

An epidemiological investigation into low back pain in schoolteachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

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I, Imé Mari Prinsloo, declare that this dissertation is representative of my own work in both conception and execution and that the use of work by others has been duly acknowledged in the text.

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DEDICATION

I dedicate this thesis to my grandmother, Mart Prinsloo, who passed away in my second year.

I am following my dream, Ouma!

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“Fear not, for I am with you; do not be dismayed, for I am your God. I will strengthen you and help you:
I will uphold you with my righteous right hand.” – Isaiah 41:10

Firstly, I would like to thank my heavenly Father for the ability and dream He placed on my heart. The never-ending guidance, mercy, and unconditional love.

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ABSTRACT

Background: Low back pain (LBP) is a common and significant disease found in the entire population but increased among the working population. Studies have shown that prevalence among LBP in schoolteachers are increased, yet there has been limited studies looking at urban and rural schoolteachers simultaneously.

Objectives: To determine the incidence and lifetime prevalence of low back pain among schoolteachers within the Greater Tzaneen Municipality, South Africa; to determine the risk factors (in terms of demographics, lifestyle, and occupational factors) of developing LBP; and to determine the management strategies sufferers of LBP use to get relief.

Methods: This was a quantitative, descriptive, cross-sectional study conducted within schools of the Greater Tzaneen Municipality. Teachers working in both the urban and rural school setting were approached to partake in the study. Those who met the criteria were invited to complete the self-administered questionnaires, online or hard copies. In total 345 questionnaires were completed.

Results: Of the 345 completed questionnaires 67% reported having LBP. Significant associations were made between the prevalence of LBP and increased mental stress (51.5%). Similarly, LBP sufferers had a higher BMI ($p=.010$); have been teaching for longer, ($p=.049$); and spend more time working at a computer, $p<.001$. Aggravating factors of LBP included bending/twisting the body, lack of sleep, reaching overhead, sitting, standing, and stress/tension. The strongest corresponding factor being stress and tension ($p<.001$).

Conclusion: In this specific community there was no significant difference in prevalence of LBP between urban and rural schoolteacher. Notwithstanding previous research, this study highlights that global statistics is not always appropriate in South African context. This draws attention to the need for research specifically based on our diverse country.

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DEFINITIONS

Biopsychosocial model: an approach that considers the interaction of biological, psychological, and social factors on their health, illness, and health care delivery. It assumes that a patient might potentially be ill without underlying pathology (Wade and Halligan 2017).

Chronic low back pain: low back pain lasting longer than three months is no longer only a symptom, but a disease that has different onset factors and continues to progress (Li *et al.* 2021).

Degeneration: was described as the loss of signal intensity, which is a change of the spinal cord reflecting pathology, and/or decrease in disc height, solely or in combination with other magnetic resonance imaging (MRI) findings (Line *et al.* 2020).

Full-time teacher: someone who is employed for at least 90% of the working hours over a school year (Anon 2002).

Low back pain: pain or discomfort localised below the costal margin and above the inferior gluteal folds, with or without leg pain (Das and Venkatesan 2020).

Mechanical causes: refer to the effect of abnormal stress and/or strain on muscles of the backbone. This includes poor posture, poorly designed ergonomics, and incorrect bending/lifting motions (Ahmed *et al.* 2020).

Pathological causes: components in the low back including the intervertebral discs, muscles, fascia, facet joints, sacroiliac joints, pubic symphysis, ligaments, and joint capsule contain nociceptors. Tissue degeneration of these structures activate massive inflammatory response which stimulate nociceptive receptors to produce inflammatory substances. In turn this directly damages the nerve root, and generates pain (Li *et al.* 2021).

ABBREVIATIONS

GTM – Greater Tzaneen Municipality

IREC – Institutional Research Ethics Committee

LBP – Low back pain

MSD – Musculoskeletal disorders

MSK – Musculoskeletal

POR – prevalence odds ratio

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Low back pain (LBP) is defined as pain located between the lower costal margin and buttock crease (Doualla *et al.* 2019). The Global Burden of Disease Study 2015 found that low back pain is within the top ten (10) causes of years lived with disability (YLDs) both globally and in South Africa (Vos *et al.* 2016).

