**51.6**	**225**	**100**	df=2
Number of children	One	32	23.4	27	19.7	59.0	43.1	

	Two	30	21.9	24	17.5	54.0	39.4	0.901
	Three and above	12	8.8	12	8.8	24.0	17.5	X^2=0.209a,
	Total	**74**	**54.0**	**63**	**46.0**	**137.0**	**100.0**	df=2
Miscarried	Yes	27	12.0	39	17.3	66.0	29.3	0.123
	No	83	36.9	76	33.8	159.0	70.7	X^2=2.380a,
	Total	**110**	**48.9**	**115**	**51.1**	**225.0**	**100.0**	df=1
Level of Education	Primary and below	16	7.1	23	10.2	39.0	17.3	
	Secondary	32	14.2	50	22.2	82.0	36.4	**0.011***
	College/Graduate	62	27.6	42	18.7	104.0	46.2	X^2=8.947a, df=2
	Total	**110**	**48.9**	**115**	**51.1**	**225.0**	**100.0**	
Employment status	Yes	70	31.1	27	12.0	97.0	43.1	**0.001***
	No	40	17.8	88	39.1	128.0	56.9	X^2=36.969a,
	Total	**110**	**48.9**	**115**	**51.1**	**225.0**	**100.0**	df=1

Further, the proportion of inactive Women increased with multiplicity of MSDs, that is; 11.1% (n=25) with one MSD, 16.9% (n= 38) with two MSDs and 23.1% (n=52) with those with over three

MSDs (see Table 4.6 and Fig 4.3). However, no association between MSD status and level of pregnancy physical activity.

Table 4.6: All activities (category)

PPA(n=225)	1 MSD		2 MSDs		>2 MSDs		Total	P-Value
	n	%	n	%	n	%	N	
Inactive	25	11.1	38	16.9	52	23.1	**115**	0.201
Active	43	19.1	33	14.7	34	15.1	**110**	X^2= 12.220a, df= 9
Total	**68**	**40.2**	**71**	**31.6**	**86**	**38.2**	**225**	

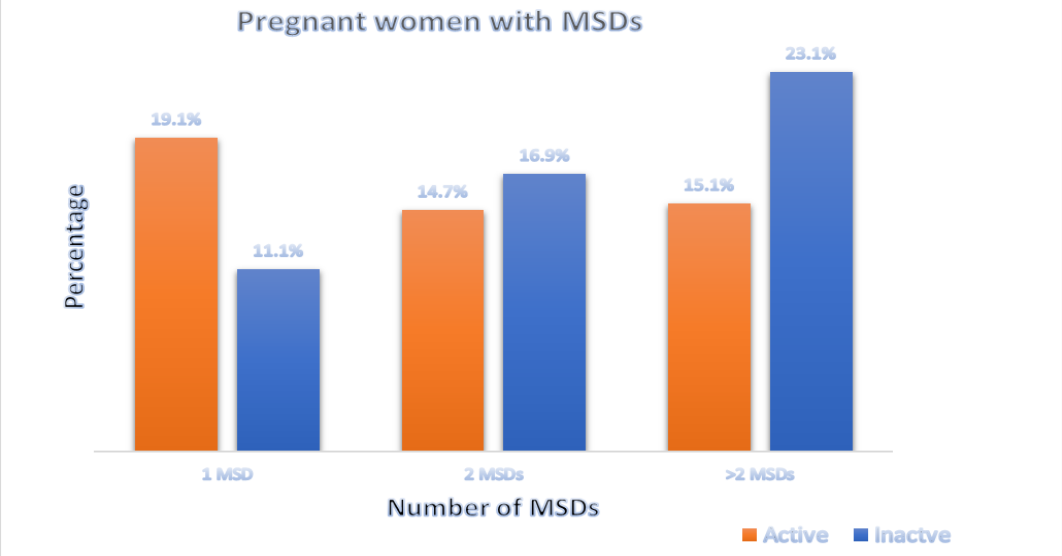

Figure 4.2: Level of PA according to MSDs profile

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the key findings from the previous chapter in line with the study objectives. Specifically, the study established the prevalence of regional MSDs, levels of pregnancy specific physical activity and the association between selected variables namely age, gestation, income, status of having MSDs and level of Pregnancy physical activity amongst women attending ANCs at selected hospitals in Nairobi County, Kenya.

5.2 Prevalence of MSDs

The study demonstrates that musculoskeletal disorders (MSDs) are a major health concern affecting women during pregnancy. In the current study, slightly more than three quarters of the women attending ANC in selected health facilities had MSDs. This was probably because of the activities the women engaged themselves in during the pregnancy. It is also plausible to hypothesize that the high prevalence of MSD maybe due to lack of mechanization and failure to observe work ergonomic at work stations, prolonged and stressing manual work and house chores based on their social-demographic characteristics including marrital status, more parity, and employment or lack of it. The study findings are similar to those of previous studies that revealed that MSDs are common in pregnancy (Ramachandra et al. 2015; Thabah, Thabah, & Ravindran, 2015). The current study established that the prevalence of MSDs is higher than that Ayanniyi *et al*., (2006) reported in Nigeria among women attending ANC. Ayanniyi's (2006) study, prevalence rate was slightly above half of the Women (52.5%). However, the Nigerian study had a much larger sample (n=2187) and Women were selected from private and government owned health facilities which may explain the difference between the two studies. Not much is mentioned on their social-demographic characteristics as the study dwelt on MSDs with regards to back pain. Nevertheless, both studies revealed that back pain had a much higher prevalence than other types of MSDs. Further, the current study portrays a much lower prevalence of MSDs compared to Kalra and Bhatnagar, (2017) study conducted in India amongst housewives (n=100) attending ANC. Kalra and Bhatnagar (2017) reported prevalence of MSDs was 100%. A possible explanation to the difference in the finding between the Indian and the current study could have been; the sample

