

An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

By

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This work is submitted in partial compliance with the requirements for the Master's Degree in Health Sciences: Chiropractic at the Durban University of Technology

I, Heidi Chapman, declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary).

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DEDICATION

They say “It takes a village to raise a child” and I just want to say thank you to my “village”. For the family, friends and educators who supported me with encouragement and prayers along my journey, I could not have done this without you.

I dedicate this work to the field of female health; may we acknowledge our progress and may we continue to advance healthcare delivery to all women.

ACKNOWLEDGEMENTS

I would like to express my sincerest gratitude to the following people:

To my supervisor, Dr Ashura Abdul-Rasheed: your guidance and expertise has been nothing but exceptional. I cannot express enough gratitude for your time and dedication to this project.

To my research assistant, Tanya Tschirpig: from the bottom of my heart, thank you for your unwavering support and assistance.

Great thanks to my statistician, Tonya Esterhuizen, for your expertise throughout the research process as well as your patience with the bumps along the way.

Thank you to my proof reader, Helen Bond, and my isiZulu translator, Dr Khanyisile Khumalo, thank you for your time, effort, and help.

To each participant in this study, I sincerely thank you for your time and contribution.

To all my educators, from my formative years to those who have nurtured me through my time at DUT: I extend my sincerest appreciation for the role you have played in my education and the passion you have fostered.

To my parents and brother, the wind beneath my wings: thank you for the years of unwavering encouragement. I hope I have made you proud.

A special thank you to Dr Jesse Bruins Roberts. Thank you for experiencing the joys of being a chiropractic student twice over. I am beyond blessed to have shared my journey with you.

ABSTRACT

Background: Primary dysmenorrhea (PD) is the most frequent gynaecological complaint affecting women across different backgrounds. Growing evidence has demonstrated a strong link between PD and comorbid musculoskeletal pain (MSK), carrying significant impact for the lives of sufferers. Despite this, few studies have isolated and investigated this association, particularly in a South African context.

Aim: The aim of this study was to determine the prevalence, risk factors, management, and impact that MSK pain associated with PD has on female university students.

Methodology: A quantitative, descriptive cross-sectional survey was conducted at a university of technology in KwaZulu-Natal, South Africa. Data were obtained through voluntary self-administered surveys from 324 participants. The surveys consisted of six parts: demographic characteristics, menstrual history, MSK pain characteristics, risk factors, management approaches and impact. Data were analysed using IBM SPSS version 27.

Results: A total of 300 participants were included. A high prevalence of MSK pain was noted. Clinical characteristics showed that the pain was moderate and distributed across anatomical regions, with low back pain being most affected. There was a high prevalence of headaches and myofascial pain. The mode of transportation, as well as heaviness of menstrual flow were significant risk factors. Various management approaches, including home remedies, allopathic and complementary healthcare, were utilised by participants. Overall impact was high across personal, social, and academic domains.

Conclusion: This study showed a strong correlation between PD and comorbid MSK pain among female university students, with various management approaches for participants. Pain appeared to carry significant impact across all aspects of life.

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ABBREVIATIONS

CAM	Complementary and alternative
DUT	Durban University of Technology
LBP	Low back pain
MFTPs	Myofascial trigger points
MSK	Musculoskeletal
MSS	Multidimensional Scoring System
NSAIDs	Non-steroidal anti-inflammatory drugs
PD	Primary dysmenorrhea
QoL	Quality of life
rESWT	Radial extracorporeal shockwave therapy
TENS	Transcutaneous electrical nerve stimulation
OCs	Oral contraceptives

CHAPTER ONE INTRODUCTION

1.1 INTRODUCTION

This chapter provides an introduction into primary dysmenorrhea (PD) and musculoskeletal (MSK) pain associated with the condition. It further provides a description of the aims, objectives, and rationale of the study. A brief study outline of the chapters is highlighted at the end of this chapter.

1.2 BACKGROUND

Primary dysmenorrhea (PD) is described as menstrual pain occurring during normal ovulation in the absence of pelvic pathology (Gaubeca-Gilarranz *et al.* 2018: 302). It has been estimated that more than 80% of the female population suffers from PD within reproductive age (Acheampong *et al.* 2019: 1). Research has demonstrated that PD affects women across age, nationality, and socioeconomic status (Proctor and Farquhar 2006: 1134). There are a variety of symptoms arising in PD, such as nausea, headache, dizziness, and fatigue (Omidvar *et al.* 2016: 135).

In addition to these principal symptoms, growing evidence has demonstrated a strong link between menstrual pain and MSK pain (Yacubovich *et al.* 2019: 1). This pain has shown to manifest globally in the body as pelvic pain, back pain, lower extremity pain and shoulder pain (Iacovides *et al.* 2013: 1067).

Studies have shown that the pain associated with PD has negatively influenced the personal, social, and academic lives of young females

(De Sanctis *et al.* 2017: 243; Lee and Park 2016: 110). Treatment and management options primarily include pharmacological intervention (Osayande and Mehulic 2014: 344 – 345). However, considering the MSK involvement, research is exploring the inclusion of complementary and alternate medical intervention in the holistic management of menstrual and MSK pain in females (Wong, Laframboise and Mior 2018: 195, Zhang *et al.* 2018: 6; Saleh, Mowafy and El Harneid 2016: 5).

With the global burden of MSK pain (Blyth *et al.* 2019: 35), and the high prevalence of PD across socioeconomic backgrounds (Acheampong *et al.* 2019: 1), further exploration of this association in a South African context is needed.

1.3 RESEARCH AIM

The aim of this study was to determine the prevalence, risk factors, management, and impact that MSK pain associated with primary dysmenorrhea has on female university students.

1.4 STUDY OBJECTIVES

- 1 To determine the point and period prevalence of musculoskeletal pain associated with primary dysmenorrhea in female students at a university of technology.
- 2 To determine selected risk factors (pre-existing musculoskeletal injury, oral contraceptives, smoking, mode of transport to university) associated with musculoskeletal pain in primary dysmenorrhea in female students at a university of technology.

- 3 To determine management approaches for musculoskeletal pain associated with primary dysmenorrhea in female students at a university of technology.
- 4 To determine the impact that musculoskeletal pain associated with primary dysmenorrhea has on the quality of life of students at a university of technology.

1.5 RATIONALE

Primary dysmenorrhea has a high global prevalence ranging between 50% to 90% (Bezuidenhout *et al.* 2018: 19). The functional disorder has shown to affect females across all races, ages, and socioeconomic backgrounds (Osayande and Mehulic 2014: 341). Research has shown that adolescents and young females within reproductive age tend to be the most affected (De Sanctis *et al.* 2016: 244). Morbidity associated with dysmenorrhea has posed a substantial burden on public health, being a leading cause of absenteeism from work and school, affecting personal and social lives of sufferers as well as diminishing their quality of life (De Sanctis *et al.* 2016: 244; Banikarim, Chacko and Kelder 2000: 1226).

Outside of this condition being a public health concern, PD has also been linked to comorbid MSK complaints (Yacubovich *et al.* 2019: 1; Iacovides *et al.* 2013: 1067). A recent study showed a significant correlation, with more than half of the participants displaying MSK pain alongside their menstrual pain in a university setting (Yacubovich *et al.* 2019: 5). Given that MSK conditions themselves contribute to a considerable proportion of global disability (Blyth *et al.* 2018: 36), the association with menstrual pain compounds the issue on female health.

A great variation exists in literature amongst different countries, which may be due to diverse study populations and the multifactorial nature of pain severity (Bezuidenhout *et al.* 2018: 19). In a South African context, some studies have explored a prevalence dysmenorrhea and certain aspects of its associations – although these are limited and to my knowledge, there has been no published literature which has investigated the MSK component.

Given the variation in literature pertaining to prevalence, risk factors and pain management interventions, it is likely that the impact of PD and MSK pain will differ in South African studies due to the great diversity among ethnicity and socioeconomic backgrounds, particularly in the diverse setting of higher education, where the population is comprised of students from all levels of society (Naidoo 2015: 1).

Few studies have explored the association of PD and MSK pain in a South African context. Taking into consideration that dysmenorrhea has been identified as a multidimensional pain experience, placement in a biopsychosocial paradigm should be further explored (Kordi, Mohamadirizi and Shakeri 2013: 316).

Chiropractic in South Africa is an alternative healthcare profession adopting a holistic patient-centred approach, making this study exploration appropriate to integrate the response of the healthcare system to the burden of menstrual and MSK pain. Understanding management options for dysmenorrhea sufferers may also aid in fostering inter-professional relationships in healthcare, and providing a sustainable multidisciplinary approach to optimise conservative management in the healthcare system. This aligns with the sustainable development goals of South Africa and the World Health Organization, which aim to strengthen the quality of healthcare,

including the essential provision of reproductive healthcare services and its integration into national strategies and programmes by 2030 (South Africa, Department of Statistics 2019: 41).

1.6 OUTLINE OF CHAPTERS

Chapter One outlines a brief introduction and context, aims, objectives and rationale behind the study. Chapter Two reviews literature surrounding the topic of PD, MSK pain and the associations and correlations that exist in current literature. Chapter Three describes the quantitative methodology utilised in the data collection of the study. Chapter Four presents the resultant statistics collated from data obtained in the study, with a discussion surrounding these results in Chapter Five. Finally, Chapter Six will conclude the study, acknowledging any limitations and provide recommendations for future related studies.

CHAPTER TWO LITERATURE REVIEW

2.1 INTRODUCTION

This chapter details a review of the existing literature pertaining to the research topic. Chapter two will give an overview of dysmenorrhea, MSK pain as a symptom of primary dysmenorrhea including prevalence, pathophysiology, risk factors, reported impact on personal, social and academic life, as well as management interventions utilised for MSK pain in PD sufferers.

2.2 BACKGROUND

Primary dysmenorrhea is described as menstrual pain that has no underlying organic disease process (Bernardi *et al.* 2017: 3). Bezuidenhout *et al.* (2018: 19) reported a wide variation in the global prevalence rates of PD, with rates ranging between 50% to 90% of women within reproductive age suffering with painful menstruation. Regardless of this variation, there is consensus that PD affects women across age, nationality, and socioeconomic status (Proctor and Farquhar 2006: 1134).

The presentation of dysmenorrhea involves abdominal and pelvic pain with non-specific symptoms such as headaches, fatigue, and nausea (Osayande and Mehulic 2014: 341). In addition to this, musculoskeletal complaints have become a prominent feature of dysmenorrhea (Yacubovich *et al.* 2019: 1).

Musculoskeletal symptoms, such as low back pain (LBP) or headache, coinciding with menstruation have been reported in

literature since the 1900s (Brynhildsen, Hammar and Hammar 1997; Boesler *et al.* 1993; Chapman 1993; Randall and Odell 1943). In more recent years, research focusing on MSK pain with PD has grown, revealing widespread MSK involvement beyond the pelvis and low back, such as the upper back, neck and extremities (Yacubovich *et al.* 2019: 1; Iacovides *et al.* 2013: 1067).

In addition to musculoskeletal pain, studies have shown that dysmenorrhea negatively impacts the quality of both personal and social life (Lee and Park 2016: 110). Mood alterations, sleep disorders and decreased daily activity have been factors affected by menstrual pain (Lee and Park 2016: 110). Moreover, dysmenorrhea has had an extensive impact on academic performance in relation to concentration, attendance, and examination performance (De Sanctis *et al.* 2017: 243). These issues become compounded as MSK pain itself poses a huge burden to the physical and emotional functioning of individuals (Blyth *et al.* 2019: 36).

Management for primary dysmenorrhea has traditionally advocated for a pharmacological approach, with non-steroidal anti-inflammatory drugs (NSAIDs) and oral contraceptives as first and second line therapies respectively (Osayande and Mehulic 2014: 345). However, these treatments can produce harmful side effects and have been said to be ineffective in relieving pain in up to 20% of women with the condition (Proctor and Farquhar 2006: 1136).

As a result of failed pharmacological management, research into the application of complementary and alternative (CAM) therapies in the management of PD has grown. Studies have focused on therapies such as physical exercise, nutrition, acupuncture, psychotherapy, transcutaneous electrical nerve stimulation (TENS) and manual therapy techniques utilized in the chiropractic and physical therapy

professions (Osayande and Mehulic 2014: 345; Proctor and Farquhar 2006: 1136 – 1137).

Understanding the full extent of the musculoskeletal component associated with primary dysmenorrhea is complex and multifactorial. Iacovides *et al.* (2013: 217) stated that treatment of all pain components experienced in dysmenorrhea may reduce the negative impacts and restore quality of life, suggesting that the placement of primary dysmenorrhoea into a biopsychosocial paradigm may be the most effective way of addressing this multidimensional pain experience (Spears 2005: 77).

2.3 OVERVIEW OF PRIMARY DYSMENORRHEA

Dysmenorrhea is a term used to describe the gynaecological complaint of painful menstruation and is said to be the most common gynaecologic disorder among females of reproductive age, despite factors such as age, nationality, and socioeconomic status (Saleh, Mowafy and El Harneid 2016: 1; Proctor and Farquhar 2006: 134). Two subtypes of dysmenorrhea exist in literature: primary and secondary.

Primary dysmenorrhea describes recurrent acute painful episodes during menstruation in absence of identifiable organic pelvic pathology whereas secondary dysmenorrhea describes menstrual pain in the presence of underlying pelvic disease (De Sanctis *et al.* 2017: 234). Secondary dysmenorrhea is most commonly attributed to endometriosis but can may also include adenomyosis, pelvic inflammatory disease, fibroids, ovarian cysts or congenital anomalies of the female reproductive system (De Sanctis *et al.* 2017: 234; Bezuidenhout 2018: 20). Of the two subtypes, primary dysmenorrhea

accounts for the majority of cases, with only 10% of severe dysmenorrhea symptoms being accounted for by underlying pathology (Osayande and Mehulic 2014: 343; Harel 2006: 363). It is widely believed that the presence of pelvic pathology directly correlates with severity of pain, but some studies have shown little correlation of menstrual pain with such pathology (Chen *et al.* 2018: 1454), demonstrating the significant burden of PD in female health and the healthcare system.

2.3.1 Pathophysiology of Primary Dysmenorrhea

The pathophysiology of PD is complex and not fully understood, but there is general consensus that the disorder is rooted in dysregulation of prostaglandins (Omidvar *et al.* 2016: 136). Prostaglandin production is regulated by progesterone; as progesterone declines, changes in the arachidonic acid cascade occur and eventually lead to the biosynthesis of prostaglandins (Iacovides, Avidon and Baker 2015: 765). This is a normal physiological response in the female hormone cycle as prostaglandins mediate myometrial contractions and vasoconstriction, which is necessary to facilitate the elimination of endometrial lining (Iacovides, Avidon and Baker 2015: 765). However, women suffering with dysmenorrhea have increased levels of prostaglandins, inducing hypercontractability of uterine tissue, uterine ischaemia and peripheral nerve sensitisation causing pain (Dawood 2006: 428). Prostaglandins are not the only etiological process involved – menstrual pain pathophysiology is multifactorial and other mechanisms include local uterine changes, vasopressin release, cytokine gene expression, complex hormonal interactions, central sensitisation, morphological changes in the central nervous system and psychosocial influences (Iacovides, Avidon and Baker 2015; Gagua *et al.* 2013; Tu *et al.* 2010; Dawood 2006).

These complexities will be further explored later in this chapter when addressing the pathophysiology linking MSK pain and PD.

2.3.2 Prevalence of Primary Dysmenorrhea

While PD is known to be the most common cause of gynaecological pain in females (Abd El-Mawgod, Alshaibany and Al-Anazi 2016: 115), epidemiology has been challenging to establish due to variations in diagnostic criteria, diversity of study populations and cultural nuances and perceptions towards menstrual pain (Acheampong *et al.* 2019: 2; Omidvar *et al.* 2016: 135). Global prevalence has been reported to vary greatly, with data ranging between 45% to 90% (Acheampong *et al.* 2019: 3; Potur, Bilgin and Komurcu 2014: 769).

African research has supported this variation in prevalence across different studies with prevalence figures as follows: 65.4% in Egypt (Nooh 2014:202), 85.1% in Ethiopia (Shiferaw, Wubshet and Tegabu 2014: 246), 77.3% in Rwanda (Kakoma *et al.* 2010: 25) and 68.1% in Ghana (Acheampong *et al.* 2019: 1).

Research pertaining to dysmenorrhea prevalence and epidemiology in a South African context is lacking. One study conducted in 2015, in rural South Africa, showed that 56.4% of teenage girls suffered with significantly painful periods (Oni and Tshitangano 2015: 217) but no other South African studies have addressed prevalence of PD.

2.3.3 Clinical Presentation of Primary Dysmenorrhea

The initial onset of PD is usually within the first year of menarche when ovulatory cycles are being established (Bernardi *et al.* 2017: 4; Chao *et al.* 2014: 50). Typically, pain arises a few hours preceding the onset of menstrual flow and lasts less than 8 to 72 hours (Omidvar *et al.* 2016: 135; Osayande and Mehulic 2014: 342). A peak in severity of

symptoms is noted with maximum blood flow, usually worse on the first or second day (Reddish 2006: 844).

Primary dysmenorrhea encompasses a variety of symptoms (De Sanctis *et al.* 2017: 233). Pain occurs in most menstrual cycles and is often described as sharp and spasmodic with intermittent frequency located in the lower abdominal and pelvic regions and may refer into the low back, groin, and proximal thigh (Bezuidenhout *et al.* 2018: 19; Gaubeca-Gillaranz *et al.* 2018: 302; De Sanctis *et al.* 2017: 234; Holtzman, Petrocco-Napuli and Burke 2007: 237). Additionally, frequently reported symptoms include upper abdominal pain, back pain, fatigue, dizziness, gastrointestinal disturbances (such as diarrhoea, nausea and vomiting), headache, oedema and affective changes (such as mood alterations, anxiety or insomnia) (Bezuidenhout *et al.* 2018: 19; Gaubeca-Gillaranz *et al.* 2018: 302; De Sanctis *et al.* 2017: 234; Iacovides, Avidon and Baker 2015: 763).

It has been acknowledged that even though pain has a fairly short duration in sufferers, its regular onset and recurrence places the clinical picture of PD in both acute and chronic pain syndromes. Emerging evidence suggests a relationship exists between dysmenorrhea and co-occurrence of chronic pain conditions, such as migraines, fibromyalgia, irritable bowel syndrome and myofascial pain syndromes (Affaitati *et al.* 2020; Li *et al.* 2020; Chen, Kwekkeboom and Ward 2016).

Dysmenorrhea can further be graded using the Multidimensional Scoring System (MSS) (De Sanctis *et al.* 2017: 242). MSS incorporates symptomatology, limitation of pain on daily activities and analgesic dependence to grade the severity of pain. MSS grades dysmenorrhea as follows:

Table 2.1: Multidimensional Scoring System for Pain Severity in Dysmenorrhea

GRADE	SEVERITY	CRITERIA
Grade 0	Absent	Menstrual pain absent with no limitation to daily activities.
Grade 1	Mild	Menstrual pain present with no limitation to daily activities but analgesics rarely required.
Grade 2	Moderate	Menstrual pain present in moderate intensity with limitation to daily activities with sufficient pain relief with analgesics.
Grade 3	Severe	Menstrual pain present in severe intensity in conjunction with systemic symptoms (fatigue, headache, diarrhoea and vomiting). Significant limitation in daily activities and minimal pain relief with analgesics.

2.3.4 Risk Factors for Primary Dysmenorrhea

Risk factors associated with primary dysmenorrhea itself have been broadly studied in different populations and contexts. Consistent across studies, a strong link to family history has been reported, whereby menstrual pain in family members has doubled the risk for the development of PD (Potur, Bilgin and Komurcu 2014: 770). Studies have also shown statistically significant associations with early age of menarche, as well as menstrual cycle irregularities (Giletew and Bekele 2019:72; Nooh 2014: 202).

A recent study conducted in Ghana found that menstrual irregularity was significantly associated with dysmenorrhea, but other factors such as age of menarche, menstrual flow and duration, cycle length and even family history were found to be insignificant (Acheampong *et al.* 2019: 3). Other factors, such as smoking, poor sleep, high physical activity levels, obesity or high body mass index, alcohol consumption, history of sexual assault and genital mutilation as a cultural practice (in parts of Africa and Asia), have been shown to

increase the severity of dysmenorrhea episodes (Abu Helwa *et al.* 2018: 18; De Sanctis *et al.* 2017: 245; Spears 2005: 79 – 81; Harlow and Park 1996: 1134).

Psychosocial risk factors that have been shown to have significance include adolescents living away from home, high stress levels, and anxiety and depression (Acheampong *et al.* 2019: 3; Abu Helwa *et al.* 2018: 18; Bernardi *et al.* 2017: 1645).

Some studies report a positive relationship has also been observed with a higher education level – with those attending tertiary education having a higher prevalence of dysmenorrhea than among secondary education school-leavers (Gagua *et al.* 213: 352). However, other studies dispute the association between education and dysmenorrhea (Ju, Jones and Mishra 2013: 111).

A review of dysmenorrhea among different countries concluded that its association with economic factors has been under-researched and requires further studies to understand this impact (De Sanctis *et al.* 2017: 234).

Limitations to many of these studies has been the inability to distinguish between primary and secondary dysmenorrhea, making the generalisation of these risk factors to women with menstrual pain in the absence of pathology challenging and, therefore, more studies are needed (Iacovides, Avidon and Baker 2015: 764).

2.4 OVERVIEW OF MUSCULOSKELETAL PAIN

Musculoskeletal pain is a broad term encompassing pain arising due to dysfunction between muscles, ligaments, tendons, bones, and joints (Gerstman, Chou and Burke 2021: 73). This pain can be further

classified into primary and referred pain. Primary pain refers to pain around the site of the origin of dysfunction whereas referred pain is that which is felt in a different location away from the site of origin (Arendt-Nielsen, Fernandez-de-las-Penas and Graven-Nielsen 2011: 186). In cases of dysmenorrhea, pelvic pain would be considered as primary, whereas low back or extremity pain would be considered as referred.

The more common presentations of MSK pain include myofascial pain, osteoarthritis, and radiculopathies (Lee and Park 2016: 108). Myofascial pain syndrome has been defined by Travell, Simons and Simons (1999: 5) as symptoms relating to sensory, motor and autonomic phenomena that are due to the presence of myofascial trigger points (MFTPs). The authors also define myofascial trigger points as hyperirritable spots in muscles which can present either as active or latent, which ultimately cause local and referred pain experienced in the syndrome. Zhuang, Tan and Huang (2014: 4271) reported that myofascial pain syndrome carries a prevalence of 85% to 95% in the general population, with the majority of tertiary pain clinic visits and chronic pain disorders involving myofascial trigger points. Studies have also shown that myofascial pain is closely related to the headache experience, with a high frequency of MFTPs present in both migraine and tension-type headache sufferers, contributing to the pain referral pattern in the head, neck, and shoulders (Affaitati *et al.* 2020: 638; Do *et al.* 2018). Studies have suggested that myofascial pain may play a significant role in relation to menstrual pain (Yacubovich *et al.* 2019; Lee and Park 2016).

The global burden of musculoskeletalMSK pain and the subsequent disability rates remain high, consequently posing a major clinical problem in the global healthcare systems (Blyth *et al.* 2019: 35;

Arendt-Nielsen, Fernandez-de-las-Penas and Graven-Nielsen 2011: 186).

2.4.1 Understanding Primary Dysmenorrhea and Musculoskeletal Pain

Musculoskeletal pain as a manifestation of PD has been a complaint reported in literature dating back to the 1900s, with majority of pain located in the low back or presenting as headaches (Brynhildsen, Hammar and Hammar 1997; Boesler *et al.* 1993; Chapman 1993; Randall and Odell 1943). In fact, the work of Billig (1943) in the 1940s represents some of the early literature which investigated a possible link between MSK pain and dysmenorrhea. Though prevalence of this pain has been widely reported for years, research seemed to struggle differentiating between MSK and menstrual pain, referring to these symptoms as interchangeable in literature (Lee and Park 2016: 108).

While aspects of menstrual-related MSK pain from these early studies have remained consistent in modern literature, there has been a shift in the understanding that pain manifests throughout the MSK system, rather than being isolated to the low back region (Yacubovich *et al.* 2019: 1). Studies isolating and investigating the relationship between the two complaints of musculoskeletal pain and menstrual pain have only recently come to the foreground in literature (Yacubovich *et al.* 2019; Lee and Park 2016). These recent studies have demonstrated that MSK pain extends beyond the traditional backache, expressing itself as widespread involvement throughout the body, including the neck, thoracic region, low back, shoulders, hips, thighs, and knees (Yacubovich *et al.* 2019: 1; Iacovides *et al.* 2013: 1067). Studies have emphasised that further exploration between PD and MSK pain has great value in finding effective and holistic management of menstrual pain (Lee and Park 2016: 108)

2.4.2 Pathophysiology of Musculoskeletal Pain Associated with Primary Dysmenorrhea

An exact link between primary dysmenorrhea and musculoskeletal pain is unclear, although researchers have proposed various theories, which include biochemical, neurological, biomechanical, genetic, as well as psychosocial and chronic pain mechanisms. Despite the lack of consensus with regards to pathophysiology, most agree that the co-occurrence of pain syndromes, such as dysmenorrhea and MSK pain, are complex and multifactorial, whereby interactions of these factors complicate the manifestation and presentation of pain (Affaitati *et al.* 2020). Thus, emphasis should be placed on the complexities within these interactions and the review of theories and hypotheses should consider the broad context of the pathophysiology.

The following tables outline the relevant theories describing pathophysiology of MSK pain primary dysmenorrhea and have been summarised according to the authors, title of studies and the underlying mechanisms and findings.

