MECHANICAL PAIN PATTERNS AND RISK FACTORS ASSOCIATED WITH ITS CHRONIFICATION AMONG PATIENTS WITH NON-SPECIFIC LOW BACK PAIN AT NAKURU TEACHING AND REFERRAL HOSPITAL

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Mechanical Pain Patterns and Risk Factors Associated with its Chronification among Patients with Non-Specific Low Back Pain at Nakuru Teaching and Referral Hospital

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DECLARATION

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

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DEDICATION

I dedicate this thesis to my late parents (Mr & Mrs Muisyo “Don’t despise humble beginnings”), Muasya’s and Muisyo’s families who unwavering support and encouragement have been my constant source of inspiration. Their guidance and love, was the lighthouse during this milestone in my academic journey.

To my wonderful spouse Lydia thank you for your love, understanding and patience.

I dedicate thesis to Koki and Emmanuel your love and warm embrace strengthened me to overcome any obstacle and achieve my goals

“Nature does not hurry yet everything is accomplished”

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DEFINITION OF TERMS

Chronification of pain	Morlion et al.(2018) describes chronification of pain "as pain processing changes as results of imbalance between pain amplication and pain inhibition. Genetic, environmental and bio-psychosocial factors determine the risk, degree and time course of chronification."
Mechanical pain pattern	Mechanical pain is pain that either increases or abolished by trunk movement or position. Pain experienced can be constant, intermittent or changed (i.e. from constant to intermittent or visa vis)(Mcintosh et al., 2016).
Non-specific low back pain	In this study nonspecific low back was defined as back pain of unknown cause no history of known specific pathology (Balagué et al., 2012).

ABBREVIATIONS AND ACRONYMS

CEN	Centralization
CI	Confidence interval
CLBP	Chronic low back pain
DP	Directional preference
HPP	Hall pain patterns
HRQoL	Health Related of Quality of Life
JKUAT	Jomo Kenyatta University of Agriculture and Technology
LBP	Low back pain
NACOSTI	National Commission of Science Technology and Innovation
NSLBP	Nonspecific low back pain
ODI	Oswestry Disability Index
OMPSQ	Orebro Musculoskeletal Pain Screening Questionnaire
OPD	Outpatient Department
P1	Pattern 1
P2	Pattern 2
P3	Pattern 3
P4	Pattern 4
PTS	Post-Traumatic Stress

ROC	Receiver Operating Characteristic
SPSS	Statistical Package for Social Scientist
USA	United States of America

ABSTRACT

The majority of patients with low back pain presents with the non-specific low back pain sub-type, research has shown that most of these patients often do not recover fully and risk transitioning to chronic pain. Causing extraordinary levels of disability, poor health-related quality of life and expensive medical cost due prolonged overutilization of healthcare services. In our setup, there is limited availability of information regarding how to address the aforementioned issue. The aim of this study was to identify the mechanical pain patterns associated with non-specific low back pain and assess the risk factors contributing to its chronification among individuals seeking treatment at the outpatient physiotherapy clinic in a tertiary facility located in Nakuru. **Study Site:** This study was done at Nakuru Teaching and Referral hospital in Nakuru County. ***Study design;*** An analytical cross-sectional; sample size of 70 participants were selected from physiotherapy out -patient department clinic. ***Methods;*** Participants were categorized into four Mechanical Pain Pattern (P1, P2, P3 &P4) through Saskatchewan Spine Pathway Assessment and Referral form and level of chronicity was established using Orebro Musculoskeletal pain screening questionnaire (OMPSQ). Descriptive and inferential statistics was generated using SPSS version26.***Results;*** Among the participants Pattern1(n=32:45.7%, Pattern 2(n=11:15.7%), Pattern 3(n=15;21.5%) and Pattern 4(n=12;17.1%) were identified. The majority of participants were categorized as follows: 37.1% at moderate risk, 17.2% at high risk, and 45.7% at low risk. Concerning risk of chronification, Pain location was significantly correlated with Pattern 3 ($p<0.012$), whilst absenteeism was significant with leg symptoms($p<0.020$) and severe disability index index/severe disability index ($p<0.046$) demonstrated a significant association. Absenteeism was found to be significant correlated with pain duration. Physical activity makes pain worse was positive correlated with extent of depression, risk of persistence and pain episodes. Significant predictors for risk of chronification were level of education, Pattern 3, and Pattern 4.Conclusion; this study established majority of patients of NSLBP categorized as P1 and 54%were flagged as moderate risk to high risk for chronification. Furthermore, those with subtype P3 mechanical pain pattern, leg symptoms, severe disability index; these clinical characteristics were associated with risk of chronification. That Orebro-musculoskeletal may implemented to identify patients at of risk of chronification.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Low back pain (LBP) is term that describes pain arising between the area bordered by the costal angle and the gluteal fold that may radiate down one or both lower limbs with self-limiting episodes (Wu *et al.*, 2020; Hall, 2014; Hallegraeff, Krijnen, Schans, & Greef, 2012). Low back pain (LBP) is a universal public health concern affecting more than 80% of the world's population in patients with musculoskeletal pain and it is the principal source of years lived with disability ((Williams *et al*., 2015; Buchbinder, *et al*., 2013; Andersson, 1999). In another study, LBP was found to cause more disability, greater than HIV/ AIDS, road accidents, pulmonary tuberculosis and preterm birth complications ((Hoy *et al*., 2014; Duthey, 2013).

1.1.1 Categorization of Non-specific Low Back Pain

Categorization of patients presenting with NSLBP is very critical in practice, because it contributes towards accurate participants clustering and diagnosis which ultimately leads to application of appropriate interventions hence leading good treatment outcomes (Vos *et al.*, 2016).

Using the patho-anatomical classification system which classifies LBP based on the lumbar structure involved, patients with LBP can be classified into three main sub-types namely; NSLBP, red flag pathologies and radicular pain (Simula *et al*. 2020; Tawa *et al.*, 2019).

Approximately 80% to 85% of individuals complaining of LBP are classified as NSLBP subtype, whereas red flags pathology and radicular pain exhibit comparatively lower prevalence (Hall *et al*., 2021; Maher, Underwood & Buchbinder, 2016).

Nonspecific low back significantly affects majority of individuals accounting for 80% to 85% of all cases of individual with LBP, while red flags and radicular pain

are relatively less prevalent. Based on research evidence more than 9 in 10 patients with NSLBP will experience biomechanical pain during acute phase (Hall *et al.*, 2021; Maher, Underwood, & Buchbinder, 2016).

1.1.2 Mechanical Pain Patterns in Nonspecific Low Back Pain

According to Morlion *et al*., (2018); Sizer, Phelps, and Matthijs (2001) NSLBP can arise from a variety of different anatomical sites in concert with complex mechanical and neurophysiological processes that arise in response to trauma and disease. In order to accurately diagnosis and provide patients-centered care health care professional often conduct physical examination. This examination aims to uncover the underlying structure or mechanism responsible for patients illness(Hall *et al*. 2021; Anon, 2012).

The mechanical pain pattern categorization considers three crucial elements to a pain pattern: the primary location of pain (either in the back or leg), characteristics of pain (constant or intermittent) and the influence of trunk flexion(aggravating, relieving or no effect) (Hall *et al*., 2021; Dipphysio, 2014; Fritz, Beneciuk, & George, 2011; Werneke, & Hart, 2004). According to Hamilton Hall (Hall, 2014), described four presenting syndrome or mechanical dominant pain patterns that feature among NSLBP which is adapted by lumber spine movement or certain positions. The four pain patterns are described below:

Pattern 1 (P1): In this pattern, the pain is predominantly located at the back and is aggravated by back flexion movement or sustained position. The pain is also either constant or intermittent and relieved by standing in extension position.

Pattern 2 (P2): In this pattern, the pain is aggravated by extension movement and is always intermittent on physical examination. Patient's symptoms are reproduced by back extension while back flexion is asymptomatic.

Pattern 3 (P3): In this pattern, the pain is characteristically dominant in the leg. The intensity of pain always varies and is related to acute irritation of one or more spinal nerves.

Pattern 4 (P4): In this pattern, the pain is intermittent in nature and dominant in the leg. In case of presence of neurogenic claudication, the leg pain is aggravated by movement and eased by sitting in a spinal flexion. Patients with P4 pain pattern also present with features of transient weakness during exercises and loss of balance.

Intermittent mechanical pain is one the clinical variables that is associated with decreased levels of disability than those of participants with constant pain, hence giving pain predictive value in terms of development chronicity and disability(Hall *et al*., 2021; Mcintosh *et al*., 2016).

1.2 Etiology of Non-specific Low Back Pain.

The causes and risk factors are highly multifactorial in nature and range from biomechanical, psycho-social, physical, genetic and cultural factors. The interactions, diversity and complexity of these factors presents with wide spectrum of clinical presentations, clinical course of disease and prognosis, hence advocacy for heterogeneous clustering of this patients into a distinct unique characteristic((Moissenet *et al*., 2021; Kent, Keating, Kent, Manipphysio, & Keating, 2005).

1.3 Risk Factors Associated with Chronification of Pain.

Chronic NSLBP is becoming a public health concern because it is associated with extraordinary levels of disability, poor health related quality of life and expensive medical cost due prolonged overutilization of healthcare services (Sattelmayer *et al*., 2012; Hill *et al*., 2010).Evidence indicates diverse psychosocial factors are associated with risk of non-recovery; hence linked to development of chronicity and poor outcomes: for instance(depression, catastrophizing, fear and self-efficacy),sedentary lifestyle, negative beliefs, work-related factors and individual factors such as (age, smoking cigarettes, obesity and gender); (Moissenet *et al.*, 2021; Robinson, 2017; O'Sullivan & Lin, 2014; Sullivan, 2005).

It is becoming increasing significant for health care workers to screen patients to identify risk factors for intended interventions and prevent chronification (Ahmed *et al*., 2021; Sattelmayer *et al*., 2012).

Screening for psychosocial prognostic predictable factors are designed to categorize risk of patients' progression to chronicity(Karran *et al.,* 2017; Dipphysio, 2014; Hill *et al*., 2011).

Research findings have noted several factors such as stress levels, work absenteeism, individual pain experiences, negative beliefs, job dissatisfaction, level of education and maladaptive coping strategies have predictive and prognostic contributory role in chronicity of LBP, (Karran *et al.,* 2017; Wippert, Puschmann, Arampatzis, Schiltenwolf, & Mayer, 2017; Casser, Seddigh, & Rauschmann, 2016; Dipphysio, 2014 ; Hill *et al.*, 2011).

Patients are categorized into three (3) distinct subgroup based on impending disability namely; 'low risk', 'medium risk' and 'high risk'. Patients are categorized as 'medium risk' have both physical predictive symptoms for poor outcomes such as lateralization symptoms of leg pain and comorbid with low levels psychosocial signs; while those of 'high risk' predictive symptoms have both high levels of physical and psychosocial signs(Robinson, 2017; Hill *et al*., 2011; Hay *et al*., 2008).

Utilization of categorization scheme is significant in health care for it contributes to several positive trends including identification of homogenous subgroup, facilitating cluster-specific investigations, intervention and risk of chronification. Evidence has shown this approach enhances health related outcomes and it is effective in decreasing levels of pain and disability in patients with NSLBP(Mora, Perruccio, & Badley, 2016; Dipphysio, 2014; Hill *et al.*, 2011; Sullivan, 2005).

1.4 Statement of the Problem

Globally NSLBP is a prevalent musculoskeletal health issue that impacts around 84% of adults, exerting a detrimental influence on both individuals and communities at large. It stands as a primary contributor to years lived with disabilities on global

scale. According to Global Burden of Disease(Wu *et al*., 2020) years lived with disability attributable to NSLBP have risen significantly from 42.5million in 1990 to 64.9 million in 2017 signifying a substantial 52.7% upward trajectory.

The economic burden associated with NSLBP is high; in high income, countries medical cost of NSLBP represent 3%-10% of Goss domestic product, decreased productivity, loss of income leading to significant financial instability. NSLBP is associated with decreased levels of quality of life(QoL), function and participation; with increase absenteeism.(Wu *et al*., 2020; Bello & Adebayo, 2017; Hoy *et al*., 2014).

According to((Williams *et al*., 2015; Louw *et al.,* 2007) the prevalence of LBP among Africans ranges between 14% to 72% higher than that of developed economies.

In Low and middle-income countries NSLBP is considered to be trivial (Buchbinder, et al., 2013), despite its increase in prevalence and burden. In Sub Sahara-Africa in a study by (Kahere & Hlongwa, 2022; Morris *et al*., 2018) reported that lifetime, annual and point prevalence of LBP was considerably higher than the global estimates. Burden not only affects individuals but society at large with associated increase in health care cost and significant losses of productivity (Mora *et al.*, 2016).

In Kenya most studies a based on working population, reported LBP as the most prevalent of musculoskeletal disorder among working population according to several studies; one study by (Downing & Elias, 2016) revealed that 65% of teachers experienced LBP in past one year. In another study done in Kericho by Langat, Bii, Opondo, and Mbakaya, (2015) amongst tea pickers and non-tea pickers reported that at the prevalence of LBP to range between 50% and 43.9% higher than those from Africa and rest of the world, respectively. This was associated with increased absenteeism from work and a decrease in productive affecting the majority of individuals in their productive age.

Furthermore, conventional practice of preventing, diagnosing and management of NSLBP was found to be responsible for patients' suboptimal medical outcomes

which may liable for recurrence and transitioning from acute stage to chronic NSLBP(Foster *et al*., 2018).

Existing management strategies include inappropriate use of opioids, imaging, rest, spinal injection and surgeries were found not to be effective (Nunn *et al*., 2017).

Embracing these practices is based on non-evidenced practices, therefore, increasing the risk of chronicity NSLBP and persistent disability levels among participants with NSLBP(Tousignant-Laflamme *et al*., 2017).

1.5 Broad Objective.

To determine the mechanical pain patterns and risk factors associated with its chronification amongst patients with non-specific low back pain attending the out-patient physiotherapy clinics at Nakuru County teaching and referral hospital.