size, culture, literacy and level of physical activities amongst the Women. Where the current study sample was more (n=287) than the Indian study, the Kenya women were more educated and majority were in employment. The Indian study targeted only the house wives who may have adopted a more sedentary lifestyle based on cultural expectation which may have contributed to them experiencing MSDs in pregnancy.

5.2.1 Most prevalent regional MSDs

Lower back pain (LBP) was the most prevalent MSDs in this study. The finding concurs with those of the previous studies (Kesikburun, *et al*., 2018, Kalra & Bhatnagar, 2017; Schroder *et al*., 2016; Thabah, 2015; Kovacs *et al*., 2012, and Pierce *et al*., 2012.). While the Kenyan women may have experienced LBP because of physical stress/overuse occasioned by manual labour, those of others studies were engaged in sedentary lifestyle/ occupations such as house chores (Kalra & Bhatnagar, 2017, Kesikburun, *et al*., 2018) resulting into disuse hence LBP experience. On the other hand, LBP MSDs was common in the third trimester, which may be attributed to pregnancy physiological and biomechanical changes and features of type of work. The physiological mechanism of strain in the back which is most commonly experience in the third trimester is, explained by the gravid uterus shift forward (anteriorly) and consequential shift of the body's center of gravity causing hyper lordosis (Kesikburun *et al*., 2018; Schroder *et al*., 2016).Additionally, Lumbar pelvic pain has been attributed to pressure exacted by uterus on the pudendal nerve while back or sacroiliac area refers pain to hip and adjacent areas(Thabah *et al*., 2015).Further, Thabah,(2015) explains that the altered biomechanical multiple shifts in pregnancy, increases the risk of vascular compression, pelvic ligamentous laxity and spondylolisthesis. These findings have implications for the antenatal education of women (on ergonomics and occupational safety) during ANC visits to forestall development of lower back pain and other MSDs.

The study also established that hip,thigh ,buttocks,ankle and feet MSDs were also prevelent. Research evidence has shown that back pain could radiate to the hip thigh and buttocks causing discomfort (Kesikburun *et al*., 2018; Schroder *et al*., 2016; Thabah *et al*., 2015). The study by Kalra and Bhatnagar (2017) and Kesikburun, *et al*., (2018), report similar findings. In a related study on MSDs in pregnancy, Varol, *et al*., (2017) deduced that feet sole pressure distribution during pregnancy were related to severity of ankle and foot pain. As a consequence, change in sole pressure distribution causes compensatory postural changes that alters trunk biomechanics

and walking (Varol, *et al*., 2017; Schroder *et al*., 2016; Thabah et al., 2015), which have implication on joint stability, muscle balance ad postnatal recovery, thus the need for pre and post-natal physiotherapy care.

5.2.2 Distribution

The distribution of MSDs amongst the women attending ANC affected virtually all quadrants but to a less extent the upper quadrant. This was probably due to the nature of work and work requirement in our study sample. These results are similar to those of related studies that reported that pregnant women experience discomfort in both quadrants (Kesikburun *et al*., 2018, Ramachandra *et al*., 2015; Thabah, Thabah, & Ravindran, 2014, Pierce *et al*., 2012, Meems *et al*., 2015). Whereas, Meems *et al*., 2015, Khosrawi and Maghrouri (2012) and Sapuan *et al*., 2012) reported Carpal tunnel syndrome as a more common upper quadrant MSD, there were not so many Women with the condition in our study. The difference in distribution pattern of MSDs between women in the current study and those from developed countries has implication on curricula of training of health care workers in Kenya. However, previous studies have dwelt more on MSDs of lower quadrant adverse effect on pregnant women activities of daily living (Schroder *et al*., 2016; Thabah, 2015).

5.2.3 MSDs and Gestation period

While looking at this study from the gestation periods, there was an exponential increase in the frequency of women reporting MSDs with transition in gestation weeks. This may have been occasioned by the increased weight from the gravid uterus and the compensatory postural changes which shifts the center of gravity as gestation advances (Korsten-Reck *et al*., 2009, Varol *et al*., 2017). The results are similar to those of other studies (Kesikburun *et al*., 2018; Schroder *et al*., 2016). According to Kesikburun *et al*., (2018) and Schroder *et al*., (2016), most MSDs appear in the third trimesters of pregnancy with the exception of those affecting the upper quadrant.