Table 2.2a: Neurological Theories

Year	Author/s	Title of Article	Findings
2002	Bajaj <i>et al.</i>	A comparison of modality-specific somatosensory changes during menstruation in dysmenorrheic and nondysmenorrheic women	Hyperalgesia and the effects of central sensitisation on musculoskeletal pain
2007	Giamberardi no <i>et al.</i>	Recent and forgotten aspects of visceral pain	
2011	Vincent <i>et al.</i>	Dysmenorrhoea is associated with central changes in otherwise healthy women	
2013	Iacovides <i>et al.</i>	Women With Dysmenorrhea Are Hypersensitive to Experimental Deep Muscle Pain Across the Menstrual Cycle	
2015	Iacovides, Avidon and Baker	What we know about primary dysmenorrhea today: a critical review	Hyperalgesia and the effects of central sensitisation on musculoskeletal pain
			Metabolic, structural and functional changes in regions of the central nervous system
2018	Stallbaum <i>et al.</i>	Postural control of women with primary dysmenorrhea in different phases of the menstrual cycle	Hyperalgesia and the effects of central sensitisation on musculoskeletal pain
2005	Spears	A Narrative Review of Medical, Chiropractic and Alternative Health Practices in the Treatment of Primary Dysmenorrhea	Pain reflex pathways and referred pain phenomena in primary dysmenorrhea
2009	Tu <i>et al.</i>	Abnormal cerebral metabolism during menstrual pain in primary dysmenorrhea	Metabolic, structural and functional changes in regions of the central nervous system
2010	Tu <i>et al.</i>	Brain morphological changes associated with cyclic menstrual pain	
Year	Author/s	Title of Study	Findings

Table 2.2b: Biochemical Theories

Year	Author/s	Title of Article	Findings
2003	Ruoff and Lema	Strategies in pain management: new and potential indications for COX-2 specific inhibitors	Systemic effects of prostaglandin dysregulation on musculoskeletal tissue
2004	Harel	Cyclooxygenase-2 specific inhibitors in the treatment of dysmenorrhea	
2005	Spears	A Narrative Review of Medical, Chiropractic and Alternative Health Practices in the Treatment of Primary Dysmenorrhea	
2014	Huang and Liu	Wet Needling of Myofascial Trigger Points in Abdominal Muscles for Treatment of Primary Dysmenorrhoea	
2015	Hoffman	Central and peripheral pain generators in women with chronic pelvic pain: patient centered assessment and treatment	
2015	Iacovides, Avidon and Baker	What we know about primary dysmenorrhea today: a critical review	
2016	Omidvar <i>et al.</i>	Primary Dysmenorrhea and Menstrual Symptoms in Indian Female Students: Prevalence, Impact and Management	Systemic effects of prostaglandin dysregulation on musculoskeletal tissue The role of sex hormones in the menstrual cycle and their modulation in musculoskeletal pain syndromes
2018	Gaubeca-Gilarranz <i>et al.</i>	Effectiveness of Dry Needling of Rectus Abdominis Trigger Points for the Treatment of Primary Dysmenorrhoea: A Randomised Parallel-Group Trial	Systemic effects of prostaglandin dysregulation on musculoskeletal tissue
2020	Affaitati <i>et al.</i>	Co-occurrence of pain syndromes	
2020	Li <i>et al.</i>	Association between dysmenorrhea and chronic pain: a systematic review and meta-analysis of population-based studies	
1989	Möller-Nielsen and Hammar	Women's soccer injuries in relation to the menstrual cycle and oral contraceptive use	The role of sex hormones in the menstrual cycle and their modulation in musculoskeletal pain syndromes.
1998	Dao, Knight and Ton-That	Modulation of myofascial pain by the reproductive hormones: a preliminary report.	
2001	Granot <i>et al.</i>	Pain perception in women with dysmenorrhea	
2011	Vincent <i>et al.</i>	Dysmenorrhoea is associated with central changes in otherwise healthy women	
2013	Iacovides <i>et al.</i>	Women With Dysmenorrhea Are Hypersensitive to Experimental Deep Muscle Pain Across the Menstrual Cycle	
2018	Chidi-Ogbolu and Baar	Effect of Estrogen on Musculoskeletal Performance and Injury Risk	
2019	Fede <i>et al.</i>	Sensitivity of the fasciae to sex hormone levels: Modulation of collagen-I, collagen-III and fibrillin production	
2005	Shah <i>et al.</i>	An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle	
2009	Kuan	Current studies on myofascial pain syndrome	
2019	Yacubovich <i>et al.</i>	The prevalence of primary dysmenorrhea among students and its association with musculoskeletal and myofascial pain	

Table 2.2c: Biomechanical Theories

Year	Author/s	Title of Article	Findings
1992	Panjabi	The stabilizing system of the spine. Part II. Neutral zone and instability hypothesis	Implication of ligament laxity, spinal instability and postural control in musculoskeletal pain and menstrual pain
2013	Shakeri <i>et al.</i>	Effect of functional lumbar stabilization exercises on pain, disability, and kinesiophobia in women with menstrual low back pain: a preliminary trial	
2018	Stallbaum <i>et al.</i>	Postural control of women with primary dysmenorrhea in different phases of the menstrual cycle	Biomechanical changes altering pelvic and spinal alignment in women with dysmenorrhea
2003	Genders <i>et al.</i>	Dysmenorrhea and pelvic dysfunction: a possible clinical relationship	
2016	Kim, Baek and Goo	The relationship between pelvic alignment and dysmenorrhea	
2020	Matsushita <i>et al.</i>	Osteopathic Manipulative Treatment and Psychosocial Management of Dysmenorrhea	
2019	Yacobovich <i>et al.</i>	The prevalence of primary dysmenorrhea among students and its association with musculoskeletal and myofascial pain	

Table 2.2d: Genetic Theories

Year	Authors/s	Title of Article	Findings
2014	Lee <i>et al.</i>	Association of brain-derived neurotrophic factor gene Val66Met polymorphism with primary dysmenorrhea	Gene polymorphisms for brain-derived neurotrophic and nerve growth factors
2014	Chen <i>et al.</i>	The effectiveness of acupuncture on relieving pain: a systematic review	
2016	Jones <i>et al.</i>	Genome-wide association analysis of pain severity in dysmenorrhea identifies association at chromosome 1p13.2, near the nerve growth factor locus	

Table 2.2e: Psychosocial and Chronic Pain Theories

Year	Author/s	Title of Article	Findings
2004	Wang <i>et al.</i>	Stress and dysmenorrhoea: a population based prospective study	The role of psychosocial and environmental influences contributing to the overall chronic pain experience in primary dysmenorrhea
2013	Gagua <i>et al.</i>	Assessment of Anxiety and Depression in Adolescents with Primary Dysmenorrhea: A Case-Control Study	
2013	Ju, Jones and Mishra	The Prevalence and Risk Factors of Dysmenorrhea	
2018	Chen <i>et al.</i>	Symptoms-Based Phenotypes Among Women with Dysmenorrhea: A Latent Class Analysis	
2019	Gupta and Shreemal	Primary dysmenorrhea and its homoeopathic therapeutics	
2020	Li <i>et al.</i>	Association between dysmenorrhea and chronic pain: a systematic review and meta-analysis of population-based studies	

2.4.3 Prevalence of Musculoskeletal Pain Associated with Primary Dysmenorrhea

The prevalence of musculoskeletal pain associated with primary dysmenorrhea is a topic that is understudied in current literature. Although these complaints have been represented in early and modern literature, fewer studies have specifically isolated MSK pain and reported on its prevalence.

2.4.3.1 Global Prevalence

Menstrual-related low back pain has been reported as the third most common symptom of menstrual discomfort, affecting approximately 46% to 56% of the population (Chen and Hu 2019; Banikarim, Chacko and Kelder 2000). An early study conducted among Swedish soccer players demonstrated a low back pain prevalence of 29% during menstruation (Brynhidsen, Hammar and Hammar 1997: 350).

Prevalence for menstrual low back pain has varied among different countries and population settings. Studies have reported the following prevalence results: 59.3% in Israel (Yacubovich *et al.* 2019), 52.6% in Brazil (Stallbaum *et al.* 2018), 33.3% in Taiwan (Chen and Chen 2005) and 5.94% in Georgia (Gagua *et al.* 2013). The studies conducted in Israel and Brazil excluded women with known gynaecological pathology, and thus the prevalence of low back pain in these studies speaks to that of PD. The studies conducted in Taiwan and Georgia only took dysmenorrhea into account and make no distinction between primary and secondary, where underlying pelvic pathology plays an important role in pathophysiology and the overall menstrual pain experience.

A study conducted among Japanese nurses with menstrual disorders showed LBP prevalence of 43.6% prior to menstruation, which

increased to 64% during menstruation (Smith *et al.* 2009: 303). However, as with the previous studies, no distinction was made between primary and secondary dysmenorrhea.

2.4.3.2 Local Prevalence

Oni and Tshitangano (2015) conducted a local study which explored the prevalence of menstrual disorders and its academic impact among teenagers in a rural district in Limpopo. This study found that approximately 34% of adolescent females with menstrual disorders suffer with back pain consistently during their menstrual periods. About 19% of the participants reported back pain as occasionally present, while 15% reported their pain to be consistently present with menstruation. The population sample consisted of scholars aged 14 to 18 years, in a rural setting and the authors did not discount gynaecological pathology when referring to dysmenorrhea, nor did they specify the location of back pain.

It is clear that, across heterogenous populations, both globally and locally, menstrual-related low back pain is a common trend.

2.4.4 Clinical Presentation of Musculoskeletal Pain Associated with Primary Dysmenorrhea

2.4.4.1 Low Back Pain

Various descriptors have been used by participants across studies when explaining the characteristics of menstrual-related MSK pain. Travell, Simons and Simons (1999: 952) stated that myofascial trigger points in rectus abdominis reproduce achy radiating pain into the abdominal, sacroiliac, and low back regions, which is comparable to that which is experienced in dysmenorrhea.

A study conducted among Swedish soccer players (Brynhidsen, Hammar and Hammar 1997: 350) revealed that among players experiencing menstrual low back pain, the most common explanations were pain and fatigue in the lumbosacral region. Other descriptors of low back pain have included “weakness, shooting, cramping and disturbing” and stabbing sensations (Evans *et al.* 2019: 3191; Gagua *et al.* 2018: 352).

A subject in a case report investigating multimodal therapy in PD described her pain as diffuse, dull aching in the lumbar spine region with bilateral referral to the anterolateral thighs (Wong, Laframboise and Mior 2018:191). This subject reported that on day two of menstruation, the referred pain extended down to the lateral aspect of the knee and ankle.

2.4.4.2 Generalised Musculoskeletal Pain

While low back pain has been a commonly reported symptom, reports on other regions of pain in the body have been less popular. There are, however, a few key studies which have researched MSK pain in conjunction with menstrual pain. Yacubovich *et al.* (2019) provided one of the most comprehensive studies to date on this topic. These researchers looked at the global presentation of MSK pain in PD among female students and showed the prevalence of pain to be in areas away from the typical referral pattern of gynaecological viscera. The prevalence of MSK symptoms were found as follows: 57.1% neck; 33.6% thoracic spine; 52.1% lumbar spine; 44.5% shoulders; 9.2% elbows; 19.3% hands and wrists; 20.2% hips and thighs; 31.1% knees and 31.9% ankles and feet (Yacubovich *et al.* 2019: 5). Additionally, the study reported a prevalence of 25.4% of general pain experienced by participants where locations were unspecified (Yacubovich *et al.* 2019: 4).

These findings corresponded with an earlier study by Lee and Park (2016), who similarly isolated the association of menstrual and MSK pain. No statistical analysis was produced with regards to prevalence; however, the study did report that the most common regions of MSK pain were located in the back, shoulders, arms, legs and head (Lee and Park 2016: 109). Chen *et al.* (2018: 1459) reported a prevalence of 17.3% and 21.5% for neck and thigh pain respectively. A clinical trial conducted in college students revealed that menstrual symptoms in dysmenorrheic students included generalised pain and foot pain (Yaralizadeh *et al.* 2020).

While anatomical regions of pain have been most commonly reported on, further information regarding severity, frequency and fluctuations are less popular. Lee and Park (2016) provided a foundation in this regard, where they found MSK pain to increase in the days preceding menstruation and peak around day one of menstruation in both menstrual pain sufferers and non-sufferers. These authors found significance in their study in relation to the severity of perceived pain, with menstrual sufferers experienced pain of a more severe nature than non-sufferers (Lee and Park 2016: 109).

In a South African context, no published studies were found exploring the prevalence or associations of generalised musculoskeletal pain in females with PD.

2.4.4.3 Headaches

It is well established that headaches represent a major health problem, with an estimated overall lifetime prevalence between 60% to 80% in the general population (Bianchin *et al.* 2019: 26). Prevalence is disproportionate between males and females, with women suffering three times more than their male counterparts

(Affaitati *et al.* 2020: 635). This disproportion coincides with pubertal development, where the onset of menstruation seems to predict headache pattern characteristics in females (Marcus 2001: 449).

The prevalence of menstrual headaches with dysmenorrhea varies between studies. It is important to acknowledge that not all headaches have a musculoskeletal component and therefore the presence of a headache is not necessarily tantamount to MSK dysfunction. However, a recent systematic review reported significant associations between dysmenorrhea and chronic pain conditions, which included overlap between headaches and general MSK pain (Li *et al.* 2020: 365). Co-occurrence between headaches and PD is high, particularly migraines (Affaitati *et al.* 2020: 637). In fact, 50% of female migraine sufferers report a link between menstruation and headache attacks – although the Headache Classification Committee of the International Headache Society (2018) reports that menstrual migraine only affects 5% to 8% of women.

Evans *et al.* (2018: 3188) found that approximately 80% of women with dysmenorrhea reported headache occurrence at least one day per menstrual cycle, with the average number of headache days amounting to ten days per month. Alongside menstrual migraine, menstrual tension-type headaches have also been reported in literature; a study conducted in a neurological outpatient clinic found that 28.5% of participants met the criteria for pure menstrual tension-type headache and a further 71.5% met the criteria for menstrual related tension-type headache (Arjona *et al.* 2007: 101). This study also found a lower prevalence of migraine, with only three participants meeting the criteria for migraine diagnosis, supporting the prevalence rates reported by the Headache Classification Committee (2018).

When exploring symptom-based phenotypes in women with dysmenorrhea, Chen *et al.* (2018) found that women with phenotype two (severe localised pain) and phenotype three (multiple severe symptoms) were more likely to report migraine and non-migraine headaches alongside dysmenorrhea than women who were categorised into phenotype one (mild localised pain).

Globally, the prevalence of headaches associated with menstruation and menstrual disorders lacks uniformity among studies: 59% in Hispanic females in the United States (Banikarim, Chacko and Kelder 2000), 17.8% in Israel (Yacubovich *et al.* 2019) and 7.9% in Iran (Rakhshae 2014). An Italian study found an overall headache prevalence of 64.4% and further analysed the patterns which revealed 66% of cases were premenstrual, 90% were perimenstrual and 38% occurred midcycle (Bianchin *et al.* 2019). Locally, Oni and Tshitangano (2015) found a headache prevalence of 37% alongside menstrual disorders in rural South African females.

As with previous studies on MSK pain, not all excluded the presence of known gynaecological pathology and thus the prevalence statistics do not reflect a true representation of those in PD sufferers. Exceptions include the studies by Yacubovich *et al.* (2019) and Rakhshae (2014), whereby secondary dysmenorrhea was specified for exclusion criteria.

2.4.4.4 Myofascial Pain

In addition to general musculoskeletal complaints, some studies have also expanded on the myofascial involvement between PD and MSK pain. Yacubovich *et al.* (2019: 5) showed a significant difference in the prevalence of active trigger points in the rectus abdominis, quadratus lumborum and paraspinal muscles bilaterally in subjects suffering with

menstrual pain compared to non-sufferers. However, not all muscles displayed such significance as researchers noted indifference between the two groups with regards to the presentation of trigger points in the gluteus medius muscle (Yacubovich *et al.* 2019: 4).

These reports of myofascial involvement corresponded with that of Lee and Park (2016), whereby quadratus lumborum and rectus abdominis produced the most severe muscular pain in participants with associated menstrual pain (Lee and Park 2016: 109).

2.5 RISK FACTORS FOR MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

Research exploring the risk factors addressing comorbid MSK pain in PD sufferers is lacking, but studies have revealed similarities to that of PD.

Yacubovich *et al.* (2019) described variables such as smoking, regular physical activity, menstrual characteristics and use of oral contraceptives as variables in their study which addressed the MSK factors in PD, but the researchers did not perform an analysis to determine risk factor association.

A study which isolated the associations between menstrual pain and low back pain in Japanese nurses found correlation between increased body weight, increased work load and history of low back pain prior to menstruation (Smith *et al.* 2009: 305). This study revealed that those who experienced mild to moderate menstrual pain were almost four times more likely to experience associated low back pain, suggesting that the severity of symptoms (such as low back pain) was inversely proportional to the severity of menstrual pain.

Smith *et al.* (2009: 305) reported that multiparous women, who had three or more children, were at lower risk of developing low back pain – a finding which supports other claims that the severity of symptoms in PD declines after giving birth (Weissman *et al.* 2004: 345).

Paananen *et al.* (2010: 1026) found correlations among high physical activity, lack of sleep, smoking and internalising problems among adolescent girls with persisting MSK pain. This study was not specific to dysmenorrhea and did not isolate menstruation as a variable in female participants. An African systematic review demonstrated positive associations with smoking, walking more than thirty minutes a day, a history of physical trauma and inadequate access to healthcare with the development and persistence of low back pain in Africans (Louw, Morris and Grimmer-Somers 2007). This review also identified that female participants were at higher risk for LBP in three of the studies reviewed (Louw, Morris and Grimmer-Somers 2007: 8). While some researchers proposed that women who engaged in regular aerobic exercise experienced reduced pain and fewer behavioural changes (Saleh, Mowafy and El Harneid 2016: 1), others found no significant correlation between active and sedentary women with dysmenorrhea (Kamel, Tantawy and Abdelsamea 2017: 1080).

The use of oral contraceptives has been controversial with regards to its protective effects against pain of both menstrual and MSK pain in dysmenorrhea. The use of oral contraceptives (OCs) has been promoted as a protective mechanism in relation to soft tissue injuries in female athletes. Some researchers have demonstrated that OCs reduce ligamentous laxity and have shown a reduction in tibial translation in anterior cruciate ligament injury (Martineau *et al.* 2004: 281). However, other authors have argued that oral contraceptives inhibit collagen synthesis in muscles, tendons and bone, thus

demonstrating the ability of exogenous hormones to alter the biomechanical properties of MSK tissue (Hansen *et al.* 2009: 1435).

In terms of severity of dysmenorrhea, some authors state the use of oral contraceptives has reduced menstrual pain (Ju, Jones and Mishra 2013: 109), whereas others have claimed that OCs increase the risk of MSK complaints, such as temporomandibular disorders in young females (LeResche *et al.* 1997: 153). Research has speculated that the exogenous hormones in OCs have a more pronounced effect on spinal and pelvic structures than that of endogenous hormones which could be responsible for the increased low back pain in OC users (Brynhildsen, Hammar and Hammar 1997: 351).

A study conducted in Italian teenagers which addressed risk factors in menstrual cycle headaches found that the prevalence of those with headaches using oral contraceptives to be significantly higher than those without headache, implying that oral contraceptives carry more risk for menstrual headache development (Bianchin *et al.* 2019: 27). The question of oral contraceptive influence on MSK pain remains unclear (Smith *et al.* 2009: 308).

Affaitati *et al.* (2020) proposed that the high degree of myofascial pain with other comorbid pain conditions, such as fibromyalgia and dysmenorrhea, may be a predisposition through repetitive microtrauma to muscular structures via inadequate postural control and analgesia.

Genetically, Chen *et al.* (2018: 1463) found that an older age was associated with the presence of the “multiple severe symptoms” phenotype which included widespread MSK symptoms and menstrual headaches. The women in this phenotype were also more likely to be Hispanic or Black and experienced an earlier menarche than

Caucasian women; this suggests that age of menarche, gynaecological age and race may play a role in predisposition to MSK pain in PD.

In addition to their findings relating to oral contraceptives, Bianchin *et al.* (2019: 27) found that an older gynaecological age, those belonging to a middle social level and those who engaged with high intensity physical activity to be significantly associated with menstrual cycle headache, although no difference was reported for menstrual cycle patterns, such as regularity or bleeding length. The finding of older gynaecological age contradicts some studies which report dysmenorrhea declines with age (Lindh, Ellström and Milsom 2012: 676), but it supports the data relevant to MSK pain in the “multiple severe symptoms” phenotype by Chen *et al.* (2018: 1463).

There appears to be a significant shortcoming in literature pertaining to MSK risk factors associated with primary dysmenorrhoea; some factors which are reported on are contradictory among study populations and there is a clear lack of literature of risk factors pertaining to a South African population and context.

2.6 MANAGEMENT APPROACHES FOR MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

Mainstream healthcare has promoted a pharmacological approach in the treatment of dysmenorrhea and its concomitant symptoms, prescribing NSAIDs and oral contraceptives as the primary treatment (Osayande and Mehulic 2014: 345). The efficacy of this pharmacological approach has been demonstrated in literature, but 10% to 20% of women do not respond to this approach and many

suffer the consequences of drug side effects (Proctor and Farquhar 2006: 1136).

The literature cites a host of complementary and alternative therapies in the management of primary dysmenorrhea such as heat, nutrition, exercise therapy, acupuncture, psychotherapy, transcutaneous electrical nerve stimulation (TENS) and various manual therapy techniques utilised in the chiropractic and physical therapy professions (Osayande and Mehulic 2014: 345; Proctor and Farquhar 2006: 1136 – 1137).

Although musculoskeletal pain was a prominent symptom uncovered in research relating to PD, most studies failed to isolate this relationship in terms of management approaches. This highlights the need for further research surrounding this topic and the gap that this study aims to fill by investigating management of MSK pain in PD.

2.6.1 General Management Approaches

Before divulging information with regards to management interventions, it is important to understand the context in which this care is provided among women with PD. There seems to be great diversity in the approach to seeking healthcare across various studies.

A recent review of dysmenorrhea across different countries revealed a discrepancy between the high prevalence of dysmenorrhea and the low rates of seeking professional treatment (De Sanctis *et al.* 2017: 243). More than half of adolescents with menstrual pain opted to ignore their pain in Ghana (Acheampong *et al.* 2019: 3). Similarly, Banikarim, Chacko and Kelder (2000: 1228) found that 67% of participants had little to no knowledge on professional management of dysmenorrhea. Other studies have reported professional consultation to be as low as 11% (Nooh 2014: 202). De Sanctis *et al.*

(2017: 244) found that self-management, pharmacologic or non-pharmacologic, ranged between 21% to 96%. About 32% of teenagers in a South African study sought professional healthcare advice (Oni and Tshitangano 2015: 217).

Additionally, studies have shown variation in the approach to complementary and alternative medicine usage. One study reported a high rate of complementary health approaches, with three quarters of women utilising CAM self-management techniques for menstrual symptoms, but conversely found that only 2% of these participants had ever consulted a complementary health professional (Chen, Kwekkeboom and Ward 2016). In Australia, up to 21% of women with dysmenorrhea seek complementary and alternative medicine from chiropractors or other CAM providers (Fisher *et al.* 2016). To my knowledge, only one study reported care seeking from traditional medicine, reporting 2% of Hispanic participants to consult *curandera* (traditional healers) (Banikarim, Chacko and Kelder *et al.* 2000: 1228).

2.6.2 Pharmacological Management Approaches

NSAIDs and oral contraceptives have long been used to manage the symptoms of dysmenorrhea. Studies have shown efficacy rates NSAIDs to be between 17% to 100% in managing symptoms of dysmenorrhea (Iacovides, Avidon and Baker 2015: 772; Proctor and Farquhar 2006: 1135). Side effects, particularly gastrointestinal complaints, can be bothersome (Proctor and Farquhar 2006: 1136). Furthermore, some report that 18% of women with dysmenorrhea experience no pain relief from NSAIDs (Oladosu, Tu and Hellman 2018: 390). Other analgesics, such as paracetamol and aspirin may also be used, particularly when NSAIDs are contraindicated (Proctor and Farquhar 2006: 1135), although literature does not cite researched efficacy for these options.

The use of oral contraceptives is controversial. A Cochrane systematic review demonstrated little evidence exists for the use of OCs in management symptoms of dysmenorrhea (Wong *et al.* 2009). As with NSAIDs, side effects of OCs cause much distress in users, such as headache, abdominal complaints, weight gain and more serious risks, such as venous thrombosis, heart attack and stroke (Proctor and Farquhar 2006: 1136). Another drawback of oral contraceptives is that their use only applies to women who desire contraception (Osayande and Mehulic 2014: 345).

Research shows that OC use can alter headache frequency and character and may induce or alleviate the crisis among sufferers (Kudrow 1975), although some studies have still advocated for hormone therapy as an effective treatment in dysmenorrhea and migraine (Affaitati *et al.* 2020: 638). Another study found that the use of OC displayed no difference on low back pain in female athletes when compared to non-users, despite literature suggesting exogenous hormones exacerbate LBP (Brynhildsen, Hammar and Hammar 1997: 351).

Although pharmacological management is considered first line therapy for PD, there is incongruency with the reported usage in studies. A review stated that approximately half of females with dysmenorrhea used analgesics to manage pain (De Sanctis *et al.* 2017: 244). Additionally, these researchers stated that medication dosage was often subtherapeutic. About 64% of South African teenagers reported to self-medicate for their menstrual pain (Oni and Tshitangano 2015: 217). The use of medication to manage menstrual related headaches in one study was found to be around 20% (Bianchin *et al.* 2019: 28).

Oral contraceptive use has varied across studies but many have reported low rates (De Sanctis *et al.* 2017: 244; Smith *et al.* 2009: 306). Some reasons for reduced efficacy for pharmacological management include fear of addiction, drug interactions, lack of education and cultural nuances in attitudes towards pain (Aziato, Dedey and Clegg-Lampsey 2015: 165).

2.6.3 Non-Pharmacological and Self-Management Approaches

2.6.3.1 Transcutaneous Electrical Nerve Stimulation

Transcutaneous electrical nerve stimulation is thought to reduce menstrual pain by stimulating nerves and altering the body's ability to receive and interpret pain signals, as well as mediating endorphin release (Proctor *et al.* 2002). Multiple clinical trials and a Cochrane systematic review have found that TENS was superior to sham or placebo treatment in reducing menstrual pain and reliance on painkillers (Bai, Bai and Yang 2017; Proctor *et al.* 2002; Dawood and Ramos 1990).

A trial combining TENS and thermotherapy was an effective method of relieving acute pain in moderate to severe PD (Lee *et al.* 2015). Evidence suggests that high-frequency TENS is more appropriate for dysmenorrhea, although these findings are conflicting (Wong, Laframboise and Mior 2018; Proctor *et al.* 2002). Overall, reports state 42% to 60% of patients experience moderate relief through treatment with TENS (Proctor *et al.* 2002).

2.6.3.2 Thermotherapy

Heat application to the low back or abdomen is a popular remedy in dysmenorrhea (Mannix 2008: 882). Similar to TENS, heat acts by overriding nerve impulses via the gate control pain theory to reduce pain perception (Spears 2005: 86). Rates vary between 11% to 65%

for the application of heat for menstrual pain management (Acheampong *et al.* 2019: 3; De Sanctis *et al.* 2017: 244). One study found that a cold compress (57%) was a more popular option than a hot compress (21%) in Japanese nurses with menstrual-related LBP (Smith *et al.* 2009: 305). Akin *et al.* (2001: 739) found that continuous low-level topical heat was superior to acetaminophen for dysmenorrhea management. One African study noted a lack of accessibility to hot water as a limitation to the heat application for menstrual discomfort among Ghanaian students (Aziato, Dedey and Clegg-Lamprey 2015:165).

Though literature supports the use of heat to manage PD symptoms, high quality trials are still required to produce evidence for its efficacy (Aboualsoltani *et al.* 2020: 137).