1.5.1 Specific Objectives.

1) To describe socio-demographic of patients presenting with NSLBP at out-patient physiotherapy clinic Nakuru County teaching and referral Hospital.
2) To determine the mechanical pain patterns and clinical characteristic of NSLBP amongst patients attending OPD clinic at Nakuru County Teaching and Referral Hospital.
3) To determine levels of chronification amongst NSLBP patients at OPD clinic at Nakuru County Teaching and Referral Hospital.
4) To determine the association of socio-demographic characteristics, clinical characteristics and psychosocial characteristics as a risk of chronification among patients with NSLBP attending out-patient physiotherapy clinic Nakuru County Teaching and Referral Hospital.

1.6 Research Questions.

1) What is the socio-demographic of patients presenting with NSLBP attending OPD clinic at Nakuru County Teaching and Referral Hospital?

2) What are the mechanical pain patterns and clinical characteristics of NSLBP based on HPP model at the Physiotherapy OPD at Nakuru County Teaching and Referral Hospital?
3) What are the levels of chronification amongst NSLBP patients at OPD clinic Nakuru County Teaching and Referral Hospital?
4) What is the association between socio-demographic characteristics, clinical characteristics and psychosocial characteristics as a risk of chronification amongst patients with NSLBP at physiotherapy OPD department at Nakuru County Teaching and Referral Hospital?

1.7 Significance of the Study.

Kenya Health Policy of 2014-2030 one of the key indicators is reducing numbers of years lived with disability by 25%; which is commonly associated with NSLBP.

Screening for risk factors is the initial steps towards prevention of chronification of NSLBP. This will assist health care providers to implement care pathways that are based on evidence in management of NSLBP. Consequently, preventing the onset of disability related to NSLBP and reducing cost healthcare in resource scarce countries. Reducing therefore, burden related to NSLBP by adapting evidence-based practices, strategies to categorization for risk of chronification to predict future clinical outcome through a screening questionnaire for prognostic outcomes, which are both physical and psychosocial factors.

1.8 Conceptual Framework.

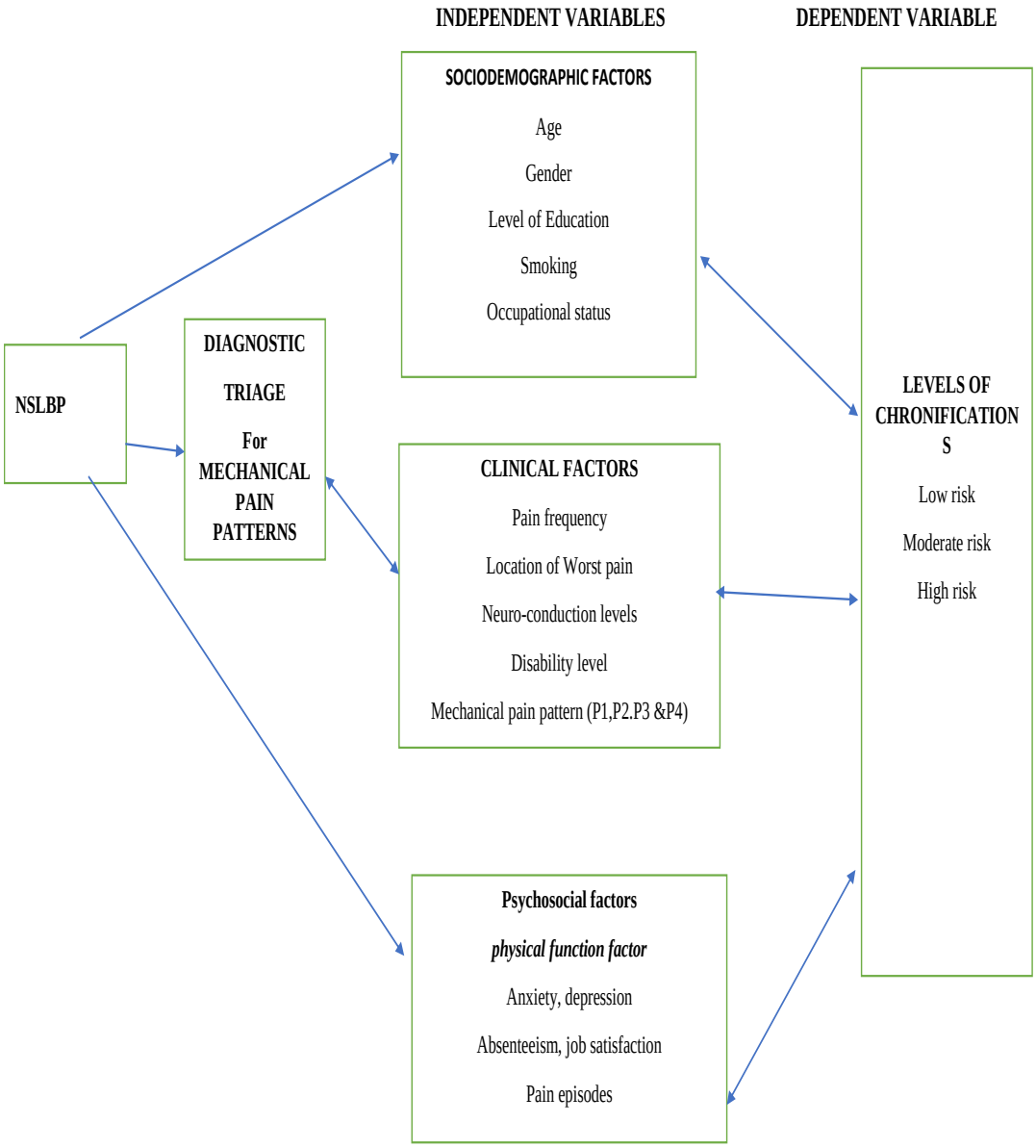

Figure 1.1: Study Conceptual Framework

KEY

Pattern 1 (P1); intermittent or constant pain, pain aggravated by flexion is categorized prone extension negative (PEN) or prone extension positive (PEP)

In pattern there is fast responder i.e. better with unloaded extension and slow responder worse with extension loaded/ unloaded.

Pattern 2 (P2); intermittent pain, pain aggravated extension; no effect or better on flexion and neurological non-contributory.

Pattern 3 (P3); Leg dominant pain below gluteal fold, affected by position/ movement of the trunk dominant and pain are constant. On physical examination, neurological dynamic is positive for irritability of nerve.

Pattern 4 (P4); intermittent leg pain, worse with activity in extension, symptoms improve with rest and extension of trunk. On neurological examination irritability test is negative with loss of conduction.

1.9 Summary of the Chapter.

Non-specific low back pain comprises approximately 80%-85% of all cases with LBP seen in primary health care. Making low back pain the leading cause of years lived with disability in primary health care. Evidence suggests more than 90% of all clients with NSLBP experience biomechanical pain during acute episode.

Evidence- based practice, strategy is to stratify for risk of chronification to predict future clinical outcome through a screening questionnaire for prognostic outcomes, which are both physical and psychosocial risk factors for NSLBP.

Utilization of classification systems in triangulation multifactorial factors in identifying prognosis outcome; based on mechanical pain patterns and risk factors associated with chronification is of clinical importance.

Identifying numerous prognostic elements to predict chronification and disability levels is a priority in health care and research; hence improved outcomes amongst this group of patients.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents document information regarding the mechanical pain patterns and risk of chronicity amongst NSLBP in clinical setup. Information from previous related studies was analyzed in order to highlight key findings in terms of consensus, disaggregation and focus area for future research which be addressed by proposed study within Kenya clinical setting.

2.2 Prevalence and Impact of Low Back Pain.

Low back pain (LBP) is a universal public health concern affecting more than 80% of world's population with musculoskeletal pain and it is the principal source of years lived with disability (Andersson, 1999; Duthey, 2013).

In another study, LBP was found to cause more disability, with greater effects than HIV/ AIDS, road accidents, pulmonary tuberculosis and preterm birth complications (Duthey, 2013). All age groups are affected by LBP ,significantly impacting on all spheres of individuals affected by it ; having an enormous domino effect to society and government in terms of work loss , huge incurred medical expense running into billions of dollars and participation disability index(Hoy *et al*., 2014; Cousins, 2000).

Studies from developed world such as Australia and United States of America(USA) according to (Cousins, 2000) reported similar estimates in prevalence of LBP with annual prevalence of ranging from 26.4% to 79.2%.

In a systematic review by (Morris e*t al*., 2018; Louw, Morris, & Grimmer-Somers, 2007) in Africa, it was observed that the prevalence of low back pain (LBP) varied widely, ranging from 14% to 72%. Many studies on LBP focused on specific occupational groups, such as nurses in private clinics. The absence of evidence-based practices could contribute to the persistence of chronic pain and disability, a common issue among the LBP patient population.

The likelihood of transitioning from acute LBP to chronic low back pain (CLBP) was found to be significantly associated with several factors. These factors included the occurrence of non-specific low back pain (NSLBP) during youth, engagement in strenuous physical activities in rural settings, and a higher prevalence among the female population. In young individuals, the adoption of information technology in education was also linked to the development of persistent poor postural habits.

In Sub Sahara Africa a systematic review by(Bello & Adebayo, 2017) prevalence of LBP among Nigerians estimates was reported be a low of 32.5% and high of 62% in 12 months period this was higher than those of the developed world. In a survey done in six developing countries among them South Africa and Ghana by (Williams et al., 2015) elucidated the following ; prevalence of CLBP stood at 41.1% higher than those of developed world at 37.3%, and LBP is common in developing countries than previously thought.

In East Africa a study done in Kampala by Galukande, Muwazi, and Mugisa, (2006) posited that most patients affected by LBP were of productive age of adults, significantly impinging on their productivity and activities of daily living. Point prevalence of LBP was 20% with 62.3% of patients stratified as mechanical low back pain and 19.1% had nerve root impingement. Approximately 87% had reported taken 14 sick off days from work secondary to LBP, most of the patients experienced pain episodes for 5 months.

In Tanzania a study by (Mwilila, 2008) yield that the prevalence of LBP amongst clinical nurses working in Muhimbili Orthopedic Institute was 73%. In Kenya most studies a based on working population, reported LBP as the most prevalent of musculoskeletal disorder among working population according to several studies; one study by (Downing & Elias, 2016)revealed that 65% of teachers in had experienced LBP in past one year. In another study by Orege, Abuya, and Elias (2013) yield that the prevalence of participants with CLBP for long periods of 3-5 years was 56% this was linked to delay hospital presentation amongst the involved patients in this study. Furthermore, 30.81% had LBP with radiculopathy and 3.24% had disabling LBP with inability to walk. It was also noted that majority of patients

were employed and exposure to manual work that entails stooping and heavy lifting or mechanization of tools of operation resulted on LBP. Lastly, there was significant correlation between disc degeneration and age in patients in this study. A study in Kericho by Langat, Bii, Opondo, and Mbakaya, (2015) amongst tea-picker and non-tea picker prevalence of LBP was 50% and 43.9% respectively; the prevalence was higher than those of Africa and that males are more affected than their female counter part. The two sub groups of workers had reported to experience LBP and this was significantly associated with absenteeism from work and 29 % with history of experience LBP before been employed. It was further posited that 35% of tea picker workers associated occupation with development of LBP. In another study by (Romanenko, 2016) recorded that CLBP affects more female than male, individuals employed in formal sectors and middle age participants with mean age of 46 years are most affected.

2.3 Mechanical Pain Pattern.

A study by Mcintosh *et al.* (2016) classification system grants patient-focused individualized care. Physiotherapy evaluation was based on the four clinical syndromes or pain patterns. Mechanical pain is pain that either increases or abolished by trunk movement or position. Pain experience was constant, intermittent or changed (i.e. from constant to intermittent or visa Vis). Intermittent LBP had the highest prevalence at 55%; with 40.3% of all participants, reporting abolished pain at the end of treatment. Patients with constant pain who transitioned to intermittent pain to full abolition of pain was 82.1%. All in all, 87% of constant pain and 84% intermittent group attributed improvement of pain symptoms mechanical pain control, directional preference exercises and pain-relieving strategies. Screening for pain status at initial stages of assessment and educating patients on possible pain changes patterns is advantageous to both clinician and patients. In a cross-sectional study by Mora *et al*. (2016) yield that proportional of patients categorized as P1 was 42%, P2 31%, P4 17% and P4 10%. Patients stratified as P3 patients had the highest score average (i.e. worse) on Oswestry Disability index (ODI) and was associated with poor quality of life. Greater proportional of women were classified in P1 and

P2: while older, and obese participants were clustered in P3 and P4, this group was also associated with highest percentage of co-morbidity.

A study by Hall (2021) reported the following findings approximately 90% of LBP describes four mechanical pain patterns which have well defined characteristics and management algothrim: Pattern 1; is described as constant or intermittent pain, pain aggravated by flexion is categorized prone extension positive (PEP) or prone extension negative(PEN).In this pattern it was further sub-grouped into fast responder i.e. better with unloaded extension and slow responder worse with extension loaded/ unloaded. Pattern 2; intermittent pain, pain-aggravated extension; no effect or better on flexion and neurological non-contributory.

Pattern 3; Leg dominant pain below gluteal fold, is affected by position/ movement of the trunk dominant and pain is constant. On physical examination, neurological dynamic is positive for irritability of nerve (lumbar radiculopathy). Pattern 4; intermittent leg pain, worse with activity in extension, symptoms improve with rest and extension of trunk. On neurological examination irritability test is negative with loss of conduction. Most patients can be triage into these four (4) distinct patterns and managed successfully through simple pattern specific treatment strategy.