In the current study, lower back pain was experienced mostly in the third trimester. As gestation period increases, changes in posture and body weight emerge and may predispose women to postural discomfort. Research evidence link increased incidence of LBP with the increased lordosis, body weight and resultant ligament instability (due to hormonal changes) as pregnancy gestation advances (Kesikburun *et al*., 2018; Schroder *et al*., 2016; Thabah *et al*., 2014, Kovacs *et*

al., 2012, Korsten-Reck *et al*., 2009).

Additionally, incidence of hip pain was more reported in the third trimesters similar to what was observed a study in Ankar, Turkey among pregnant women attending ANC (Kesikburun *et al*., 2018).

Further, wrist and hand MSDs notably took a similar gestational trend as noted in this study. The trend for carpal tunnel syndrome (CTS) was slightly upwards as the gestation progresses though other studies noted that it became asymptomatic (Meems *et al*., 2015, Khosrawi *et al*., 2012, Sapuan *et al*., 2012). It is worth noting that despite the rise in MSDs as the gestational period advanced, the functional levels of women were not affected in the study.

5.3 Levels of Pregnancy Physical Activity

From the results of the current study, the prevalence of inactivity lifestyle was slightly higher than that of the active women with MSDs. This is probably because the study settings were within environs that serve both middle- and lower-income populations.

It is plausible to infer that MSDs status influence pregnancy physical activity. Badri *et al*., (2020) in a study among pregnant women in Plaju Health Center in Indonesia, found that there was a statistical significance association between physical activity and MSDs for pregnant women. Our results contrast those of similar study conducted within African region. Gebregziabher *et al*., (2019) in an Ethiopia study amongst the pregnant women, found that three quarters of the women led a sufficiently active lifestyle. Gebregziabher (2019) attributed this level of pregnancy physical activity to the fact that the women were housewives with low income and were unable to outsource for house helps hence did more manual work and house chores on their own.

Further, the current study revealed that level of physical activity amongst the women decreased with gestation week which implies that MSDs may have slowed down participant's active lifestyle. Advanced gestation evidently characterized the prevalence of the MSDs. Similar findings were observed in a previous study by Nascimento *et al*., (2015), who noted that inactivity was most prevalent among women in the first and the last trimesters of pregnancy. According to Nascimento *et al*., (2015), few women who had remained active, spent most of their time in activities of daily living, occupation related activities and leisure excluding sporting activities.

Similar finding was reported in a study by Santo's *et al*., (2016) carried out in an ANCs in Minho, Portugal. Santo's (2016) also reported that some health care providers discouraged physical activities in pregnancy. The over 50 % Inactivity recorded in the current study has an implication on the demand for restorative health care services to alleviate functional decline due to MSDs acquired during pregnancy.

5.3.1 Effects of MSDs on Physical Activity and activities of daily living

The study established that despite having various MSDs, almost one in two women led active lifestyles despite the fact that in the third semester most women were likely to be inactive. This is probably because as women, they had to continue with their day to day house chores and employment related activities. The study findings are similar to those of Badri *et al*., (2020) who found that despite the significant association between the physical activities and the MSDs the women continued with their physical activities. From this study it was evident that lower back disorder was the most prevalent of MSD conditions followed by hip/thigh/buttocks, ankle/feet, wrist and knee respectively. The structures affected largely hampered the women engagement in physical activities notably in the advanced gestation period. Similar results were reported in several previous studies (Morino *et al*., 2017; Elden *et al*., 2016, & Saxena *et al*., 2019). The activities of daily living that are more affected by lower back (LBP) and pelvic girdle pain were sitting, standing, hurling and turning (Morino *et al*., 2017; Elden *et al*., 2016 & Saxena *et al*., 2019). There is implication for innovation of assistive technology/aids to help women maintain active lifestyles.

5.3.2 Others factors influencing Pregnancy Physical Activity

Other factors that were influencing physical activity in pregnancy in this study were parity, employment status and level of education. Most importantly there was statistically significant association between level of pregnancy physical activity and parity, gestation, level of education and as well as employment status. This was partly because Women had to make do with work related activities and chores or vice versa.

Similar findings were reported in other previous studies; which showed that number of children, gestation stage of pregnancy, gravid status and employment status had significant influence on pregnancy physical activity amongst women (Badri *et al*., 2020; Kikuchi *et al*., 2019; Santo *et al*.,

2017; Mercado *et al*., 2017; Nascimento *et al*., 2015 & Adeniyi *et al*., 2014). Further, literacy is key for women to be able to understand the importance and the risk associated with inactivity for training of prenatal exercise, physical activity guidance and adherence to advice during prenatal care (Santo *et al*., 2017; Mercado *et al*., 2017; Nascimento *et al*., 2015).

CHAPTER SIX

CONCLUSION, RECOMMNDATIONS AND LIMITATION

6.1 Conclusion

The study concludes that the prevalence of musculoskeletal disorders (MSDs) among women was high. More than three out of four women attending antenatal clinics in Nairobi have MSDs. The most common MSDs reported were lower back pain, hips/thigh/buttocks disorders, and ankle and feet disorders. The prevalence of MSDs increased with the advancement of gestation weeks. Furthermore, the study found that one in two women did not achieve acceptable levels of physical activity (PPA). Additionally, the study illustrates that inactivity progresses as gestation advances. Factors such as parity, level of education, and employment status may influence physical activity levels among women.