According to Hurwitz *et al.* (2018) 21% of the general population have LBP, but 52% of the working population suffer from LBP. Poor general health, physical stress like: prolonged driving and awkward body postures are physical risk factors commonly associated with LBP along with psychological stressors like anxiety and depression (Parreira *et al.* 2018). There are various causes of LBP, Das and Venkatesan (2020) reported that mechanical LBP was one of the most common causes. Teachers are exposed to all the above-mentioned factors, which put them at a high risk of LBP.

A study done in Ethiopia showed a one-year prevalence of 74.8% (n=611) in LBP among primary school teachers due to factors such as prolonged standing during lessons, irregular physical activity, and sleep disturbances (Kebede *et al.* 2019). A one-week prevalence of LBP was found to be 16% (n=250) in urban schoolteachers versus 18.6% (n=347) in rural schoolteachers in Bolivia (Solis-Soto *et al.* 2017). Researchers found the one-year prevalence of low back pain in primary school teachers in the eThekweni Municipality, an urban population in South Africa, to be 68.0% (n=97) (Eggers, Pillay and Govender 2018).

1.2 STUDY RATIONALE AND SIGNIFICANCE

Musculoskeletal disorders (MSD) are injuries to a person's bones, joints, cartilage, intervertebral discs, muscles, ligaments, tendons, or nerves compromising normal function including blood flow to the structures (da Costa and Vieira 2010; Erick and Smith 2015). LBP is a subtype of MSD as it is caused by abnormalities in the previously mentioned structures, but specifically structures in the low back region (Hartvigsen *et al.* 2018). Hartvigsen *et al.* (2018) also mentioned that LBP is a common symptom occurring in all ages and levels of income.

The burden of LBP on its sufferers includes mental implications such as depression and anxiety, leading to indirect financial implications, increased visits to physicians and early retirement (Gouveia *et al.* 2016). Arvidsson *et al.* (2016) concluded that different occupations have different effects on the health of its occupants, this includes musculoskeletal injuries such as LBP. LBP is found in many occupations, but is also frequently found in teachers due to their everyday activities such as heavy load lifting, improper

and prolonged sitting positions, increased workload causing poor mental status and anxiety levels (Abdulmonem *et al.* 2014).

A study done on primary school teachers in the eThekweni Municipality, considered to be an urban setting, found that there is a strong association between LBP and extended periods of flexion and extension of the spine as well as carrying heavy loads (Eggers, Pillay and Govender 2018). Illustrating that South African teachers aren't excluded from the international concern of prevalence of LBP.

A study (Solis-Soto *et al.* 2017), in Bolivia found that rural schoolteachers are at greater risk of developing work-limiting pain as they face greater challenges in their working environment (Solis-Soto *et al.* 2017). These working environmental challenges include lack of adequate resources and equipment, poor community involvement, social and geographic isolation that also leads to limited work opportunities and lack in attracting and retaining competent teachers (Solis-Soto *et al.* 2019). Factors like low social support and job satisfaction could increase rural schoolteachers' chances of developing MSD (Solis-Soto *et al.* 2017).

Abdul Samad *et al.* (2010) found that urban schoolteachers in Klang Valley, Malaysia, had a higher prevalence of LBP. In Malaysia, the urban schools had more pupils than those in the rural schools, this is contrary to South African schools as the larger class sizes are found in the rural schools rather than the urban schools (Zenda 2020). Presenting a paucity in research as the previous study done on South African teachers was based on an urban population and not enough literature explores the rural schoolteachers population (Eggers, Pillay and Govender 2018; Solis-Soto *et al.* 2019).

The Greater Tzaneen Municipality (GTM) face different challenges and socioeconomic factors as it may be similar to certain aspects of the rural community, Solis-Soto *et al.* (2017) alluded to, which is different from Abdul Samad *et al.* (2010). Therefore, the GTM may be different to other populations which potentially affect the epidemiology of LBP in this specific region.

The GTM consists of a town with rural establishments surrounding it and falls under a rural agricultural community with plans to develop 100,000 jobs by 2030. This will have a significant impact on the economy and educational sectors within the community (Consultancy 2017). The educational sector will see an influx of pupils, thus more learners in schools, increased demand for teachers, larger or more classrooms. This would lead to increased demands on teachers, such as increased workload, increased stress and longer working hours leading to less personal time and time to recover which, may perpetuate risk factors that lead to LBP.