2.4 Factors Associated with Risk of Chronification

Patients with NSLP faces multiple risk factors associated with risk of chronicity. In a recent review by Hartvigsen, Hancock, Kongsted, and Ferreira, (2018) recorded that persistent disabling LBP is most not only prevalent but also affects working class population. There is array of factors that contribute to disabling persistent LBP including patho-anatomical, psychological, social, genetic factors and comorbidities. These factors are known to interact with each other in an intricate and seamless manner and are associated with chronification of NSLBP. A systematic review by (Maher *et al.*, 2016) yield that it is possible to cluster patients at risk of developing chronicity in initial stages of management through use of screening tool such Keele STarT Back Screening Tool and Orebro Musculoskeletal Pain Screening Questionnaire(OMPQ). These tools cluster and identifies individual patients that are at risk of chronification and poor outcomes. Predictive values for chronification and

poor outcomes are associated with bio anatomical, psychological, societal and work-related factors. It further singled out presence of the following factors such as; sciatica nerve root irritation, poor overall health, advanced age, negative beliefs patterns, strained relationship at work, increased manual work and compensation mechanism. In another study by (Omoke & Amaraegbulam, 2016) in Nigeria recorded that, most the patients had mechanical LBP at 82.1%, those that developed CLBP were 51%. Recurrent LBP was also observed in this study representing 55.7% with most patients experiencing LBP with radiating lower limbs symptoms. It was also noted than more 50% of the participants had comorbidities such as, hypertension been recorded as the highest; with depression and anxiety following. Poor health seeking behavior such as delay in presentation to hospital treatment was associated in development of chronicity of LBP; this was secondary to several factors such as self-medication, consulting herbalist, spiritualist and traditional bonesetter. It was also noted that history of LBP and lifting of heavy material predispose one to risk of developing CLBP.

In a large cross-sectional survey involving six developing countries (Russian, China, South Africa, Ghana, Mexico and India) by(Williams *et al*., 2015) noted that increase in age, female gender, not completing primary school, smoking cigarettes, rural residents and individuals in labor intensive occupation were at greater risk of developing increased pain intensity of LBP; which significantly correlates with development of CLBP.

According to an integrated review by Karayannis *et al.* (2012) noted that NSLBP is considered multidimensional, therefore psychosocial domain and neurophysiologic pain mechanisms potentially influence movement presentation and pain experience.

Psychosocial factors such as socioeconomic levels, educational levels, personality, culture, work, family, past pain experiences motivate and influences pain presentation and treatment. Psychological factors largely appear to determine persistent LBP. Predictors associated with poor predictive outcomes such as long period of sickness, distress, low job satisfaction, unemployment and financial compensation this was noted in patho-anatomic classification of LBP. Heightens fear

avoidance behavior and “magnified illness behavior” have psychological influence and impact on NSLBP. On neurophysiologic pain mechanism participants with neuropathic pain had clinical characterization such as higher rating of pain intensity, depression, panic, anxiety and sleep disorder; which correlated with poor outcome. Neuropathic pain has been noted to coexist with other pain types such as mechanical pain and central sensitization pain, which occur in patients with LBP.

In another review by Balagué *et al*. (2012) noted approximately 10% -15% of patients with acute LBP transitioned to CLBP. The yellow flag system was developed to categorize patients at risk of developing chronic symptoms and long-term disability in health care. The predictors included: inappropriate attitudes and beliefs about back pain” will ever get better?” passive treatment, inappropriate pain behavior and maladaptive pain coping mechanism. Presence of mental comorbidities and poor general health status was linked to predict poor outcomes of acute low back pain at initial stages. In Europe a review by Richard, Ramond, Roquelaure, Baufreton, and Legrand, (2011) yield increased pain intensity was related to fear was dominant amongst European populace in predicting disabling LBP and disability index in participation at 6 months. More often psychosocial factors had predictive value on development of disability than pain levels. A review by Chou, Shekelle, and Chou, (2010) was of a contrary view; which reported its finding that increased pain intensity; with presence of leg pain slightly predicted poor outcomes at 3 to 6months. Consensus been that maladaptive pain behavior characterized by excessive negative thoughts and statement of future is associated with persistent chronic LBP was strong predictor risk of chronification. A review by Æ and Brunner, (2009) reported that psychosocial factors played a critical role in transitioning from subacute stage to chronic NSLBP and advocates for multidisciplinary approach intervention in back care.

In a retrospective study by Ritzwoller,(2019.) on mechanical pain pattern and risk of chronicity reported, that the following factors were associated with chronicity of NSLBP: presence of physical of co morbidities (hypertension, diabetes mellitus type II, and rheumatoid arthritis), depression, psychopathology, and older age at index correlated significantly prolonged duration of LBP.

In Ethiopia by Jr and Galea, (2011) reported this findings that post-traumatic stress(PTS) was predictor of back pain up to 6years.

In another prospective five-year study, prognostic indicator of low back both short and long-term prognostic factors by Campbell, Foster, and Dunn, (2013) reported that short-term prognostic factors such as fear-avoidance, catastrophizing, passive coping strategy and unemployment predicted poor outcomes at 1 year. Prognostic factors for poor outcomes at 5 years were described as depression, pain intensity and disability. Worth noting was pain is modifiable risk factor reduction of pain was associated with minimize risk of chronicity amongst participants with NSLBP. In prospective cohort study of 18 months by Thomas *et al*. (1999) data findings reported that ,possibility of identifying group of patients of high risk of poor outcome is possible through evaluating preexisting factors .Such as gender and age; women was associated with poor outcome as was increase of age has been associated with persistent LBP. High-levels of psychosomatic stress, decreased levels of participation in activities, history of cigarette smoking, intake of alcohol, unemployment, frustration with current employment status each of these characteristics increased 2-5 folds' odds of developing persistent LBP. Episodic factors associated with persistent LBP and predictor of poor outcomes was reported as presence of widespread pain, radicular leg pain symptoms, long duration of symptoms before consultation and restriction spinal segment movement.

In another cohort study by Delecoeuillerie, Lara, Parc, and Paolaggi, (1994) factors of predictive value for poor outcomes were initial disability index, pain worse in standing or lying and compensation status

CHAPTER THREE

METHODOLOGY

3.1 Study Design

The study was conducted within the framework of STROBE reporting guidelines using a quantitative observational cross-sectional design. The researcher directly observed and recorded the mechanical pain patterns of participants as they present to clinicians. The analytical cross-sectional design can easily identify the presentation in the target participants' population and can correlate between certain risk factors and particular study outcomes. This study utilized a quantitative approach, which quantifies the mechanical pain pattern among participants' presenting with NSLBP by way of creating empirical numerical data which was later transformed into usable statistics.

3.2 Study Location and Setting

This study was done at Nakuru County in physiotherapy out-patient clinic at Nakuru County Teaching and Referral Hospital in Nakuru West sub-county. It is approximately 165km from the capital of Kenya, North-west of Nairobi city. Nakuru County has eleven constituencies, with a population of approximately 2.2 million people according to 2019 National Census of Kenya. Economic activities carried out in the county is mostly agricultural and tourism with various tourist attraction such as lakes and craters.

Nakuru County Teaching and Referral Hospital is county Referral hospital. It is a referral facility-serving client from South Rift Region and some parts of Central Region in Kenya. It is a 600-bed capacity and a 250-bed capacity in Mother–Baby unit.

It has several specialized outpatient clinics; this study was done in physiotherapy outpatient department (OPD) clinics within the facility.

3.3 Study Population and Sampling

3.3.1 Population

This study targeted all participants presenting and classified as NSLBP coming to OPD at Nakuru County Teaching and Referral Hospital in physiotherapy clinic.

3.3.2 Sample Size Determination

Taro Yamane sample size determination formula was used to establish minimum number of participants to be recruited in the study. The determination was during the COVID-19 period which presented a challenge in terms of number of individuals seeking care with NSLBP at OPD clinic.

Taro Yamane method:

n= N/ (1+N (e) 2)

n = signifies the sample

N = signifies the population under study size

e = signifies the margin error (0.05)

n= 90/1+90(0.05)2

n= 90/ 1+90(0.0025)

n= 90/1+0.25

n=90/ 1.25

n= 74

3.3.3 Sampling Method

The researcher adapted census technique for this study.

3.4 Participants' Selection Criteria

3.4.1 Inclusion Criteria

For purposes of this study, the researcher only included patients presenting with NSLBP and who meet the following criterion;

a) Participants with non-specific LBP

   In this study nonspecific low back was defined as back pain of unknown cause no history of known specific pathology (Balagué et al., 2012).

b) Participants with or without radiating pain symptoms.

3.4.2 Exclusion Criteria

The researcher excluded participants with LBP who present with the following characteristics;

a) Signs and symptoms of cord compression and caudal equine syndrome
b) LBP caused by specific pathologies.
c) Participants with history of post-operative back pain and malignancy
d) Signs and symptoms of mental instability

3.5 Data Collection Tools and Materials

During data collection of the study, the following tools and materials were used by the researcher. ***Study questionnaires*** namely standardized social-demographic questionnaire (*appendix iii)* was used during history taking along with Saskatchewan Spine Pathway (SSP) (appendix *iv*), which has different subset Saskatchewan Spine Pathway Assessment and Referral form used for diagnostic triage. Saskatchewan Spine" Quick Reference Triage Algorithm Pattern of Low Back Pain(*appendix v*) used to allocate respondent" to different subgroup based on mechanical pain according to physical examination of lumber spine (Fourney, Dettori, Hall, Härtl, McGirt et al., 2011).

Thereafter the researcher issued another questionnaire the self-administered Orebro Musculoskeletal pain screening questionnaire (OMPSQ) (*appendix vi)* which consist of 21 questions, is intended to assess participants' moods, attitude towards work, thoughts, beliefs, and behavior in relation to NSLBP.

3.6 Data Collection Procedure

First, the investigator recruited participants during the data collection process, who were enrolled and met the inclusion criteria of NSLBP. The enrolled participants were then issued an information sheet by the researcher, which contains letter of approval and authorization documents from relevant institutions; indicating the objectives of the study. ***A study participants' information sheet*** explained the objectives of the study and the expectations of the respondents. The researcher then issued a written consent for signing. ***Participants consent form***, which provides information to the respondents and also provides a written proof of respondent's willingness to participate in the study, following signing and return of the consent form. The researcher carried out clinical history taking and physical examination. To establish the four mechanical pain patterns through history taking in structured manner to identify key points such location of pain. The participant is required to point out chief complaint as presented in diagnostic triage **(appendix iv).** Thereafter the researcher conducted physical examination to establish and support the encounter of history taking as confirmatory assessment test **(appendix v)**

The researcher then administered a study self-administered questionnaire OMPSQ for self-completion to each respondent **(appendix vi)** to determine the risk of chronification. Imaging and radiographic reports from participant was taken into consideration. All duly signed consent forms and completed study questionnaires were collected for safekeeping in a safe and secure storage.

3.7 Standard and Quality Assurance

3.7.1 Reliability of Data Collecting Tools

In a systematic review by Hockings, Mcauley, and Maher,(2008) established that OMPSQ has" moderate capability in prognostic outcome in long term pain , sick off and predicting such as identifying days off work 0.72- 0.80 and persisting disability 0.68 to 0.83. The OMPSQ takes 5 minutes to complete filling".

Philip, Markus, and Roiko, (2011) recorded reliability test and retest of OMPSQ has high (0.975, $p < 0.05$, ICC 2.1), criterion validity (Spearman r-0.97 & internal consistency 0.84) was established.

The reliability of Hall pain pattern system was good (kappa 0.6) this has established in the Canadian province of Saskatchewan as Saskatchewan spine pathway (Stynes et al., 2016).

According Fourney, Dettori, Hall, Härtl, Mcgirt et al., (2011) inter-reliability of Saskatchewan Spine Pathway system was found to be 79%,Kappa 0.61.

3.7.2 Validity of Data Collecting Tools

In a systematic review by (Hockings et al., 2008)established that OMPSQ criterion validity (Spearman's $r = 0.97$) and internal consistency ($\alpha = 0.84$) were achieved, as were predictive ability cut-off scores from (receiver operating characteristic curve) ROC curves (112–120 ÖMSQ-points), statistically different ÖMSQ scores ($p < 0.001$) for each outcome trait, and a strong correlation with recovery time (Spearman's, $r = 0.71$).

According to Philip et al., (2011) established the validity of OMPSQ (Spearman's $r = 0.97$) and internal consistency ($\alpha = 0.84$) were achieved, as were predictive ability cut-off scores from (receiver operating characteristic curve) (ROC)curves (112–120 ÖMSQ-points), statistically different ÖMSQ scores ($p < 0.001$) for each outcome trait, and a strong correlation with recovery time (Spearman's, $r = 0.71$).

3.8 Data Handling and Management

After authorization had been sought from relevant authorities and permission granted. The researcher gathered all study questionnaires for safe storage and serialized data collecting tools. Data from complete questionnaire was entered into Microsoft excel sheet using predetermined data variables in spreadsheet. Data was cleaned by cross checking the entries for each variable in the excel spreadsheet against the study questionnaires. The researcher then proceeded to extract the predetermined study variables into a Microsoft excel spreadsheet. Data extraction included; socio-demographic (gender, age, level of education, religion) clinical pain patterns based on HPP Model (which trunk movement causes pain, flexion or extension; is pain radiating to left or right lower limb).

The clean data spreadsheet was then imported to the Statistical Package for Social Scientist (SPSS) version 26 software for processing and analysis after coding of variables.

3.9 Data Analysis

Data was inspected and edited for inclusivity and reliability, questionnaire missing 10% of total response was eliminated. During this stage of the study, the researcher keyed in the quantitative data from the questionnaires into Microsoft excel spreadsheet database. The data was coded for all the variables. Then the data was assessed for normality using Kolmogorov-Smirnov test and Shapiro-Wilks test. If the outcome represented normal distribution, data was analyzed by non-parametric tests (ordinal and categorical data). Descriptive statistics was generated for each of the study variable by clinical pattern of NSLBP subtype, age and gender was calculated by frequency, median, mode, means and percentages using tables. Frequencies was used to report socio-demographic characteristics of patients including age, gender, marital status, occupation, education, and smoking status. The clinical characteristics was also summarized using frequencies and percentages. Kruskal Wallis tests was implemented to test significant differences between mechanical pain pattern and clinical characteristics and significant differences were declared at $P \leq 0.05$. A correlation analysis was implemented using Spearman Rank Correlation Coefficient

to determine the relationship between 20 different psychosocial measures. Factor Analysis was used to examine the relationship between psychometric measures to determine the main pain psychometric dimensions in NSLBP patients at Nakuru Teaching and Referral hospital. A Varimax rotation procedure with Kaiser Normalization was used in the Factor analysis because it generates a factor pattern, which loads highly significant variables into one factor. This results into factors, which are plausible for interpretation. Each given factor loads highly (has high correlation) with a limited number of variables, while loading very low with the rest of the variables, which makes the interpretation of independent factors convenient (Pituch & Stevens, 2016). The study assumed that the resultant factors were uncorrelated, thus the choice of orthogonal factor rotation (IBM, 2013). Originally, 20 psychometric items were used in the factor analysis to study their interrelationship patterns. The items included Q6-Q25, and factors with an Eigen value of greater than 1 were retained for interpretation. The cut off point for displaying loadings or correlations between score items and factors was set at 0.5. Odds-ratio tests were used to test the association of risk of chronification and socio-demographic characteristics after they were recoded to fit a 2x2 table. For the odd-ratio tests, the original 3 level for risk of chronification were recorded as follows: 1= low and medium and 2=High. A generalized linear regression model (GLM) was used to determine the relationship between the level of risk of chronification (y response) and age, marital status, smoking, and Mechanical pain pattern using R GLM procedures.