6.2 Recommendations

These findings underline the importance of prioritizing screening for MSDs among pregnant women. This would help in developing strategies to cope with pregnancy-related changes in MSDs and physical activities. Some of the strategies to consider include developing health education programs to raise awareness of risk factors and educate women on exercises that promote active lifestyles throughout pregnancy. Furthermore, it is crucial to implement health profession trainings to equip healthcare workers with the skills to identify and manage MSDs, as well as protocols for referring women for appropriate interventions.

Future research should focus on further clinically characterizing MSDs during pregnancy and developing effective strategies for prevention and treatment.

6.3 Study Limitation

To determine the prevalence of MSDs, the study utilized the preferred outcome measuring tool, the Nordic Musculoskeletal Questionnaire (NMQ). However, the study could have added more value by conducting a thorough assessment to establish the condition and magnitude of the MSDs. Additionally, for a more accurate representation of the physical activities of women, it would have

been beneficial to undertake translation and cross-cultural adaptation of the Pregnancy Physical Activity Questionnaire (PPAQ) in the African context.

Furthermore, it should be noted that the findings of the study may not be generalized to the entire population of Nairobi County since the study only targeted the main referral institutions

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APPENDICES

Appendix I: Information and Consent Form

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

P.O. Box 62000 – 00200 NAIROBI, KENYA

+254202
602270

info@jkuat.ac.ke or dagutu@yahoo.com

Dear Participant,

I am a postgraduate student undertaking a Master of Science in Orthopedic Physiotherapy-Department of Physiotherapy at the *Jomo Kenyatta University of Agriculture and Technology*. As part of the study, I'm expected to conduct research. The title of my research is *"***Levels of Pregnancy Physical Activity amongst Women with Regional Musculoskeletal Disorders Attending Antenatal Clinics at The National and Selected County Referral Hospitals in Nairobi, Kenya**".

Information gathered in this study will be important in establishing the magnitude of muscles and bone related illness affecting the pregnant women and how they affect their day-to-day physical activities. The study will increase the understanding of the healthcare personnel (Doctors Nurses Physiotherapist etc) to such illnesses. In addition, it will address gaps in planning and help put in place policies of antenatal care for pregnant women in our Country.

There is absolutely minimal risk to you for participating in this study. It is expected that you will

experience minimal discomfort or stress from the questions asked in the interview. You don't have to respond to every question or provide information you do not want to provide and can withdraw from participating at any time.

All Women will be identified using codes and the information kept in secure filling cabinet or safe so as to safeguard their anonymity and all the individuals directly or indirectly referred to in the questionnaire. In the future the researcher will destroy all code lists.

CONSENT FORM

I.....agree to participate in the study being conducted by Mr. Dickson Okumu Agutu, a post-graduate student doing Master of Science degree in the Department of Physiotherapy at *Jomo Kenyatta University of Agriculture and Technology*, Kenya. He has informed me that; this is a study for his Master of Science degree designed to establishing the magnitude of illness (musculoskeletal) affecting pregnant women and how they affect their day-to-day physical activities, in Nairobi County, Kenya.

I understand that:

- Participation is voluntary and will involve interview taking at least 20 minutes mutually as agreed upon by me and the researcher.
- The benefits I may expect from the study are; an opportunity to contribute to scientific research that may provide information on Effects of musculoskeletal disorders on pregnancy physical activities amongst women attending antenatal clinics and that could be useful to healthcare workers and contribute to health policies among others.
- The researcher does not foresee any risks to me participating in this study and it is expected that I will experience minimal discomfort or stress from the questions asked.
- I do not have to respond to every question or provide information I do not want to provide and I can withdraw from participating at any time.
- Codes identifying Women will be kept in secure filling cabinet or safe so as to safeguard the anonymity of myself and all the individuals directly or indirectly referred to in the questionnaire(s). I understand that in the future the researcher will destroy all codes lists.
- Only people associated with the study will see/listen to my responses. To protect privacy pseudonyms will be assigned for publications and

presentations, unless written consent is provided. My responses will not be associated with my name: instead, my name will be converted to a code number when the researcher stores the data.

- The researcher will answer any other questions about the research either before or after the research. If I have other questions or concerns, I can address them to the researcher by email or phone.
- Enrolling in the study will mean; signing a consent form and them responding to a questionnaire with the aid of a research assistant. Your response will thereafter be subjected to a thorough analysis with the purpose of deducing logic that can be used for purposes of improving health and course of action about health in the society and the country at large.

Signature:	Witness:

I Agree/decline; during my participation in this study and I understand I may withdraw fro participating at any time.

If you have any questions or concerns before or after the study, you may contact me through phone or email given hereunder.