2.6.3.3 Manipulative Therapy

Manipulative therapy as a treatment for menstrual symptoms has various proposed mechanisms, including: restoring somatosensory balance by removing local neurological irritations at the relevant spinal levels (lower thoracic, lumbar and sacral regions); removing mechanical joint restrictions eliciting a sympathetic response which reduces uterine contraction; altering pain reflexes and response in the cerebral cortex, as well as a direct mechanical link via ligamentous attachments between the sacrum and uterus (Holtzman, Petrocco-Napuli and Burke 2007: 238; Spears 2005: 79, 85).

An early pilot study claimed reduction of prostaglandin F2 α metabolite and reduced menstrual pain after short lever, high velocity low amplitude thrust applied to spinal and sacroiliac joints on the first day of menstruation – although participants receiving sham adjustments also displayed prostaglandin reduction (Kokjohn *et al.* 1992). Studies

conducted in the early 1990s report similar success with osteopathic manipulation in dysmenorrhea (Boesler *et al.* 1993; Chapman 1993).

Holtzman, Petrocco-Napuli and Burke (2007: 243) found that removal of motion segment restrictions of the lumbar and sacral joints with drop table technique alleviated pain in PD. More recent studies have shared the similar sentiment that manipulative therapy is effective for menstrual pain (Matsushita *et al.* 2019; Molins-Cubero *et al.* 2014; Molins-Cubero, Bosca-Gandia and Rus-Martinez 2012).

In contrast, a Cochrane systematic review failed to find evidence supporting manipulation as an intervention for dysmenorrhea, suggesting that spinal manipulation was more no effective than sham manipulation (Proctor *et al.* 2006). However, a conclusion drawn by a more recent meta-analysis stated that manipulative therapy may serve as an adjunct for pain relief in PD but further evidence through high quality research is needed (Abaraogu *et al.* 2017: 386).

2.6.3.4 Acupuncture and Acupressure

Acupuncture and acupressure have been shown to be effective techniques in relieving pain in various conditions, including dysmenorrhea and low back pain (Chen and Wang 2014: 539). The methods behinds behind these techniques involve a stimulation of free nerve endings which attempt to override pain pathways, as well as endorphin modulation (Spears 2005: 86). Two trials showed significant benefit of acupuncture over no treatment, but, both studies showed no statistical difference between acupuncture and sham treatment (Shi *et al.* 2011; Ma *et al.* 2010).

Acupressure massage on SP6, BL32 and Li3 points produced high levels of pain relief and satisfaction in menstrual low back pain (Chen *et al.* 2015). Systematic reviews have provided evidence for the use

of acupuncture and acupressure in alleviating both low back pain and dysmenorrhea, but more quality research is needed (Chen and Wang 2014; Cho and Hwang 2010; Proctor *et al.* 2002).

2.6.3.5 Other Myofascial Techniques

Authors have endorsed interventions of dry needling, trigger point injection, manual trigger point compression and myofascial release techniques as effective treatments to eliminate myofascial dysfunction in patients (Affaitati *et al.* 2020; Gerwin 2005).

Gaubeca-Gilarranz *et al.* (2018) found that a single session of dry needling of active MFTPs in rectus abdominis, combined with stretching, was more effective than the control in reducing pain and reliance on NSAIDs. This study did not observe changes in quality of life in either group. Similar results were demonstrated in an earlier study with wet needling of abdominal MFTPs and stretching (Huang and Liu 2014). Gaubeca-Gilarranz *et al.* (2018: 307) emphasised the need for further research investigating the effects of dry needling of MFTPs in women with PD.

Several studies evaluating myofascial release of cervical and cranial MFTPs using various techniques, such as anaesthetic injection and topical NSAID treatment, have been effective in reducing intensity and frequency of migraines (Affaitati *et al.* 2018; Giamberardino *et al.* 2007; Garcia-Leiva *et al.* 2007).

Ischaemic compression is another myofascial technique which may benefit menstrual pain by dissipating trigger points that would otherwise refer pain into the abdomen, low back and legs (Spears 2005: 86). A total of 95% of females expressed relief of MSK pelvic pain with techniques such as ischaemic compression, through

removal of referred pain patterns which complicate dysmenorrhea (Spears 2005: 86).

Neuromuscular manipulation has been described in the management of PD. One study found neuromuscular manipulation to be as effective as NSAIDs in reducing pain intensity (Barassi *et al.* 2018: 291).

Several studies have also found benefits with abdominal massage, in conjunction with aromatherapy, in reducing the severity of dysmenorrhea when compared to placebo, with particular success using lavender essential oil (Ari Andiputri, Darmiyanti and Candra 2018; Bakhtshirin *et al.* 2015; Apay *et al.* 2012).

Preliminary evidence supporting radial extracorporeal shockwave therapy (rESWT) has emerged for the treatment of dysmenorrheic symptoms. rESWT targets dysfunction and pain by producing mechanical waves which induce biochemical and molecular changes to cells and modulate pain suppression (Liu, Wang and Yang 2020: 2). A recent trial has found success in managing menstrual pain with rESWT applied to abdominal acupoints (Xing *et al.* 2021). A currently pending clinical trial will further explore the efficacy of radial extracorporeal shockwave therapy in PD using functional magnetic resonance imaging (Liu, Wang and Yang 2020).

2.6.3.6 Exercise Therapy

Physical exercise has been suggested as a non-pharmacological intervention for dysmenorrhea management (Saleh, Mowafy and El Harneid 2016: 1). Proposed mechanisms include endorphin regulation, improve pelvic blood flow correction of biomechanical abnormalities and maintaining functional stability (Saleh, Mowafy and El Harneid 2016: 2; Proctor and Farquhar 2006: 1136). A variety of

exercise therapies have been researched, including aerobic, core strengthening, stretching, yoga and Pilates.

College females engaging in aerobic training showed a linear decline in symptoms of PD as compared to controls (Israel, Sutton and O'Brien 1985). Other studies have found a moderate number of females engage in walking as a pain management strategy (De Sanctis *et al.* 2017: 244). Core exercises and stretching have shown to reduce the duration and intensity of menstrual pain (Saleh, Mowafy and El Harneid 2016: 5).

After three months of lumbar stabilisation exercises, researchers reported improvement of pain, disability and kinesiophobia in menstrual low back pain (Shakeri *et al.* 2013: 163). Chen and Hu (2019: 238) reported a significant reduction in pain and higher self-efficacy after 12 months of a modified stretching programme in women with menstrual low back pain when compared to the control group. A physiotherapy programme combining aerobic activity, strengthening, stretching and muscle relaxation techniques was effective in reducing symptoms of dysmenorrhea when engaged in on a regular basis (Ortiz *et al.* 2015: 24).

Several studies report yoga has a positive effect on menstrual pain through combining physical exercises with relaxation and breathing techniques, impacting both body and mind (Yonglitthipagon *et al.* 2017: 840; Rakhshae 2011: 192). Additionally, yoga has been used as a successful complementary therapy in the treatment of MSK pain and headaches (Raub 2002: 801). Randomised controlled trials have shown yoga not only reduces pain, but also improves quality of life, functional ability, mental health and social aspects (Yonglitthipagon *et al.* 2017: 843; Rakhshae 2011: 195). Experimental studies have

similarly shown significant pain reduction, both sensory and affective, in participants engaging in Pilates (de Araujo *et al.* 2012).

The qualities of these studies are variable and efficacy cannot be refuted until further research is conducted with regards to the role of exercise in PD management (Kannan and Claydon 2014: 20).

2.6.3.7 Kinesio-Taping

Kinesio-taping (KT) has become a popular technique utilised in the management of MSK pain (Cupler *et al.* 2020: 52). Some researchers have explored its possible application in the management of MSK pain relating to dysmenorrhea. Forozeshfard *et al.* (2016 709) investigated the efficacy of kinesio-taping on menstrual low back pain and found that KT effectively reduced pain and disability in subjects, supporting its clinical application in menstrual LBP.

Significant relief of menstrual pain was also seen by Lim, Park and Bae (2013: 761). There is mixed quality evidence of effectiveness of kinesio-taping and further controlled research is needed to establish its efficacy (Cupler *et al.* 2020: 52; Montalvo, Cara and Myer 2014: 48), particularly as a treatment for musculoskeletal pain in PD.

2.6.3.8 Herbal Remedies, Supplementation and Nutrition

Many studies have reported herbal preparations, supplementation and special diets alongside dysmenorrhea management (Chen, Kwekkeboom and Ward 2016; Banikarim, Chacko and Kelder 2000).

Homoeopathy and herbal preparations are widely used to manage menstrual disorders worldwide (Gupta and Shreemal 2019: 78; Mirabi *et al.* 2013: 757). A large portion of females use self-administered herbal preparations or teas to manage menstrual pain, often passed down from their mothers (De Sanctis *et al.* 2017: 244; Aziato, Dedey

and Clegg-Lamptey 2015: 165; Banikarim, Chacko and Kelder 2000: 1228). Some medicinal herbs for use in dysmenorrhea cited in literature include *Foeniculum vulgare* (anti-inflammatory, analgesic and anti-spasmodic effects), *Zingiber officinale* (prostaglandin inhibitor) and *Valeriana officinalis* (muscular antispasmodic) (Mirabi *et al.* 2013).

Other homoeopathic remedies which have proposed value in managing menstrual backpain or generalised pain include *Caulophyllum*, *Xanthoxylum*, *Viburnum opulus*, *Magnesia phosporica*, *Pulsatilla* and *Veratrum viride* (Gupta and Shreemal 2019: 78). *Melilotus* may also be beneficial in menstrual-related headaches (Gupta and Shreemal 2019: 78). Several systematic reviews and trials have found efficacy for the use of fennel, ginger and curcumin in PD due to their anti-prostaglandin effects (Xu, Yang and Wang 2020; Rahman *et al.* 2020; Ghodsi and Asstoghiri 2014; Omidvar *et al.* 2016).

Supplementation suggested in literature to manage menstrual related symptoms has included calcium carbonate (1200 mg/d), vitamins B, C, E, thiamine, and beta-carotene, which all inhibit formation of prostaglandins, (Spears 2005: 84). Magnesium may have particular value in not only significantly reducing menstrual pain (Yaralizadeh *et al.* 2020: 4), but also showing success in reducing migraine symptoms – as such, twice as advantageous in patients with menstrual-related headache phenomena (Mannix 2008: 882).

Dietary considerations have included avoiding high amounts of meat and omega-6 fatty acids which promote a pro-inflammatory state (with excess arachidonic acid and prostaglandins) due to acidity (Spears 2005: 84). Counteracting dietary acidity can be achieved through increasing omega-3 fatty acid intake and consuming fruits and vegetables containing magnesium, sodium, calcium and potassium

ions (Spears 2005: 84). A low-fat vegetarian diet has also been proposed (Barnard *et al.* 2000: 245).

Further studies measuring nutritional status and dietary deficiencies could provide necessary information in understanding the role of nutrition and supplementation in PD (Yaralizadeh *et al.* 2020: 6).

2.6.3.9 Behavioural and Psychological Interventions

A variety of behavioural and psychological interventions, such as relaxation techniques, biofeedback, mind-body awareness, cognitive behavioural therapy and hypnotherapy, have been suggested to exert a positive effect on dysmenorrhea (Farshbaf Manei Sefat *et al.* 2017; Gagua *et al.* 2013). Studies on these interventions have been small and of low quality and further research is needed to verify their efficacy (Gagua *et al.* 2013: 353).

One well reported behavioural change young women seem to rely on to manage symptoms of dysmenorrhea includes rest. One systematic review cited rest as being the most common pain management strategy (De Sanctis *et al.* 2017: 244), whereas individual studies have reported rest to varying degrees (Acheampong *et al.* 2019: 3; Banikarim, Chacko and Kelder *et al.* 2000: 1228).

Studies consistently agree that the management of the psychological component may improve dysmenorrhea and effective management includes education and support, which should additionally be extended to the family and educators of sufferers (Acheampong *et al.* 2019: 4; De Sanctis *et al.* 2017: 244; Gagua *et al.* 2013: 354).

2.7 IMPACT OF MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

The burden of primary dysmenorrhea is greater than any other gynaecological complaint in females (Patel 2006: 453). The consequence of recurrent menstrual pain, due to both non-specific symptoms and comorbid conditions, such as MSK pain, have exerted negative effects on daily functioning and psychosocial status of sufferers and resulted in an overall reduction in quality of life (Iacovides, Avidon and Baker 2015: 770). Studies have not reported the impact of isolated symptoms, but rather have considered the entire pain experience in PD sufferers.

The following section will therefore review literature pertaining to the broad context of impact, under which MSK pain will be considered as a component.

2.7.1 Impact on Daily Activities

Impact of dysmenorrhea on daily activities has been well documented in research, although the degree of impact has varied among different study populations. The impact on daily activities, according to the dysmenorrhea grading system, correlates with severity of pain: mild pain exerts minimal impact on daily activities, whereas severe pain carries significant limitations (Nooh 2014: 199). This is consistent with researchers who have revealed significant differences between those who suffer with moderate versus severe menstrual pain in relation to daily activity restriction (Potur, Bilgin and Komurcu 2014: 772).

Various studies have shown a reduction in daily activity in dysmenorrhea sufferers when compared to otherwise healthy participants (Chen, Kwekkeboom and Ward 2016; Lee and Park 2016; Aziato, Dedey and Clegg-Lampsey 2015). Reports of dysmenorrhea

limiting daily activity range between 22% in Ghana (Acheampong *et al.* 2019) to 58% in Ethiopia (Giletew and Bekele 2019).

A qualitative study conducted in Ghana revealed that participants affected by dysmenorrhea attempted to “condition” themselves to perform activities during painful episodes as a coping mechanism, whereas others relied on support from colleagues and roommates to assist with tasks (Aziato, Dedey and Clegg-Lampsey 2015:167). However, the impact of dysmenorrhea on daily activities has not reached a consensus as some researchers report limitations to daily activities as an infrequent finding (Ju, Jones and Mishra 2013; Smith *et al.* 2009).

2.7.2 Impact on Sleep

An intricate relationship exists between pain and sleep, with studies suggesting that sleep disturbance is affected by pain in dysmenorrhea (Iacovides, Avidon and Baker 2015: 771). Lee and Park (2016: 110) found that the sleep score in menstrual pain sufferers was significantly lower than non-sufferers in the premenstrual, bleeding and postmenstrual phases. Chia *et al.* (2013) reported sleep disturbance of 26% in Hong Kong university females, whereas Rakhshae (2014) only found 3.7% of Iranian university females to suffer with insomnia alongside dysmenorrhea, although the latter study reported a high rate of fatigue in participants (18%).

Sleep disturbance may be a consequence of menstrual pain, but menstrual pain may also be modified by sleep disturbance, ultimately heightening pain sensitivity and compounding the negative aspects experienced by both factors (Iacovides, Avidon and Baker 2015: 772).

2.7.3 Impact on Psychological Status, Mood and Affect

A relationship between psychological factors and the severity of dysmenorrhea has been described since the 1970s in literature, with psychological disorders, such as depression and anxiety, coexisting with dysmenorrhea and chronic pain conditions (Gagua *et al.* 2013; Rodrigues *et al.* 2011).

A Georgian study revealed that depression and anxiety was considerably higher in women suffering with dysmenorrhea than healthy counterparts, and further found that smoking acting as a protective mechanism against the development of depressive symptoms (Gagua *et al.* 2013: 352).

Mood is negatively impacted in many women suffering from menstrual pain. Chen, Kwekkeboom and Ward (2016: 269) reported moderate emotional disturbances in participants with self-reported dysmenorrhea. A Korean study revealed lower mood scores in dysmenorrheic women throughout menstruation, although non-sufferers displayed equally low scores on the first day of menstruation (Lee and Park 2016: 110). This is consistent with an earlier South African study which demonstrated significantly poorer moods during menstruation in women with dysmenorrhea when compared to controls and to their own follicular phases (Iacovides *et al.* 2013: 1070).

Converse to many studies, Acheampong *et al.* (2019: 3) found little significance in relation to mood swings in adolescents with dysmenorrhea.

2.7.4 Impact on Socialisation and Relationships

The psychological impact of dysmenorrhea consequently extends into other domains of life, such as individual attitudes, relationships and

social interaction (Gagua *et al.* 2013: 353). Acheampong *et al.* (2019: 4) reported a social withdrawal prevalence of 38.2%. A review by De Sanctis *et al.* (2017: 243) reported that during menstruation, sufferers found socialisation with family and friends difficult, with over half of participants opting for social withdrawal. Similarly, Banikarim, Chacko and Kelder (2000: 1227) reported a significantly greater proportion of adolescents with severe menstrual pain to limit their social interaction.

As previously mentioned, some women reported relying on those around them to assist with tasks, as well as relying on friends for emotional support (Aziato, Dedey and Clegg-Lampsey 2015:167). This dependency could potentially lead to undue strain and impact relationships negatively.

2.7.5 Impact on Academic Performance

The academic consequences of dysmenorrhoea are significant across many studies, with negative impact on concentration, class and peer participation, ability to write tests or exams, overall academic performance and absenteeism (Acheampong *et al.* 2019; De Sanctis *et al.* 2017; Aziato, Dedey and Clegg-Lampsey 2015; Potur, Bilgin and Komurcu 2014; Rakhshae 2014; Banikarim, Chacko and Kelder 2000).

Of these academic factors, studies are uniform with regards to reports of menstrual-related symptoms to be the leading cause for absenteeism in school (Acheampong *et al.* 2019; De Sanctis *et al.* 2017; Banikarim, Chacko and Kelder 2000). The rate of absenteeism has, however, varied in different research settings with reports ranging from 7% to 58% (De Sanctis *et al.* 2017: 243), which has been attributed to cultural context of pain perception (Kamel, Tantawy and Abdelsamea 2017: 1083).

Two studies (Rakhshae 2014; Banikarim, Chacko and Kelder 2000) reported a directly proportional relationship between severity of pain and the impact on academic activities, correlating with the Multi-Dimensional Scoring System reviewed by De Sanctis *et al.* (2017). A South African study which investigated impact found that approximately half of the female participants could not do homework or study during menstrual pain episodes and the absenteeism rate during menstruation was 22% (Oni and Tshitangano 2015: 217).

Academic impact is further complicated where education systems lack the necessary policies to assist students where severe dysmenorrhea has impacted the ability to attend lectures, write exams or complete tasks (Aziato, Dedey and Clegg-Lamprey 2015: 166).

2.7.6 Impact on Quality of Life

The complexities and multifactorial experience of primary dysmenorrhea that have been discussed throughout this chapter all contribute to the negative impact on quality of life (QoL), particularly during menstruation (Iacovides, Avidon and Baker 2015: 771). Primary dysmenorrhea affecting quality of life has been reported in literature as early as 1996, where up to 90% of sufferers experienced reduced QoL (Spears 2005: 76).

A South African study exploring the quality of life in women with PD revealed substantial reduction in QoL in the menstruation phase, when compared to their own pain-free follicular phase, as well as controls, with impairment evident in almost all domains of QoL (Iacovides *et al.* 2014: 214). This study attributed this impact to the predictability of recurrent pain. Chen, Kwekkeboom and Ward (2016: 273) made a provocative argument for their data that the impact of dysmenorrhea on the lives of sufferers may play a more significant

role than pain or symptom severity itself, relative to seeking healthcare.

2.8 CONCLUSION

Comprehensive prevalence studies are lacking regarding the musculoskeletal component in primary dysmenorrhea, but evidence does suggest that MSK pain plays a vital role in the overall experience of menstrual pain. Risk factors have not been well defined in this regard and evidence is conflicting across studies for those factors which have been proposed. Regardless of this, impact on personal, social and academic life is consistent and clear, with menstrual pain and its associated symptoms, including its MSK component, playing a significant part in reducing the overall quality of life in young females. There appears to be a myriad of management interventions available, but evidence for the efficacy for many of these approaches is insufficient and requires further high-quality research.

The review of literature revealed that although MSK pain is a prominent symptom in PD, the association seems to be understudied and requires further investigation.

CHAPTER THREE METHODOLOGY

3.1 INTRODUCTION

This chapter will present the research methods, the data collection process, the research procedure and the data collection tool that was utilised and governed in this study.

3.2 STUDY DESIGN

The study was conducted with a quantitative approach and required a descriptive cross-sectional survey design. A quantitative approach was chosen as the study pertained to inquiry into a human problem with numeric measurement employed to understand variables to determine if generalisation can be made to the greater population (Rahman 2016: 105).

Descriptive studies allow for a description of variables without regarding hypotheses, while the cross-sectional approach was chosen for its appropriateness to measure prevalence and risk factors, as well as assess healthcare needs surrounding this topic (Aggarwal and Ranganathan 2019: 35). Furthermore, this design is economical and ethically sound (Aggarwal and Ranganathan 2019: 35).

3.3 STUDY LOCATION

The campuses of the Durban University of Technology were chosen for this study. The study location was appropriate as it allowed for adequate diversity of the study population in question. The campuses

used for data collection were the Steve Biko campus, Ritson campus, M.L. Sultan campus, City campus and the Midlands campus. Gatekeeper permission to administer surveys around the campus grounds was obtained from the respective Director of Research at DUT (Appendix N).

3.4 STUDY POPULATION

The study population included female students at a university of technology in Durban suffering from PD.

3.5 PARTICIPANT RECRUITMENT

Participants were recruited by means of advertisement (Appendix A), word-of-mouth and direct approach by the researcher. Advertisements were placed around the abovementioned campuses of DUT. Direct approach of participants included a verbal explanation of the study, as well as a written letter of information in both English and isiZulu (Appendix B and D).

3.6 SAMPLING

3.6.1 Sample Size

The population in this study included female participants suffering from PD. The sample size was calculated according to the 2018 DUT Annual Report regarding population statistics which was 15 763 female students (Durban University of Technology 2018: 25). Of this population, a 50% prevalence of PD was assumed leaving a total available population size of 7 882 from which the sample size was

calculated. The sample size governing this study was calculated to be 367, assuming a 50% prevalence of MSK pain and calculated using a 95% confidence interval and a 5% margin for error (Esterhuizen 2020).

The main study received a total of 324 participants which correlated to an overall response rate of 88%.

3.6.2 Sample Strategy

The sampling strategy incorporated in this study was non-probability sampling with convenience sampling being the strategy of choice. Non-probability techniques draw a sample through non-randomised methods, by selecting participants through accessibility (Showkat and Parveen 2017: 6). Convenience sampling was selected to allow for collection of quantitative data through convenient access to the student population (Elfil and Negida 2017: 52).

This method was well suited for this study as it allowed for research to proceed through availability and accessibility to the female student population in a rapid and inexpensive way, provided that inclusion criteria was met by the participants (Elfil and Negida 2017: 52).

3.6.2.1 Inclusion Criteria

- Females with grade 1 to 3 PD.
- Females between the ages of 18 and 30. Research reports that the population most affected are females under the age of 30 (Ju, Jones and Mishra 2013: 107), thereby providing the maximum age inclusion for this study.
- Females who were currently registered students at the Durban University of Technology.
- Participants who signed the informed consent.

3.6.2.2 Exclusion Criteria

- Females with a known diagnosis of secondary dysmenorrhea, which may include, but not limited to endometriosis, adenomyosis, uterine fibroids, pelvic inflammatory disease and congenital uterine or vaginal conditions.
- Pregnant females. Borg-Stein and Dugan (2007: 459) reported that virtually all women suffer from MSK pain throughout pregnancy, which could have a negative impact on data gathered, and thus not provide a true reflection of the MSK pain experienced in the PD population.
- Participants who wished to rescind their participation in the study were automatically excluded and any data gathered from such participant were excluded from the final results.
- Participants who were part of the focus group or pilot study.

3.7 DATA COLLECTION TOOL

The survey (Appendix L) was adapted from several sources. Questions relating to demographics, menstrual history and MSK pain were adapted from a study by Yacubovich *et al.* (2019). Questions pertaining to risk factors were adapted from studies by Yacubovich *et al.* (2019) and Paananen *et al.* (2010). Questions regarding MSK pain were obtained via adaption of the Nordic Musculoskeletal Questionnaire, developed by Kuorinka *et al.* (1987), which has been said to be the world's most widely utilized indirect evaluation for MSK symptoms with demonstrated reliability and validity (López-Aragón *et al.* 2017: 28). Questions relating to impact of personal life, social life, academic life and management were adapted from the study by Acheampong *et al.* (2019).

Surveys were obtained from the authors via email correspondence and permission to utilise and adapt research was obtained (Appendix M).

Table 3.1 depicts the reference list for the survey.

Table 3.1: Survey Reference List

Question	Section	Reference
Demographics (age, race, faculty, BMI)	Section A	Yacubovich <i>et al.</i> (2019)
Menstrual history	Section A	Yacubovich <i>et al.</i> (2019)
Risk factors	Section B	Yacubovich <i>et al.</i> (2019) and Paananen <i>et al.</i> (2010)
Musculoskeletal pain	Section C	Yacubovich <i>et al.</i> (2019) and Kuorinka <i>et al.</i> (1987)
Impact on personal life	Section D	Acheampong <i>et al.</i> (2019)
Impact on social life	Section D	Acheampong <i>et al.</i> (2019)
Impact on academics	Section D	Acheampong <i>et al.</i> (2019)
Management	Section E	Acheampong <i>et al.</i> (2019)

3.8 STUDY PROCEDURE

The study procedure involved various stages which will be highlighted. The study received ethical clearance from the DUT Institutional Research and Ethical Committee with ethical clearance number 022/21 (Appendix O).

3.8.1 Focus Group Procedure

A focus is a method to engage a small number of people in a discussion surrounding a particular topic, where the researcher moderates the conversation and group members participate in

providing insights and opinions (Wilkinson 2021: 88) to ensure internal validity of the data collection tool (Nyumba *et al.* 2018).

A focus group was selected and the procedure was conducted as follows:

- A date and time were determined for the focus group meeting. This occurred on 29th March 2021.
- An appropriate venue was secured.
- Focus group participants included the student researcher, researcher supervisor, two chiropractic staff members or clinicians and two participants who met the inclusion criteria for the study with diversity to adequately represent the population of university students.
- Participants were required to read a letter of information (Appendix F) and sign a letter of informed consent (Appendix G), as well as a confidentiality agreement (Appendix H).
- The focus group commenced with discussion of the survey (Appendix L).
- The researcher read questions to the group with discussion of the relevance of the question to the aims and objectives of the study.
- The response of the focus group to each question could be in agreement, disagreement or undecided on whether the question should be included in the questionnaire. Where there was indecision, a vote by majority decided on the fate of the inclusion of the question.
- The researcher also obtained verbal permission from the focus group to record the discussion on a tape in addition to written notes obtained during the meeting.

- The focus group concluded its discussion once all questions had been addressed. The participants were thanked for their participation and the meeting was adjourned.
- Alterations were made from the recording and notes drafted during the meeting to develop the post-focus group survey.