3.10 Ethical Considerations

The researcher sought approval, permission and authority to carry this research from

Jomo Kenyatta University of Agriculture and Technology ERC **(Ref: JKU/2/4/896B)**

The National Commission for Science, Technology, and Innovation (**Research License No 602172)** and Medical Superintendent of Nakuru Teaching and Referral hospital.

Informed written consent was obtained from all the participants prior to administration of the questionnaires. Participants were made aware that participation was voluntary and that they were at liberty to withdraw from the study at stage without being subjected to any repercussion.

Biasness was avoided so that the data collected was a true reflection of respondent presenting with NSLBP, the information acquired was treated with high confidentiality and study results were disseminated to relevant authorities with the aim of improving management of patients presenting with NSLBP.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter comprises of the presentation of the study finding. It comprises of the participants recruitment and response rate, socio-demographic and clinical characteristics of study participants, mechanical pain patterns of NSLBP based on HPP model for participants, risk factors for chronification among participants, association of socio-demographic characteristics and mechanical pain pattern, association of socio-demographic characteristics and risk of chronification among participants and association of mechanical pain pattern and risk of chronification among participants

4.2 Participants Recruitment and Response Rate

The flow chart diagram 4.1 below describes the procedure and protocol used by the researcher. Participants were referred from OPD department triage clinic to physiotherapy OPD clinic. The research enlisted 90 participants based on the study's sample determination. Among them, 70 participants satisfied the inclusion criteria and were eligible to take part in the study. The remaining 20 participants were either excluded due to post-surgical conditions or declined to provide consent for participation.

Data entry was done using excel spreadsheet and SSPS version 26. Data was clustered; scored and analyzed into socio-demographic, clinical pattern, mechanical pain pattern, and risk of chronification and association of the above stated factors.

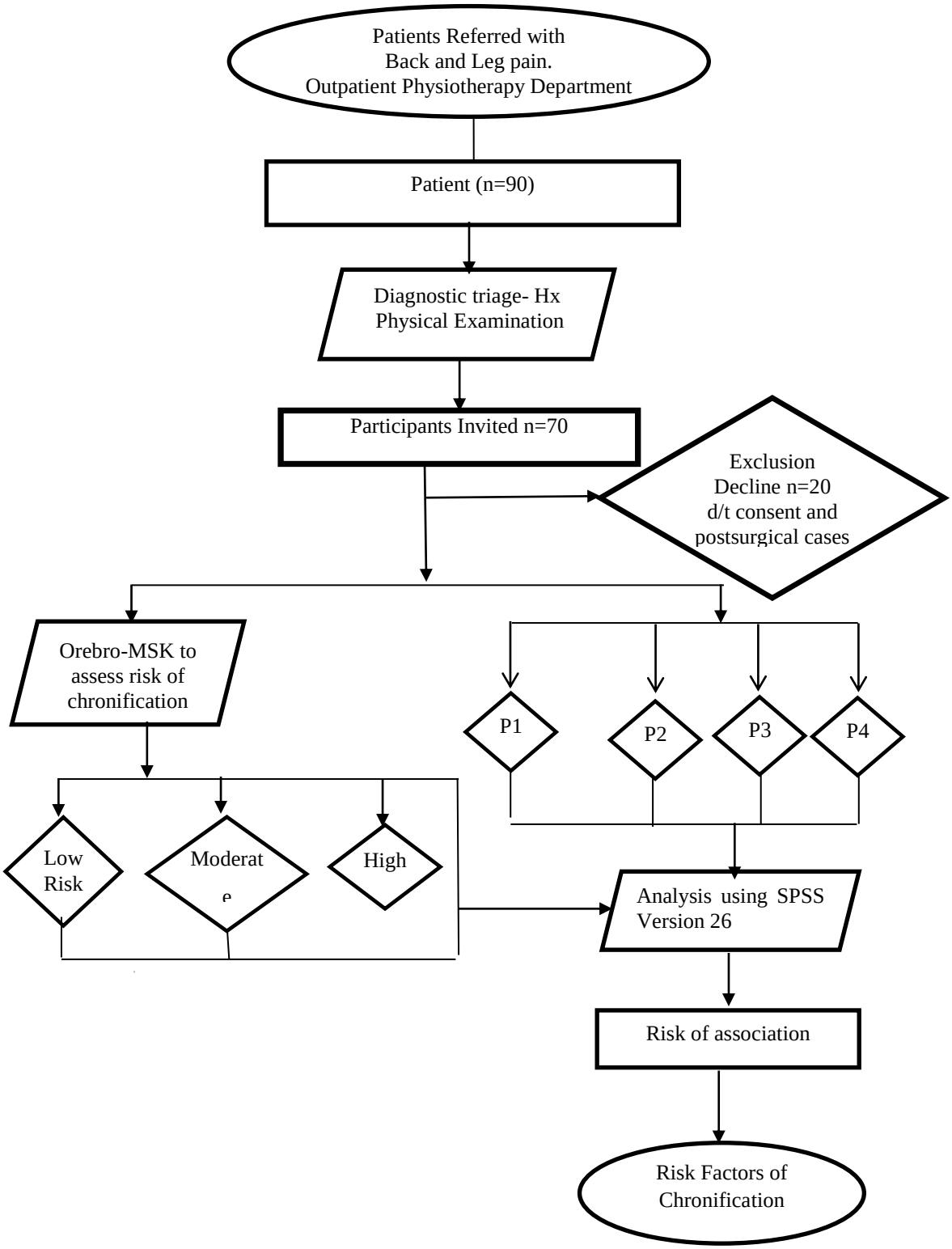

Figure 4.1: Procedure and Protocol Flow Chart

4.3 Socio-Demographics of Study Participants

4.3.1: Normality Test for Sociodemographic Characteristics

Age Cohort: The Kolmogorov-Smirnov and Shapiro-Wilk tests assess the normality of age cohorts (18-29, 30-44, 45-59, Over 60). None of the age cohorts show significant deviations from normality, as the p-values are all above the conventional significance level of 0.05. This study adapted the Kolmogorov-Smirnov test to assess the normality of sociodemographic characteristics.

Gender: The tests are conducted separately for males and females. Both genders have p-values greater than 0.05, suggesting that there is no significant departure from normality.

Marital Status: Categories include Single, Married, and Divorced/Widowed. Again, all categories show p-values above 0.05, indicating no significant departure from normality.

Occupation: The normality tests are performed for different occupational statuses, such as Employed, Retired, Unemployed, Casual, and Housewife. None of the categories exhibit a significant departure from normality, based on the given p-values.

Education: The tests are applied to individuals with different education levels: Primary, Secondary, and Tertiary. Similar to the other variables, all education levels show p-values above 0.05, suggesting no significant deviation from normality.

Table 4.1: Normality Test of Socio-Demographic Characteristics using Kolmogorov-Smirnov and Shapiro-Wilk Tests.

Variable	Categories	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	df	Sig.
Age cohort	18-29	.220	4		.945	4	.683
	30-44	.126	15	0.200	.979	15	.963
	45-59	.206	17	.054	.896	17	.059
	Over 60	.162	10	0.200	.931	10	.462
Gender	Male	.175	16	0.200	.940	16	.355
	Female	.125	30	0.200	.957	30	.259
Marital status	Single	.135	16	0.200	.966	16	.762
	Married	.114	46	.170	.956	46	.081
	Divorced and widowed	.166	8	0.200	.969	8	.888
Occupation	Employed	.127	42	.086	.967	42	.264
	Retired	.185	7	0.200	.939	7	.631
	Unemployed	.213	6	0.200	.912	6	.449
	Casual	.176	6	0.200	.943	6	.685
	House wife	.219	6	0.200	.915	6	.471
Education	Primary	.106	22	0.200	.970	22	.715
	Secondary	.109	23	0.200	.956	23	.383
	Tertiary	.143	25	0.200	.957	25	.354

4.3.2 Socio-Demographic Characteristics of Study Participants

The participants were asked to indicate their age in years. According to Table 4.2, the age of participants was distributed into six clusters that was distributed as follows: 28.6 % were between ages of 36 to 45 years, those of 46 to 55 years contributed to 25.7 % and the lowest were those between 18 to 25 years at 5.7 %. The participants were requested to indicate their gender. According to Table 4.2, the study revealed that more female than male experienced NSLBP at 68.6 % while than of male was 31.4 %.

According to Table 4.2 married couples were affected by NSLBP at 64.3 %, followed by those who were single at 22.9 %, 7.1 % who were divorced or separated and lastly widowed/ widower was least affected at 5.7 %. The participants were also asked to indicate their level of education. As elucidated by Table 4.2, majority of the participants (37.1 %) had attained secondary education followed by 28.6 % with primary education, 25.7 % with college diploma, 7.1 % university degrees and only 1.4 % had attained postgraduate studies. As for the participants' occupational status, Table 4.2 revealed that majority were employed full-time (47.1 %), followed by those employed part-time (14.3 %), retired (8.6 %), casual worker (8.6 %), housewife (8.6 %), unemployed (7.1 %), business man/woman (4.3 %) as well as those not working due to ill-health (1.4 %).

Table 4.2: Socio-Demographic Characteristics of Study Participants

Variables	Categories	Frequency	Percent
Age	18-25 years	4	5.7
	26-35 years	14	20.0
	36-45 years	20	28.6
	46-55 years	18	25.7
	56-65 years	5	7.1
	66-75 years	9	12.9
	Total	70	100.0
Gender	Male	22	31.4
	Female	48	68.6
	Total	70	100.0
Marital Status	Single	16	22.9
	Married	45	64.3
	Divorced/ Separated	5	7.1
	Widowed	4	5.7
	Total	70	100.0
Level of Education	Primary	20	28.6
	Secondary	26	37.1
	College/diploma	18	25.7
	University/degree	5	7.1
	Postgraduate	1	1.4
	Total	70	100
Occupational Status	Employed full-time	33	47.1
	Employed part-time	10	14.3
	Retired	6	8.6
	Unemployed	5	7.1
	Casual worker	6	8.6
	Not working due to ill-health	1	1.4
	Housewife	6	8.6
	Business man/woman	3	4.3
	Total	70	100

4.4 Distribution of Mechanical Pain Pattern and Clinical Characteristics of Study Participants

Significantly higher number of the participants had Pattern 1 (n=32; 45.7 %), Pattern 2 (n=11; 15.7 %), Pattern 3 (n=15; 21.4%) and Pattern 4 (n=12; 17.2 %).

The proportion 65.7 % of participants experienced back pain (back dominant) and 34.3 % pointed that the worst pain was located on the leg (leg dominant).

A considerable majority of participants, 88.6% with a frequency of 66, reported experiencing intermittent NSLBP, whereas 11.4% with frequency of 8 indicated that their pain was constant. In terms of lumbar movement, a significant higher proportion of participants (72.9%) reported pain on lumbar flexion compared to 25.9% who reported pain on lumbar extension.

The proportion 52.9 % of participants reported a negative test (neuro-conduction/neuro-dynamic test) which was significantly higher than 47.1 % recorded a positive test.

Participants were asked to describe their perceived levels of disability that NSLBP had affected them.

According to Table 4.4, majority of the participants (55.7 %) indicated that NSLBP had caused moderate disability index, those with severe disability index was 30 %, mild disability index was at 11.5 % with only 2.8 % indicating that they experienced no disability index.