Contact numbers of Dickson Okumu

Phone: +254 723 018 998; Email:

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

Head of Department Physiotherapy, College of Health Sciences: **Dr Joseph Mwangi Matheri** email: mmatheri@gmail.com**OR Dr Nassib Tawa** emailnassibtawa@gmail.com **OR** Dean of the College of Health Sciences: *Jomo Kenyatta University of Agriculture and Technology.* P.O. Box 62000 – 00200 NAIROBI, KENYA

Kenyatta National Hospital-University of Nairobi Ethic and Research Committee, **(KNH-UoN ERC)**

Email: uonknh_erc@uonbi.ac.ke,Website: http://www.erc.uonbi.ac.ke. (254-020) 2726300 Ext

44355

This research was approved by Both: The*Jomo Kenyatta University of Agriculture and Technology* Senate Research and Ethics Committee and *Kenyatta National Hospital-University of Nairobi* Ethics

Appendix II: Questionnaires: Respondent Demographic Data

NO.	QUESTIONS	CODING CATEGORY
1	What month and year were you born	Month Year
2	Gestation age/week	1. 1-12 weeks 2. 12-24 weeks 3. 24-36 weeks
3	Marital status	1. Single 2. Married 3. Divorced 4. Widowed
4	Parity	1. 0 2. ≥ 1 Specify (No of children) …….
5	Have you ever miscarried	1. Yes 2. No Specify (No)…….
6	What is the highest level of school attended	1. None 2. Primary 3. Secondary

		4. College/Graduate
7.	Are you employed / Do you have work	1. Yes 2. No
8.	Do you have any medical condition	1. Yes 2. No Specify…….
9.	Have you had any Pregnancy related medical condition in your previous pregnancy? (Diabetic, miscarried etc.)	1. Yes 2. No Specify……. (Gestation period) ……

Appendix III: Questionnaires: Nordic Musculoskeletal Questionnaire

Please answer by using the tick boxes ☑
– *one tick for each question*

Please note that this part of the questionnaire should be answered, even if you have never had trouble in any parts of your body.

Have you at any time during the **last 12 months** had **trouble (such as ache, pain, discomfort, numbness)** in:	Have you had **trouble** during the **last 7 days:**	During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. job, housework, hobbies) because of this trouble:
1 ***Neck*** No 1☐ Yes 2☐	2 ***Neck*** No 1☐ Yes 2☐	3 ***Neck*** No 1☐ Yes 2☐
4 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	5 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	6 ***Shoulders (both/either)*** No 1☐ Yes 2☐
7 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	8 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	9 ***Elbows (both/either)*** No 1☐ Yes 2☐
10 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	11 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	12 ***Wrists/hands (both/either)*** No 1☐ Yes 2☐
13 ***Upper back*** No 1☐ Yes 2☐	14 ***Upper back*** No 1☐ Yes 2☐	15 ***Upper back*** No 1☐ Yes 2☐
16 ***Lower back (small of the back)*** No 1☐ Yes 2☐	17 ***Lower back*** No 1☐ Yes 2☐	18 ***Lower back*** No 1☐ Yes 2☐
19 ***One or both hips/thighs/buttocks*** No 1☐ Yes 2☐	20 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐	21 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐
22 ***One or both knees*** No 1☐ Yes 2☐	23 ***Knees*** No 1☐ Yes 2☐	24 ***Knees*** No 1☐ Yes 2☐
25 ***One or both ankles/feet*** No 1☐ Yes 2☐	26 ***Ankles/feet*** No 1☐ Yes 2☐	27 ***Ankles/feet*** No 1☐ Yes 2☐

Figure 2 Musculoskeletal questionnaire

Source*: Crawford, J.O., 2007, 'The Nordic musculoskeletal questionnaire',* Occupational Medicine

57(4), 300–301. https://doi.org/10.1093/occmed/kqm036

Appendix IV: Questionnaires: Pregnancy Physical Activity Questionnaire

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Pregnancy Physical Activity Questionnaire

Instructions:
Please use an ordinary No. 2 pencil. *Fill in the circles completely. The Question will be read by a machine so if you need to change your answer, erase the incorrect mark* ***completely****. If you have comments, please write them on the back of the questionnaire.*

Example: During this trimester, when you are NOT at work, how much time do you usually spend:

E1. **Taking care of an older adult**

If you take care of your mom for 2 hours each day, then your answer should look like this... →

- ○ None
- ○ Less than 1/2 hour per day
- ○ 1/2 to almost 1 hour per day
- ○ 1 to almost 2 hours per day
- ● 2 to almost 3 hours per day
- ○ 3 or more hours per day

It is very important you tell us about yourself honestly. There are no right or wrong answers. We just want to know about the things you are doing during this trimester.

1. Today's Date: ☐☐ / ☐☐ / ☐☐☐☐ (Month / Day / Year)
2. What was the first day of your last period? ☐☐ / ☐☐ / ☐☐☐☐ (Month / Day / Year) ○ I don't know
3. When is your baby due? ☐☐ / ☐☐ / ☐☐☐☐ (Month / Day / Year) ○ I don't know

---

During this trimester, when you are NOT at work, how much time do you usually spend:

4. **Preparing meals (cook, set table, wash dishes)**
   - ○ None
   - ○ Less than 1/2 hour per day
   - ○ 1/2 to almost 1 hour per day
   - ○ 1 to almost 2 hours per day
   - ○ 2 to almost 3 hours per day
   - ○ 3 or more hours per day
5. **Dressing, bathing, feeding children while you are <u>sitting</u>**
   - ○ None
   - ○ Less than 1/2 hour per day
   - ○ 1/2 to almost 1 hour per day
   - ○ 1 to almost 2 hours per day
   - ○ 2 to almost 3 hours per day
   - ○ 3 or more hours per day