3.8.1.1 Focus Group Inclusion Criteria

- Participants were required to be over the age of 18.
- Participants were required to sign an informed letter of consent (Appendix G), as well as a confidentiality agreement (Appendix H), before participation.

3.8.1.2 Focus Group Exclusion Criteria

- Participants who no longer wished to be involved in the focus group.
- Potential participants for the pilot study and main study were excluded.

3.8.2 Pilot Study Procedure

The pilot study aimed to evaluate the feasibility of the study in relation to recruitment, procedures and overall approach intended to be applied to the study on a larger scale (Leon, Davis and Kraemer 2011: 262).

The pilot study was conducted as follows:

- Permission was obtained from the Gatekeepers at DUT for access to the female student body (Appendix N).
- The two participants who met the inclusion criteria of the main study were selected. These participants were similar to the main study but were not be limited to the age range of 18 to 30 years to avoid diminishing the study population unnecessarily.

However, participants were required to be within the reproductive age.

- The participants were approached under the procedure for the main study. This was to identify logistical problems and feasibility with the outlined procedure (Leon, Davis and Kraemer 2011: 626).
- The participants were required read the letter of information (Appendix I) and to sign informed consent (Appendix J) before participation in the study was granted.
- The participants were then asked to complete the post-focus group survey and fill out the pilot study feedback form (Appendix K).
- Feedback received in the pilot study were incorporated into the post-focus group survey. This resulted in production of the final survey for the main study (Appendix L).

3.8.2.1 Pilot Study Inclusion Criteria

- Participants were required to be over the age of 18.
- Participants were required to be of reproductive age.
- Participants were required to be sufferers of grade 1 to 3 PD.
- Participants were required to sign an informed letter of consent before participation.

3.8.2.2 Pilot Study Exclusion Criteria:

- Participants who no longer wished to be involved in the pilot study.
- Participants involved in the focus group.
- Participants who did not comply with the guidelines for social interaction under the COVID-19 pandemic as mandated by the South African government.

3.8.3 Main Study Procedure

The main study was conducted as follows:

- Permission was sought from the relevant Gatekeepers at the university for access to the female student body (Appendix N).
- Once this permission was granted (Appendix N), the researcher travelled to the campuses mentioned in the study location to advertise and begin administering surveys.
- Female students were individually approached by the researcher and research assistant and assessed for exclusion criteria and provided with the letter of information (Appendix B and D).
- If no criteria for exclusion was identified and the student wished to participate in the study, they were required to sign an informed letter of consent (Appendix C and E).
- The use of a research assistant was attained to assist with isiZulu participants. Additionally, isiZulu translation of the survey was provided to participants who experienced difficulty with English.
- If a participant did not understand a question, the researcher or research assistant provided the necessary clarification.
- Completed informed letters of consent were stored in “Ballot Box A”. This was to ensure document safety and maintain confidentiality and anonymity of all participants.
- Completed surveys were stored in “Ballot Box B”. This was to ensure document safety and maintain confidentiality and anonymity of the participants’ responses.
- A tracking sheet was attached to each box which kept track of the progress of the survey administration. The ballot boxes remained sealed until all data have been collected.

- The ballot boxes were then unsealed and the documents were kept safe in storage at the DUT Chiropractic Clinic during the process of data capture, recording, analysis and reporting. All data were coded for the purpose of data capturing, and ensuring anonymity of all participants.

3.9 COVID-19 SAFETY PROTOCOL

Given the safety concerns of interaction with research participants during the data collection process of this study under the COVID-19 pandemic, strict adherence to the COVID-19 guidelines under the Disaster Management Act, mandated by the South African government, was of vital importance. The following safety protocol was implemented to ensure the safety of the researcher, research assistant and participants:

- Social distancing among the researcher, research assistant and the participants was maintained with a minimum distance of 1.5 metres between all individuals.
- The researcher and research assistant wore appropriate PPE attire. This included a surgical face mask, surgical gloves and a clinic coat which were worn for the duration of the interaction with participants during the data collection process.
- The participants were required to wear a face mask for the duration of the survey. If they did not comply with wearing a mask, their participation was revoked.
- The participants were required to have their hands sanitized both before and after the questionnaire administration.
- The researcher kept sanitizer which was used regularly to clean the clipboards between each use.

- Participants were requested to use their own pen to fill out the questionnaire. If the participant did not have a pen to use, a pen was provided that was sanitized prior to use, after which the participant was allowed to keep the pen to minimise the interaction among the researcher, research assistant and other participants thereafter.
- Completed surveys were placed into a sealed ballot box by each participant. The box allowed for the participants to “drop” the document in to prevent contact with the box. Thereafter the ballot box underwent a quarantine with sun exposure for the duration of 24 to 48 hours before being attended to by the researcher.

3.10 DATA ANALYSIS

Data from the surveys were captured and coded in an Excel spreadsheet. The coded data were then imported into IBM SPSS version 27 and used to analyse the data. Descriptive analysis entailed frequency counts and percentages for categorical variables. Fisher’s exact 2-sided tests were used to compare risk factors between those reporting current MSK pain and those reporting no pain. A p value <0.05 was considered as statistically significant. Odds ratios and 95% confidence intervals were reported. Logistic regression was not performed as only a few risk factors were found to be significant (Esterhuizen 2022).

3.11 ETHICAL CONSIDERATIONS

This study was governed by the four ethical pillars of human research: autonomy, beneficence, nonmaleficence and justice (Artal and Rubinfeld 2017: 108).

3.11.1 Autonomy

Autonomy is a prerequisite to research whereby the participant can provide voluntary consent free of force, duress or coercion with sufficient knowledge and understanding of duration, purpose, risks and health effects of the study (Kirchhoffer and Richards 2019: 3). This study respected autonomy by ensuring participation was on a purely voluntary basis. All participants were provided with a letter containing information (Appendix B and D) about the study, as well as having any further questions regarding the study answered by the researcher and research assistant at any point in the research procedure. Once participants fully understood the purpose, benefits, risks and procedure, autonomy was once again respected with the participants being required to sign a letter of informed consent (Appendix C and E), acknowledging their understanding before partaking in the survey. Participants were also given the option to drop out of the study at any point without duress.

3.11.2 Beneficence

Beneficence represents the positive contribution that research should make to benefit the study population (Artal and Rubinfeld 2017: 109). This study aimed to provide valuable information with regards to prevalence and influence of the association between PD and MSK pain, provide a baseline for current management sought out by sufferers, and explore the role of complementary and alternative therapy as a management option.

3.11.3 Non-Maleficence

Non-maleficence aims to reduce or eradicate harm to study participants (Artal and Rubenfeld 2017: 108). The study was first approved by the Ethics Committee of DUT and the respective gatekeepers (Appendix N) before survey administration around campus began. As the data were collected via survey distribution, minimal harm to participants was anticipated. As data were collected during the COVID-19 pandemic, careful consideration was made with regards to researcher and participant safety and strict adherence to the COVID-19 safety protocol as explained in 3.9, was upheld for safe social interactions.

Confidentiality was also maintained to protect participants. This was achieved by ensuring no personal details were required on the survey itself and informed consent forms with identification details were kept separate to ensure anonymity. Confidentiality was also maintained by storing all raw data in the chiropractic department and all electronic transcribed data being stored on password protected devices.

Raw data will be shredded and electronic data will be deleted after five years.

3.11.4 Justice

Justice ensures that studies display equality with regards to participant recruitment, benefit and harm to prevent social inequality (Artal and Rubenfeld 2017: 110). This study upheld the ethical principle of justice as participants were chosen at random with no bias shown toward race, religion and socioeconomic status.

An isiZulu translation of the letter of information (Appendix D) and informed consent (Appendix E) and an isiZulu speaking research

assistant were provided to the participants who did not speak or understand English.

3.12 CONCLUSION

This chapter has covered the study design, population details, study procedures, data collection tool, COVID-19 protocols as well as the ethical considerations maintained throughout the study.

The following chapter will discuss results obtained during the data collection of the main study.

CHAPTER FOUR RESULTS

4.1 INTRODUCTION

This chapter will provide description of the results obtained after data collection and statistical analysis. The results will be explained and depicted in tables and figures.

4.2 SAMPLE SIZE AND RESPONSE RATE

A total of 300 responses were received from the survey (Figure 4.1).

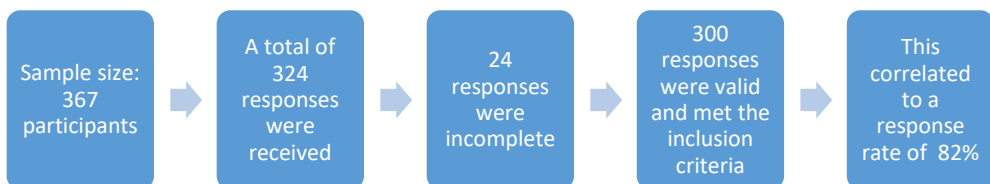


Figure 4.1: Sample Size and Response Rate

4.3 DEMOGRAPHIC CHARACTERISTICS

Demographic characteristics included age and race of participants, as well as their faculty of study.

4.3.1 Age

By age group, almost equal proportions of respondents were in the 18 to 20 year age group and the 21 to 23 year age group, with 43.1% and 45.2% respectively.

Participants in the 24 to 26 year age group made up 7.1% of participants and the remaining 4.1% fell into the 27 to 30 group year age (Table 4.1).

4.3.2 Race

By race, the majority of the participants were Black, accounting for 75% of the participants. The second largest race profile was accounted for by Indian participants, making up 13.1% of this study. The remaining participants were White and Coloured, accounting for 8.1% and 4% respectively (Table 4.2).

4.3.3 Faculty of Study

The majority of participants in this study were from the Health Science Faculty, accounting for 48% of participants. The second largest cohort was from Accounting and Informatics with 23.8%. Management Sciences students accounted for 17.7% of participants. The smallest student cohorts were noted from Art and Design and Engineering and the Built Environment Faculties, each accounting for 2.4% of participants (Table 4.3).

Table 4.1: Participant Age

Age Group		Frequency	Valid Percent
Valid	18 – 20	128	43.5
	21 – 23	133	45.2
	24 – 26	21	7.1
	27 – 30	12	4.1
	Total	294	100.0
Missing	System	6	
Total		300	

Table 4.2: Participant Race

	Race	Frequency	Valid Percent
Valid	Black	222	74.7
	Coloured	12	4.0
	Indian	39	13.1
	White	24	8.1
	Total	297	100.0
Missing	System	3	
Total		300	

Table 4.3: Participant Faculty of Study

	Faculty of Study	Frequency	Valid Percent
Valid	Accounting and Informatics	70	23.8
	Applied Sciences	16	5.4
	Art and Design	7	2.4
	Engineering and Built Environment	7	2.4
	Health Sciences	142	48.3
	Management Sciences	52	17.7
	Total	294	100.0
Missing	System	6	
Total		300	

4.4 PREVALENCE

Point and period prevalence were determined in this study.

4.4.1 Point Prevalence

The prevalence of musculoskeletal pain at the most recent period was 66.3%. Included in the sample were the 45 students who reported no lifetime prevalence of MSK pain, as well as those who reported no

current pain or were unsure and left the question out. Of the total 300 participants, 199 reported current pain (Table 4.4).

4.4.2 Period Prevalence

The prevalence of musculoskeletal pain experienced with period pain in the last 12 months was 78%. Included in the sample were the 45 students with no lifetime prevalence of MSK pain, as well as those who reported no history of pain in the past 12 months or were unsure or left the question out. Of the 300 participants, 234 reported pain in the last 12 months (Table 4.5).

Table 4.4: Point Prevalence of Musculoskeletal Pain

Musculoskeletal Pain at Most Recent Period		Frequency	Percent
Valid	No	29	9.7
	Yes	199	66.3
	Unsure	25	8.3
	Total	253	84.3
Missing	System	47	15.7
Total		300	100.0

Table 4.5: Period Prevalence of Musculoskeletal Pain

Musculoskeletal Pain at Period in the Last 12 Months		Frequency	Percent
Valid	No	3	1.0
	Yes	234	78.0
	Unsure	16	5.3
	Total	253	84.3
Missing	System	47	15.7
Total		300	100.0

4.5 CLINICAL PRESENTATION OF MUSCULOSKELETAL PAIN

The following details regarding MSK pain were given by those participants who reported pain. Those participants who were unsure if they had or had not experienced pain were included. This amounted to a total of 254 eligible participants.

4.5.1 Severity of Musculoskeletal Pain

Overall, the severity of MSK pain among the participants was rated mostly as moderate, with a total of 48% of the participants reporting this. Another 26% of participants felt their pain was mild in nature, whereas 19.5% felt their pain was severe. Fewer responses were received for the extreme ends of pain, with 4.5% of participants experiencing very mild pain and 2.4% experiencing very severe pain (Table 4.6).

Table 4.6: Severity of Musculoskeletal Pain

Severity of Musculoskeletal Pain		Frequency	Valid Percent
Valid	Very mild	11	4.5
	Mild	64	26.0
	Moderate	117	47.6
	Severe	48	19.5
	Very severe	6	2.4
	Total	246	100.0

4.5.2 Length and Intensity Changes of Musculoskeletal Pain

The majority of the participants experienced pain for only 1 to 2 days, accounting for 68% of the responses. A further 26.2% of the participants reported their pain to last between 3 to 5 days. Only 0.8%

of participants reported their pain to last between 6 to 8 days. Musculoskeletal pain lasting for the entire menstrual period was reported by 5.2% of participants (Table 7).

Table 4.7: Length and Intensity Changes of Musculoskeletal Pain

Length and Intensity Changes of Musculoskeletal Pain		Count	Column N %
Musculoskeletal Pain Length (Days)	1-2	168	67.7%
	3-5	65	26.2%
	6-8	2	0.8%
	Throughout period	13	5.2%
	Total	248	100.0%
Musculoskeletal Pain Changes Preceding Period	Improves	68	27.1%
	Worsens	100	39.8%
	Unchanged	55	21.9%
	Unsure	28	11.2%
	Total	251	100.0%
Musculoskeletal Pain Changes During Period	Improves	52	21.3%
	Worsens	118	48.4%
	Unchanged	66	27.0%
	Unsure	8	3.3%
	Total	244	100.0%

Pain worsening preceding and during menstruation was noted by 39.8% and 48.4% of participants, respectively. A portion of participants reported improvement of their pain preceding and during menstruation, accounting for 27.1% and 21.3% of responses, respectively. A total of 21.9% and 27% of the participants felt their MSK pain intensity to remain unchanged preceding and during their

period, respectively. A small portion of participants felt unsure about changes in pain intensity, with 11% reporting uncertainty preceding and 3% during their menstrual periods (Table 7).

4.5.3 Prevalence and Distribution of General Musculoskeletal Pain by Anatomical Region

Overall, pain was prevalent in every anatomical region of the body in this study (Table 4.8). The worst affected region was the low back, with a prevalence of 88.7%. Other prominent regions of MSK complaints included 33.6% neck pain, 33.2% hips and thigh pain, 30.4% upper back pain and 21.9% shoulder pain. Regions where fewer complaints included the knees, wrists and hands, and the ankles, with pain reports of 12.6%, 10.5% and 8.9% respectively. The elbow region received the fewest complaints with only 2.4% of participants reporting pain (Figure 4.2).

4.5.4 Prevalence of Headache

A high prevalence of headaches was evident in this population, with 57.9% of participants reporting headaches during the menstrual phase. Of these participants, 44.8% reported that their headaches were accompanied by neck pain, while 9.8% of headache respondents were unsure of associated neck pain (Table 4.9).

4.5.5 Prevalence of Myofascial Pain

The prevalence of myofascial pain during menstruation was high, with 76.3% of participants experiencing muscular cramps (Table 4.10). The majority of these muscular cramps occurred in the low back and gluteal region and the pelvic and abdominal regions, accounting for 52% and 50% of pain respectively. To a lesser degree, 14% of the participants complained of cramping in the hips and thighs, 9% in the knees and calves, 7% in the neck, 6% in the midback and 6% in the

shoulder girdle. Few participants reported cramping in regions of the ankles and feet, arms and chest, with only 1% of participant complaints occurring in these regions respectively (Figure 4.3).

Table 4.8: Prevalence of Musculoskeletal Pain by Anatomical Region

Anatomical Region of Musculoskeletal Pain		No	Yes	Total
Neck	Count	164	83	247
	Row N %	66.4%	33.6%	100.0%
Shoulders	Count	193	54	247
	Row N %	78.1%	21.9%	100.0%
Upper Back	Count	172	75	247
	Row N %	69.6%	30.4%	100.0%
Elbows	Count	241	6	247
	Row N %	97.6%	2.4%	100.0%
Wrists and Hands	Count	221	26	247
	Row N %	89.5%	10.5%	100.0%
Low Back	Count	28	219	247
	Row N %	11.3%	88.7%	100.0%
Hips and Thighs	Count	165	82	247
	Row N %	66.8%	33.2%	100.0%
Knees	Count	216	31	247
	Row N %	87.4%	12.6%	100.0%
Ankles and Feet	Count	225	22	247
	Row N %	91.1%	8.9%	100.0%

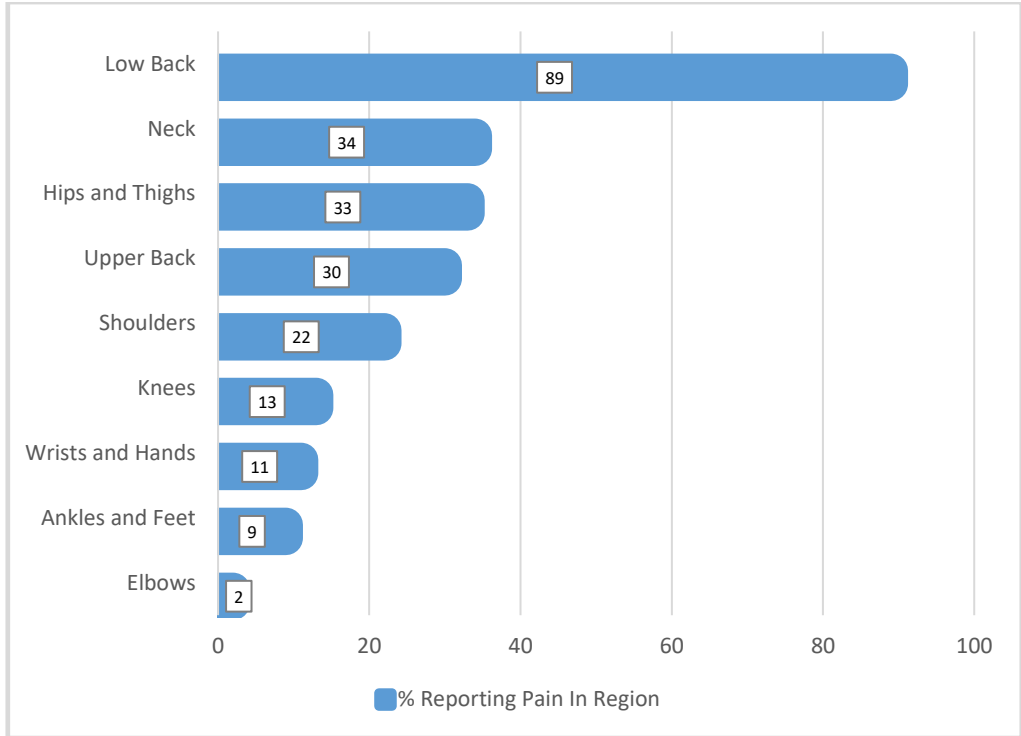


Figure 4.2: Distribution of Musculoskeletal Pain by Anatomical Region

Table 4.9: Prevalence of Headache and Associated Neck Pain

Prevalence of Headache and Associated Neck Pain		No	Yes	Unsure	Total
Headache Prevalence (Perimenstrual)	Count	84	147	23	254
	Row N %	33.1%	57.9%	9.1%	100.0%
Headache Accompanied with Neck Pain	Count	79	78	17	174
	Row N %	45.4%	44.8%	9.8%	100.0%

Table 4.10: Prevalence of Myofascial Pain

Prevalence of Myofascial Pain		No	Yes	Unsure	Total
Prevalence of Muscular Cramps (Perimenstrual)	Count	47	193	13	253
	Row N %	18.6%	76.3%	5.1%	100.0%

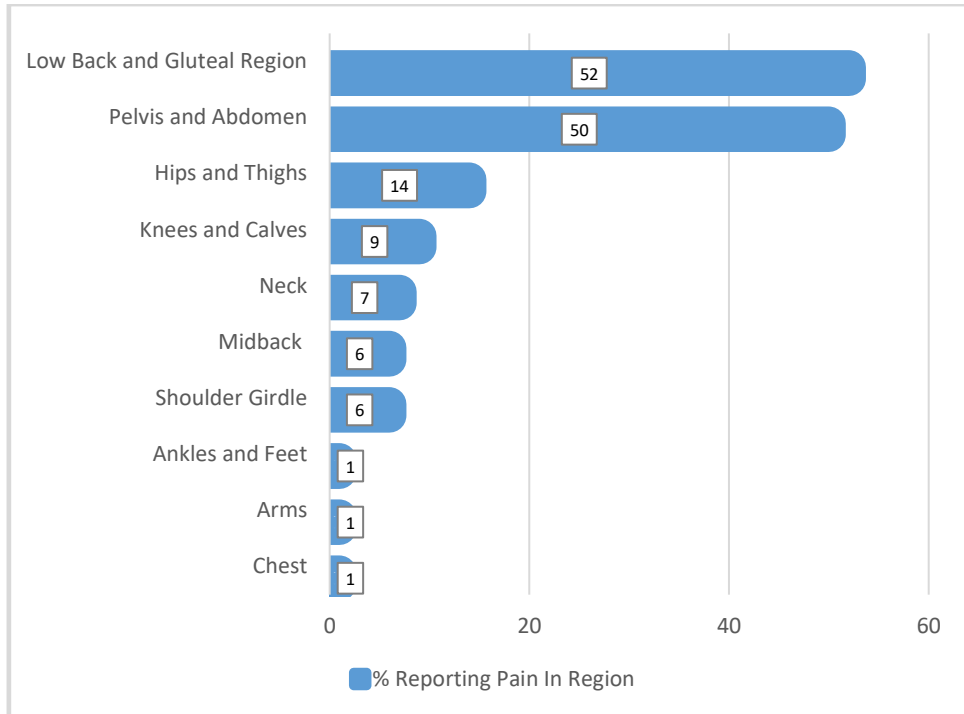


Figure 4.3: Distribution of Myofascial Pain by Anatomical Region

4.6 RISK FACTORS

Since only those with a lifetime prevalence of MSK pain answered the questions about risk factors, the 45 participants without a lifetime prevalence, and those who did not answer the specific risk factor questions, were excluded from risk factor analysis. Those who reported that they were unsure whether they had musculoskeletal pain were combined with those reporting no pain.

4.6.1 General Risk Factors

Current smoking history was noted in 10.6% of participants with a further 3.5% of participants reporting a prior history of smoking. No significant associations were found between smoking history and MSK pain (Table 4.11a).

Activity levels varied among participants, with 30.5% reporting a low level and 42.1% reporting a moderate level of physical activity. About 21% of participants reported little to no physical activity, whereas only 6.6% of participants reported their activity levels to be high (Table 4.11a).

With regards to time spent sitting, the majority of participants spent between 3 to 6 hours or more than 6 hours, accounting for 49% and 38.1% of responses, respectively. Less than 3 hours of sitting a day was reported by 12.9% participants. No significant associations were determined between activity levels or time spent sitting with regards to MSK pain (Table 4.11a).

The mode of transportation utilised by participants showed significant association with MSK pain ($p=0.008$). The majority of the participants were found to travel by car or public transport, accounting for 32.3% and 54.5% of participants, respectively, whereas only 13.1% of participants walked. Those who travelled by car or public transport were more likely to experience MSK pain than those who walked. The majority of participants lived in proximity to the university campuses, with 48.7% living within 10 km, and another 41.1% living between 10 km to 30 km. Only 9.6% of participants lived further than 30 km. Distance from the campuses was not determined to be a significant risk factor (Table 4.11a).

The location of primary residence was fairly distributed, with 34.5% of participants residing in a township, 36.5% in a suburban area and 25.4% in an urban city. Only 3.6% of participants did not reveal the location of their primary residence. No significant association was found between location of residence and MSK pain (Table 4.11a).

Table 4.11a: General Risk Factors

General Risk Factors			Musculoskeletal Pain Point Prevalence			p-value
			No	Yes	Total	
Smoking History	No	Count	49	171	220	0.663
		Column N %	90.7%	85.9%	87.0%	
	Yes	Count	4	21	25	
		Column N %	7.4%	10.6%	9.9%	
	Used To	Count	1	7	8	
		Column N %	1.9%	3.5%	3.2%	
Total	Count	54	199	253		
	Column N %	100.0%	100.0%	100.0%		
Level of Physical Activity	Little to None	Count	11	41	52	0.814
		Column N %	21.2%	20.8%	20.9%	
	Low	Count	13	60	73	
		Column N %	25.0%	30.5%	29.3%	
	Moderate	Count	23	83	106	
		Column N %	44.2%	42.1%	42.6%	
	High	Count	5	13	18	
		Column N %	9.6%	6.6%	7.2%	
Total	Count	52	197	249		
	Column N %	100.0%	100.0%	100.0%		
Time Spent Sitting in a Day (Hours)	< 3	Count	8	25	33	0.439
		Column N %	15.1%	12.9%	13.4%	
	3 – 6	Count	30	95	125	
		Column N %	56.6%	49.0%	50.6%	
	> 6	Count	15	74	89	
		Column N %	28.3%	38.1%	36.0%	
Total	Count	53	194	247		
	Column N %	100.0%	100.0%	100.0%		
Mode of Transportation	Car	Count	12	64	76	0.008
		Column N %	22.6%	32.3%	30.3%	
	Public Transport	Count	25	108	133	
		Column N %	47.2%	54.5%	53.0%	
	Motorbike	Count	1	0	1	
		Column N %	1.9%	0.0%	0.4%	
	Walk	Count	15	26	41	
Column N %		28.3%	13.1%	16.3%		
Total	Count	53	198	251		
	Column N %	100.0%	100.0%	100.0%		
Location of Primary Residence	Township	Count	16	68	84	0.814
		Column N %	30.2%	34.5%	33.6%	
	Suburb	Count	18	72	90	
		Column N %	34.0%	36.5%	36.0%	
	City	Count	17	50	67	
		Column N %	32.1%	25.4%	26.8%	
	Rather Not Say	Count	2	7	9	
Column N %	3.8%	3.6%	3.6%			
Total	Count	53	197	250		
	Column N %	100.0%	100.0%	100.0%		
Distance From Campus (Km)	1 – 10	Count	32	96	128	0.428
		Column N %	59.3%	48.7%	51.0%	
	10 – 30	Count	18	81	99	
		Column N %	33.3%	41.1%	39.4%	
	> 30	Count	4	19	23	
		Column N %	7.4%	9.6%	9.2%	
Total	Count	54	196	250		
	Column N %	100.0%	100.0%	100.0%		

A small portion of students reported to be using oral contraceptives at the time, accounting for 20.9% of participants. Among those using oral contraceptives, respondents who utilised it for contraception purposes were more likely to have MSK pain during their periods ($p=0.015$). With regards to influence of the use of oral contraceptives on MSK pain, 21.4% felt an increase in pain, 50% reported a decrease in pain and 28.6% were unsure of any influence on pain severity. No significant association was determined for oral contraceptive influence on MSK pain severity (Table 4.11b).