Table 4.3: Distribution of Mechanical Pain Pattern and Clinical Characteristics of Study Participants

Variables	Categories	Frequency	Percent
Pain Pattern	Pattern 1	32	45.7
	Pattern 2	11	15.7
	Pattern 3	15	21.4
	Pattern 4	12	17.1
	Total	70	100
Location of Worst	Back dominant	46	65.7
	Leg dominant	24	34.3
	Total	70	100.0
Pain Frequency	Intermittent	62	88.6
	Constant	8	11.4
	Total	70	100.0
Movement testing	Pain of flexion	51	72.9
	Pain of extension	19	27.1
	Total	70	100.0
Neuro-conduction	Positive	33	47.1
levels	Negative	37	52.9
	Total	70	100.0
Disability levels	No disability index	2	2.8
	Mild disability index	8	11.5
	Moderate disability index	39	55.7
	Severe disability index	21	30
	Total	70	100.0

4.5 Level of Risk of Chronification

Orebro-musculoskeletal Pain Questionnaire was administered to patients to measure risk of chronification; twenty one of the 25 items are scored on scale of 0-10 (where 0 means no impairment and 10 severe impairment) and cumulatively the scores are calculated a higher score indicates high risk. The level of chronification was scored

as follows; a score < 105 indicates low risk, moderate risk is a range of 105-130 while high risk is <130. The OREBRO musculoskeletal pain score revealed a proportion of 45.7 % were categorized as low risk; while 37.1% were reported as moderate risk with 17.2% as high risk

Pie chart Summative Level of Risk of Chronification

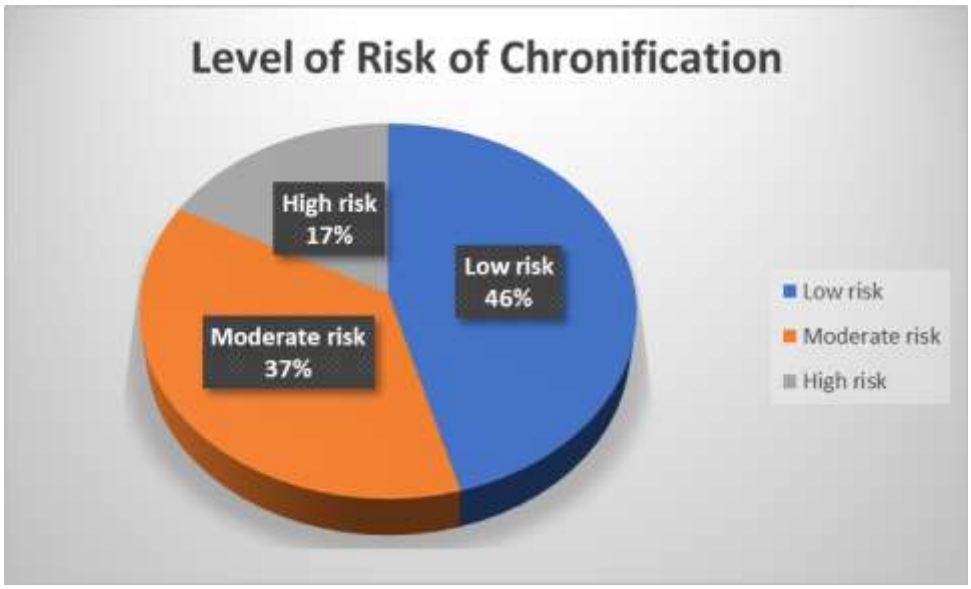

Figure 4.2: Proportion for Level of Risk of Chronification

4.6 Distribution of Mechanical Pain Patterns across the Risk of Chronification

Pattern 1 participants were mostly categorized has low risk (72%), while Pattern 2 participants were mostly categorized moderate risk (40%), with an equal balance between low and high-risk groups. Pattern 3 participants were mostly categorized moderate risk (43%) and high risk (29%), while Pattern 4 participants were moderate risk (67%) and low risk (25%).

Table 4.4: Cross Tabulation of Mechanical Pain Patterns and Risk of Chronification.

Levels of Chronification	Mechanical Pain Pattern				Total
	Pattern 1	Pattern 2	Pattern 3	Pattern 4	
Low risk	22 (72.4)	3 (30.0)	4 (26.6)	3 (25.0)	32 (45.7)
Moderate risk	6 (17.2)	5(40.0)	7 (46.7)	8 (66.7)	26 (37.1)
High risk	4 (10.3)	3 (30.0)	3 (26.6)	2 (8.3)	12(17.2)
Total	32 (100)	11 (100)	15 (100)	12 (100)	70 (100)

4.7 Factor Structure of Risk of Chronification in NSLBP

The factor analysis included 21 original psychometric variables which were reduced to 6 independent factors that explained 76.1% of the co-variance. The pain related variables fit well in the factor analysis model due to the magnitude of communalities with ranged from 0.658-0.894. The factor analysis included 21 variables which were reduced to 6 independent factors that explained 68% of the total variance in psychometric measures. According to Table 4.7 the first factor (factor 1) was described by high positive correlations between physical activity variables (Q22-walk for one hour, Q21-light work, Q23-household chores, Q24- weekly shopping, Q25-sleep at night, Q6-Days of work missed, and a negative loading from Q7-pain duration. The factor was labeled as the "*physical function factor*". Factor 2 was described by high positive loadings from Q13-tension/ anxiety, Q14-depression, Q15-persistence risk and Q9-rate pain for the past week thus was labeled as the *"psychological factor*". Factor 3 was comprised of pain is an indication I should stop Q19, not working with pain Q20 and physical activity makes pain worse Q18 which was correlated with associated variables such as missed days at work Q6, pain episodes Q11, and with negative correlations from nature of work Q8 and sleeping Q25. Increased duration of pain was associated with poor sleeping due to the negative association between factor 3 and sleeping (-0.485)., thus was labeled as the *"fear avoidance factor"*. Factor 4 was described by positive loadings by Q10-pain last 3 months, Q11-pain episodes, and Q8-work monotony, which was labeled as the

"*personal pain experience factor*", while Factor 5 was described by high loadings from Q17-job satisfaction, and Q16-work in 6 months thus was labeled as the "*return to work/ personal work expectancy*" while factor 6 was the "*pain coping factor*".

Table 4.5: Factor Structure of Risk of Chronification in NSLBP.

	Factor						
	1	**2**	**3**	**4**	**5**	**6**	**Communalities**
Walk for hour	0.930						0.894
Light work for 1hr	0.887						0.824
Weekly shopping	0.866						0.856
Can do normal house chores	0.842						0.795
Physical activity makes pain worse		0.854					0.865
Feeling depression		0.830					0.723
Felt anxiety		0.746					0.722
Rate pain intensity in last 3/12		0.711					0.722
Rate of pain in past week		0.655					0.769
Duration of pain			0.837				0.746
Missed days of work -pain			0.744				0.686
Pain episodes in the last 3/12			0.718				0.658
Monotonous nature of work			-0.642				0.754
Cannot sleep-pain			-0.485				0.676
Normal work affected-pain			0.420				0.738
Work satisfaction				0.787			0.753
Ability to resume work				0.763			0.745
Risk ofpain persistent				-0.548			0.670
Decreasing pain					-0.900		0.835
Increase in pain stop activity						0.592	0.797
Eigen values	5.7	3.0	2.5	1.8	1.2	1.1	
% of variance	28.4	14.8	12.3	9.2	6.1	5.4	
Cumulative %	28.4	43.1	55.4	64.6	70.7	76.1	

4.7.1 Association between Risk of Chronification and Biopsychosocial characteristics.

Spearman's rank correlation co-efficient indicated that days of work missed due to pain (q6) was significantly and positively associated with Days of work missed in past 18 months due to pain (q7), but negatively and significantly associated with job

satisfaction (q17), participants' ability to do light work (q21), walk for an hour (q22) doing normal house chores (q23), weekly shopping (q23) and sleeping at night (q24). Q8 (Is work heavy or monotonous) recorded positive correlations with pain intensity in the last 3 months (q10), pain episodes in the las 3 months (q11), Physical activity makes pain worse (q18), and sleeping at night (q25). Q9 (rate of pain in last week) was significantly and positively correlated with Pain episodes last 3 months (q11), How tense felt in last week (q13), Extent of depression last week (q14), Risk of pain persistence (q15) and negatively associated with q21 (Can do light work for an hour). Q10 (Pain intensity in the last 3 months) was positively associated with q11 (Pain episodes in the last 3 months), Physical activity makes pain worse (q18), q20 (Not do normal work with present pain). Also, q11 (Pain episodes in the last 3 months) was correlated positively with How tense felt in last week (q13), Extent of depression last week (q14) and Risk of pain persistence (q15). Q13 (How tense felt in last week) and q14 (Extent of depression last week) were positively and significantly correlated with q15 (Risk of pain persistence), while q13 (How tense felt in last week) was positively and significantly correlated with q14 (Extent of depression last week) and q18 (Physical activity makes pain worse). Q16 (Chances to work in six months) was correlated with q17 (Job satisfaction), while q17 (Job satisfaction) was positively and significantly correlated with q21 (Can do light work for an hour) and q22 (Can walk for an hour). Q18 recorded positive and significant correlations with Increase in pain indicates need to stop current activity (q19) and not do normal work with present pain (q20). Q19 (Increase in pain indicates need to stop current activity) was positively and significantly correlated with q20 (Not do normal work with present pain), while q20 (Not do normal work with present pain) was negatively and significantly correlated with q21 (Can do light work for an hour) and q23 (Can do normal house chores). All variables including q21-q24 were significantly and strongly positively correlated (Can do light work for an hour, can walk for an hour, can do normal house chores, and an do weekly shopping.

Table 4.6: Spearman's Rank Correlation Coefficient between Risk of Chronification and Biopsychosocial characteristics.

	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
Q6	1																			
Q7	**.355****	1																		
Q8	0.207	0.107	1																	
Q9	0.075	-0.122	0.170	1																
Q10	**.266***	0.090	**.360****	0.117	1															
Q11	0.134	0.155	**.307***	**.265***	**.466****	1														
Q12	-0.016	0.167	-0.005	0.023	-0.026	0.025	1													
Q13	0.060	-0.132	0.161	**.478****	0.039	**.338****	0.030	1												
Q14	0.175	-0.168	0.081	**.341****	0.206	**.329****	-0.027	**.675****	1											
Q15	0.166	0.058	0.217	**.247***	0.176	**.271***	0.051	**.444****	**.574****	1										
Q16	-0.178	-0.211	-0.193	-0.093	-0.019	0.046	-0.027	0.029	0.058	-0.127	1									
Q17	**-.322****	-0.164	-0.175	0.077	-0.005	0.099	-0.100	0.079	-0.112	-0.096	**.238***	1								
Q18	0.014	-0.135	**.256***	0.077	**.285***	0.212	0.011	**.315****	**.269***	0.046	-0.097	-0.089	1							
Q19	0.071	-0.002	0.138	0.014	0.183	0.129	0.130	0.110	0.043	0.008	-0.034	0.133	**.408****	1						
Q20	0.128	-0.017	0.115	0.147	**.250***	0.188	0.060	0.166	**.318****	0.114	-0.188	-0.081	**.456****	**.462****	1					
Q21	**-.399****	-0.057	0.020	**-.242***	-0.097	-0.103	-0.046	-0.047	-0.157	-0.083	0.228	**.308****	-0.229	-0.003	**-.360****	1				
Q22	**-.386****	-0.072	0.106	-0.172	0.044	0.084	-0.169	-0.089	-0.109	-0.160	0.199	**.254***	-0.032	0.084	-0.167	**.695****	1			
Q23	**-.285***	-0.074	-0.027	-0.233	-0.121	-0.072	-0.167	-0.203	-0.194	-0.213	0.153	0.195	-0.217	-0.163	**-.240***	**.570****	**.635****	1		
Q24	**-.320****	-0.087	0.053	-0.212	-0.075	-0.093	-0.197	-0.153	-0.123	-0.092	0.055	0.169	-0.094	-0.003	-0.202	**.556****	**.627****	**.631****	1	
Q25	-0.211	-0.071	**.238***	-0.219	0.109	-0.157	-0.087	-0.074	-0.097	-0.097	0.087	0.198	0.023	0.201	-0.069	**.430****	**.407****	**.361****	**.297***	1

4.7.2 Association between Risk of Chronification and Mechanical Pain Pattern

Regarding association between risk of chronification and mechanical pain pattern and its clinical characteristics, using the Kruskal-Wallis test “Days of work missed in the past 18 months due to pain” was statistically significant (p = 0.020) with worst pain location. “Rate of pain in the last week” was notably significantly different on disability level (p=0.046) and pain frequency (p=**0.004).** “How tense or anxious have you felt in last one week”. Regarding “the risk that your current pain may become persistent? “there was significant difference between disability index levels **(p=0.042)** and pain frequency (constant pain) **(0.003).** On “Chance that you will be able to work in six months?” was significantly correlated with severe disability level (**p=0.042)**. “I should not do normal work with present pain” was statistical correlated with disability index level **(p=0.013)** and pain frequency at **(0.040).** Pain location was significantly correlated with Mechanical pain pattern **(p=0.012).**

Table 4.7: Association between Risk of Chronification and Mechanical Pain Pattern.

Description	Disability		mechanical pain		worst pain		Pain frequency	
	stat	P-value	stat	P-value	stat	P-value	stat	P-value
Pain location	2.692	0.442	10.886	0.012	3.776	0.052	0.016	0.900
Days of work missed in past 18 months due to pain	2.004	0.572	5.224	0.156	5.379	0.020	2.654	0.103
Is work heavy or monotonous	1.788	0.617	3.322	0.345	0.926	0.336	0.506	0.477
rate of pain in last week	7.994	0.046	7.294	0.063	0.650	0.420	8.461	0.004
Pain intensity in the last 3 months	3.033	0.387	0.582	0.900	0.021	0.885	0.063	0.802
Pain episodes last 3 months	4.015	0.260	2.687	0.442	0.010	0.921	0.359	0.549
How much able to cope/ decrease pain	1.764	0.623	3.257	0.354	2.790	0.095	0.377	0.539
How tense felt in last week	9.333	0.025	2.546	0.467	0.007	0.935	4.302	0.038
Extent of depression last week	7.358	0.061	0.398	0.941	1.268	0.260	1.916	0.166
Risk of pain persistence	9.781	0.021	6.986	0.072	0.572	0.449	8.610	0.003
Chances to work in six months	8.200	0.042	3.194	0.363	3.131	0.077	0.847	0.357
Job satisfaction	3.152	0.369	1.098	0.778	0.016	0.899	1.371	0.242
Physical activity makes pain worse	3.717	0.294	7.029	0.071	0.148	0.701	0.215	0.643
Increase in pain indicates need to stop current activity	5.450	0.142	3.024	0.388	1.068	0.301	2.847	0.092
Not do normal work with present pain	10.787	0.013	2.729	0.435	0.604	0.437	4.225	0.040
Can do light work for an hour	6.340	0.096	7.571	0.056	0.631	0.427	0.916	0.339
Can walk for an hour	7.725	0.052	2.560	0.465	2.540	0.111	0.544	0.461
Can do normal house chores	7.740	0.052	6.804	0.078	3.219	0.073	0.038	0.846
Can do weekly shopping	7.297	0.063	2.642	0.450	2.936	0.087	0.323	0.570
I can sleep at night	3.748	0.290	3.424	0.331	0.359	0.549	0.063	0.802

4.7.3 Mean Differences in Ranks between Risk of Chronification and Mechanical Pain Pattern

Disability and Pain Severity: participants with severe disability index had significantly higher risk of chronification compared to other categories.