Page 1

During this trimester, when you are NOT at work, how much time do you usually spend:

6. **Dressing, bathing, feeding children while you are standing**
   - O None
   - O Less than 1/2 hour per day
   - O 1/2 to almost 1 hour per day
   - O 1 to almost 2 hours per day
   - O 2 to almost 3 hours per day
   - O 3 or more hours per day

7. **Playing with children while you are sitting or standing**
   - O None
   - O Less than 1/2 hour per day
   - O 1/2 to almost 1 hour per day
   - O 1 to almost 2 hours per day
   - O 2 to almost 3 hours per day
   - O 3 or more hours per day

8. **Playing with children while you are walking or running**
   - O None
   - O Less than 1/2 hour per day
   - O 1/2 to almost 1 hour per day
   - O 1 to almost 2 hours per day
   - O 2 to almost 3 hours per day
   - O 3 or more hours per day

9. **Carrying children**
   - O None
   - O Less than 1/2 hour per day
   - O 1/2 to almost 1 hour per day
   - O 1 to almost 2 hours per day
   - O 2 to almost 3 hours per day
   - O 3 or more hours per day

10. **Taking care of an older adult**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 1 hour per day
    - O 1 to almost 2 hours per day
    - O 2 to almost 3 hours per day
    - O 3 or more hours per day

11. **Sitting and using a computer or writing, while not at work**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 1 hour per day
    - O 1 to almost 2 hours per day
    - O 2 to almost 3 hours per day
    - O 3 or more hours per day

12. **Watching TV or a video**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 2 hours per day
    - O 2 to almost 4 hours per day
    - O 4 to almost 6 hours per day
    - O 6 or more hours per day

13. **Sitting and reading, talking, or on the phone, while not at work**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 2 hours per day
    - O 2 to almost 4 hours per day
    - O 4 to almost 6 hours per day
    - O 6 or more hours per day

14. **Playing with pets**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 1 hour per day
    - O 1 to almost 2 hours per day
    - O 2 to almost 3 hours per day
    - O 3 or more hours per day

15. **Light cleaning (make beds, laundry, iron, put things away)**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 1 hour per day
    - O 1 to almost 2 hours per day
    - O 2 to almost 3 hours per day
    - O 3 or more hours per day

16. **Shopping (for food, clothes, or other items)**
    - O None
    - O Less than 1/2 hour per day
    - O 1/2 to almost 1 hour per day
    - O 1 to almost 2 hours per day
    - O 2 to almost 3 hours per day
    - O 3 or more hours per day

During this trimester, when you are NOT at work, how much time do you usually spend:

17. **Heavier cleaning (vacuum, mop, sweep, wash windows)**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

18. **Mowing lawn while on a riding mower**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

19. **Mowing lawn using a walking mower, raking, gardening**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

Going Places...

During this trimester, how much time do you usually spend:

20. **Walking <u>slowly</u> to go places (such as to the bus, work, visiting)** ***<u>Not</u> for fun or exercise***

- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 1 hour per day
- O 1 to almost 2 hours per day
- O 2 to almost 3 hours per day
- O 3 or more hours per day

21. **Walking quickly to go places (such as to the bus, work, or school)** ***<u>Not</u> for fun or exercise***

- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 1 hour per day
- O 1 to almost 2 hours per day
- O 2 to almost 3 hours per day
- O 3 or more hours per day

22. **Driving or riding in a car or bus**

- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 1 hour per day
- O 1 to almost 2 hours per day
- O 2 to almost 3 hours per day
- O 3 or more hours per day

For Fun or Exercise...

During this trimester, how much time do you usually spend:

23. **Walking <u>slowly</u> for fun or exercise**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

24. **Walking more <u>quickly</u> for fun or exercise**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

25. **Walking <u>quickly up hills</u> for fun or exercise**

- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

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During this trimester, how much time do you usually spend:

26. **Jogging**
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

27. **Prenatal exercise class**
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

28. **Swimming**
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

29. **Dancing**
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

Doing other things for fun or exercise? Please tell us what they are.

30. _____ Name of Activity
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

31. _____ Name of Activity
- O None
- O Less than 1/2 hour per week
- O 1/2 to almost 1 hour per week
- O 1 to almost 2 hours per week
- O 2 to almost 3 hours per week
- O 3 or more hours per week

Please fill out the next section if you work for wages, as a volunteer, or if you are a student. If you are a homemaker, out of work, or unable to work, you do not need to complete this last section.

At Work...