Table 4.11b: Oral Contraceptive Risk Factors

Oral Contraceptive Risk Factors			Musculoskeletal Pain Point Prevalence			p-value
			No	Yes	Total	
Use of Oral Contraceptive	No	Count	40	155	195	0.460
		Column N %	74.1%	79.1%	78.0%	
	Yes	Count	14	41	55	
		Column N %	25.9%	20.9%	22.0%	
	Used To	Count	0	0	0	
		Column N %	0.0%	0.0%	0.0%	
Total	Count	54	196	250		
	Column N %	100.0%	100.0%	100.0%		
Reason For Use of Oral Contraceptive (Subgroup)	Contraception	Count	3	21	24	0.015
		Column N %	20.0%	51.2%	42.9%	
	Acne Control	Count	5	15	20	
		Column N %	33.3%	36.6%	35.7%	
	Period Regulation	Count	6	5	11	
		Column N %	40.0%	12.2%	19.6%	
Other	Count	1	0	1		
	Column N %	6.7%	0.0%	1.8%		
Total	Count	15	41	56		
	Column N %	100.0%	100.0%	100.0%		
Influence of Oral Contraceptive on Musculoskeletal Pain (Subgroup)	Increase	Count	0	9	9	0.118
		Column N %	0.0%	21.4%	15.8%	
	Decrease	Count	8	21	29	
		Column N %	53.3%	50.0%	50.9%	
	Unsure	Count	7	12	19	
		Column N %	46.7%	28.6%	33.3%	
Total	Count	15	42	57		
	Column N %	100.0%	100.0%	100.0%		

A further 29.1% of participants reported a history of serious injury although no association was determined with MSK pain (Table 4.11 c).

The majority of students had access to healthcare, with 89.9% of participants reporting some form of access to healthcare when they needed it. Healthcare access options varied among students, with 62.4% reporting access to clinics, 16.9% utilising public hospitals and 43.5% having access to private healthcare. About 10% of participants reported having no access to healthcare when it was required. No significant associations were determined for healthcare access nor for the type of healthcare received (Table 4.11c).

Risk assessment for demographic factors, such as age, race and faculty of study, revealed no significance for risk for MSK pain.

Table 4.11c: Healthcare Risk Factors

Healthcare Risk Factors			Musculoskeletal Pain Point Prevalence			p-value
			No	Yes	Total	
History of Serious Injury	No	Count	41	139	180	0.392
		Column N %	77.4%	70.9%	72.3%	
	Yes	Count	12	57	69	
		Column N %	22.6%	29.1%	27.7%	
	Total	Count	53	196	249	
		Column N %	100.0%	100.0%	100.0%	
Access To Healthcare	No	Count	3	20	23	0.427
		Column N %	5.6%	10.1%	9.1%	
	Yes	Count	51	178	229	
		Column N %	94.4%	89.9%	90.9%	
	Total	Count	54	198	252	
		Column N %	100.0%	100.0%	100.0%	
Healthcare Type: Clinic	No	Count	16	67	83	0.509
		Column N %	31.4%	37.6%	36.2%	
	Yes	Count	35	111	146	
		Column N %	68.6%	62.4%	63.8%	
	Total	Count	51	178	229	
		Column N %	100.0%	100.0%	100.0%	
Healthcare Type: Public Hospital	No	Count	43	147	190	1.000
		Column N %	84.3%	83.1%	83.3%	
	Yes	Count	8	30	38	
		Column N %	15.7%	16.9%	16.7%	
	Total	Count	51	177	228	
		Column N %	100.0%	100.0%	100.0%	
Healthcare Type: Private Healthcare	No	Count	29	100	129	1.000
		Column N %	56.9%	56.5%	56.6%	
	Yes	Count	22	77	99	
		Column N %	43.1%	43.5%	43.4%	
	Total	Count	51	177	228	
		Column N %	100.0%	100.0%	100.0%	

4.6.2 Menstrual History Risk Factors

The age of menarche was early in adolescence for the majority of participants, with 34.5% reporting onset between the ages of 10 to 12, and 46.2% reporting the onset between 12 to 14. Fewer participants experienced menarche later in adolescence, with 15.2% reporting onset between the ages of 15 and 16. A small portion of participants

reported an earlier or later onset, with 0.5% reporting onset before 10 years and 3.6% reporting onset after 16 years.

Periods were said to be regular for 64.6% and irregular for 31.3%. The average menstruation length was reported to be 3 to 5 days for 62.2% of participants, followed by 6 to 7 days for 29.1% of participants. Few participants experienced very short or prolonged periods, with only 1.5% reporting menstruation to last less than 2 days and 3.1% reporting their periods to exceed 10 days.

Heaviness of menstrual flow varied among participants: The most common findings were either moderate or moderate to heavy flows, with reports ranging from 32.5% to 39.6%, respectively. To a lesser degree, 2.5% reported very light flow, 14.7% reported light to moderate flow and 10.7% reported very heavy flow. The duration of dysmenorrhea among participants, on average, ranged between two to four days: 36.7% reported two days of pain, 29.6% reported three days of pain and 21.9% reported pain to last up to four days. Only 11.7% reported pain to last less than on day.

The severity of dysmenorrhea was rated as mostly “severe” by 40.6% of participants followed by “moderate” in 28.4% of participants. Pain rated as very mild, mild or very severe was reported to a lesser degree by 4.6%, 16.8% and 9.6% of participants, respectively (Table 4.12).

Of the menstrual clinical factors, significant association with MSK pain was determined for heaviness of menstrual flow ($p=0.023$) where those who reported moderate to heavy periods were most at risk for the development of MSK pain (Table 4.12).

Table 4.12: Menstrual History Risk Factors

Menstrual History Risk Factors			Musculoskeletal Pain Point Prevalence			p-value
			No	Yes	Total	
Onset of Menarche (Age)	Under 10 Years	Count	1	1	2	0.828
		Column N %	1.9%	0.5%	0.8%	
	10 to 12 Years	Count	17	68	85	
		Column N %	31.5%	34.5%	33.9%	
	13 to 14 Years	Count	26	91	117	
		Column N %	48.1%	46.2%	46.6%	
15 to 16 Years	Count	7	30	37		
	Column N %	13.0%	15.2%	14.7%		
Over 16 Years	Count	3	7	10		
	Column N %	5.6%	3.6%	4.0%		
Regularity of Periods	Regular	Count	31	128	159	0.271
		Column N %	58.5%	64.6%	63.3%	
	Irregular	Count	17	62	79	
		Column N %	32.1%	31.3%	31.5%	
	Unsure	Count	5	8	13	
		Column N %	9.4%	4.0%	5.2%	
Length of bleeding (Days)	1 to 2 Days	Count	1	3	4	0.739
		Column N %	1.9%	1.5%	1.6%	
	3 to 5 Days	Count	35	122	157	
		Column N %	66.0%	62.2%	63.1%	
	6 to 7 Days	Count	14	57	71	
		Column N %	26.4%	29.1%	28.5%	
8 to 9 Days	Count	3	8	11		
	Column N %	5.7%	4.1%	4.4%		
10 or More	Count	0	6	6		
	Column N %	0.0%	3.1%	2.4%		
Heaviness of Period	Very Light	Count	1	5	6	0.023
		Column N %	1.9%	2.5%	2.4%	
	Light to Moderate	Count	10	29	39	
		Column N %	18.5%	14.7%	15.5%	
	Moderate	Count	28	64	92	
		Column N %	51.9%	32.5%	36.7%	
Moderate to Heavy	Count	9	78	87		
	Column N %	16.7%	39.6%	34.7%		
Very Heavy	Count	6	21	27		
	Column N %	11.1%	10.7%	10.8%		
Length of Period Pain (Days)	1 Day	Count	10	23	33	0.170
		Column N %	18.5%	11.7%	13.2%	
	2 Days	Count	25	72	97	
		Column N %	46.3%	36.7%	38.8%	
	3 Days	Count	14	58	72	
		Column N %	25.9%	29.6%	28.8%	
Exceeding 4 Days	Count	5	43	48		
	Column N %	9.3%	21.9%	19.2%		
Severity of Period Pain	Very Mild	Count	5	9	14	0.161
		Column N %	9.3%	4.6%	5.6%	
	Mild	Count	4	33	37	
		Column N %	7.4%	16.8%	14.7%	
	Moderate	Count	21	56	77	
		Column N %	38.9%	28.4%	30.7%	
Severe	Count	21	80	101		
	Column N %	38.9%	40.6%	40.2%		
Very Severe	Count	3	19	22		
	Column N %	5.6%	9.6%	8.8%		

4.7 MANAGEMENT FOR MUSCULOSKELETAL PAIN

4.7.1 General Management Approaches

Management approaches varied among participants for their MSK pain. A fairly equal distribution was seen with 38.8% of participants mostly ignoring their pain, 38.4% sometimes ignoring their pain and 22.7% who did not ignore their pain. The most frequently used strategy for pain management was self-medication, where around 77.5% of participants reported to self-medicate when experiencing MSK pain. Around 59% of participants also utilised home remedies. Fewer students engaged in physical activity as a strategy, with only 19.8% of participants reporting pain relief through exercise (Table 4.13).

Table 4.13: General Management Approaches for Musculoskeletal Pain

General Management Approaches		No	Yes	Sometimes	Total
Ignore Musculoskeletal Pain	Count	58	99	98	255
	Row N %	22.7%	38.8%	38.4%	100.0%
Practice Self-medication	Count	53	196	4	253
	Row N %	20.9%	77.5%	1.6%	100.0%
Engage in Exercise	Count	152	50	51	253
	Row N %	60.1%	19.8%	20.2%	100.0%
Practice Home Remedies	Count	102	147	0	249
	Row N %	41.0%	59.0%	0.0%	100.0%

4.7.2 Type and Distribution of Home Remedies

Of the participants who reportedly used home remedies, 126 specified the types of remedies utilised. Heat application was the most popular remedy, with 65.1% of participants reporting its use. Following heat application, rest was another commonly used remedy for 22.2% of participants. Remedies used to a lesser degree included the

consumption of herbs or herbal remedies by 8.7%, ice application by 7.9%, topical muscle lotions or rubs by 5.6%, stretching by 4.8% and self-massage by 4.8% of participants. The consumption of various substances included teas by 3.2%, vinegar by 3.2%, black coffee by 1.6% and cold water by 0.8% of participants. Infrequently reported remedies included steaming used by 2.4%, chiropractic pain management techniques by 1.6%, essential oils or aromatherapy by 0.8%, TENS application by 0.8% and engaging in household chores by 0.8% of participants (Table 4.14).

Table 4.14: Type of Home Remedies

Type of Home Remedies		No	Yes	Total
Consume Black Coffee	Count	124	2	126
	Row N %	98.4%	1.6%	100.0%
Heat Application	Count	44	82	126
	Row N %	34.9%	65.1%	100.0%
Ice Application	Count	116	10	126
	Row N %	92.1%	7.9%	100.0%
Stretching	Count	120	6	126
	Row N %	95.2%	4.8%	100.0%
Rest	Count	98	28	126
	Row N %	77.8%	22.2%	100.0%
Consume Warm Water	Count	113	13	126
	Row N %	89.7%	10.3%	100.0%
Consume Cold Water	Count	125	1	126
	Row N %	99.2%	0.8%	100.0%
Consume Herbs	Count	115	11	126
	Row N %	91.3%	8.7%	100.0%
Steaming	Count	123	3	126
	Row N %	97.6%	2.4%	100.0%
Engage In Household Chores	Count	125	1	126
	Row N %	99.2%	0.8%	100.0%
Chiropractic Pain Management Techniques	Count	124	2	126
	Row N %	98.4%	1.6%	100.0%
Consume Vinegar	Count	122	4	126
	Row N %	96.8%	3.2%	100.0%
Consume Tea	Count	122	4	126
	Row N %	96.8%	3.2%	100.0%
TENS Application	Count	125	1	126
	Row N %	99.2%	0.8%	100.0%
Self-Massage	Count	120	6	126
	Row N %	95.2%	4.8%	100.0%
Essential Oils or Aromatherapy	Count	125	1	126
	Row N %	99.2%	0.8%	100.0%
Topical Muscle Lotions or rubs	Count	119	7	126
	Row N %	94.4%	5.6%	100.0%

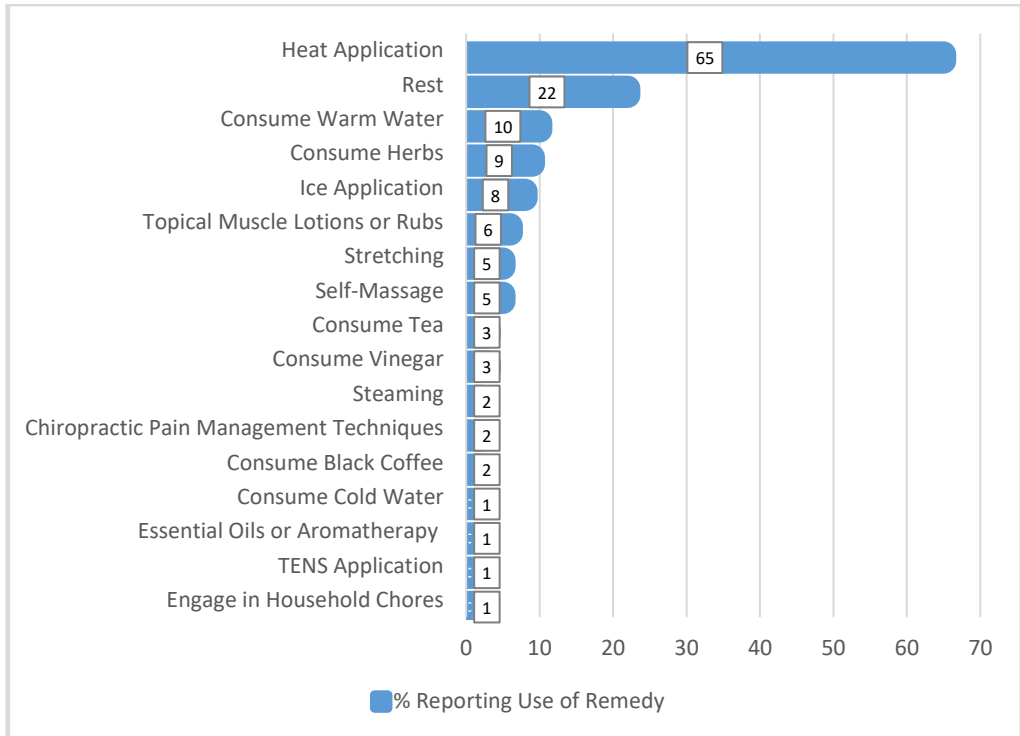


Figure 4.4: Distribution of Home Remedies

4.7.3 Type and Distribution of Professional Healthcare Sought

Participants consulted a range of healthcare providers for management of their MSK pain. Approximately 80% of participants reported seeing a healthcare provider for their pain. Of those who sought healthcare for MSK pain, clinics were the most popular option with 50.2% of participants seeking care from a clinic. Following this, 25.3% of participants opted for care from general practitioners. Only 0.4% of participants consulted a pharmacist for advice on MSK pain. Among manual therapy professions, 10% of participants consulted a chiropractor, whereas only 2% received healthcare from a physiotherapist and 0.4% from an orthopaedist. A few participants consulted other complementary and alternative providers, with 2% seeing a traditional African healer, 1.6% seeing a homoeopath and 0.8% seeing an acupuncturist. About 2% of participants reported to

consult other healthcare providers though they did not specify the type.

Table 4.15: Type of Professional Healthcare Sought

Type of Professional Healthcare		No	Yes	Total
Clinic	Count	126	127	253
	Row N %	49.8%	50.2%	100.0%
General Practitioner	Count	189	64	253
	Row N %	74.7%	25.3%	100.0%
Acupuncturist	Count	251	2	253
	Row N %	99.2%	0.8%	100.0%
Chiropractor	Count	227	26	253
	Row N %	89.7%	10.3%	100.0%
Traditional African Healer	Count	248	5	253
	Row N %	98.0%	2.0%	100.0%
Homoeopath	Count	249	4	253
	Row N %	98.4%	1.6%	100.0%
Physiotherapist	Count	248	5	253
	Row N %	98.0%	2.0%	100.0%
Ayurvedic Doctor	Count	253	0	253
	Row N %	100.0%	0.0%	100.0%
Pharmacist	Count	252	1	253
	Row N %	99.6%	0.4%	100.0%
Orthopaedist	Count	252	1	253
	Row N %	99.6%	0.4%	100.0%
Other Healthcare Provider	Count	249	4	253
	Row N %	98.4%	1.6%	100.0%

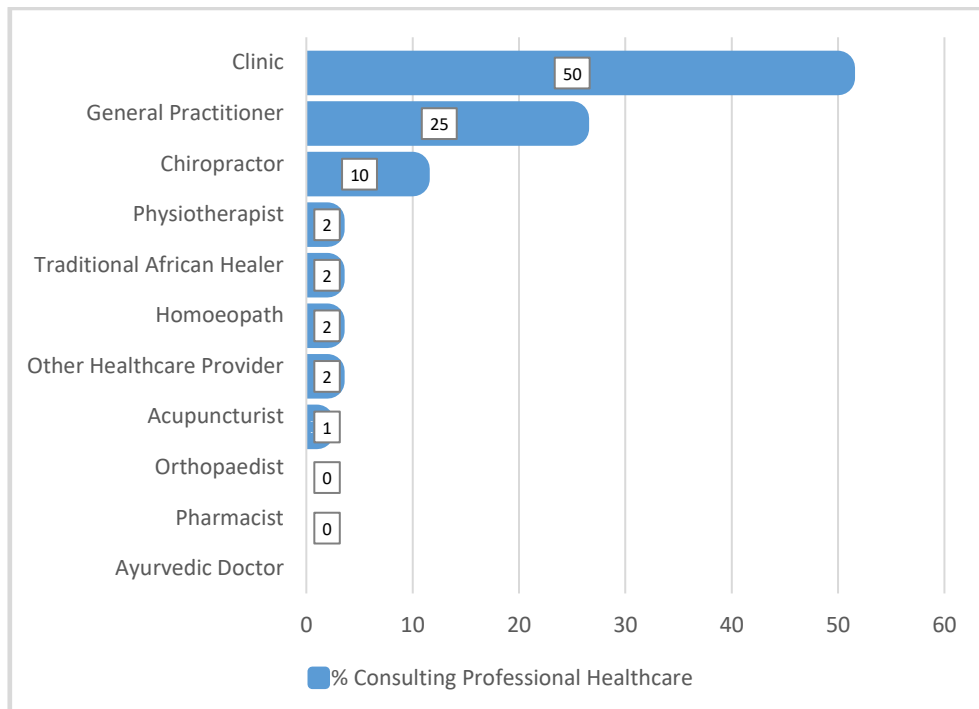


Figure 4.5: Distribution of Professional Healthcare Sought

4.8 IMPACT OF MUSCULOSKELETAL PAIN

4.8.1 Impact on Personal Life

Results show that MSK pain was found to have a significant impact on aspects of personal life of participants. Of the most frequently affected domains, sleep was affected in 68.2% of participants, mood in 78.3% and increased stress levels in 71.7% of participants. In 67.7% of participants, there was a decline in interest in hobbies and 77.4% noted disruption in activities of daily living. Additionally, 72.9% of participants noted a negative impact on their exercise or physical activity. Overall, about half of participants felt their pain negatively impacted their wellbeing, with 52.5% reporting a reduction in their quality of life.

Table 4.16: Impact on Personal Life

Impact on Personal Life		No	Yes	Neutral	Total
Sleep Disturbance	Count	48	174	33	255
	Row N %	18.8%	68.2%	12.9%	100.0%
Negative Effect on Mood	Count	27	199	28	254
	Row N %	10.6%	78.3%	11.0%	100.0%
Increasing Stress Levels	Count	51	182	21	254
	Row N %	20.1%	71.7%	8.3%	100.0%
Disinterest In Hobbies	Count	69	172	13	254
	Row N %	27.2%	67.7%	5.1%	100.0%
Activities of Daily Living	Count	35	195	22	252
	Row N %	13.9%	77.4%	8.7%	100.0%
Exercise	Count	45	186	24	255
	Row N %	17.6%	72.9%	9.4%	100.0%
Wellbeing and Quality of Life	Count	59	134	62	255
	Row N %	23.1%	52.5%	24.3%	100.0%

4.8.2 Impact on Social Life and Relationships

There was significant impact in the social lives of students, with 63.5% reporting a decline in their desire to social and 62.8% avoiding social

situations due to pain. To a lesser degree, about 40% of participants felt their MSK pain negatively impact their relationships.

Table 4.17: Impact on Social Life and Relationships

Impact on Social Life and Relationships		No	Yes	Neutral	Total
Desire To Socialise	Count	79	162	14	255
	Row N %	31.0%	63.5%	5.5%	100.0%
Negative Impact on Relationships	Count	119	101	35	255
	Row N %	46.7%	39.6%	13.7%	100.0%
Avoidance of Social Situations	Count	69	157	28	254
	Row N %	27.2%	61.8%	11.0%	100.0%

Table 4.18: Impact on Academic Life

Impact on Academic Life		No	Yes	Neutral	Total
Concentration	Count	51	187	16	254
	Row N %	20.1%	73.6%	6.3%	100.0%
Lecture Attendance	Count	109	113	32	254
	Row N %	42.9%	44.5%	12.6%	100.0%
Studying	Count	56	160	38	254
	Row N %	22.0%	63.0%	15.0%	100.0%
Writing Tests and Exams	Count	119	93	41	253
	Row N %	47.0%	36.8%	16.2%	100.0%
Completing Academic Tasks	Count	123	94	37	254
	Row N %	48.4%	37.0%	14.6%	100.0%
Overall Academic Performance	Count	138	68	48	254
	Row N %	54.3%	26.8%	18.9%	100.0%

4.8.3 Impact on Academic Life

The most affected academic aspects due to MSK pain were related to concentration, with 73.6% reporting a direct impact on concentration and 63% reporting their pain affected their ability to study. To a lesser degree, 44.5% of participants were unable to attend lectures, 36.8%

felt their ability to write tests and exams decreased and 37% struggled to complete academic tasks. Overall, 26.8% of participants reported a decline in their overall academic performance owing to MSK pain.

4.9 CONCLUSION

This chapter covered the results found from the data collected from participants in this study. The study investigated point and period prevalence, details regarding musculoskeletal pain, risk factors, management and the overall impact of MSK pain associated with primary dysmenorrhea.

Point and period prevalence was found to be high among participants with MSK pain manifested in all locations of the body. Risk factors included the use of oral contraceptives with the intention for contraception, traveling by car or public transport as well as the heaviness of menstrual flow. A variety of management approaches were noted by participants with the most popular options being self-medication, use of heat and consultation at a clinic. Musculoskeletal pain associated with PD had an overall negative impact on the personal, social and academic life of participants.

The following chapter will compare and contrast the results from this chapter in relation to similar studies.

CHAPTER FIVE DISCUSSION

5.1 INTRODUCTION

This chapter will compare and contrast the results obtained in the study in correlation with the study objectives and literature reviewed in chapter two. This discussion will include sample size and response rate, demographics, prevalence of musculoskeletal pain associated with primary dysmenorrhea, risk factors and impact of this pain as well as management approaches of sufferers.

5.2 SAMPLE SIZE AND RESPONSE RATE

The total sample size required for this study was 367 (Esterhuizen 2018). A total of 324 participants responded, correlating with an 88% response rate. Of this, 24 responses were excluded as they failed to meet the inclusion criteria or completed the survey incorrectly. The challenges faced due to the COVID-19 pandemic affected data collection and consequently a 100% response rate could not be achieved for this study.

The population size for this study was much larger than some previously conducted studies. Yacubovich *et al.* (2019: 3) received a total of 119 participants for the survey portion of their study, where they addressed the prevalence of menstrual related symptoms and MSK pain. Lee and Park (2016: 109) only had a total of 30 participants for their study, which focused on MSK pain and its impact in women with menstrual pain. Both of these studies included females with and without menstrual pain.

Lee and Park (2016: 109) had fewer dysmenorrhea sufferers (13) than non-sufferers (17). This study screened participants to only include those with PD to isolate and focus on the MSK association in this population. However, Yacubovich *et al.* (2019) and Lee and Park (2016) included experimental aspects to their study where physical assessments of MSK pain (such as myofascial pain palpation) were performed in the participants which was excluded in this study. A larger population size of 760 was seen in a study by Acheampong *et al.* (2019), although this study was not specific to the musculoskeletal association with PD sufferers.

This study achieved a sufficient response rate for it to be statistically acceptable and applicable when compared to the total number of female students in relation to the predicted prevalence of primary dysmenorrhea in a South African university setting.

5.3 DEMOGRAPHIC CHARACTERISTICS

5.3.1 Age

The majority of participants were between the ages of 18 and 23. This is the timeframe for majority of diploma and bachelor's degrees for which students are enrolled for. Fewer participants in the age category between 24 to 30 years were seen. This differs from a comparative study in an Israeli university population where the average age of participants was 25 (Yacubovich *et al.* 2019: 4). The age category of this study also contrasted those of other studies where women over the age of 30 were included (Yacubovich *et al.* 2019: 4; Lee and Park 2016: 109).

The decision to limit the age inclusion criteria was two-fold. Firstly, literature shows that a younger population seems to be most affected

by PD (Ju, Jones and Mishra 2013: 107). Secondly, the onset of secondary dysmenorrhea is more likely to occur later in life due to the development of causative conditions in an older population (Bezuidenhout *et al.* 2018: 19). Therefore, age was limited to reduce the chance of participants with underlying conditions, which may have affected the correlation of the study with the condition of PD.

5.3.2 Race

Primary dysmenorrhea does not appear to have preference for race or nationality (Proctor and Farquhar 2006: 1134). Racial characteristics displayed diversity among study participants, with all major South African race profiles being represented. The majority (74.7%) were Black, and the remaining participants were Indian (13.1%), White (8.1%) and Coloured (4%). The race profile of this study is consistent with the racial composition of the student body according to the DUT Annual Report of 2020, where majority of students are Black followed by Indian and then White and Coloured.