Tension and anxious in scores were also higher in participants with severe disability index compared to other groups. The risk of pain persistence was significantly higher in participants with mild and severe disability index compared to those with moderate disability index. Comparison of Disability index Levels: Participants with severe disability index had higher pain scores than those with mild disability index. Participants with moderate disability index showed significantly lower scores compared to other groups. Type and Dominance of Pain: Participants with leg-dominant pain had more missed work days in the last 18 months due to pain compared to back-dominant pain. Constant pain was associated with higher risk of chronification in pain rate, tension, pain persistence, and difficulty doing normal work.

Mechanical Pain Pattern: There were significant differences between categories in mechanical pain patterns. Participants with Mechanical Pain Pattern 1 had significantly lower mean ranks in days of work missed compared to other Mechanical Pain Patterns.

Table 4.8: Mean Differences in Ranks between Risk of Chronification and Mechanical Pain Pattern.

Categories	mean rank	groups	Categories	mean rank	groups
Disability*Rate of pain in last week			**Worst pain* days missed 18 months**		
Severe disability index	31.9	a	Leg dominant	33.6	a
Moderate disability index	21.2	b	Back dominant	23.9	b
No disability index	20.5	b	Pain frequency* pain rate last week		
Mild disability index	15.5	b	Constant	44.9	a
Disability* How tense felt in last week			Intermittent	25.3	b
Severe disability index	32.4	a	Pain frequency* tension last week		
Moderate disability index	21.2	b	Constant	39.8	a
Mild disability index	15.5	b	Intermittent	26.0	b
No disability index	14	b	Pain frequency* pain persistence		
Disability* Risk of pain persistence			Constant	45.2	a
Mild disability index	34.3	a	Intermittent	25.3	b
Severe disability index	30.8	a	Pain frequency* Not do normal work with pain		
No disability index	27	ab	Constant	39.8	A
Moderate disability index	18.8	b	Intermittent	26.0	b
Disability* Chances to work in six months			Mechanical pain pattern* Days of work missed		
No disability index	43.5	a	Pattern 2	34.8	a
Moderate disability index	28.4	a	Pattern 3	31.2	a
Severe disability index	19.8	ab	Pattern 4	29.2	a
Mild disability index	14.3	b	Pattern 1	18.2	b
Disability*Not do normal work with present pain					
Severe disability index	32.7	a			
No disability index	27.5	ab			
Mild disability index	27.1	ab			
Moderate disability index	18.6	b			

Mean ranks followed by the same letter are significantly different

4.8 Association between Risk of Chronification and Socio-Demographic Characteristics among Participants

Gender:

Male: Odds Ratio (OR) = 1.454, 95% CI (0.354 - 6.029)

Female: This category serves as the reference.

Interpretation: The odds of being in the High category for males are 1.454 times higher than for females, but the result is not statistically significant (as the 95% CI includes 1).

Age:

18-44 years: OR = 0.467 (compared to Over 45), but the confidence interval is not provided.

Over 45 years: This category serves as the reference.

Interpretation: There is an association, but the strength and statistical significance are unclear without the confidence interval for the 15-44 age group.

Marital Status:

Not married: OR = 0.450, 95% CI (0.126 - 1.723)

Married: This category serves as the reference.

Interpretation: The odds of being in the High category for those not married are 0.450 times the odds for married individuals. However, the result is not statistically significant (as the 95% CI includes 1).

Education:

Primary and secondary: OR = 0.309, 95% CI (0.061 - 1.518)

Tertiary: This category serves as the reference.

Interpretation: The odds of being in the High category for those with primary and secondary education are 0.309 times the odds for those with tertiary education. The result is not statistically significant (as the 95% CI includes 1).

Occupation:

Employed: OR = 1.086, 95% CI (0.308 - 3.841)

Not employed: This category serves as the reference.

Interpretation: The odds of being in the High category for employed individuals are 1.086 times the odds for not employed individuals. The result is not statistically significant (as the 95% CI includes 1).

Smoking:

Never: OR = 1.201, 95% CI (0.123 - 11.841)

Has smoked: This category serves as the reference.

Interpretation: The odds of being in the High category for those who have never smoked are 1.201 times the odds for those who have smoked. However, the result is not statistically significant (as the 95% CI includes 1).

Table 4.9: Odds Ratio Tests between Risk of Chronification and Socio-Demographic Characteristics among Participants.

Variable	Categories	Orebro group		Total	Odds Ratio	Value	95% CI	
		Low and Medium	High				Lower	Upper
Gender	Male	19 (32.8)	3 (25)	22 (32.4)	gender (Male/ Female)	1.454	0.354	6.029
	Female	39 (67.2)	9 (75)	48 (70.6)				
Age	18-44	28 (48.3)	8 (66.7)	36 (51.4)	age (15-44 / Over 45)	0.467		
	Over 45	30 (51.7)	4 (33.3)	34 (48.6)				
Marital status	Not married	18 (31)	6 (50)	24 (34.3)	marital (Not married/Married)	0.450	0.126	1.723
	Married	40 (69)	6 (50)	46 (65.7)				
Education	Primary and secondary	35 (60.3)	10 (83.3)	45 (64.3)	education (Primary and secondary/Tertiary)	0.309	0.061	1.518
	Tertiary	23 (39.7)	2 (16.7)	25 (35.7)				
Occupation	Employed	35 (60.3)	7 (58.3)	42 (60)	occupation (Employed/ Not employed)	1.086	0.308	3.841
	Not employed	23 (39.7)	5 (41.7)	28 (40)				
Smoking	Never	53 (93)	11 (91.7)	64 (92.8)	smoking (Never/ Has smoked)	1.201	0.123	11.841
	Has smoked	4 (7)	1 (8.3)	5 (7.2)				
Sample size		57	12	69				

4.9 Factors Influencing Risk of Chronification Using Generalized Linear Regression Analysis

The following results show factors influencing the risk of chronification in sociodemographic and clinical characteristics. Level of education and mechanical pain pattern were significantly associated with high risk of chronification. Patients who were more highly educated (tertiary) recorded lower risk, relative to patients with education below the secondary level. Additionally, Pattern 3, Pattern 4, and Pattern 2 patients recorded significantly at higher risk relative to Pattern 1 patients**.**

Table 4.10: Factors Influencing Risk of Chronification using Generalized Linear Regression Analysis

Parameter	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	102.529	8.508	12.05	< 2e-16	***
Age: Over 45	1.43	6.191	0.231	0.818	
Gender: Female	0.645	6.944	0.093	0.926	
Marital: Married	-5.061	5.887	-0.86	0.394	
Level of education.	-17.852	5.798	-3.079	0.003	**
Smoking: Has smoked	-8.636	13.034	-0.663	0.510	
Pattern 2	16.193	8.414	1.925	0.050	*
Pattern 3	24.893	7.239	3.439	0.001	**
Pattern 4	18.744	8.021	2.337	0.021	*

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter comprises of the discussion of the key study findings as per the study objectives. Conclusions are also drawn from the study findings from which recommendations are formulated. The researcher also suggested the areas for further studies in complementing the study findings in the area of mechanical pain patterns and risk factors for chronification among participants with non-specific low back pain.

5.2 Discussion

5.2.1 Mechanical Pain Patterns for Participants with Non-Specific Low Back Pain

According to the results of this study, 45% of the participants were classified as having P1 subtype of NSLBP based on Hall Pain Pattern (HPP). The other participants were classified as follows: P 3 (22 %) P 4(19 %) and P2 (15 %). Pattern 1 participants were mostly categorized has low risk (72%), while Pattern 2 participants were mostly categorized moderate risk (40%), with an equal balance between low and high-risk groups. Pattern 3 participants were mostly categorized moderate risk (43%) and high risk (29%), while Pattern 4 participants were moderate risk (67%) and low risk (25%).

Most participants described or defined NSLBP arising from the physio-anatomical structures of lumber spine which were influenced by biomechanics of lumber spine. These findings are in line with a study by (Mora et al., 2016) on subgrouping of pain pattern the findings were that P1 subtype had 42% followed by P2 -31%, P3- 17% and P4-10%. A similar study by Hall, (2014) which reported that approximately 90% of NSLBP will classified into 4 distinct pain pattern with most patients having back dominant P1 subtype. These findings therefore indicated that in clinical practice, majority of patients who present with NSLBP are most likely to have P1 subtype (back dominant) of mechanical back pain pattern.

5.2.2 Proportion of Participants Categorized Based on Level of Risk

Results of this study recorded that majority of participants were categorized as moderate risk 37% to high risk at 17% while low risk was 46%. Evidence suggests that genesis of NSLBP and its clinical factors are altered by psychosocial characteristics which influence severity of NSLBP. Finding from this study is line with recent study by (Ahmed et al., 2021) in Saudi Arabia posited that 54% of participant were in low risk while 38% were categorized as moderate risk and 8.3% were high risk. However; the study in Saudi Arabia reported significantly lower percentage of high-risk participants this could be attributed to cultural and ethnicity differences. Contrary to study a in Norway study by (Unsgaard-Tøndel et al., 2018) participants were categorized as low risk 24.7%, while 28.6% as moderate risk and 46.7% as high risk. In another study by Hill, Dunn, Main, and Hay, (2010) categorized 40% of participants as low risk, 22% moderate risk and 38% as high risk.

These studies reported significant higher percentage of participants as high risk than our study. This may be attributed to care pathways that participants are enrolled in resource rich countries to prevent delayed recovery and low back pain related disability.

The socio-economic contextual dynamics difference in developed and developing world may be responsible for the significant difference in categorizing patients with NSLBP. Profiling of patients at risk of chronification may facilitate collaborative and comprehensive care pathways. Body of evidence suggests that, psych-social factors in NSLBP are known to function differently in different individuals, social, ethnic and cultural groups.

5.2.3 Association between Risk of Chronification and Socio-demographic Characteristics

In this study 9% of participants were smokers, which was not significantly associated but faced risk of chronicity compared to non-smoker. Evidence suggests that use of nicotine and nicotine related products accelerates degeneration musculoskeletal structure of spine, therefore increasing incidences and delay in recovery in NSLBP. This

finding agrees with a recent study by (Magayane, 2021) posited that smoking was modifiable risk factor for delayed recovery of NSLBP. . In a similar study by (Simula *et al*., 2020) smoking was listed as lifestyle factor which was significantly associated with high risk participants. Modifiable risk factors particularly smoking status should be addressed in preventive measures for long standing persistent NSLBP.

In this study participants increase of age were not significantly associated with risk of chronicity but individuals over 45 years exhibited higher Orebro score than any other group. Symptoms of NSLBP tend to manifest from 30 years and peaks with advancement of age. This age bracket is associated with intensification of socioeconomic activities and productivity; in the community. This is line with (Ritzwoller, 2019) who postulates that age is one of the factors associated with chronicity of NSLBP. Prevalence of NSLBP affects the most resourceful and productive population in our community.

In the context of employment, individual in workforce were not significantly associated with risk chronification; however, this group had considerable higher Orebro-scores compared to unemployed group. Leaving a considerable number of active adult population with back-related disability. Several attributable factors may be involved, such as suboptimal job-related activities, poor ergonomics and intense physical labour. This finding agrees with (Luckhaupt *et al*., 2019; Hartvigsen, *et al*., 2018; Harkness *et al*., 2003) that onset of NSLBP symptoms affects the working population which was attributed by factors such as, monotonous work and high-temperature working conditions showing a strong association with the development of future lower back pain. In a study by Orege, Abuya, and Elias (2013) yield that majority of patients were employed and exposure to manual work that entails stooping and heavy lifting or mechanization of tools of operation resulted on LBP.

In terms of marital status, that married couple were not significant associated with risk chronicity; although, they reported higher Orebro scores. This observation may linked to excessive overload and intensive physical lifestyles in households. These findings agrees with a study by (Biglarian et al., 2012) who noted that intensive physical manual labor is associated with high prevalence of NSLBP especially those that involve

bending, twisting and whole body vibration. This suggests the social roles of managing affairs of a home; particularly those that involve working in difficult positions for long periods will influence the presence of high risk NSLBP.

According to this study basic level of education was significant associated as predictable factor of high risk in NSLBP than any other group. Evidence suggests individuals with primary/basic education attainment have less access to resources, leading to a lower socioeconomic status disproportionally exposing them to a wide range of risks. These include inaccessible and affordable health care services; lack of financial safety net such as universal health insurance to cover for cost of treatment.

These findings were also apparent in a recent review by, (Biglarian et al., 2012) which noted lower education index was significant correlated with high prevalence of NSLBP. In another study by, (Wong et al., 2017; Rahimi et al., 2015) reported that participants who had attained higher levels of schooling presented with minimal symptoms of LBP; due to better understanding of pain, better compliance to treatment and strong willingness to adapt a healthy lifestyle. Level of education is a prognostic factor: patient's lower education index experience higher pain frequencies that influences the progression and delay of recovery in NSLBP patients.

5.2.4 Association between Risk of Chronification and Clinical Characteristics

This study reported that participants classified as having P3 and P4 subtype of NSLBP based on Mechanical Pain Pattern and (34%) who pointed out that the worst pain was located on leg (leg dominant) while majority (86%) experienced moderate to severe disability index. Additionally, P2 was marginally significant predictors for risk of chronicity.

Participants who had severe of disability index, constant pain and leg symptoms; were significantly associated with high risk of chronification. These individuals assumed that severe pain was caused by a series of physical activities, further jeopardizing the spinal related structures. Therefore, this belief resulted in adaptation of passive pain strategies such as bed rest, decreased mobility and reduced functions as mechanism of preventing

further tissue damage. Heightening levels of disability and decreased levels of participation in this group.

According to Mora et al., (2016) that participants who were triaged as P3 subtype reported constant leg pain which was associated with poor health outcomes which was attributed by severe pain and disability. This was also noted by (Kongsted et al., 2012) participants with leg pain symptoms have more severe somatic clinical presentation than back dominant symptoms alone In a review by Chou, Shekelle, and Chou,(2010) which reported its finding that increased pain intensity; with presence of leg pain symptoms was significantly associated with poor outcomes.

In our clinical setup, categorization will enhance screening participants at risk of future chronicity and direct participants-centered care; therefore, restoring optimum function and improving quality of life.