Determining the risk factors of low back pain in those schoolteachers may lead to improved prevention strategies implemented by the government and schools which would potentially decrease the amount of work absenteeism (Mody and Brooks 2012).

Knowing the epidemiology of LBP within this community will assist healthcare providers, such as chiropractors, gain knowledge and training specifically for this and similar communities. For example, a rehabilitation program to retrain kinematic chains and strengthen muscles will look different for an

individual that lives in a township, which may have limited resources, in comparison to an individual who has access to a fully equipped gym. Healthcare providers will also be able to advise patients on home and occupational ergonomics taking the patient's lifestyle and available resources into consideration (Chiang *et al.* 2019).

According to Pincus *et al.* (2013) there is evidence of each of the three aspects of the Biopsychosocial Model in low back pain research, but there is a paucity in research that includes effect of the entire model on the prevalence of LBP. This study intended to see the effect of all three: biological, psychological, and social aspects on the prevalence LBP in teachers in the chosen community.

Furthermore, knowing the prevalence, incidence, and management of LBP in this community would highlight the need for research surrounding correct treatment of LBP, prevention of LBP, bettering work-related ergonomics and educating teachers on the implications of LBP which will in turn alleviate the burden of LBP. This aims to increase the understanding of LBP in South African rural based teachers and the challenges they face.

This study was a quantitative, descriptive, cross-sectional study conducted within schools of the Greater Tzaneen Municipality. Three hundred and sixty-two teachers working in both the urban and rural school setting were approached to partake in the study. Once all permissions were granted from relative stakeholders (Department of Education, principals, and participants), data collection took place by means of a self-administered questionnaire.

Descriptive analyses were performed to present all categorical variables using text, frequency tables and graphs where appropriate. Inferential analyses were used to investigate trends in the data. The data was analysed with Statistical Package for the Social Sciences (IBM® SPSS® Statistics) Version 26 software. A p-value of <0.05 was considered as statistically significant.

1.3 AIMS AND OBJECTIVE

1.3.1 Aim

The aim of this study was to investigate the incidence, prevalence, risk factors and self-management of low back pain amongst schoolteachers within the Greater Tzaneen Municipality.

1.3.2 Objectives

1. Determine the incidence of low back pain among schoolteachers within the Greater Tzaneen Municipality, in Limpopo, South Africa
2. Determine the lifetime prevalence period of low back pain amongst schoolteachers within the Greater Tzaneen Municipality, in Limpopo, South Africa.
3. Determine the risk factors (in terms of demographics, lifestyle, and occupational factors) of low back pain amongst schoolteachers within the Greater Tzaneen Municipality, in Limpopo, South Africa.
4. Determine the management strategies sufferers of LBP use to get relief.

1.4 HYPOTHESIS

Null hypothesis 1: There is no difference between the association in prevalence of low back pain to selected risk factors of urban and rural schoolteachers.

Null hypothesis 2: There is no difference between the risk factors predisposing schoolteachers to low back pain between urban and rural schoolteachers.

1.5 POTENTIAL LIMITATIONS OF THE STUDY

A cross-sectional study is where data is collected at one point in time and the eventuality of bias is high (Setia 2016; Vaghela and Parekh 2017: 199). In this particular study, recall bias plays a significant role and possibly proves difficult to derive casual relationships as Setia (2016) mentions commonly occurs with cross-sectional studies.

Notable limitations that are that the results depend on the participant's measure of understanding and feeling while completing the questionnaire (Vaghela and Parekh 2017: 199).

1.6 OUTLINE OF CHAPTERS

Chapter 1 is the introduction to the research; it outlines the aims and objectives as well as the rationale for the study, hypothesis, and potential limitations.

Chapter 2 discusses a review of the literature pertinent to the topic, indicating the gap in literature in the specific field of research.

Chapter 3 outlines the methodology and materials implemented in the approach of the study, including the data analysis.

Chapter 4 portrays the results derived from the analysed data.

Chapter 5 serves as the interpretation and discussion of results.

Chapter 6 draw conclusions and provide future recommendations.

The reference list provides all the academic resources used for this study.

The appendences include all the permission letters, consent forms, information letters and all additional material used for this study.