Other South African studies investigating dysmenorrhea did not define race characteristics of their participants (Oni and Tshitangano 2015; Iacovides *et al.* 2013). However, Padmanabhanunni and Fennie (2017) revealed that race played a role in the perception of menstrual symptoms, with Black and Coloured students being more likely to perceive menstruation as debilitating when compared to white students, although this study did not find significance between race and MSK pain in this population.

5.3.3 Faculty of Study

Participants across all faculties of study at the university were represented, but a large portion were based in the health sciences. This may pose significance as those in the health sciences field may

have greater insight into health-related complaints when compared to those in other fields of study.

Some studies opted to look at education level as a risk factor (Acheampong *et al.* 2019; Omidvar *et al.* 2016; Gagua *et al.* 2013) but as this study was conducted among students already enrolled in a tertiary education institution, the faculty of study was deemed more appropriate. The inclusion of faculty of study was based on a Turkish study evaluating dysmenorrhea (Potur, Bilgin and Komurcu 2014: 771). The faculty of study was included as a demographic factor with the intention to assess if certain faculties within the university carried increased risk of developing MSK pain alongside menstrual pain and, although included, no significance was found.

5.4 PREVALENCE OF MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

5.4.1 Point and Period Prevalence

This study addressed point and period prevalence of musculoskeletal pain associated with PD. Point prevalence was defined as pain experienced during a participant's most recent period and was found to be 66.3%. A slight increase was seen in period prevalence, where 78% of participants had experienced some form of MSK pain during a menstrual period over the last twelve months. To date, studies which have addressed the prevalence of MSK pain as a symptom of dysmenorrhea have not investigated or reported on point and period prevalence of overall comorbid MSK pain. This information provides valuable insight into the occurrence of MSK pain associated with PD with regards to prevalence and forms a foundation of literature from which future studies can expand upon.

5.5 CLINICAL PRESENTATION OF MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

This study analysed the overall severity, length and frequency characteristics, as well as the distribution of musculoskeletal pain, according to anatomical region, to provide comprehensive insight into the clinical characteristics of MSK pain.

5.5.1 Severity of Musculoskeletal Pain

The overall self-reported severity of MSK pain experienced by participants appeared to show variation between individuals, with some 5% reporting very mild pain carrying little impact to 2% reporting very severe and debilitating pain. The majority of participants felt their pain was moderate in nature, accounting for 48% of responses.

Lee and Park (2016: 109) found that women suffering from menstrual pain reported MSK pain of “severe” nature with a Visual Analog Scale of around 9 out of 10. Lee and Park (2016: 109) also discovered that women in the non-sufferer group also developed MSK pain during menstruation but to a lesser degree where pain was less frequent and, at its maximum, was only rated 4 out of 10 on a Visual Analog Scale.

This study contrasts with the findings of Lee and Park (2016) as the majority of participants described their pain as more moderate in nature than severe.

5.5.2 Length and Intensity Changes of Pain

The characteristics of MSK pain in this study included description of pain duration, as well as changes in pain intensity preceding and during menstruation. The majority of participants only experienced MSK pain for one to two days of menstruation. Pain exceeding five

days was a rare finding. About 5% of participants experienced pain throughout the duration of their menstrual period but the length of menstruation varied for each of these participants. Pain also worsened in the days preceding menstruation (40%), as well as intensified during the menstrual period itself (48%).

Lee and Park (2016) provided a comprehensive insight into pain severity by tracking a pain score over a six-day period. They found that MSK pain in menstrual sufferers was significantly higher in the days preceding the onset of menstruation in those suffering with dysmenorrhea compared to non-sufferers (Lee and Park 2016: 109).

Lee and Park (2016: 109) reported pain to peak on the first day of menstruation, which fell into a steady decline thereafter. This study shares some similarities with the work of Lee and Park (2016) in relation to the increase in pain intensity preceding menstruation, but these studies differ in the finding of pain intensity change after the onset of menstruation.

A total of 48.4% of the participants reported pain to increase, disagreeing with the general findings of decline in pain reported by Lee and Park (2016). However, this trend of pain increasing during menstruation is synonymous with that of Smith *et al.* (2009: 303), where researchers noted an increase in low back pain among Japanese nurses from 44% prior to menstruation to 64% during menstruation.

An additional finding not reported by other studies was the portion of participants who felt their MSK pain remained unchanged before and during menstruation.

5.5.3 Low Back Pain

This study demonstrated a high rate of low back pain in a population with dysmenorrhea, with a prevalence of 89% among those with musculoskeletal pain. Studies have shown a wide range in reports of menstrual-related low back pain. The report of LBP in this study appears to be significantly higher in comparison to studies in Taiwan and the United States, which had estimated the prevalence of menstrual-related low back pain to be around 50% (Chen and Hu 2019; Banikarim, Chacko and Kelder 2000).

In a global comparison, this study appears to carry a higher rate of low back pain associated with primary dysmenorrhoea, where this affected around 60% of Israeli females (Yacubovich *et al.* 2019), 53% of Brazilian females (Stallbaum *et al.* 2018) and 35% of Iranian females (Rakhshae 2014).

The rate of low back pain in this study contrasts an early study from the 1990s, where a significantly lower rate of females (29%) displayed low back pain during menstruation (Brynhildsen, Hammar and Hammar 1997: 350). Studies reporting prevalence of low back pain which closer represents this study have included rates of 64% (Smith *et al.* 2009: 303) and 75% (Chen *et al.* 2018: 1459). Unfortunately, both studies included women with underlying gynaecological pathologies and therefore these statistics do not speak solely to PD but are representative of menstrual disorders in general.

Similar to global statistics, there is a discrepancy within a local context with regards to menstrual-related low back pain. Oni and Tshitangano (2015) reported a prevalence of 34% for low back pain accompanying menstrual disorders in rural South Africa. The population differed from this one as the authors addressed an adolescent population in a rural

setting, contrasting the older population and urban environment represented in this study. Additionally, Oni and Tshitangano (2015) did not exclude the presence of gynaecological pathology and therefore their reported prevalence speaks to that of primary and secondary dysmenorrhea.

Moreover, urbanisation carries distinct effects on health status and researchers have found that urban populations in South Africa report a higher severity of illness than those in a rural setting (van der Hoeven, Kruger and Greef 2012: 31). This may provide an explanation to the differences in reports of menstrual-related low back pain seen between this study and that of Oni and Tshitangano (2015).

5.5.4 Generalised Musculoskeletal Pain

Yacubovich *et al.* (2019) laid an important foundation for the investigation into MSK symptoms associated with PD which had not been fully explored at the time. As this study was largely based on the work of Yacubovich *et al.* (2019) in terms of the prevalence and distribution of musculoskeletal pain, comparisons can be drawn between the findings of the two studies.

Following low back pain, regions reporting a high prevalence of pain in this study included the neck (33.6%), hips and thighs (33.2%), upper back (30.4%) and shoulders (21.9%). Comparatively, Yacubovich *et al.* (2019) reported higher prevalence for pain in the regions of the neck (57.1%) and shoulder girdle (44.5%). This study displayed a marginal increase in reports of hip and thigh pain than that of Yacubovich *et al.* (2019) (20.2%) and about three times more upper back pain than Yacubovich *et al.* (2019) (9.2%).

Regions reporting lower prevalence of MSK pain in this study included knees (12.6%), wrists and hands (10.5%), ankles and feet (8.9%) as

well as the elbows (19.3%). Differences were noted here as well, where Yacubovich *et al.* (2019) reported much higher rates of pain in all these regions.

The study population for both studies included females at universities, but there were differences between the inclusion and exclusion criteria which may account for some of the discrepancies seen. Yacubovich *et al.* (2019) included nulliparous females aged 20 – 35 years with exclusion of those on hormonal therapies, such as oral contraceptives and intrauterine devices, whereas this study capped the age limit at 30 years and included the use of oral contraceptives in order to investigate its potential influence on MSK pain.

As oral contraceptives play a controversial role in the modulation of MSK pain (Ju, Jones and Mishra 2013; Hansen *et al.* 2009; Smith *et al.* 2009), the clinical presentation between the participants in this study and Yacubovich *et al.* (2019) could be explained by the inclusion and exclusion of oral contraceptives, as well as participant age limits.

Chen *et al.* (2018) reported a similar prevalence of hip and thigh pain (21.5%) to that of Yacubovich *et al.* (2019) (20.2%). The neck pain (17.3%) reported by Chen *et al.* 2018 (1459) was also lower than that found in this study. An earlier study by Lee and Park (2016: 109) similarly reported the most common regions of MSK pain being that in the back, shoulders, arms, legs and head (although locations for arm and leg pain were not explicit regarding anatomical region).

The results in this study show that the existence of musculoskeletal pain manifested across all regions of the body in participants, which is a consistent finding in many studies who have either reported on specific locations or the finding of generalised pain as a symptom of dysmenorrhea (Yaralizadeh *et al.* 2020; Yacubovich *et al.* 2019; Chen

et al. 2018; Omidvar *et al.* 2016; Lee and Park 2016). Low back pain was the most prevalent of these complaints, consistent with many studies (Yacubovich *et al.* 2019; Chen and Hu 2019; Chen *et al.* 2018; Stallbaum *et al.* 2018; Lee and Park 2016; Oni and Tshitangano 2015; Banikarim, Smith *et al.* 2009; Chacko and Kelder 2000). However, this study reported LBP to a higher degree than that of previous global and local studies.

That this was consistent with earlier reports, pain in other spinal regions (cervical and thoracic), the shoulder girdle and the hip was also a prominent feature (Yacubovich *et al.* 2019; Iacovides *et al.* 2013).

5.5.5 Headaches

Along with general musculoskeletal complaints, a high rate of menstrual headaches was noted among students, with more than half (57.9%) reporting the occurrence of headaches during their menstrual phase. Evans *et al.* (2018: 3188) reported that approximately 80% of women with dysmenorrhea reported the occurrence of at least headache day during their menstrual cycle but this considers all phases of the menstrual cycle and not exclusive to the menstruation phase. The results regarding headache prevalence are comparable with that of other studies where the rates have included 59% among Hispanic females in the United States (Banikarim, Chacko and Kelder 2000: 1227) and 65% in Italy (Bianchin *et al.* 2019: 27). Conversely, much lower rates were seen in other countries such as Israel (17.8%) (Yacubovich *et al.* 2019: 4) and Iran (7.9%) (Rakhshae 2014: 2818).

The rate of headaches in this study was much higher than previously established by Oni and Tshitangano (2015: 216), who reported 37% of female adolescents to experience headaches alongside menstrual

disorders. However, a recent African study reported a comparable menstrual-related headache prevalence, with about 67% of adolescents reporting recurrent headache attacks with menstruation (Adebayo, Otubogun and Akinyemi 2020: 143). The authors further classified the headache presentation into 18% migraine and 41% tension-type headaches (Adebayo, Otubogun and Akinyemi 2020: 143).

This study did not address the clinical presentation of headaches for classification purposes but a factor that was considered was the co-occurrence of neck pain alongside headache. This study found that close to half (44.8%) of participants reporting headache experienced concomitant neck pain. Primary headaches, such as migraine and tension-type, are commonly associated with neck pain (Castien and De Hertogh 2019: 276). As literature highlights a high prevalence of menstrual migraine and tension-type headaches (Affaitati *et al.* 2020; Evans *et al.* 2018; Arjona *et al.* 2007), the presentation of neck pain, alongside headaches, helps to further establish the MSK link.

Another consideration for neck pain and headaches is the high prevalence of cervicogenic headache in the female population and the implication of hormonal shifts on the MSK system playing a role in a cervicogenic headache pattern (Page 2011: 255).

While this study did not render a detailed headache investigation, it provides some insight into the prevalence of menstrual-related headache disorders. Additionally, this study only looked at the presence of perimenstrual headache pertaining to the onset of dysmenorrhea, but literature has shown that headache attacks can occur throughout the phases of the menstrual cycle (Bianchin *et al.* 2019: 27).

Due to the complexity of headaches, further investigation is required to address menstrual headache prevalence, classification as well as their cyclical presentation and patterns, particularly in a South African context where studies on this topic are limited.

5.5.6 Myofascial Pain

A large body of literature proposes that dysregulation in the myofascial tissue is implicated in the pain experience of primary dysmenorrhea (Yacubovich *et al.* 2019; Fede *et al.* 2019; Lee and Park 2016; Kuan 2009; Shah *et al.* 2005; Dao, Knight and Ton-That 1998).

Participants were asked to report on the presence of muscular cramps which they may experience during menstruation. Overall, about 76% of participants with MSK pain reported to experience muscle ache or cramps during menstruation. By far, the most common regions of myofascial pain included the low back and gluteal regions (52%) and the pelvic and abdominal regions (50%). These findings are synonymous with earlier studies where active trigger points in muscles of the low back, pelvic and abdominal regions have been reported (Yacubovich *et al.* 2019; Lee and Park 2016).

Quadratus lumborum and rectus abdominis have proven to be the most affected muscles across these studies (Yacubovich *et al.* 2019; Lee and Park 2016), although Yacubovich *et al.* (2019: 5) reported additional implication of bilateral paraspinal MFTPs in women with PD. Gluteus medius was not found to have significant involvement in both non-sufferers and sufferers of PD (Yacubovich *et al.* 2019: 5).

To date, no studies have addressed global myofascial pain in terms of anatomical regions away from the low back and abdomen. This study found self-reported myofascial pain in other regions such as the hips and thighs (14%), knees and calves (9%), neck (7%), midback

(6%) and shoulder girdle (6%). Pain from muscular structures in the arms, chest and ankles and feet were minimal.

It is important to highlight that the report of muscle pain in these regions may not correlate to the presence of active or latent myofascial trigger points. The low back, abdominal and thigh regions are commonly implicated in menstrual pain due to pain reflex pathways and referred pain phenomena. The uterus shares sensory and motor pathways with the muscles of the abdomen and low back; this design allows for referred pain phenomena to occur where stimulation in one of these locations creates perceived pain in another (Spears 2005: 79). Therefore, muscle pain experienced in these somatic regions may be originating from visceral structures in the pelvis and not reflective of true myofascial origin. However, it is possible that hyper-stimulation at those levels may also facilitate ischaemia and inflammation which in turn may result in muscle dysfunction and produce legitimate myofascial pain (Spears 2005: 79).

This study did not provide a comprehensive investigation into myofascial pain, nor did it define and assess the precise distribution of myofascial trigger points. Rather, the study aimed to provide a self-reported evaluation of muscle pain by participants to provide necessary insight into where future studies may be beneficial. Studies evaluating myofascial involvement can further expand research to address the global implication of myofascial trigger points in the MSK pain experienced in PD.

5.6 RISK FACTORS FOR MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

This study addressed risk factors associated with general variables, demographic variables and menstrual-specific variables.

Of the general characteristics, the mode of transportation utilised by a participant was found to have a positive association with developing the MSK pain associated with PD. Those who travelled by car or public transport were more likely to experience pain than those who walked. The mode of transportation as a risk factor in this study contrasts with the African systematic review by Louw, Morris and Grimmer-Somers (2007), which found that those who walked more than 30 minutes a day showed a positive association with the persistence of low back pain. It should be noted that the population of this study differs greatly as it has focused on younger females of reproductive age with menstrual pain, whereas the systemic review looked at studies without strict population characteristics.

No significance was found with smoking and physical injury, contrasting other studies where MSK pain was seen to positively correlate with smoking and physical trauma (Paananen *et al.* 2010; Louw, Morris and Grimmer-Somers 2007). Additionally, physical activity was not found to have positive associations for MSK pain in this study with regards to the level of physical activity and time spent sitting.

Although some authors have reported physical activity to either increase (Paananen *et al.* 2010: 1026; Bianchin *et al.* 2019: 27) or reduce (Saleh, Mowafy and El Harneid 2016: 1) MSK symptoms with menstrual pain in females, the findings of this study align with that of

Kamel, Tantawy and Abdelsamea (2017: 1080), who found no significance between active and sedentary women.

Louw, Morris and Grimmer-Somers (2007: 8) found inadequate access to healthcare to be a significant risk factor for MSK pain among African countries. This study found no correlation between access to healthcare and MSK pain, most likely because 90% of participants reported to have access to some form of healthcare when they required it.

Many studies concerning dysmenorrhea have included an assessment of body mass index (BMI) (Yacubovich *et al.* 2019; Gaubeca-Gilarranz *et al.* 2018; Stallbaum *et al.* 2018; Lee and Park 2016; Gagua *et al.* 2013) and BMI has previously been reported as a risk factor for menstrual related low back pain (Smith *et al.* 2009: 305).

Initially, the survey included questions pertaining to height and weight with the intention to assess participant BMI as a potential risk factor for the development of MSK pain. However, the focus group and pilot study revealed that the average university student was unaware of or unable to precisely recount their height and current weight. As this survey was conducted informally around the DUT campuses, an issue became apparent with being able to accurately use self-reported BMI for statistical purposes. BMI was therefore removed from the survey to avoid unreliable results and conclusions.

The use of oral contraceptives was not found to be significant for MSK pain among participants. Subjective reports on the influence of OCs on MSK pain show that about half of the participants reported relief from MSK pain, whereas 21% reported their pain to increase. The conflict regarding the use of oral contraceptives for pain in this study is consistent with the overall controversial nature of the role

exogenous hormones play in MSK pain, where some studies have suggested it plays a protective role (Hansen *et al.* 2009: 1435; Martineau *et al.* 2004: 281), while others have demonstrated the increased risk OCs carry for MSK complaints among users (Bianchin *et al.* 2019: 27; LeResche *et al.* 1997: 153).

While no significance was found for the use of oral contraceptives, participants using OCs for the purpose of contraception was found to be positively associated with the development and persistence of MSK pain. No studies have looked at this as a factor. Given the conflicting evidence with regards to oral contraceptives and female MSK pain, further studies are needed to explore this association.

No significant associations were determined for demographic factors, such as age and race. Some studies have found participant race, particularly Black and Hispanic women, to be significant in developing widespread MSK pain and menstrual headaches alongside dysmenorrhea (Chen *et al.* 2018: 1463).

Age has been debated as a risk factor where some have found an increasing gynaecological age to increase menstrual headaches (Bianchin *et al.* 2019: 27), whereas others find a decline in reports of dysmenorrhea symptoms with age (Lindh, Ellström and Milsom 2012: 676).

The menstrual variable of the heaviness of menstrual flow was determined to be positively associated with MSK pain. This factor had previously not been described in a population with PD. Contrary to previous authors who found positive risk association for the onset of menarche (Chen *et al.* 2018: 1463) and experiencing mild to moderate menstrual pain (Smith *et al.* 2009: 305), these variables were found to be insignificant. Similar to Bianchin *et al.* (2019: 27), this study did not

find the length or regularity of menstruation to affect the risk for MSK pain.

Given the limited literature available pertaining to risk factors for musculoskeletal pain in a population with primary dysmenorrhea, this study provides a foundation for further exploration.

5.7 MANAGEMENT APPROACHES FOR MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

Few studies have investigated the overall management approaches for musculoskeletal utilised by women with primary dysmenorrhea. This study provided insight into the common approaches, both self-administered and professional healthcare options, sought by students at a university of technology.

5.7.1 Personal and Cultural Influence on Management

This study showed a split between those who were mostly able to ignore their MSK pain (38.8%) and those who could not (22.7%). The remaining participants (38.4%) felt their pain could be ignored at some points but not others. Acheampong *et al.* (2019: 5) found that more than half (56.6%) of Ghanaian university females opted to ignore their menstrual pain, contrasting the findings of this study.

A major factor to take into consideration with regards to management approaches is the cultural and social nuances surrounding menstruation pain (Acheampong *et al.* 2019: 2; Omidvar *et al.* 2015: 135). De Sanctis *et al.* (2017: 244) identified discrepancies between prevalence rates and seeking medical treatment, concluding with

suggestions that culture plays a role in symptom interpretation and influencing the overall experience which is a determinant of treatment.

In an African context, cultural perceptions and beliefs along with economic and institutional resources have influenced the experience around menstruation and subsequent management of pain (Fenni, Moletsane and Padmanabhanunni 2022). A strong belief that pain accompanying menstruation is “normal” has been linked to lower rates of seeking healthcare (Chen, Kwekkeboom and Ward 2016: 271). Chen, Kwekkeboom and Ward (2016: 271) highlighted an importance in reassuring sufferers that dysmenorrhea is a legitimate reason to seek treatment.

5.7.2 Self-Management Approaches

A variety of self-management approaches for MSK pain were noted among participants including self-medication and numerous home remedies.

5.7.2.1 Self-Medication

The most frequently used strategy among participants was self-medication (78%). Studies appear to be incongruent with their reports on self-medication use for symptoms of dysmenorrhea, ranging anywhere between 20% to 50% (Acheampong *et al.* 2019: 5; De Sanctis *et al.* 2017: 244; Bianchin *et al.* 2019: 28). The use of self-medication was marginally higher than another report, where around 64% of South African teenagers self-medicated for menstrual pain (Oni and Tshitangano 2015: 217). Negative beliefs towards the use of analgesics, such as a lack of knowledge, dangers and interactions, have explained some of the lower rates for self-medication in the past (Aziato, Dedey and Clegg-Lampthey 2015: 165).

No further questions such as medication type, dosage and knowledge of use were obtained in this study.

5.7.2.2 Home Remedies

A large portion (59%) of the participants practiced home remedies for their MSK pain. Of the numerous remedies that were described, some were consistent with evidence for their application, whereas others had not previously been described in literature. The percentage of participants engaging with home remedies was fairly consistent with previous reports (De Sanctis *et al.* 2017: 244; Aziato, Dedey and Clegg-Lampsey 2015: 165; Banikarim, Chacko and Kelder 2000: 1228).

Synonymous with previous studies, heat appeared to be the most popular method used to manage MSK pain among participants (De Sanctis *et al.* 2017: 244; Mannix 2008: 882). In fact, participants showed a marked preference for heat (65%) over ice application (8%), contrasting with the findings of Smith *et al.* (2009: 305), where Japanese nurses opted for cold compress over warm compress for menstrual related low back pain.

Following the use of heat, rest was a popular pain management tool used by participants (22%), sharing similarity with other studies reporting high rates of rest among menstrual pain sufferers (Chen, Kwekkeboom and Ward 2016: 270; Banikarim, Chacko and Kelder (2000: 1228). An interesting association may be present here: this study agrees with other findings that sleep is significantly impacted in women with PD and research has demonstrated that sleep disturbance due to pain may increase daytime fatigue, another widely reported symptom of PD (Iacovides, Avidon and Baker 2015; Rakhshae 2014; Iacovides *et al.* 2009). It has also been shown that

fatigue and sleep disturbance ultimately heighten pain sensitivity (Iacovides, Avidon and Baker 2015: 772). This suggests that resting may be a beneficial pain management strategy in women with PD through relief for fatigue and subsequently reducing pain sensitivity.

This study found a smaller portion of participants found pain relief through physical activity strategies, such as exercise or stretching. This finding is consistent with other studies, with reports ranging between 10% to 27% (Acheampong *et al.* 2019; Chen, Kwekkeboom and Ward 2016; Banikarim, Chacko and Kelder 2000). Authors have advocated for the use of exercise and stretching as an effective method for not only reducing symptoms of dysmenorrhea, but positively impact functional ability and mental health – implicating physical activity in the psychosocial aspects of pain (Chen and Hu 2019; Yonglitthipagon *et al.* 2017; Saleh, Mowafy and El Harneid 2016; Ortiz *et al.* 2015; Shakeri *et al.* 2013; Rakhshae 2011; Raub 2002).

Students were also found to consume herbs (9%) and a variety of other liquids, including teas, coffee, vinegar and water. Comparatively, the use of herbs in this study parallels its application in Ghana, where around 7% of adolescents with menstrual pain reportedly used herbal remedies for pain management (Acheampong *et al.* 2019: 5). However, the use of herbal teas has been higher across other study populations, with reports ranging between 32% and 50% (De Sanctis *et al.* 2017: 244; Potur, Bilgin and Komurcu 2014: 773). Information pertaining to the type, blend, quantity and method of consumption was not obtained in this study. Furthermore, these herbal preparations were recorded as self-prescribed remedies and not treatments from a healthcare provider such as a homoeopath or traditional healer.

The use of warm beverages as remedies used among females with dysmenorrhea has previously been described in other studies (De Sanctis *et al.* 2017; Chia *et al.* 2013; Mohamed 2012). However, except for certain herbal teas, there is no evidence for efficacy provided in literature for these approaches.

A small portion of participants found pain relief with self-massage, topical lotions and rubs, steaming and aromatherapy with essential oils. Studies have found that massage and aromatherapy to be successful self-management tools for symptoms of PD (Ari Andiputri, Darmiyanti and Candra 2018; Bakhtshirin *et al.* 2015; Potur, Bilgin and Komurcu 2014; Apay *et al.* 2012). This combination is said to have a two-part effect on menstrual pain symptoms: massage exerts analgesic effects through endorphin release while lavender oil accelerates pain relief by through relaxation and anxiety reduction (Bakhtshirin *et al.* 2015: 156).

As it has become evident that both MSK pain and PD are multidimensional pain experiences, combining remedies which target both physical and psychological contributors of pain may prove to be an effective self-management strategy.

A few participants reportedly used chiropractic pain management techniques as self-remedies. These participants did not specify the types of techniques used. Chiropractic pain management includes a variety of evidence-based techniques such as thermotherapy with ice or heat application, mechanoreceptor stimulation and a range of stretches and exercise therapies (Hawk *et al.* 2020; Skelly *et al.* 2018). Most of these techniques have already been mentioned as remedies used by other participants across this study. Additionally, the use of transcutaneous electrical nerve stimulation was used as a self-management tool.

5.7.3 Professional Healthcare Approaches

A variety of healthcare professions were consulted for pain management, which included primary healthcare, as well as complementary and alternative medicine. Approximately 80% of participants sought advice or treatment from a healthcare professional which appears to be significantly higher than reports from other African countries, such as Egypt and Ghana (Acheampong *et al.* 2019; Nooh 2014). This contrasts earlier reports which found that females had little knowledge on professional management options (Banikarim, Chacko and Kelder 2000: 1228). This study also displays fewer discrepancies between the high prevalence rates of pain and the rate of care seeking noted in an earlier review (De Sanctis *et al.* 2017: 243).

Additionally, this study shows a much higher rate of professional consultation than what has been previously reported among rural teenagers in Limpopo, where only 32% sought professional care for menstrual symptoms (Oni and Tshitangano 2015: 217). Socioeconomic barriers play a large role in the healthcare seeking behaviours between urban and rural populations (van der Hoeven, Kruger and Greeff 2012: 31) and, thus, there is understandable difference in professional healthcare approaches between this study and the study of Oni and Tshitangano (2015).

Among participants in this study, management approaches included primary healthcare consultations and traditional, complementary and alternative healthcare. Amongst the primary healthcare professions, about half of participants utilised the DUT formal clinic, which offers the services of nurses and doctors, where they received management for MSK pain through allopathic medicine. Additionally, some utilised the chiropractic (10%) and homoeopathy (2%) clinics which are the

complementary and alternative healthcare facilities based at the university.