5.2.5 Association between Risk of Chronification and Biopsychosocial Characteristics

Participants with severe pain intensity experienced more incidences of lethargy which inadvertently led to rest, further decline in activity disability index hence impeding productivity and completion of task assigned. The feeling of helplessness and gloom was significant associated with severe depression and severe anxiety; thus, poor health outcomes and health related behavior. Robust evidence is of consistent view that integration of biomechanical features and psychosocial domain alters the clinical presentation.

In a recent study by Ahmed et al., (2021) delay in recovery in NSLBP is influenced related to socio-demographic and psychosocial characteristics of individuals not patho-anatomical structure alone. Similar finding was reported by Ritzwoller,(2019.) noted that depression, psychopathology, and older age at index correlated significantly prolonged duration of LBP. This was also noted in a study by (Sagheer et al., 2013) that anxiety and depression are singularly the common psychological characteristics experienced by NSLBP participants. In an integrated review by Karayannis *et al*, (2012)

noted that NSLBP is considered multidimensional, therefore psychosocial domain and neurophysiologic pain mechanisms potentially influence movement presentation and pain experience.

Biomechanical characteristics are significantly involved incidences of NSLBP whereas psychosocial factors play a major role in risk chronification in participants; hence results sanction the need to screen participants using validated screening tool such as OMPQ to identify participants at risk for chronicity.

5.3 Conclusions

Among the four patterns of pain, majority of participants who present with NSLBP are most likely to have P1 subtype of mechanical back pain pattern.

Biomechanical characteristics are significantly involved incidences of NSLBP whereas socio-demographic characteristics and bio-psychosocial factors play a major role in severity alteration and clinical evolution of chronification. Significant predictors for risk of chronification were level of education, Pattern 3, and Pattern 4.Highlighting the multidimensional nature of NSLBP at play, suggesting the need to screen participants using validated screening tools such as OMPQ to identify participants at risk for chronicity.

5.4 Recommendations

Focus on health education promotion and preventive measures to maintain and enhance the low-risk status for Mechanical Pain Pattern. Implement broad educational programs raising awareness about risk factors and promoting healthy lifestyles. Empowering individuals with knowledge and resources can contribute to long-term risk reduction across all patterns.

Implementation of preventative strategies at outset detect likelihood of chronicity which will facilitate customize-care for moderate to risk patients in Pattern 2, Pattern 3 and Pattern 4 to optimize good health outcomes.

Health systems to invest and continuous monitor all pain patterns and their biopsychosocial dimension to identify changes in risk status and to enable timely interventions. Redesign clinical-care pathways that will integrate holistic interventions strategies that address the complexity of NSLBP.

5.5 Suggestion for Further Studies

Since the study was limited to mechanical pain patterns of non-specific low back pain and risk factors for its chronification, the research recommends the study can be replicated in to conduct a study on the general population to assess the risk in general population.

Further research should be carried out on prevalence, back related disability and cost of health related to NSLBP in Kenya.

Disability Index

Recruitment of participants was done in an OPD physiotherapy facility in a tertiary hospital and biasness associated with self-reporting tools.

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APPENDICES

Appendix I: Participants' Information Sheet

Study title: Mechanical pain patterns and risk of chronicity amongst patients with non-specific low back.

Dear Participant,

You are invited to participate in research study by **Jonah Muasya Muisyo,** a Master of Science student at the Department of Rehabilitation Sciences, Jomo Kenyatta University of Agriculture and Technology. The purpose of this research is to clinically classify low back pain into 4 pain patterns and screen for risk of persistent low back pain.

Study procedure

The researcher will take history of the participant and do physical examination of the back to establish pain pattern. Thereafter participant will be requested to fill out a questionnaire that we take approximately 5 minutes to complete.

Risk and discomforts

There are no foreseeable risks or discomfort to participating in this research.

You may decline to answer any or all questions and you may terminate your involvement at any time you choose.

Potential benefits

There are also no obvious or direct benefits to you as participant, your time and effort will contribute to the greater good by increasing our understanding of key aspects of nonspecific low back pain.

Protection of confidentiality

We will do everything we can to protect your privacy. Your identity will not be revealed in any publication resulting from this study. All information you provide will be confidential and anonymous, with no one, including the researchers, being able to link questionnaires and identities. Only a code number, and not your name, will be attached to your questionnaire. While this consent form will have your name on it, it will not be attached to your survey and will be stored in a separate location. All research documents will be kept in a locked file cabinet in a locked office, accessible only by the researcher. Only the researchers, and no outside parties, will be able to link your identity to the information you provide.

Voluntary participation

Your participation in this research study is voluntary. You may choose not to participate and you may withdraw your consent to participate at any time. You will not be penalized in any way should you decide not to participate or to withdraw from this study. If you decide to take part in this study, you will be requested to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

Contact information

If you have any questions or concerns about this study or if any problems arise, please contact Muisyo Jonah Muasya 254 722 348334 OR Jonah.muasya@gmail.com(Jomo Kenyatta University of Technology and Agriculture). The following are contacts of my Research Supervisor **Contact**

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If you have any questions or concerns about your rights as a research participant, please contact the Jomo Kenyatta University of Technology and Agriculture Ethical Review Board OR NACOSTI

Appendix II: Consent Form

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time without giving reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study

Participant's signature…….
Date…….

Researcher's signature…….
Date…….

Appendix III: Sociodemographic Questionnaire

Instructions: For choice fields please place a firm cross e.g. ☒ in a single box per item. For all numeric responses (including dates) please complete all the boxes with leading zeros as required e.g. 0 5 All dates are in dd/mm/yyyy format.

Initials ☐☐☐☐ **Date of birth** d d / m m / y y y y

Gender
- Male ☐
- Female ☐

Marital status
- Single ☐
- Married ☐
- Divorced or separated ☐
- Widowed ☐

Educational attainment
- Primary school ☐
- Secondary school ☐
- College/Diploma ☐
- University/Degree ☐
- Postgraduate ☐

Ethnic origin
- Caucasian ☐
- Black ☐
- Asian/Chinese ☐
- Mixed ☐

Religious affiliation
- Christian ☐
- Muslim ☐
- Hindu ☐
- None ☐
- Prefers not to say ☐
- Other ☐

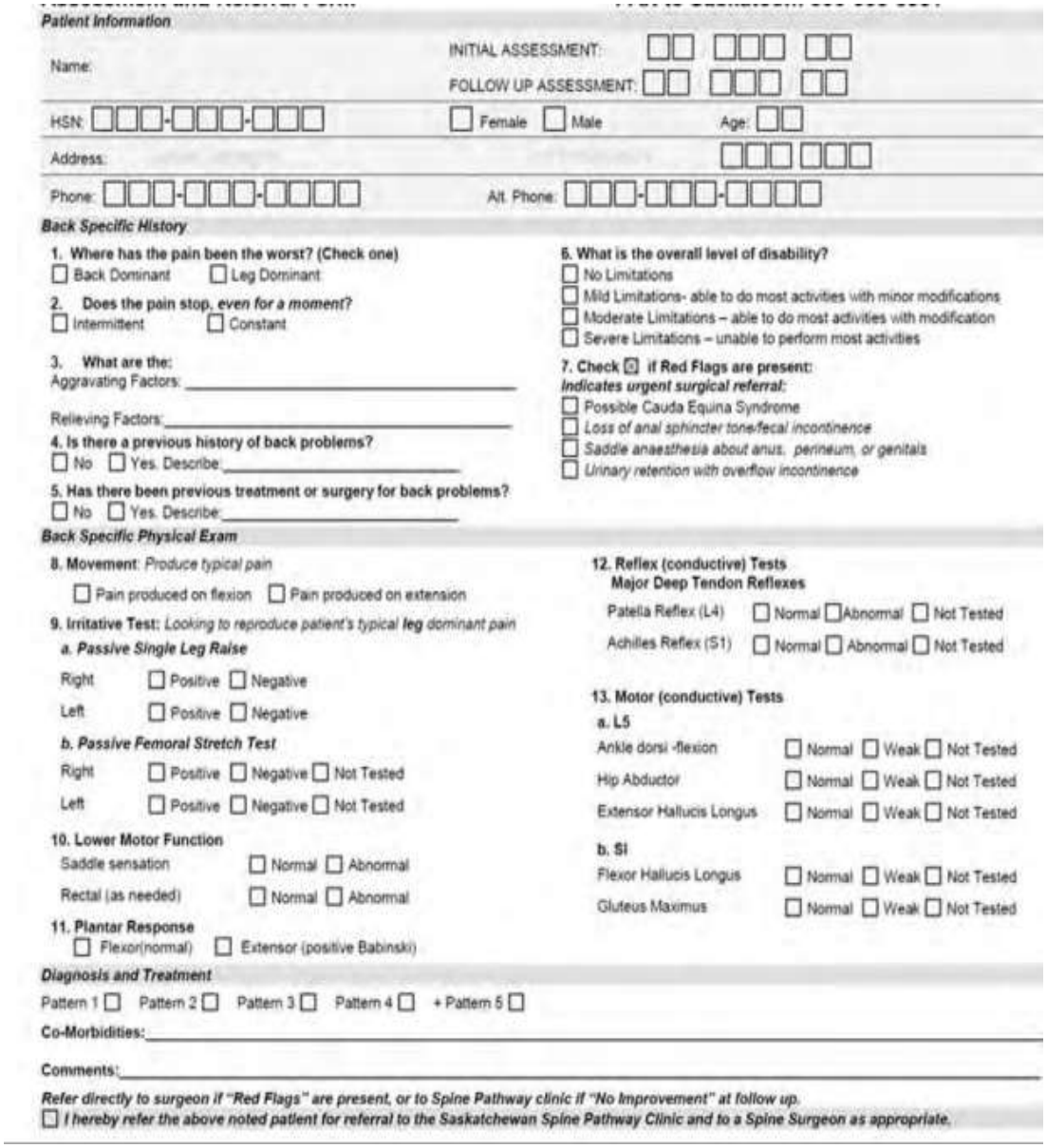
Occupational group
- Professional ☐
- Managerial & technical ☐
- Skilled non manual ☐
- Skilled manual ☐
- Unskilled ☐
- Not applicable ☐

Occupational status
- Employed full-time ☐
- Employed part-time ☐
- Retired ☐
- Unemployed ☐
- Casual worker ☐
- Not working due to ill health ☐
- Housewife ☐
- Other ☐

Smoking history
- Never ☐
- Previously ☐
- Current ☐

Date completed d d / m m / y y y y Signed _____

Appendix IV: Diagnostic Triage



Patient Information

Name:

INITIAL ASSESSMENT: ☐☐ ☐☐☐ ☐☐

FOLLOW UP ASSESSMENT: ☐☐ ☐☐☐ ☐☐

HSN: ☐☐☐-☐☐☐-☐☐☐ ☐ Female ☐ Male Age: ☐☐

Address: ☐☐☐ ☐☐☐

Phone: ☐☐☐-☐☐☐-☐☐☐☐ Alt. Phone: ☐☐☐-☐☐☐-☐☐☐☐

Back Specific History

1. Where has the pain been the worst? (Check one)
☐ Back Dominant ☐ Leg Dominant

2. Does the pain stop, *even for a moment*?
☐ Intermittent ☐ Constant

3. What are the:
Aggravating Factors: _____

Relieving Factors: _____

4. Is there a previous history of back problems?
☐ No ☐ Yes. Describe: _____

5. Has there been previous treatment or surgery for back problems?
☐ No ☐ Yes. Describe: _____

6. What is the overall level of disability?
☐ No Limitations
☐ Mild Limitations- able to do most activities with minor modifications
☐ Moderate Limitations – able to do most activities with modification
☐ Severe Limitations – unable to perform most activities

7. Check ☒ if Red Flags are present:
Indicates urgent surgical referral:
☐ Possible Cauda Equina Syndrome
☐ *Loss of anal sphincter tone/fecal incontinence*
☐ *Saddle anaesthesia about anus, perineum, or genitals*
☐ *Urinary retention with overflow incontinence*