During this trimester, how much time do you usually spend:

32. **Sitting at working or in class**

- O None
- O Less than 1/2 hours per day
- O 1/2 to almost 2 hours per day
- O 2 to almost 4 hours per day
- O 4 to almost 6 hours per day
- O 6 or more hours per day

33. **Standing or slowly walking at work while carrying things (heavier than a 1 gallon milk jug)**
- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 2 hours per day
- O 2 to almost 4 hours per day
- O 4 to almost 6 hours per day
- O 6 or more hours per day

34. **Standing or slowly walking at work not carrying anything**
- O None
- O Less than 1/2 hours per day
- O 1/2 to almost 2 hours per day
- O 2 to almost 4 hours per day
- O 4 to almost 6 hours per day
- O 6 or more hours per day

35. **Walking quickly at work while carrying things (heavier than a 1 gallon milk jug)**
- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 2 hours per day
- O 2 to almost 4 hours per day
- O 4 to almost 6 hours per day
- O 6 or more hours per day

36. **Walking quickly at work not carrying anything**
- O None
- O Less than 1/2 hour per day
- O 1/2 to almost 2 hours per day
- O 2 to almost 4 hours per day
- O 4 to almost 6 hours per day
- O 6 or more hours per day

Thank You

Appendix V: Work plan

	Apr–Jun 2019	**Jul–Sept 2019**	**Oct–Dec 2019**	**Jan-Mar 2020**	**Apr–Jun 2020**	**Jul–Sept**
Proposal development						
Presentation to BPS						
Submission to ERC						
Pilot study – data collection						
Main study – data collection						
Data analysis						
Presentation of results						
Write up						
Submission						
Publication						

Appendix VI: Budget

ITEM	NO. OF UNITS	UNIT COST (KSH)	TOTAL COST
Stationary	10 reams	600	6,000
Transport			10,000
Printing	(10 x 300) pages	5	15,000
Biostastician	1	55,000	55,000
Bag	3	1,000	3,000
Research Assistants	2	30,000 per month x 2	60,000
Internet		6,000	6000
Laptop	1	40,000	40,000
Total			186,000
Miscellaneous	10% of Total cost		18,600
Grand Total			**203,600**

Appendix VII: Approvals

JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

P.O. BOX 62000
NAIROBI – 00200
KENYA
Email: director@bps.jkuat.ac.ke
TEL: 254-67-5870000/1-5

REF: JKU/2/11/HSM321-1675/2017

25TH JULY, 2019

AGUTU DICKSON OKUMU
C/o SoMED
JKUAT

Dear Mr. Okumu,

RE: APPROVAL OF RESEARCH PROPOSAL AND OF SUPERVISORS

Kindly note that your MSc. research proposal entitled: **"LVELS OF PREGNANCY PHYSICAL ACTIVITY AMONGST WOMEN WITH REGIONAL MUSCULOSKELETAL DISORDERS ATTENDING ANTENATAL CLINICS AT SELECTED COUNTY REFERRAL HOSPITALS IN NAIROBI, KENYA"** has been approved. The following are your approved supervisors:-

1. Dr. Nassib Tawa
2. Dr. Joseph Mwangi
3. Dr. Evaristo Opondo

Yours sincerely,

PROF. MATHEW KINYANJUI
DIRECTOR, BOARD OF POSTGRADUATE STUDIES
Copy to: Dean, SoMED

/cm

Levels of Pregnancy Physical Activity amongst Women with Regional Musculoskeletal Disorders Attending Antenatal Clinics at the National and Selected County Referral Hospitals in Nairobi, Kenya

Dickson Okumu Agutu
HSM 321-1675/2017

A research proposal submitted in partial fulfillment of the requirements for the award of the degree of Master of Science in Orthopedic Physiotherapy, at the Department of Rehabilitation Sciences, Jomo Kenyatta University of Agriculture and Technology

2019

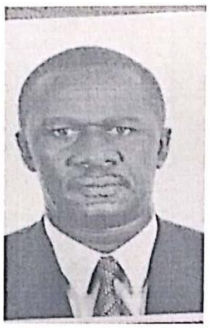
REPUBLIC OF KENYA

NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **440711**

Date of Issue: **01/October/2019**

RESEARCH LICENSE



This is to Certify that Mr.. DICKSON AGUTU of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Nairobi on the topic: "LEVELS OF PREGNANCY PHYSICAL ACTIVITY AMONGST WOMEN WITH REGIONAL MUSCULOSKELETAL DISORDERS ATTENDING ANTENATAL CLINICS AT THE NATIONAL AND SELECTED COUNTY REFERRAL HOSPITALS IN NAIROBI, KENYA" for the period ending : 01/October/2020.

License No: **NACOSTI/P/19/1736**

440711

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY &
INNOVATION

Verification QR Code

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

KNH/R&P/FORM/01

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
   DICKSON OKUMU AGUTU
2. Email address: daguty@yahoo.com Tel No. 0723015998
3. Contact person (if different from PI) ——
4. Email address: —— Tel No. ——
5. Study Title
   LEVELS OF PREGNANCY PHYSICAL ACTIVITY AMONGST WOMEN WITH REGIONAL MUSCULOSKELETAL DISORDERS ATTENDING ANTENATAL CLINICS AT KIAMBU AND SELECTED COUNTY REFERRAL HOSPITALS IN NAIROBI, KENYA
6. Department where the study will be conducted OBSTETRICS AND GYNAECOLOGICAL CLINICS (CLINICS)
   (Please attach copy of Abstract)
7. Endorsed by Research Coordinator of the KNH Department where the study will be conducted.
   Name: DR. IKOL KOINGO Signature [signature] Date 7/10/19
8. Endorsed by KNH Head of Department where study will be conducted.
   Name: DR MAUREEN AUTI Signature [signature] Date 7/10/19
9. KNH UoN Ethics Research Committee approved study number P598/07/2019
   (Please attach copy of ERC approval)
10. I DICKSON OKUMU AGUTU commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Research and Programs.
    Signature [signature] Date 30/9/2019
11. Study Registration number (Dept/Number/Year) OBS & GYNAE /339/2019
    (To be completed by Research and Programs Department)
12. Research and Program Stamp KENYATTA NATIONAL HOSPITAL 03 OCT 2019

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Research and Programs and investigators **must commit** to share results with the hospital.