CHAPTER 2: LITERATURE REVIEW

2.1 LOW BACK PAIN

Low back pain (LBP) is defined as pain located between the lower costal margin and buttock crease and is currently considered as the number one cause of disability worldwide (Hartvigsen *et al.* 2018; Doualla *et al.* 2019). Identifying the source of LBP has proven difficult, but when certain structures are stimulated it can produce pain due to the complex nerve innervation (Vlaeyen *et al.* 2018). The effect of LBP affects a person's everyday life, as well as performance at work and socially due to the limitations caused by the pain (Hartvigsen *et al.* 2018). Bansal *et al.* (2020) reported that the prevalence of LBP significantly negatively affected 24% of their participants' sleep, mental health problems (24%), and 28% reported their social life being negatively affected due to the LBP (n=1531).

Vlaeyen *et al.* (2018) stated that almost everyone will experience an episode of acute LBP in their lifetime. Hurwitz *et al.* (2018) concluded that according to their systematic review LBP is more prevalent among females and older people, and that factors such as regular alcohol consumption, lower levels of education and psychological factors such as stress and depression, are associated with the higher prevalence of low back pain.

The impact that LBP has on the economy can be compared to diseases like cancer, cardiovascular diseases, and autoimmune diseases among others, which can explain why LBP places a greater burden on the medical and social systems of low and middle-income countries (Vos *et al.* 2016; Hartvigsen *et al.* 2018). A study done by Davis and Kotowski (2015), reported in the US, *The National Injury*, that the cost for nurses and nurse aides' LBP amounted to \$1,6 billion in 2013. A study in Japan revealed the estimated economic impact of chronic LBP on their society amounted to roughly ¥1.2 trillion (\$10 billion and €8.3 billion) yearly in lost productivity when the study was done (Montgomery *et al.* 2017).

Andersen, Haahr and Frost (2007) found in their two-year prospective study that only 7,7% (n=4006) of the working population reported no pain in any region. Therefore, obtaining the data from this study is important not only to the health care profession, but also the economic industry as it affects the entire population.

2.1.1 Incidence and prevalence of low back pain

The following studies have looked at the prevalence and incidence of LBP based on age ranges, availability of studies, different socio-economic status, and occupations within various countries. The overall prevalence of LBP found in a systematic review was 21% (95% CI 15-27%) in the general population and higher in the elderly population [28% (95% CI 16-42%)] however in the working

population LBP was the highest [52% (95% CI 26-77%)] (Hurwitz *et al.* 2018). Notwithstanding previous mentioned research, Schwertner *et al.* (2020) found a lifetime prevalence of LBP in youngsters from Brazil, between 15 and 18 years of age, of 77% (n=330), showing that LBP does not discriminate against age.

One of the most recent systematic reviews (Morris *et al.* 2018) investigating the prevalence of LBP in the African population found that the lifetime, 1-year, and point prevalence of LBP among the African population was considerably higher than or similar to LBP prevalence estimates reported globally. Hurwitz *et al.* (2018) mentions the limitation of research studies looking at prevalence specifically, among other aspects such as low-quality studies and lack of prospective designs. Punnett *et al.* (2005) mentioned that the variation in defining LBP would affect the prevalence, as it would dictate what would be included or excluded.

Some literature has explored the differences in prevalence of LBP in different socio-economic groups and developed versus developing countries. The prevalence odds ratios (POR) is a statistic calculation of the odds of prevalence in a specific group compared to the odds of prevalence in another group (Hazra and Gogtay 2017). The POR were higher in developing countries in comparison to developed countries, (Punnett *et al.* 2005), indicating that LBP prevalence may depend on the study population. Hurwitz *et al.* (2018) reported that the prevalence of back pain within the previous month was positively associated with lower-income groups compared, which highlights the effect of economic status on LBP, therefore it is expected that the prevalence of LBP also potentially varies amongst occupations. This has been represented in Table 2, below.