Back Specific Physical Exam

8. Movement: *Produce typical pain*
☐ Pain produced on flexion ☐ Pain produced on extension

9. Irritative Test: *Looking to reproduce patient's typical* ***leg*** *dominant pain*

a. Passive Single Leg Raise

Right ☐ Positive ☐ Negative

Left ☐ Positive ☐ Negative

b. Passive Femoral Stretch Test

Right ☐ Positive ☐ Negative ☐ Not Tested

Left ☐ Positive ☐ Negative ☐ Not Tested

10. Lower Motor Function

Saddle sensation ☐ Normal ☐ Abnormal

Rectal (as needed) ☐ Normal ☐ Abnormal

11. Plantar Response
☐ Flexor(normal) ☐ Extensor (positive Babinski)

12. Reflex (conductive) Tests
Major Deep Tendon Reflexes

Patella Reflex (L4) ☐ Normal ☐ Abnormal ☐ Not Tested

Achilles Reflex (S1) ☐ Normal ☐ Abnormal ☐ Not Tested

13. Motor (conductive) Tests

a. L5

Ankle dorsi -flexion ☐ Normal ☐ Weak ☐ Not Tested

Hip Abductor ☐ Normal ☐ Weak ☐ Not Tested

Extensor Hallucis Longus ☐ Normal ☐ Weak ☐ Not Tested

b. S1

Flexor Hallucis Longus ☐ Normal ☐ Weak ☐ Not Tested

Gluteus Maximus ☐ Normal ☐ Weak ☐ Not Tested

Diagnosis and Treatment

Pattern 1 ☐ Pattern 2 ☐ Pattern 3 ☐ Pattern 4 ☐ + Pattern 5 ☐

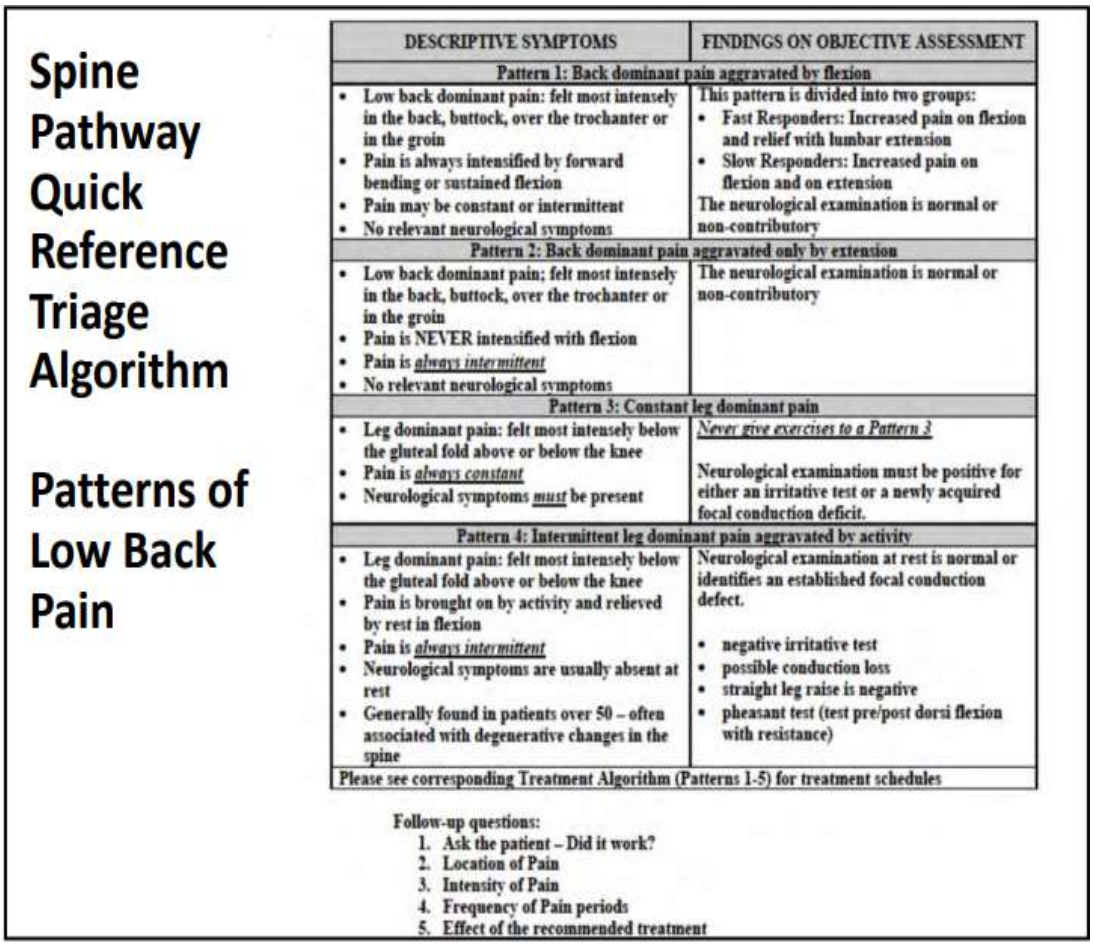
Co-Morbidities: _____

Comments: _____

Refer directly to surgeon if "Red Flags" are present, or to Spine Pathway clinic if "No Improvement" at follow up.

☐ ***I hereby refer the above noted patient for referral to the Saskatchewan Spine Pathway Clinic and to a Spine Surgeon as appropriate.***

Appendix V: Spine Pathway Quick Reference Triage Algorithm



Spine Pathway Quick Reference Triage Algorithm

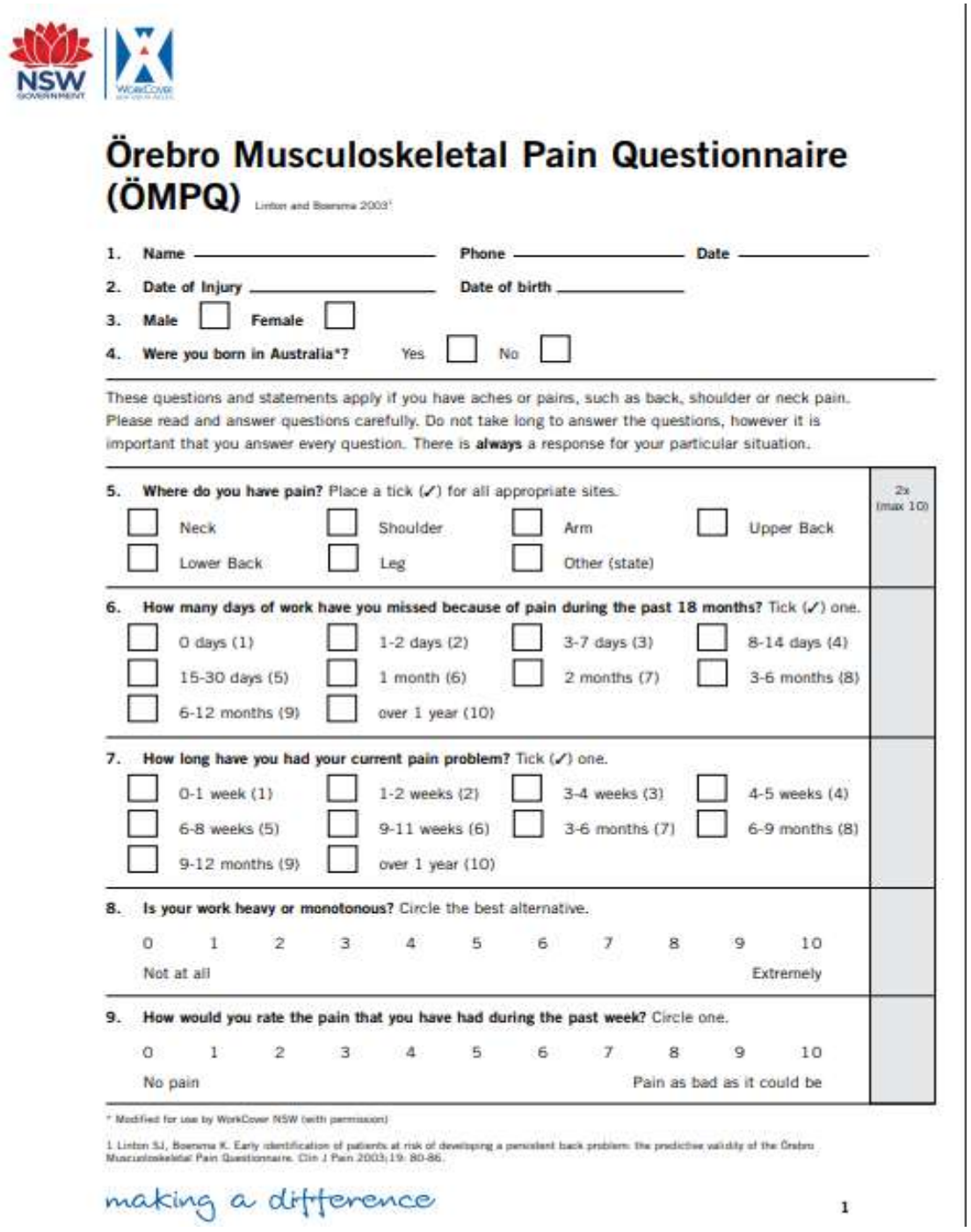
Patterns of Low Back Pain

DESCRIPTIVE SYMPTOMS	FINDINGS ON OBJECTIVE ASSESSMENT
Pattern 1: Back dominant pain aggravated by flexion	
• Low back dominant pain: felt most intensely in the back, buttock, over the trochanter or in the groin • Pain is always intensified by forward bending or sustained flexion • Pain may be constant or intermittent • No relevant neurological symptoms	This pattern is divided into two groups: • Fast Responders: Increased pain on flexion and relief with lumbar extension • Slow Responders: Increased pain on flexion and on extension The neurological examination is normal or non-contributory
Pattern 2: Back dominant pain aggravated only by extension	
• Low back dominant pain; felt most intensely in the back, buttock, over the trochanter or in the groin • Pain is NEVER intensified with flexion • Pain is *always intermittent* • No relevant neurological symptoms	The neurological examination is normal or non-contributory
Pattern 3: Constant leg dominant pain	
• Leg dominant pain: felt most intensely below the gluteal fold above or below the knee • Pain is *always constant* • Neurological symptoms *must* be present	*Never give exercises to a Pattern 3* Neurological examination must be positive for either an irritative test or a newly acquired focal conduction deficit.
Pattern 4: Intermittent leg dominant pain aggravated by activity	
• Leg dominant pain: felt most intensely below the gluteal fold above or below the knee • Pain is brought on by activity and relieved by rest in flexion • Pain is *always intermittent* • Neurological symptoms are usually absent at rest • Generally found in patients over 50 – often associated with degenerative changes in the spine	Neurological examination at rest is normal or identifies an established focal conduction defect. • negative irritative test • possible conduction loss • straight leg raise is negative • pheasant test (test pre/post dorsi flexion with resistance)
Please see corresponding Treatment Algorithm (Patterns 1-5) for treatment schedules	

Follow-up questions:

1. Ask the patient – Did it work?
2. Location of Pain
3. Intensity of Pain
4. Frequency of Pain periods
5. Effect of the recommended treatment

Appendix VI: Orebro Musculoskeletal Pain Questionnaire



Örebro Musculoskeletal Pain Questionnaire (ÖMPQ)

Linton and Boersma 2003[1]

1. **Name** _____ **Phone** _____ **Date** _____
2. **Date of Injury** _____ **Date of birth** _____
3. **Male** ☐ **Female** ☐
4. **Were you born in Australia*?** Yes ☐ No ☐

These questions and statements apply if you have aches or pains, such as back, shoulder or neck pain. Please read and answer questions carefully. Do not take long to answer the questions, however it is important that you answer every question. There is **always** a response for your particular situation.

5. **Where do you have pain?** Place a tick (✓) for all appropriate sites. (2x (max 10))

☐ Neck ☐ Shoulder ☐ Arm ☐ Upper Back
☐ Lower Back ☐ Leg ☐ Other (state)

6. **How many days of work have you missed because of pain during the past 18 months?** Tick (✓) one.

☐ 0 days (1) ☐ 1-2 days (2) ☐ 3-7 days (3) ☐ 8-14 days (4)
☐ 15-30 days (5) ☐ 1 month (6) ☐ 2 months (7) ☐ 3-6 months (8)
☐ 6-12 months (9) ☐ over 1 year (10)

7. **How long have you had your current pain problem?** Tick (✓) one.

☐ 0-1 week (1) ☐ 1-2 weeks (2) ☐ 3-4 weeks (3) ☐ 4-5 weeks (4)
☐ 6-8 weeks (5) ☐ 9-11 weeks (6) ☐ 3-6 months (7) ☐ 6-9 months (8)
☐ 9-12 months (9) ☐ over 1 year (10)

8. **Is your work heavy or monotonous?** Circle the best alternative.

0 1 2 3 4 5 6 7 8 9 10
Not at all Extremely

9. **How would you rate the pain that you have had during the past week?** Circle one.

0 1 2 3 4 5 6 7 8 9 10
No pain Pain as bad as it could be

* Modified for use by WorkCover NSW (with permission)

1 Linton SJ, Boersma K. Early identification of patients at risk of developing a persistent back problem: the predictive validity of the Örebro Musculoskeletal Pain Questionnaire. Clin J Pain 2003;19: 80-86.

making a difference

1

10. In the past three months, on average, how bad was your pain on a 0-10 scale? Circle one. 0 1 2 3 4 5 6 7 8 9 10 No pain — Pain as bad as it could be	
11. How often would you say that you have experience pain episodes, on average, during the past three months? Circle one. 0 1 2 3 4 5 6 7 8 9 10 Never — Always	
12. Based on all things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it? Circle the appropriate number. 0 1 2 3 4 5 6 7 8 9 10 Can't decrease it at all — Can decrease it completely	10 - x
13. How tense or anxious have you felt in the past week? Circle one. 0 1 2 3 4 5 6 7 8 9 10 Absolutely clam and relaxed — As tense and anxious as I've ever felt	
14. How much have you been bothered by feeling depressed in the past week? Circle one. 0 1 2 3 4 5 6 7 8 9 10 Not at all — Extremely	
15. In your view, how large is the risk that your current pain may become persistent? Circle one. 0 1 2 3 4 5 6 7 8 9 10 No risk — Very large risk	
16. In your estimation, what are the chances that you will be able to work in six months? Circle one. 0 1 2 3 4 5 6 7 8 9 10 No chance — Very large chance	10 - x
17. If you take into consideration your work routines, management, salary, promotion possibilities and work mates, how satisfied are you with your job? Circle one. 0 1 2 3 4 5 6 7 8 9 10 Not satisfied at all — Completely satisfied	10 - x

:

Here are some of the things that other people have told us about their pain. For each statement, circle one number from 0 to 10 to say how much physical activities, such as bending, lifting, walking or driving, would affect your pain.

18. Physical activity makes my pain worse.

0 1 2 3 4 5 6 7 8 9 10

Completely disagree — Completely agree

19. An increase in pain is an indication that I should stop what I'm doing until the pain decreases.

0 1 2 3 4 5 6 7 8 9 10

Completely disagree — Completely agree

20. I should not do my normal work with my present pain.

0 1 2 3 4 5 6 7 8 9 10

Completely disagree — Completely agree

Here is a list of five activities. Circle the one number that best describes your current ability to participate in each of these activities.

21. I can do light work for an hour. 10 - x

0 1 2 3 4 5 6 7 8 9 10

Can't do it because of pain problem — Can do it without pain being a problem

22. I can walk for an hour. 10 - x

0 1 2 3 4 5 6 7 8 9 10

Can't do it because of pain problem — Can do it without pain being a problem

23. I can do ordinary household chores. 10 - x

0 1 2 3 4 5 6 7 8 9 10

Can't do it because of pain problem — Can do it without pain being a problem

24. I can do the weekly shopping. 10 - x

0 1 2 3 4 5 6 7 8 9 10

Can't do it because of pain problem — Can do it without pain being a problem

25. I can sleep at night. 10 - x

0 1 2 3 4 5 6 7 8 9 10

Can't do it because of pain problem — Can do it without pain being a problem