Version 2: August 2014

NAIROBI CITY COUNTY

legrams: "PROMINHEALTH" Nairobi
lephone: Nairobi 217131/313281
x: 217148
mail: pmonairobi@yahoo.com

COUNTY HEALTH OFFICE
NAIROBI
NYAYO HOUSE
P.O. Box 34349-00100
NAIROBI

hen replying please quote

ef. No. CMO/NRB/OPR/VOL1-2/2019/164

COUNTY HEALTH SERVICE

DICKSON OKUMU AGUTU
JOMO KENYATTA UNIVRESITY OF AGRICULTURE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCE
P.O.BOX 20723-00202
NAIROBI
6.12.2019

RE: RESEARCH AUTHORIZATION

This is to inform you that the Nairobi City County Operational Technical Working group reviewed the documents on the study titled, **"Levels of Pregnancy Physical Activity Amongst Women with Regional Musculoskeletal Disorders attending ANC at KNH and county referral hospitals in Nairobi County-Kenya**

I am pleased to inform you that you have been authorized to undertake the study in Nairobi County.

The researcher will be required to adhere to the ethical code of conduct for health research in accordance to the Science Technology and Innovation Act, 2013 and the approval procedure and protocol for research for Nairobi County

On completion of the study, you will submit one hard copy and one copy in PDF of the research findings to our operational research technical working group.

Raphael Muli

FOR COUNTY DIRECTOR OF MEDICAL SERVICES

CC: **Medical Superintendent – Mama Lucy Kibaki, Mbagathi and Pumwani Hospitals**

Telephone:
020 - 2297000

E-mail: medsupnedh@yahoo.com

When replying please quote

REPUBLIC OF KENYA
MINISTRY OF HEALTH
NAIROBI CITY COUNTY

MAMA LUCY KIBAKI HOSPITAL-EMBAKASI
P.O. Box 1278-00515
NAIROBI

Ref: No.- MLKH/ADM/RES/1

Date: 17th December , 2019.

DICKSON OKUMU AGUTU
JKUAT, COLLEGE OF HEALTH SCIENCE
PO BOX 20723-00202,
Nairobi.

RE: TEMPORARY PERMISSION TO COLLECT DATA.

TITTLE: "LEVELS OF PREGNANCY PHYSICAL ACTIVITY AMONGST WOMEN WITH REGIONAL MUSCULOSKELETAL DISORDERS ATTENDING ANC AT KNH AND COUNTY REFFRAL HOSPITALS IN NAIROBI COUNTY-KENYA. "

Refer to your application to collect data on the above research in this institution.

This is to inform you that hospital has given you temporally permission to allow you collect data which expires after the next research committee meeting.

MAMA LUCY KIBAKI HOSPITAL
17 DEC 2019
P.O. Box 1278-00515, BURUBURU

DR. MUSA MOHAMMED
FOR **MEDICAL SUPERINTENDENT.**

NAIROBI CITY COUNTY

Telephone: +254 218 2114
Website: www.nairobi.go.ke

City Hall
P. O. Box 30075-00100
Nairobi
KENYA

COUNTY HEALTH SERVICES:
PUMWANI MATERNITY HOSPITAL:

PMH/DMOH/75/010167/2019

20TH DECEMBER 2019

To:
Dickson Okumu Agutu
Jomo Kenyatta Universtiy of Agriculture and Technology
College of Health Science
P O Box 20723-00202
NAIROBI

RE: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that the research entitled "**Levels of Pregnancy Physical Activity Amongst Women with Regional Musculoskeletal Disorders attending ANC at KNH and county referral hospitals in Nairobi County - Kenya".**" has been approved.

You are hereby allowed to collect data. We look forward to receiving a summary of the research findings upon completion of the study.

Yours sincerely,

24/12/19

DR. FARHIA A. AFFI
AG.MEDICAL SUPERINTENDENT

NAIROBI CITY COUNTY

Tel: 2724712, 2725791, 0721 311 808
Email: mbagathihosp@gmail.co

Mbagathi Hospital
P.O. Box 20725- 00202,
Nairobi.

COUNTY HEALTH SERVICES

Re: MDH/RS/1/VOL.1

23rd January 2020

Dickson Okumu Agutu
JKUAT

RE: RESEARCH AUTHORIZATION

This is in reference to your application for authority to carry out a research on *"Levels of Pregnancy Physical Activity Amongst Women With Regional Musculoskeletal Disorders Attending Antenatal Clinics At Mbagathi"*

I am pleased to inform you that your request to undertake research in the hospital has been granted.

On completion of the research you are expected to submit one hard copy and one soft copy of the research report/ thesis to this office.

24 JAN 2020

Dr. D. Kimutai
Chairman – Research Committee
Mbagathi Hospital