Year of Study	Author	Country of origin	Occupation	One-year Prevalence (%)
2016	Arvidsson <i>et al.</i>	Sweden	Teacher	36.0
			Anaesthetic nurses	38.0
2017	Campos-Fumero <i>et al.</i>	Spain	Office workers	53.4
		Nicaragua		61.1
		Costa Rica		67.9
2018	Dlungwane, Voce and Knight	South Africa	Enrolled nurses	54.0
2018	Eggers, Pillay and Govender	South Africa	Primary school teacher	68.0
2019	Mekonnen	Ethiopia	Barbers	55.7
2019	Alnaami <i>et al.</i>	Saudi Arabia	Health care workers	73.9
2021	Adhikari <i>et al.</i>	Nepal	Construction workers	52.0
2021	Yunoos and Dankoly	Nigeria	Street Cleaners	78.2
2021	Bakhsh <i>et al.</i>	Saudi Arabia	Dental assistant	62.2
			Dental lab technician	71.9
			Dental sterilization	78.1
			Dental radiology technician	80.0

Table 1: Studies on Prevalence of LBP in different Occupations

2.1.2 Causes of low back pain

Low back pain can be caused by a variety of aetiologies. Most cases of LBP are termed as non-specific considering there is rarely one specific cause and the remaining can be attributed to a specific cause that can be identified i.e., spondylolisthesis or fractures (Balagué *et al.* 2012; Hartvigsen *et al.* 2018).

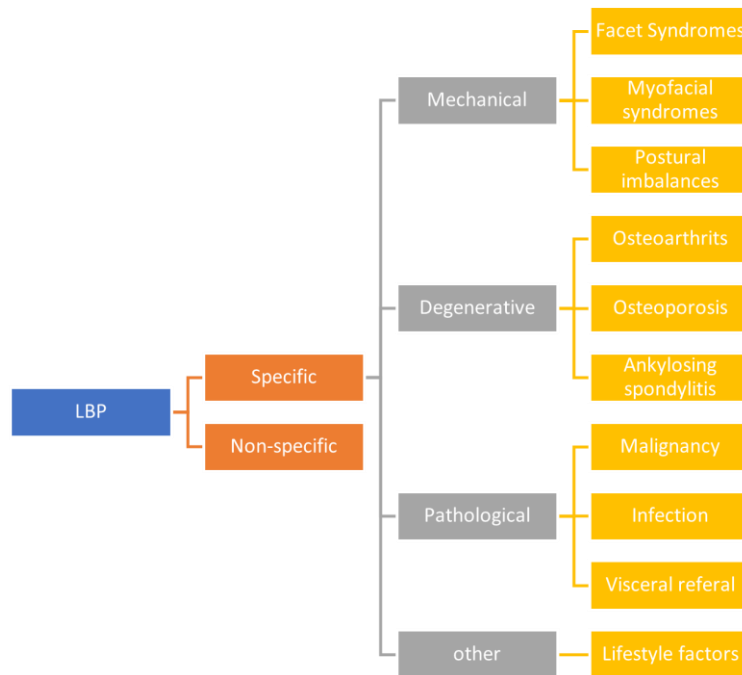


Figure 1: Causes of LBP

(Boon and Davidson 2006; Balagué *et al.* 2012; Clark and Kumar 2017)

Mechanical causes

Mechanical LBP is affected by movements and postures on the spine such as decreased lumbar lordosis, increased muscle activity or pressure on the structures (Das and Venkatesan 2020). Common mechanical causes include facet syndromes, myofascial trigger points, scoliosis (Boon and Davidson 2006). Das and Venkatesan (2020) noted that mechanical LBP is most commonly associated with occupational LBP.

Degenerative causes

Degenerative disease in the lumbar spine is characterised by low back pain, radiculopathies, and neurogenic claudication (Jia *et al.* 2020). Degeneration of vertebral structures may lead to an array of conditions. Spinal stenosis in the lumbar region presents as pain and/or discomfort with walking or standing for extended periods of time, that radiates into one or both legs and is usually relieved by rest or lumbar flexion (Hartvigsen *et al.* 2018). Common types of degeneration include spondylolisthesis, lumbar spinal stenosis, osteoarthritis (Clark and Kumar 2017; Jia *et al.* 2020).

Radicular pain occurs with the compression or irritation of nerve-roots. Diagnosing radicular pain relies on specific clinical findings, which includes dermatomal leg pain, leg pain worse than back pain, coughing, sneezing, or straining worsening the leg pain and positive orthopadeic tests like the straight leg raise test (Hartvigsen *et al.* 2018).