Local comparison demonstrates a greater access to professional healthcare for students at an urban university than in rural South Africa for menstrual related complaints (Oni and Tshitangano 2015: 217). Furthermore, when compared to international studies conducted in first world countries, where access to both primary and complementary healthcare is widely available, this study demonstrates sufficient access to healthcare for both traditional and alternative approaches for DUT students for menstrual pain management.

Regarding allopathic medicine, a stark contrast is seen between the low rate of pharmacist consultation (0.4%) when compared to the high rate of self-medication use (78%) among participants. This discrepancy agrees with questions posed regarding knowledge, safety and efficacy of the self-medication strategies utilised for MSK pain in this population (Aziato, Dedey and Clegg-Lampthey 2015: 165).

To a lesser degree than chiropractic, manual therapy was also obtained through consultation with physiotherapists (2%) and orthopaedists (0.4%). A larger percentage of physiotherapy consultation for dysmenorrhea has previously been recorded in India (Charu *et al.* 2012: 281). The accessibility to the on-campus chiropractic clinic may explain its popularity among students. Overall, the utilisation of manual therapy appears to be lower than traditional healthcare for MSK pain among students with PD.

In a South African context, it was evident that a marginal percentage of the study population utilised traditional medicine, with participants consulting traditional African healers (2%) and acupuncturists (0.8%).

This study shares similarities to international studies where traditional medicine has been used for menstrual pain among Hispanic (Banikarim, Chacko and Kelder *et al.* 2000) and Asian populations (Chia *et al.* 2013). In an African context, traditional medicine is not only popular, but carries much cultural and religious bearing (Mahomoodally 2013), therefore making the results of this study significant in terms of providing alternative approaches that keep within the cultural context of the population.

5.8 IMPACT OF MUSCULOSKELETAL PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA

While many studies have investigated the impact of primary dysmenorrhea is both quantitative and qualitative approaches, few studies have isolated the impact of its musculoskeletal component. This study revealed that MSK pain carried significant burden on the personal, social and academic lives of students with PD.

5.8.1 Impact on Daily Activities

Musculoskeletal pain placed a significant burden on all factors of daily activities among participants, with negative impact on daily living (77.4%), exercise (72.9%) and interest in hobbies (67.7%). A higher impact on daily activities was seen in this population than previously recorded in Ghana and Ethiopia (Acheampong *et al.* 2019; Giletew and Bekele 2019).

This study has shown consistence with other reports of PD sufferers experiencing a reduction in daily activity when compared to otherwise healthy counterparts (Chen, Kwekkeboom and Ward 2016; Lee and Park 2016; Aziato, Dedey and Clegg-Lamptey 2015). Reduced

activity levels are not only seen during menstruation, but have been known to impact sufferers in the premenstrual and postmenstrual phases too (Lee and Park 2016: 110), emphasising the significance of MSK pain on the daily life of students with PD. Additionally, the results of this study speak to the close relationship shared between the impact on daily activities and the overall severity of dysmenorrhea (Nooh 2014: 199).

With majority of participants reporting their menstrual pain as moderate to very severe (78.6%), correlation can be seen between self-reported severity of menstrual pain and the significant impact of the MSK component on the daily lives of the participants. These results mirror the findings of Potur, Bilgin and Komurcu (2014: 774), who noted a greater degree of limitation in daily activity in those reporting moderate to severe dysmenorrhea. Given the high impact found in this domain among students, the results of this study conflict with other reports that severe dysmenorrhea limiting daily activities is an uncommon finding (Ju, Jones and Mishra 2013: 112).

5.8.2 Impact on Sleep

Musculoskeletal pain appeared to interfere with sleeping patterns in a large portion of participants (68.2%). Research has shown that PD has affected sleep in sufferers for many years (Arafa *et al.* 2020; Iacovides, Avidon and Baker 2015; Woosley and Lichstein 2014; Iacovides *et al.* 2009). Though many of these reports speak to menstrual pain directly, literature shows a strong correlation between MSK pain and sleep disorders (Arnison *et al.* 2022; Skarpsno *et al.* 2020; Chun *et al.* 2018; Meltzer, Logan and Mindell 2005).

Participants suffering with sleep disturbance due to the contribution of MSK pain, aligns with Lee and Park (2016: 110), who found that

subjects experiencing pain displayed significantly lower sleep scores than non-sufferers. This population of university students appears to experience more impact on sleep due to pain than what has previously been recorded in university females from Hong Kong and Iran (Rakhshaei 2014; Chia *et al.* 2013).

The correlation and causation between MSK pain, menstrual pain and sleep are still being debated in literature. Earlier studies did suggest that sleep disturbance was a consequence of menstrual pain, but there was a possibility of a bidirectional relationship where sensitivity to pain may be heightened because of sleep disturbance (Iacovides, Avidon and Baker 2015: 772).

Arnison *et al.* (2022: 287) recently proposed that rather than a reciprocal correlation, sleep disturbance mediates MSK pain through additional factors such as mood. Therefore, the impact of MSK pain on sleep in this population may need to be considered in the context of the impact experienced in other domains as well.

5.8.3 Impact on Psychological Status, Mood and Affect

The participants revealed that musculoskeletal pain experienced during menstruation carried a significant impact on their overall psychological status, with negative effects extending into mood (78%) and the ability to cope with stress (72%). These findings are consistent with prior studies finding that lower mood scores and emotional disturbances to be prominent among females experiencing concomitant MSK and menstrual pain (Chen, Kwekkeboom and Ward 2016: 269; Lee and Park 2016: 110; Gagua *et al.* 2013: 352). In a South African context, significantly poorer moods over the menstrual phase have been identified in women suffering with dysmenorrhea Iacovides *et al.* (2013: 1070).

Given this study has shown a high prevalence of repetitive MSK pain, consideration needs to be given for the interactions among dysmenorrhea, chronic pain and the psychological influences which play an important role in the net pain experience (Li *et al.* 2020; Gagua *et al.* 2013; Rodrigues *et al.* 2011). It is well established that pain is a subjective experience which is primarily modulated by the central nervous system but receives important integration with psychosocial factors (Gagua *et al.* 2013: 351). Reoccurring menstrual and MSK pain in this population may lead to the development of psychological disorders such as depression and anxiety, which further enhance pain and sensitivity (Gupta and Shreemal 2019:78).

The finding of increased stress and poor coping skills relating to stress management in students may play an important role in mediating monthly pain. Repeated monthly pain may be considered as a stressor; stress is mediated by various biochemical and endocrine mechanisms which not only disrupt homeostasis and physiological processes such as prostaglandin synthesis but creates alterations in pathways which may be predispositions for pain and anxiety (Ju, Jones and Mishra 2013: 112; Gagua *et al.* 2013: 354; Wang *et al.* 2004: 1025).

This study supports conclusions drawn by other authors that future research exploring the biopsychosocial implications in PD is critical for the provision of optimal healthcare (Chen *et al.* 2018: 1463; Gagua *et al.* 2013: 351).

5.8.4 Impact on Socialisation and Relationships

In addition to pain influencing aspects of personal life and daily living among students, social domains were also negatively affected by MSK pain for a large portion of participants. Students felt their desire

to socialise declined (63.5%) and resulted in most participants avoiding or withdrawing from social situations entirely (61.8%). The findings regarding socialisation in this study are equivalent to other populations, where menstrual pain negatively impacted the socialisation of dysmenorrhea sufferers (De Sanctis *et al.* 2017: 243; Rakhshae 2014: 2820; Banikarim, Chacko and Kelder 2000: 1227). Social withdrawal seemed to be affected to a larger degree among this population than what other studies have found (De Sanctis *et al.* 2017: 243; Acheampong *et al.* 2019: 4).

Pain not only influenced socialisation, but expressed an impact on the interpersonal relationships of students, with a large percentage (40%) of students feeling despondent towards their relationships. Participants in an Iranian study shared similar sentiments in this regard (Rakhshae 2014: 2820). With students often relying on family and friends for assistance with academic and daily tasks, as well as emotional support during menstruation, the negative impact on relationships may be implicated in the overall reduction of wellbeing in students with PD (Aziato, Dedey and Clegg-Lampsey 2015:167).

5.8.5 Impact on Academic Performance

Consistent with many studies evaluating the academic impact of menstrual pain, this study identified significant impact in the academic domain for students with MSK pain associated with PD. This included effects on focus and concentration (74%), lecture attendance (45%) and an overall reduction in academic performance (27%).

The results from this study parallel the consensus that concentration and absenteeism appear to be the most affected areas of the academic domain (De Sanctis *et al.* 2017; Rakhshae 2014; Banikarim, Chacko and Kelder 2000). In the African context, this study

displayed more academic impact with regards to concentration and attendance than that reported in Ghana (Acheampong *et al.* 2019). Locally, the rate of absenteeism appeared to be higher than that Oni and Tshitangano (2015: 217), where only 22% of adolescents missed school due to menstrual complaints. Not only is this a comparison of urban students versus rural adolescents, but this study examined young adults in a tertiary institution where there is more freedom and flexibility over personal schedules when compared to scholars in a secondary schooling system.

Other areas of academic impact, such as studying, writing formal assessment and completing academic tasks have shown similar results to international studies (De Sanctis *et al.* 2017; Rakhshae 2014; Banikarim, Chacko and Kelder 2000). Contrary to other studies, where a large portion of respondents felt a negative effect on academic performance (De Sanctis *et al.* 2017: 243; Rakhshae 2014: 2820), a lower impact was seen among DUT students.

The findings of this study agree with the body of literature which suggests symptoms of dysmenorrhea carry a significant burden on the academic lives of sufferers. This study further highlights the need for an evaluation into the South African education system to identify the role of policies to assist female students suffering with symptoms relating to PD in navigating academic challenges, such as attendance, concentration and writing of examinations, which concern the overall academic performance among female students.

5.8.6 Impact on Quality of Life

The impact reported across the personal, social and academic lives of students in this study contribute to a large percentage (53%) of participants reporting an overall reduction in well-being and self-

reported quality of life. While this is lower than previous international reports (Spears 2005: 76), the findings are consistent with other South African findings of decline in quality of life among women with PD (Iacovides *et al.* 2014: 214).

The evaluation of the impact of musculoskeletal pain in this population has revealed the significant role it plays across all domains of quality of life, further emphasising the multifactorial experience of primary dysmenorrhea and highlighting the intimate relationship between physical pain and psychosocial dysfunction.

5.9 RESULTS IN RELATION TO SUSTAINABLE DEVELOPMENT GOALS OF SOUTH AFRICA

An important issue has been raised regarding the neglect of musculoskeletal health in the public sector (Adebajo and Gabriel 2010: 439). The current quadruple burden of disease challenging the South African healthcare system, with focus on communicable, non-communicable, maternal and perinatal health, and trauma-related incidents (Mayosi *et al.* 2009: 934) and therefore resources are not only scarce in sub-Saharan Africa, but are channelled towards these priorities and, consequently, the burden of MSK conditions becomes heavier (Adebajo and Gabriel 2010: 439).

This begs the question of whether public facilities are providing sufficient evaluation of MSK pain in patients with PD. This study did not address the attitudes of participants towards professional healthcare; however, the results of this study appear to show favour towards students have access to sufficient healthcare both in traditional and alternative approaches.

Additionally, women have beliefs about dysmenorrhea which not only influence self-management behaviours but do not always fit into a biomedical model (Chen, Kwekkeboom and Ward 2016: 271). Fostering interprofessional relationships between the formal clinic and complementary clinics at the university may optimise conservative management for MSK pain. The integration of a sustainable multidisciplinary approach towards quality MSK and reproductive healthcare not only aligns with the sustainable goals of South Africa and the World Health Organisation, but can address a much-needed biopsychosocial approach for the holistic management of comorbid musculoskeletal pain in primary dysmenorrhea.

5.10 CONCLUSION

This chapter reviewed the results and provided a comparative discussion of these results in relation to relevant studies on musculoskeletal pain and primary dysmenorrhea. Overall, MSK pain (including headaches and myofascial pain) was found to be highly prevalent among female students with PD and was distributed across all anatomical regions. Using a car or public transport, using oral contraceptives for contraception purposes and the heaviness of menstrual flow were all found to increase the risk for MSK pain. In addition to this, a variety of self-management and professional healthcare management approaches were used by participants. The overall impact of MSK pain was found to be high in personal, social and academic domains, with participants reporting an overall reduction in quality of life due to the consequences of pain.

The following chapter will conclude this study as well as provide limitations and recommendations for future research.

CHAPTER SIX CONCLUSION

6.1 INTRODUCTION

This chapter will discuss limitations identified in this study, provide recommendations for future research and conclude the study.

6.2 LIMITATIONS

This study was conducted at only one university which limited the application of these results to a smaller population. Furthermore, the study was conducted during the COVID-19 pandemic, where lockdown restriction prevented much of the on-campus activity. Subsequently, the population size was smaller and hindered the exposure to a wider variety of students, which would have provided greater statistical significance.

This study was conducted among students from various faculties and not every participant had a background knowledge of health science and its related terms. Steps were taken to eliminate miscomprehension in the survey through using layman's terms and providing explanations where necessary, as well as in-person clarification by the researcher and the research assistant. However, the risk of miscomprehension did exist to a small degree.

Given that causes of secondary dysmenorrhea requires a clinical diagnosis and possible laboratory or imaging investigations, it is acknowledged that there may have been participants who had unknown underlying pelvic pathology and therefore data may not accurately represent those suffering from PD exclusively.

Furthermore, this study had a minimum age requirement of 18 years old. This was chosen as it was likely most university students were over the age of 18, but it prevented younger students from participating. As it is evident in literature, PD equally affects both adult women and adolescents and, therefore, the age requirements limit the application of the study results to younger females with PD.

6.3 RECOMMENDATIONS

Given the high prevalence of MSK pain associated with PD among students at a university of technology, further studies with larger cohorts should be conducted among other populations to determine correlation or differences that may exist between this association. Additionally, future studies should include or focus on adolescents as there appears to be high prevalence of dysmenorrhea and associated complaints among a younger age group.

This study provided a quantitative analysis for MSK pain associated with PD. As it has become evident that participants experienced much negative impact from pain, a qualitative analysis is recommended to understand the lived experiences of females suffering with MSK pain and dysmenorrhea.

Furthermore, due to the significant impact detected across many domains of personal, social and academic life of participants, an in-depth study addressing impact may be beneficial. A quality of life study is also recommended to better understand the significance of musculoskeletal pain among students with PD.

Of all the MSK findings, low back pain appeared to be the most dominating complaint reported. From a South African public health perspective, the effects of low back pain in females suffering with PD

needs further investigation. Future studies exploring the role of healthcare in terms of treatment options for low back pain in this population should be emphasised.

Moreover, this study aimed to provide a broad understanding of MSK pain and demonstrated a high rate of self-reported menstrual-related headaches and myofascial involvement. As there is much complexity with regards to headaches, as well as expertise required to quantitatively assess myofascial trigger points, future studies should provide an in-depth quantitative analysis of headaches and expert myofascial assessment to gain insight into their implication in musculoskeletal pain.

6.4 CONCLUSION

This study was guided by its aims and objectives to explain and discuss the findings. A high point and period prevalence of musculoskeletal pain was found to be associated with primary dysmenorrhea among students at the Durban University of Technology.

Clinical characteristics of MSK pain showed that, on average, pain was rated as mostly moderate and lasted for only one to two days. Pain was also said to worsen preceding menstruation, as well as worsen during menstruation. The distribution of pain was seen globally in relation to anatomical regions, with the most affected region being the low back followed by the neck, hips and thighs, upper back and shoulders.

Although fewer reports were noted, pain was also present in the elbows, wrists, hands, ankles and feet. Additionally, a high prevalence of headaches was noted with about half of menstrual-related

headaches occurring with neck pain. Moreover, myofascial pain was highly prevalent, with the majority of complaints occurring in the low back and gluteal region and pelvic and abdominal region, with other anatomical regions implicated to a lesser degree.

Those who used a car or public transport as their primary mode of transportation were at an increased risk of MSK pain than those who walked. Students who reported menstrual flow to be moderate to heavy were also at increased risk for MSK pain.

Management approaches varied among participants with the most frequently used strategy being self-medication followed by home remedies. Numerous home remedies were reported, but the most commonly reported remedies included heat application followed by rest. Those participants who consulted a professional healthcare provider, mostly utilised the services of clinics, general practitioners and chiropractors. A range of other complementary and alternative medicine practitioners were also noted.

Additionally, this study revealed that those suffering with MSK pain experienced significant impact on the personal, social and academic domains of life and this contributed to about half of participants feeling a decline in their overall quality of life.

This study has made apparent the link between MSK pain and PD, highlighting its contribution to the chronic pain experience, as well as impacting physical and psychological health. Furthermore, this study has explained management options and proposes multidisciplinary holistic management as an appropriate approach towards optimal healthcare for females with PD.

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APPENDICES

Appendix A: Advertisement

Are you a female student
at DUT suffering from
painful periods?

Participate in a research study
today

Contact Heidi:

082 674 1445

Appendix B: Letter of Information – Main Study (English)



LETTER OF INFORMATION

Title of Research Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Principal Investigator / Researcher: Heidi Michaela Chapman (BTech: Chiropractic)

Supervisor: Dr A. Abdul-Rasheed (PhD: Health Sciences, MTech: Chiropractic)

Dear research participant

I am a 5th year student completing my research for my Master's degree in Chiropractic at DUT. I am very passionate about female health and furthering the knowledge in South Africa about problems affecting our women.

I would like to invite you to participate in my research. Your time is appreciated and will assist in providing valuable information regarding female health.

What is Research

Research is a systematic search for generalized new knowledge. Your participation will help us contribute to the knowledge that exists on the relationship between period pains and body aches. You are welcome to ask as many questions as you need, I am happy to explain more in detail. Otherwise, you are welcome to take this letter of information home to read through or discuss with a friend or family member. You are under no obligation to commit at this stage.

Outline of the Procedure

Primary dysmenorrhea, also known as very painful periods, is a very common condition that women suffer from. Body aches and pains are a common association with period pains but there is a lack of information on South African women and how they suffer with this. The aim of the study is to determine prevalence, risk factors, the impact and management of musculoskeletal pain associated with primary dysmenorrhea. Participants will be chosen at random and requested to fill out a

questionnaire on DUT campuses around Durban. The expected time to complete each questionnaire is approximately 10 minutes. You will be expected to complete and sign Informed Consent prior to receiving the questionnaire. Once the questionnaire is completed, the process is complete and you will not be contacted further. The number of participants needed in this study is 367 female students across the DUT campuses.

Risks or discomfort to the participant

There are no risks or risk of discomfort to you during this study.

Reason why you may be withdrawn from the study

If you are non-compliant and have not completed at least 80% of the questionnaire, you will be withdrawn from the study. As a voluntary participant in this research study, you are free to withdraw from the study at any given time without giving a reason for withdrawing and without consequence.

Benefits

Your contribution to this study by volunteering to partake will help Chiropractors to build on our knowledge of how musculoskeletal pain affects young women. This will benefit you as a patient, as we will be able to provide you with more effective healthcare in the future as a sufferer of primary dysmenorrhea. This study will give you a better understanding of the association between painful periods and musculoskeletal pain, the influence that it has on your daily living as well as the management plans which are most successful in providing pain relief.

Remuneration

You will not be receiving any monetary or other type of remuneration for participation in this study.

Cost of the study

You will not be expected to cover any costs towards the study.

Confidentiality

All patient information is confidential. You will not be expected to record any personal details that could identify you. The results of this study will be used for research purposes only. Only individuals that are directly involved in this study (Dr A Abdul-Rasheed (PhD: Health Sciences, MTech: Chiropractic) and myself) will be allowed to access these records.

Results

Once the information has been collected, the results from the study will be published in the dissertation section of the DUT Library which can be taken out through normal library protocol. There will also be an online copy available to you through the DUT online library system.

Research Related Injury

There is no risk or injury that you can sustain by participating in this study.

Storage of all electronic and hard copies

Once you complete the questionnaire, it will be placed into a sealed envelope which will remain sealed until all 367 required questionnaires have been completed. Hard copies will be stored in the Chiropractic Department and shredded after five years. All electronic data on a computer and external storage device, will be kept for five years after which it will be deleted.

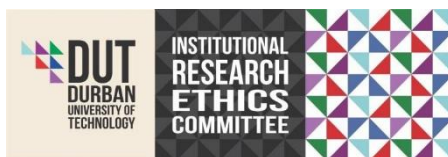
Persons to contact should you have any problems or questions

Should you wish to contact me, feel free to do so on 082 674 1445. Should you have any questions that you would prefer being answered by an independent individual, feel free to contact my supervisor on the following numbers Dr A. Abdul-Rasheed (Tel: (031) 3732102). Alternatively, the Institutional Research Ethics Administrator can be contacted on (031) 373 2375. Any complaints can be reported to the Director: Research and Postgraduate Support Dr L. Linganiso on 031 373 2577 or researchdirector@dut.ac.za.

Thank you for participating in my research study.

Heidi Chapman
(Research student)

Appendix C: Informed Consent – Main Study (English)



CONSENT

Full Title of the Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Names of Researcher/s: Heidi Michaela Chapman (BTech: Chiropractic)

Statement of Agreement to Participate in the Research Study:

I hereby confirm that I have been informed by the researcher, Heidi Michaela Chapman about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 022/21

I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.

I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.

In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.

I may, at any stage, without prejudice, withdraw my consent and participation in the study.

I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	Date	Time	Signature/Right Thumbprint

I, Heidi Michaela Chapman herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	Date	Signature

_____	_____	_____
Full Name of Witness (If applicable)	Date	Signature

_____	_____	_____
Full Name of Legal Guardian	Date	Signature

Appendix D: Letter of Information – Main Study (isiZulu)



INCWADI YOLWAZI

Siyakubingelela

Siyabonga ngokwamukela ukuba yingxenywe yalolucwaningo. Siyabonga nange sikhathi sakho esizosiza ngokuhlinzeka ngolwazi mayelana nempilo yabezifazane.

Isihloko socwaningo/ sopenyo: Uphenyo ngobudlange bezinhlungu eziyinhlanganisela yemisipha, amamasela kanye namathambo ezihambelana nesilumo ezibakhona uma owesifazane/ owesimame esesikhathini kubafundi base Nyuvesithi yoBuchwepheshe: ucwaningo oluchazayo

Umcwaniqi/ umphenyi omkhulu: UHeidi Michaela Chapman (i- BTech: yeKhayirophrakthikhi)

Umphathi/ umbhekeleli wocwaningo: UDkt. A Abdul-Rasheed (iPhD: Health Sciences, i-MTech: yeKhayirophrakthikhi)

Isingeniso kafushane kanye nenhloso yocwaningo/ yopenyo

Inhloso yalolu cwano ngokuthola ukwanda, izinkomba zobungozi, umthelela kanye nokwelashwa/ ukuphathwa kwezinhlungu eziyinhlanganisela yemisipha, amamasela kanye namathambo ezihambelana nesilumo ezibakhona uma owesifazane/ owesimame esesikhathini kubafundi besifazane base Nyuvesi.

Uhlaka lwenqubo yocwaningo/ yopenyo

Uzothola inhlomibuzo ozoyiphendula, kwizikhungo/ amakhampasi ase DUT azungeze iTheku. Ukuphendula le nhlomibuzo ngeke kuthathe isikhathi esingaphezu kwemizuzu eyi-10. Kulindelwe nokuthi ugcwalise futhi usayine Isivumelwano esicatshangisiwe (Isithasiselo C) ngaphambi kokuthola inhlomibuzo (Isithasiselo M).

Inzuzo

Igalelo lakho kulolu cwano ngokuzinikela ekuhlanganyeleni kuzosisiza thina amaKhayirophraktha ukuthi sakhe ulwazi lwethu mayelana nokuthi izinhlungu eziyinhlanganisela yemisipha, amamasela kanye namathambo zizithinta/ zizikhinyabeza kanjani izimpilo zabezifazane abasebancane. Lokhu kuzokusiza wena njengesiguli, ngoba sizokwazi ukukunikeza ukunakekelwa kwezempilo okanye ukwelashwa okusezingeni ngokuzayo njengomuntu ophethwe yisilumo ngenxa yokuba sesikhathini. Lolu phenyo luzokunikeza ukuqonda okubanzi futhi okungcono mayelana nobudlelwano phakathi kwesilumo/ ubuhlungu obubangelwa ukuba sesikhathini kanye nobuhlungu obuyinhlanganisela yemisipha, amamasela

kanye namathambo, kuphinde kube ithonya/ umthelela walezi zinhlungu empilweni yansuku zonke kanye nezindlela zokwelashwa ezisiza ekudambiseni izinhlungu.

Ubungozi noma ukuphazamiseka kukambamqhaza

Abukho ubungozi okanye ubungozi bokuphazamiseka obuphathelene nalolu phenyo.

Izizathu ezingenza ukuthi umbamqhaza ahoxiswe ekubambeni iqhaza kulolu phenyo

Uma ungathobeli umthetho okanye ungenzi lokho okufanele futhi ungaqedi okungenani ingxenye elinganiselwa kuma-80% yenhlokomibuzo, uzohoxiswa kulolu phenyo. Njengombamqhaza oyivolontiya kulolu phenyo, uvumelekile ukuhoxa ekubambeni iqhaza kulolu waning nanoma yingasiphi isikhathi osithandayo, ngaphandle kokuthi uze unikeze izizathu sokwenzenjalo kanti futhi angeke lokho kukufake enkingeni.

Umkomelo/ umholo

Angeke kube khona umholo okanye imali ozoyinikezwa ngokubamba kwakho iqhaza kulolu cwaningo.

Inani elikhokhwa umbamqhaza wocwaningo/ wophenyo

Ayikho imali ozoyikhokha ngokuhlanganyela okanye ngokubamba kwakho iqhaza kulolu cwaningo.

Ubumfihlo

Yonke imininingwane yeziguli izogcinwa iyimfihlo. Angeke kulindeleke ukuthi ubhale okanye ushicilele imininingwane yakho engase iveze ubuwena noma ukuthi ungubani. Imiphumela yalolu cwaningo izosetshenziselwa ucwaningo kuphela. Yilabo bantu kuphela abathintekayo ngqo okanye abayingxenye yalolu cwaningo (uDkt. A Abdul-Rasheed (i-MTech: yeKhayirophrakthikhi) kanye nami) abanegunya/ abavumelekile ukufinyelela kulawa marekhodi.