Pathological causes

Some conditions affect spinal structures directly, resulting in pain i.e., infections, malignancy, or arthritic diseases (Vlaeyen *et al.* 2018). Visceral diseases may refer pain to the low back due to the dermatomal

distribution i.e. kidney stones, ectopic pregnancy, prostatitis, aortic aneurism, and gastrointestinal diseases (Clark and Kumar 2017).

Pathological fractures are also a cause of LBP, where the spine becomes comprised due to the underlying disease such as osteomyelitis, Paget's disease, and osteoporosis (Hartvigsen *et al.* 2018). Hartvigsen *et al.* (2018) also mentioned that malignancy is an uncommon cause of LBP, patients with metastatic cancer commonly report having back pain with 97% of spinal tumours being metastatic.

Other causes

Lifestyle factors that were found to be contributors to LBP included low education, psychological distress, as well as alcohol consumption (Hurwitz *et al.* 2018). Work-related musculoskeletal disorders are a subtype of MSD that occur due to occupational factors that influence an individual's health (Cheng *et al.* 2016). According to a systematic review by da Costa and Vieira (2010) common factors that influence work-related MSD are smoking, high body mass index, increased psychosocial demands, comorbidities, and heavy physical work. Abdul Samad *et al.* (2010) found that cigarette smoking had an odds ratio of 1.32 of increasing the risk of LBP which was reiterated by other studies. Punnett *et al.* (2005) found that 37% of LBP was attributed to occupational factors such as whole-body vibration and heavy lifting, subsequently noting a higher prevalence in men due to the greater participation in the labour force.

Therefore, there could be various reasons a person suffers from LBP. The individual's occupation plays a role in determining that cause as different occupations require different ergonomics in example prolonged sitting, repetitive actions, and average working hours (Bakhsh *et al.* 2021).

2.1.3 Incidence and prevalence of low back pain in teachers

According to Alnaami *et al.* (2019) reported that 37% of LBP cases worldwide are caused by their occupations. Teachers have a specific set of occupational risk factors that expose them to LBP such as prolonged standing, marking while sitting, and extracurricular activities (Kebede *et al.* 2019).

The point-prevalence of LBP resulted in 49.92% (n=314) among teachers in Gujarat, India (Vaghela and Parekh 2017: 199). A study on special education teachers and teachers' aids in Taiwan 68.8% (n=388) of participants reported work related low back pain and 28.9% (n=388) of participants experience LBP almost daily (Cheng *et al.* 2016). According to Mohseni Bandpei *et al.* (2014: 1) statistics for 6-month prevalence of low back pain were 15.1% (n=586) in primary school teachers and 44.1% (n=586) in high school teachers in a study done in Iran.

In rural Kenya a study done by Elias, Downing and Mwangi (2019) reported a 64.98% (n=417) one-year prevalence of LBP amongst primary school teachers, as well as leading risk factors amongst them being female gender and low supervisor support. Ojukwu, Anekwu and Onanike (2017) reported 23.9% (n=330) one-year prevalence in primary school teachers and 68.1% (n=330) in high school teachers in

Enugu, Nigeria. A study done in Mekele City, Ethiopia, revealed the one-year prevalence of LBP in public primary school teachers to be as high as 74.8% (n=611) (Kebede *et al.* 2019: 1).

Mohseni Bandpei *et al.* (2014: 1) noted the one-year and lifetime prevalence of LBP among Iranian teachers (n=586) were 29.6% and 31.1% respectively. According to Zamri, Moy and Hoe (2017) their results correlated with similar studies on a one-year prevalence of self-reported LBP in Malaysian primary school teachers which ranged between 40.4% and 72.9%. Schoolteachers from Chuquisaca, Bolivia, reported a one-year prevalence of 33.1% (n=517) and a one-week prevalence 21.3% (n=517) of low back pain (Solis-Soto *et al.* 2019). A Botswana based study by Erick and Smith (2014) on LBP on schoolteachers revealed 55.7% (n=1747) one-year prevalence. Eggers, Pillay and Govender (2018) found a one-year prevalence of 68.0% (n=97) in low back pain of primary school teachers in Durban, South Africa.

Considering the differences in the percentages, factors like research methods, type of population, and teaching environments potentially played a role. From the literature above we can say with certainty that teachers worldwide suffer from LBP, yet there is a paucity in research comparing South African rural versus urban teachers as they face different challenges daily including class sizes, resources, and teaching roles.