Abantu ongaxhumana nabo uma unemibuzo noma izinkinga

Uma unesifiso sokuxhumana nami, ukhululekile ukwenze njalo kule nombolo 082 674 1445. Uma unemibuzo ofisa/othanda ukuthi iphendulwe umuntu ozimele, zizwe ukhululekile ukuxhumana nomphathi wami kulezinombolo ezilandelayo uDkt. A Abdul-Rasheed ku (i- Tel: 031) 373 2102). Kanti futhi ungathintana noMlawuli wezimiso zokuhle kwezocwaningo weNyuvesithi yobuchwepheshe yaseThekwini ku (031) 373 2375. Uma ungagculisekile ngengxenye/ ngendawo ethize yalolu cwaningo, izinkonondo okanye izikhalazo zingabikwa ku- DVC: Wezocwaningo, Nokusungula kanye Nezokuxhumana Ezingeni eliphezulu uSolwazi L Linganiso kule nombolo 031 373 2577 noma researchdirector@dut.ac.za

Ngiyabonga ngokubamba kwakho iqhaza kulolu cwaningo.
UHeidi Chapman
(Umcwaningi/ umphenyi)

Appendix E: Informed Consent – Main Study (isiZulu)



IMVUME

- Isitatimende semvumelwano yokubamba iqhaza kucwaningo/ kuphenyo:
- Mina ngiyaqinisekisa ukuthi umcwaningi; uHeidi Michaela Chapman ungazisile ngenkambo, uhlobo, inzuzo kanye nobungozi balolu cwano- Inombolo yezimiso zokuhle yocwaningo: 022/21
- Ulwazi kanye nencazelo emayelana nalolu cwano ebhalwe lapha ngenhla (Incwadi Yolwazi kaMbambiqhaza) nayo ngiyitholile, ngayifunda futhi ngayiqondisisa.
- Ngियाqonda ukuthi imiphumela yocwaningo, okubala imininingwane yami yobulili, iminyaka, usuku lokuzalwa, ama-inishiyali nokuthi ngiphethwe yini kuzosetshenziswa ngokungaziwa/ ngobumfihlo ukuze kwenziwe umbiko wocwaningo.
- Ngokubona izidingo zocwaningo, mina ngiyavuma ukuthi imininingwane yami etholakale kulolu cwano isetshenziswe ngu mcwaningi ohlelweni lwekhompiyutha.
- Ngingakwazi, kunoma yisiphi isigaba, ukuthi ngihoxise imvume nokubamba kwami iqhaza kulolu cwano ngale kwengcindezi.
- Ngibe nethuba elanele lokubuza imibuzo futhi (ngokuzikhethela/ ngokuzithandela kwami) ngiyafunga ukuthi ngikulungele ukubamba iqhaza kulolu cwano.
- Ngियाqonda ukuthi lolu lwazi olusha, olubalulekile futhi oluthintana nokubamba kwami iqhaza ngenkathi kwenziwa lolu cwano ngizovumeleka ukulwazi.

_____	_____	_____
Igama eliphelele loMbambiqhaza	Usuku	Isikhathi
Isiginisha/Isithupha sakwisandla sokudla		

Mina, uHeidi Michaela Chapman, ngiyaqinisekisa ukuthi lo mbambiqhaza ongenhla uchazeliwe kabanzi ngohlobo, inkambo kanye nobungozi balolu cwano olungenhla.
Heidie

_____	_____	_____
Igama eliphelele loMcwaningi	Usuku	Isiginisha

_____	_____	_____
Igama eliphelele likaFakazi (Uma kufanelekile)	Usuku	Isiginisha

_____	_____	_____
Igama eliphelele loMnakekeli Osemthethweni (Uma kufanelekile)	Usuku	Isiginisha

Appendix F: Letter of Information – Focus Group



LETTER OF INFORMATION – FOCUS GROUP

Title of Research Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Principal Investigator / Researcher: Heidi Michaela Chapman (BTech: Chiropractic)

Supervisor: Dr A. Abdul-Rasheed (PhD: Health Sciences, MTech: Chiropractic)

Dear focus group participant

I am a 5th year student completing my research for my Master's degree in Chiropractic at DUT. I am very passionate about female health and furthering the knowledge in South Africa about problems affecting our women.

I would like to invite you to participate in the focus group for my research. Your participation will assist in ensuring the validity and reliability of the research. Your time is greatly appreciated. Please note you will not be allowed to participate in the main study if you agree to participate in the focus group.

What is Research

Research is a systematic search for generalized new knowledge. Your participation will help us contribute to the knowledge that exists on the relationship between period pains and body aches. You are welcome to ask as many questions as you need, I am happy to explain more in detail. Otherwise, you are welcome to take this letter of information home to read through or discuss with a friend or family member. You are under no obligation to commit at this stage.

Procedures

Primary dysmenorrhea, also known as very painful periods, is a very common condition that women suffer from. Body aches and pains are a common association with period pains but there is a lack of information on South African women and how they suffer with this. The aim of the study is to determine prevalence, risk factors, the impact and management of musculoskeletal pain associated with primary dysmenorrhea. You will be asked to read the Letter of Information, the Confidentiality agreement and Informed Consent. You will then be given an opportunity to ask any questions regarding the focus group procedure and have time to sign the Letter of Information and Informed Consent as well as which states that

you will keep confidential any discussion within and regarding the focus group. The focus group will then proceed with the discussion of the questionnaire. The researcher as the chair of the meeting will sequentially read the questions out aloud before the group is asked to discuss the relevance of the question to the aims and objectives of the study as well as then deciding whether the questions are understandable by the general female student body. Thereafter, the focus group may agree to, disagree with or be undecided about the inclusion of questions in the questionnaire. In order for the questions to be included or excluded, the group is required to be unanimous in their agreement to include or exclude questions. For those questions where there is indecision about the relevance or inclusion of the question, it may either need to reside to a simple vote with a majority or the question can be deferred for purposes of being reviewed by the researcher in the context of the literature available in the domain of primary dysmenorrhea and its musculoskeletal associations.

Risks or discomfort to the participant

There are no risks or risk of discomfort to you in this study

Reason why you may be withdrawn from the study

If you are non-compliant and have not completed at least 80% of the questionnaire, you will be withdrawn from the study. As a voluntary participant in this research study, you are free to withdraw from the study at any given time without giving a reason for withdrawing and without consequence.

Benefits

Your contribution to this study by volunteering to partake will help us Chiropractors to build on our knowledge of how musculoskeletal pain affects young women. This will benefit you as a patient, as we will be able to provide you with more effective health care in the future as a sufferer of primary dysmenorrhea. This study will give you a better understanding of the association between painful periods and musculoskeletal pain, the influence that it has on your daily living as well as the management plans which are most successful in providing pain relief.

Remuneration

You will not be receiving any monetary or other type of remuneration for participation in this study.

Cost of the study

You will not be expected to cover any costs towards the study.

Confidentiality

All patient information is confidential. You will not be expected to record any personal details that could identify you. The results of this study will be used for research purposes only. Only individuals that are directly involved in this study (Dr A Abdul-Rasheed (PhD: Health Sciences, MTech: Chiropractic) and myself) will be allowed to access these records.

Results

Once the information has been collected, the results from the study will be published in the dissertation section of the DUT Library which can be taken out through normal library protocol. There will also be an online copy available to you through the DUT online library system.

Research Related Injury

There is no risk or injury that you can sustain by participating in this study.

Storage of all electronic and hard copies

Feedback from this focus group may be in hardcopy or electronic form. Hard copies will be stored in the Chiropractic Department and shredded after five years. All electronic data on a computer and external storage device, will be kept for five years after which it will be deleted.

Persons to contact should you have any problems or questions

Should you wish to contact me, feel free to do so on 082 674 1445. Should you have any questions that you would prefer being answered by an independent individual, feel free to contact my supervisor on the following numbers Dr A. Abdul-Rasheed (Tel: (031) 3732102). Alternatively, the Institutional Research Ethics Administrator can be contacted on (031) 373 2375. Any complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.

Thank you for participating in my research study.

Heidi Chapman
(Research student)

Appendix G: Informed Consent – Focus Group



Full Title of the Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Names of Researcher/s: Heidi Michaela Chapman (BTech: Chiropractic)

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Heidi Michaela Chapman about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 022/21
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	Date	Time	Signature/Right Thumbprint

I, Heidi Michaela Chapman herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher	Date	Signature

Full Name of Witness (If applicable)	Date	Signature

Full Name of Legal Guardian (If applicable)	Date	Signature

Appendix H: Confidentiality Agreement – Focus Group

IMPORTANT NOTICE: This form is to be read and filled in by every member participating in the focus group, before the focus group meeting convenes.

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Focus group

1. All information contained in the research documents and any information discussed during the focus group meeting must be kept private and confidential. This is especially binding to any information that may identify any of the participants in the expert group.
2. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
3. The information from this focus group will be made public in terms of a dissertation/thesis and/or journal publication, which will in no way identify any of the participants involved in this focus group.
4. The returned questionnaires will be coded and kept anonymous in the research process.
5. The focus group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.
6. All data generated from this expert group (including the recording) will be kept for five years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Please print in block letters:

Focus Group Member: _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's Name: _____ Signature: _____

Appendix I: Letter of Information – Pilot Study



Title of Research Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Principal Investigator / Researcher: Heidi Michaela Chapman (BTech: Chiropractic)

Supervisor: Dr A Abdul-Rasheed (PhD: Health Sciences, MTech: Chiropractic)

Dear pilot study participant

I am a 5th year student completing my research for my Master's degree in Chiropractic at DUT. I am very passionate about female health and furthering the knowledge in South Africa about problems affecting our women.

I would like to invite you to participate in my research in this pilot study. Your participation will assist in ensuring the validity and reliability of the research and will assist in providing valuable information regarding female health. Your time is greatly appreciated. Please note that by agreeing to participate in the pilot study, you will not be allowed to participate in the main study.

What is Research

Research is a systematic search for generalized new knowledge. Your participation will help us contribute to the knowledge that exists on the relationship between period pains and body aches. You are welcome to ask as many questions as you need, I am happy to explain more in detail. Otherwise, you are welcome to take this letter of information home to read through or discuss with a friend or family member. You are under no obligation to commit at this stage.

Outline of the Procedure

Primary dysmenorrhea, also known as very painful periods, is a very common condition that women suffer from. Body aches and pains are a common association with period pains but there is a lack of information on South African women and how they suffer with this. The aim of the study is to determine prevalence, risk factors, the impact and management of musculoskeletal pain associated with primary dysmenorrhea. The participants will be required to read and complete the Letter of Information and Informed Consent. Thereafter the participant will be required to complete the questionnaire (post-focus group). The participant will then be required to complete a questionnaire feedback form in order to identify any problems with the questionnaire.

Risks or discomfort to the participant

There are no risks or risk of discomfort to you during this study.

Reason why you may be withdrawn from the study

If you are non-compliant and have not completed at least 80% of the questionnaire, you will be withdrawn from the study. As a voluntary participant in this research study, you are free to withdraw from the study at any given time without giving a reason for withdrawing and without consequence.

Benefits

Your contribution to this study by volunteering to partake will help Chiropractors to build on our knowledge of how musculoskeletal pain affects young women. This will benefit you as a patient, as we will be able to provide you with more effective healthcare in the future as a sufferer of primary dysmenorrhea. This study will give you a better understanding of the association between painful periods and musculoskeletal pain, the influence that it has on your daily living as well as the management plans which are most successful in providing pain relief.

Remuneration

You will not be receiving any monetary or other type of remuneration for participation in this study.

Cost of the study

You will not be expected to cover any costs towards the study.

Confidentiality

All patient information is confidential. You will not be expected to record any personal details that could identify you. The results of this study will be used for research purposes only. Only individuals that are directly involved in this study (Dr A Abdul-Rasheed (PhD: Health Sciences, MTEch: Chiropractic) and myself) will be allowed to access these records.

Results

Once the information has been collected, the results from the study will be published in the dissertation section of the DUT Library which can be taken out through normal library protocol. There will also be an online copy available to you through the DUT online library system.

Research Related Injury

There is no risk or injury that you can sustain by participating in this study.

Storage of all electronic and hard copies

Once you complete the questionnaire and feedback form, it will be placed into a sealed envelope until all pilot study data has been collected. Hard copies will be stored in the Chiropractic Department and shredded after five years. All electronic data on a computer and external storage device, will be kept for five years after which it will be deleted.

Persons to contact should you have any problems or questions

Should you wish to contact me, feel free to do so on 082 674 1445. Should you have any questions that you would prefer being answered by an independent individual, feel free to contact my supervisor on the following numbers Dr A. Abdul-Rasheed (Tel: (031) 3732102). Alternatively, the Institutional Research Ethics Administrator can be contacted on (031) 373 2375. Any complaints can be reported to the Director: Research and Postgraduate Support Dr L Langaniso on 031 373 2577 or researchdirector@dut.ac.za. Thank you for participating in my research study.

Heidi Chapman
(Research student)

Appendix J: Informed Consent – Pilot Study



CONSENT – PILOT STUDY

Full Title of the Study: An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study

Names of Researcher/s: Heidi Michaela Chapman (BTech: Chiropractic)

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Heidi Michaela Chapman about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 022/21
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	Date	Time	Signature/Right Thumbprint
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I, Heidi Michaela Chapman herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher	Date	Signature
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Full Name of Witness (If applicable)	Date	Signature
--------------------------------------	------	-----------

Full Name of Legal Guardian (If applicable)	Date	Signature
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Appendix K: Feedback Form – Pilot Study

Pilot Group Feedback Form

Please provide any feedback you feel is relevant regarding the sections of the questionnaire in the appropriate boxes below:

SECTION	FEEDBACK	
SECTION A	1. Demographics	
	2. Menstrual history	
SECTION B	3. Risk factors	
SECTION C	4. Musculoskeletal pain	
SECTION D	5. Influence on personal life	
	6. Influence on social life	
	7. Influence on academics	
SECTION E	8. Management	

Appendix L: Survey – Main Study

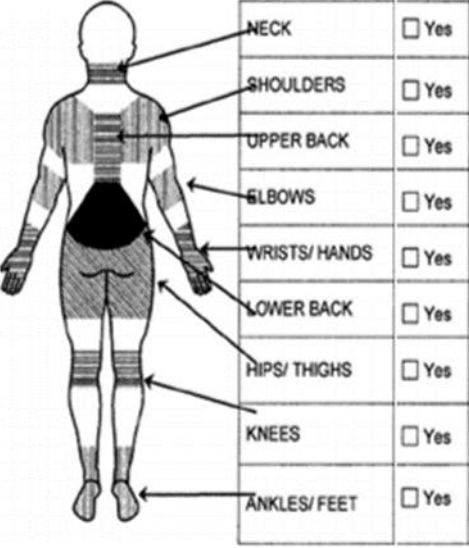
SECTION A

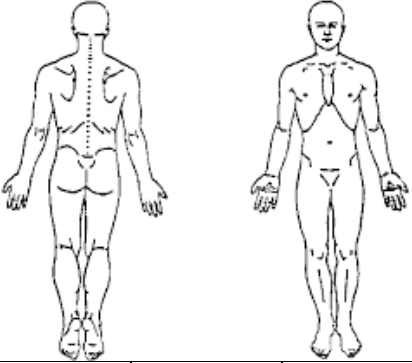
1. Demographics (please tick where relevant)						
1.1 Age	18 – 20	21 – 23	24 – 26	27 - 30		
1.2 Race	Black	Coloured	Indian	White	Other	
1.3 Faculty of study	Accounting and Informatics	Applied Sciences	Art and Design	Engineering and the Built Environment	Health Sciences	Management Sciences

2. Menstrual History					
2.1 At what age did you get your first period?	Younger than 10	10 – 12	13 – 14	15 – 16	Older than 16
2.1 Are your periods:	Regular	Irregular		I'm not sure	
2.3 How long do your periods last:	1 – 2 days	3 – 5 days	6 – 7 days	8 – 9 days	10 or more days
2.4 How would you describe your menstrual flow?	Very light	Light to moderate	Moderate	Moderate to heavy	Very heavy
2.5 Do you suffer from painful periods?	Yes		No <i>If no please proceed to the end of survey</i>		
2.6 How long does your pain last?	1 day	2 days	3 days	More than 3 days	
2.7 How painful are your periods on average?	Very mild	Mild	Moderate	Severe	Very severe
2.8 Have you ever been diagnosed with one of the following conditions?	Secondary dysmenorrhea		Adenomyosis		fibroids
	Endometriosis		Pelvic inflammatory disease		Congenital uterine or vaginal conditions
	<i>If you ticked any of the conditions in 2.8, please proceed to the end of this survey. If you do not have any of these conditions, please proceed to section B.</i>				

SECTION B

3. Musculoskeletal Pain			
<i>Musculoskeletal pain means pain (“body aches”) that you may experience in your joints, bones, muscles, tendons or ligaments (eg: back pain, foot pain, muscle cramps, stiff joints etc)</i>			
3.1 Have you ever experienced musculoskeletal pain during your period?	Yes	No	I'm not sure

		<i>If no, please proceed to end</i>		
3.2 Have you experience musculoskeletal pain during your period in the past 12 months?	Yes	No		I'm not sure
3.3 Did you experience musculoskeletal pain during your most recent period?	Yes	No		I'm not sure
3.4 How many days do you experience musculoskeletal pain during your period?	1 – 2 days	3 – 5 days	6 – 8 days	I have musculoskeletal pain during my entire period
3.5 What happens to your musculoskeletal pain just before your period?	It gets better	It gets worse	It stays the same	I'm not sure
3.6 What happens to your musculoskeletal pain during your period?	It gets better	It gets worse	It stays the same	I'm not sure
3.7 Please tick yes if you have experienced pain in the following regions:				
				
3.8 Do you experience headaches on your period?	Yes	No	I'm not sure	
3.9 If you ticked yes to 3.8, do these headaches occur with neck pain?	Yes	No	I'm not sure	
3.10 Do you experience muscle cramps or spasms on your period?	Yes	No	I'm not sure	
3.11 If yes to 3.10, please circle on the diagram where you feel these muscle cramps or spasms:				

					
3.12 Overall, how severe is your musculoskeletal pain on your period?	Very mild	Mild	Moderate	Severe	Very severe

SECTION C

4. Risk factors					
4.1 Do you smoke?	Yes		No		In the past
4.2 Do you use oral contraceptives (“the pill”)?	Yes		No		
4.3 If yes to 4.2 please state a reason:	Contraception	Acne control	Period regulation		Other (state):
4.5 If you to 4.2 does using an oral contraceptive increase or decrease your musculoskeletal pain?	Increases pain		Decreases pain		I’m not s
4.6 What is your mode of transport to campus?	Car	Taxi or bus		Scooter or motorbike	Walk
4.7 How far do you live from campus to campus	1 – 10km		10 – 30km	More than 30km	
4.8 What is your physical activity level?	Little to none		Low		Moderate
4.9 How many hours do you sit for on an average day?	Less than 3 hours		3 to 6 hours		More than 6 hours
4.10 have you ever had a serious injury to any part of your body? (for example, a car accident, broken bone, stab wound etc)				Yes	No
4.11 do you have access to healthcare when you are in pain?	Yes		No		
4.12 If yes to 4.11, please tick the place/s you receive healthcare:	Clinic	Public hospital	Private healthcare		Other
4.13 Where is your primary residence?	Township	Suburb	City	I’d rather not say	

SECTION D

5. Influence on personal life

Does your musculoskeletal pain:

5.1 Affect your ability to sleep / disrupt sleeping patterns	Yes	No	Neutral
5.2 Alter your mood negatively	Yes	No	Neutral
5.3 Increase your stress levels	Yes	No	Neutral
5.4 Affect your interest in hobbies	Yes	No	Neutral
5.5 Affect your ability to perform daily activities	Yes	No	Neutral
5.6 Affect your ability to exercise	Yes	No	Neutral
5.7 affect your overall wellbeing and quality of life	Yes	No	Neutral

6. Influence of social life

Does your musculoskeletal pain:

6.1 Affect your desire to socialise	Yes	No	Neutral
6.2 Impact negatively on your relationships with family and friends	Yes	No	Neutral
6.3 Cause you to avoid social situations	Yes	No	Neutral

7. Influence on academics

Does your musculoskeletal pain:

7.1 Affect your ability to concentrate	Yes	No	Neutral
7.2 Affect your ability to attend lectures	Yes	No	Neutral
7.3 Affect your ability to study	Yes	No	Neutral
7.4 Affect your ability to write tests and exams	Yes	No	Neutral
7.5 Affect your academic performance negatively	Yes	No	Neutral
7.6 Affect your ability to complete academic tasks	Yes	No	Neutral

SECTION E

8. Management

When you experience musculoskeletal pain, you tend to:

8.1 Mostly ignore the pain	Yes	No	Sometimes
8.2 Practice self-medication (take medication on your own)	Yes	No	Sometimes
8.3 Engage in physical activity	Yes	No	Sometimes
8.4 Practice home remedies to relieve pain (examples: rest, heat or ice, herbs etc)	Yes If yes, please state what remedies you do:		No

8.5 Consult one of the following healthcare provider/s (you may tick multiple options):	Clinic	General practitioner (GP / family doctor)	Acupuncturist	Chiropractor
	Traditional African Healer	Homeopath	Physiotherapist	Ayurvedic doctor
	Other (please state):			

This is the end of the questionnaire.

Thank you so much for your participation.

Appendix M: Study Adaption Permission

Permission to utilize research

4 messages

Heidi Chapman <heidichapman.hc@gmail.com>

7 March 2020 at
20:16

To: paananma@mail.student oulu.fi, markus.paananen@oulu.fi

Good Day

I am conducting my Master's research on the epidemiology of musculoskeletal pain associated with primary dysmenorrhea among female university students in South Africa.

I have referenced your study "Risk factors for persistence of multiple musculoskeletal pains in adolescent: A 2 year follow-up study". I would like to request permission to adapt your research in the development of my self-administered questionnaire.

Please advise if this permission is granted. If you require more information please let me know.

Thank you
Heidi Chapman

Markus Paananen <Markus.Paananen@oulu.fi>

8 March 2020 at 17:21

To: Heidi Chapman <heidichapman.hc@gmail.com>

Hi Heidi,

Thank you for contacting me!

Could you please specify how you are going to utilize the study?

Bw, Markus Paananen
[Quoted text hidden]

Heidi Chapman <heidichapman.hc@gmail.com>

12 March 2020 at
08:48

To: Markus Paananen <Markus.Paananen@oulu.fi>

Good morning Markus

I would like to adapt your risk factors found in adolescent females (internalizing problems, high physical activity, short sleep time and smoking) in my questionnaire. There is little literature on risk factors that specifically addresses musculoskeletal pain in primary dysmenorrhea. As this condition primarily affects adolescent females and young women, I believe the risk factors

found in your study may be applicable in the context of primary dysmenorrhea as well.

Regards
Heidi Chapman
[Quoted text hidden]

Markus Paananen <Markus.Paananen@oulu.fi>

14 March 2020 at
19:27

To: Heidi Chapman <heidichapman.hc@gmail.com>

Hi Heidi,

It's really ok that you use the findings of my study in this way.

Good luck for research!

Bw, Markus

Lähetäjä: Heidi Chapman <heidichapman.hc@gmail.com>
Lähetetty: torstai 12. maaliskuuta 2020 8.48
Vastaanottaja: Markus Paananen <Markus.Paananen@oulu.fi>
Aihe: Re: Permission to utilize research

Permission to utilize research

2 messages

Heidi Chapman <heidichapman.hc@gmail.com>

1 March 2020 at
10:07

To: kleonid@bgu.ac.il

Good Day

I am conducting my Master's research on the prevalence, influence and management of musculoskeletal pain associated with primary dysmenorrhea in South African University students.

I have referenced your study extensively thus far in my research I would like to obtain permission to utilize your study, The prevalence of primary dysmenorrhea among students and its association with musculoskeletal and myofascial pain. I would like to adapt your questionnaire to use in the data collection process of my study which will be a self-administered questionnaire.

Please advise if this permission is granted. Feel free to contact me if any additional information is required.

Thank you
Heidi Chapman

Leonid Kalichman <kleonid@bgu.ac.il>

1 March 2020 at
11:22

To: Heidi Chapman <heidichapman.hc@gmail.com>

Dear Heidi

Please feel free to use any part of this study for your research

Good luck

Leonid

Dr. Leonid Kalichman Associate professor
Director of Musculoskeletal Clinical Research Unit
Head of Department of Physical Therapy
Recanati School for Community Health Professions
Faculty of Health Sciences
Ben-Gurion University of the Negev

P.O.B. 653 Beer-Sheva 84105, Israel

[972-52-2767050+](tel:972-52-2767050) :Phone

kleonid@bgu.ac.il :e-mail

Permission to utilize research

2 messages

Heidi Chapman <heidichapman.hc@gmail.com>

1 March 2020 at
10:22

To: lazroy@live.cn

Good Day Aizhong Liu

I am conducting my Master's research on the prevalence, influence and management of musculoskeletal pain associated with primary dysmenorrhea in South African University students.

I have referenced your study extensively thus far in my research and would like to obtain permission to utilize your study, Prevalence and Predictors of Dysmenorrhea, Its Effects, and coping mechanisms among Adolescents in Shai Osudoku District, Ghana. I would like to adapt your questionnaire to use in the data collection process of my study which will be a self-administered questionnaire.

Please advise if this permission is granted. Feel free to contact me should any additional information be required.

Thank you

Heidi Chapman

Liu Roy <lazroy@live.cn>

2 March 2020 at 04:50

To: Heidi Chapman <heidichapman.hc@gmail.com>

OK, no problem

Appendix N: Gatekeeper Permission



*Directorate for Research and Postgraduate
Support
Durban University of Technology Tromso
Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7 Fax: 031-3732946*

16th March 2021

Ms Heidi M Chapman

c/o Department of Chiropractic and Somatology Faculty of Health Sciences
Durban University of Technology

Dear Ms Chapman

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Gatekeeper Permission** for you to conduct your research “An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study” at the Durban University of Technology. **Kindly note that this letter must be issued to the IREC for approval before you commence data collection.**

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

Appendix O: Institutional Research Ethics Committee Clearance



Institutional Research Ethics Committee Research and Postgraduate Support Directorate 2nd Floor, Berwyn Court Gate 1, Steve Biko Campus Durban University of Technology

P O Box 1334, Durban, South Africa, 4001 Tel: 031 373 2375
Email: lavishad@dut.ac.za

http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

5 May 2021

Ms H M Chapman 12 Mathias Place Durban North 4051

Dear Ms Chapman

An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study
Ethical Clearance number IREC 022/21

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that **FULL APPROVAL** is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Prof J K Adam
Chairperson: IREC

Appendix P: Editor's Certificate



Helen Bond

IMPELA EDITING SERVICES

impelaediting@gmail.com

079 395 5873

28 April 2022

CERTIFICATE

Heidi Chapman

heidichapman.hc@gmail.com

Dear Heidi

Thank you for using Impela Editing Services to edit your Master's dissertation entitled "An investigation into musculoskeletal pain associated with primary dysmenorrhea in students at a University of Technology: A descriptive study".

I have proofread for errors of grammar, punctuation, spelling, syntax and typing mistakes. I have formatted your work and checked the references (this means checking the formatting). I believe your work to be error free.

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Appendix Q: Plagiarism Report

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