2.1.4 Risk factors of low back pain in teachers

Risk factors are characteristics and exposures that increase the probability of a patient to become ill. Parreira *et al.* (2018) did an umbrella review that provided evidence of factors that increased the risk of LBP which included poor general health, physical stress (time driving, flexion/extension, prolonged standing/walking), and psychological stress (depression, anxiety, psychosomatic factors). According to a study by Nicholas *et al.* (2011) there has been substantial evidence for prompt identification and clinical intervention of patients with psychological factors while simultaneous intervention at the workplace. Therefore, revealing a strong concordance between certain work-place risk factors and intervention for acute LBP such as graded activity exposure, organisational interventions as well as cognitive restructuring of pain relief, but not all interventions (Nicholas *et al.* 2011).

Zamri, Moy and Hoe (2017) noted that psychological factors including depression, severe anxiety, poor mental health, and high psychological job demand, played a significant role in development of back pain amongst various groups of the working population. Bevan (2015) listed the following as the most frequently cited risk factors for MSD in the workplace: repetitive motions and rapid work pace, heavy lifting and forceful manual exertions, non-neutral dynamic/static body postures, frequent bending and twisting of the body, mechanical pressure concentrations, body vibrations, exposure to cold (local area or whole-body), and insufficient recovery time.

Kebede *et al.* (2019: 1) completed a multivariate analysis on Ethiopian public primary school teachers that revealed the participants' pain was associated with prolonged and irregular standing, and sleep disturbances. Silva and Almeida (2012) found that 55% (n=120) of their population teachers who suffered from LBP were not taking part in any physical activity.

Abdul Samad *et al.* (2010) found that larger classroom sizes increase the prevalence of LBP. A cross-sectional study done in Iran looked specifically at the difference in prevalence of Musculoskeletal disorders (MSD) between rural compared to urban schoolteachers and found that rural schoolteachers had a higher prevalence of MSD than urban schoolteachers (Solis-Soto *et al.* 2017). A study done in India revealed a 71.95% (n=314) prevalence of MSD in schoolteachers of which 72% were females and 28% were males (Vaghela and Parekh 2017). The previously mentioned factors are based on MSD not LBP exclusively, whereas this study aimed to get accurate and specific data on LBP.

2.1.5 Impact of low back pain on teachers

LBP has been associated with conditions like anxiety, insomnia, functional disability as well as increased utilisation of health care and unemployment (Vlaeyen *et al.* 2018). Punnett *et al.* (2005) noted that although LBP does not directly cause premature mortality, it is a substantial cause of disability with influence on society, and occupational ergonomic stressors attributing to approximately 818 000 disability adjusted life years lost annually. According to a study (n=42785) done by Vasoontara *et al.* (2017) high prevalence of LBP among all ages was reported in their Thai population. Meaning all ages are impacted and it played a vital role in the limitation of clinically important activities of daily living. There seemed to be a paucity in studies on the impact of LBP specifically on teachers, an illness to which they are at higher risk of due to their profession.

The calculation of the financial/economic impact of MSD, or any illness i.e., LBP, has on an employee, employer, families, and the economy are not straightforward considering that different factors need to be accounted for (Bevan 2015). Direct costs of LBP include cost of diagnosis, treatment, rehabilitation, prevention, and long-term or on-going medical and private expenses. Indirect costs are decreased productivity, loss of income and opportunity; intangible costs comprised of the psychological burden of the prognosis or health problems as well as job stress, economic burden, and reduced quality of life (Bevan 2015). MSD is one of the most common reasons for individuals taking sick leave (Finnes *et al.* 2019).

According to the study Olafsson *et al.* (2018) completed in Sweden on the cost of LBP included a mean of €10 million for pharmaceuticals, €68 million for LBP surgery, and €337 million in work absence (sick leave). The total cost of LBP in Sweden was €740 million, which is similar to the cost in other western countries (Olafsson *et al.* 2018). Morris and Themba (2021) noted that the cost of LBP has not yet been determined in South Africa, at the time of that study.

According to Hill *et al.* (2011) approaching LBP in a stratified management manner combining prognostic screening and treatment targeting improved not only primary care efficiency, but secondary outcomes as well including pain intensity, quality of life, physical and emotional well-being, decreased days off work, therefore having a positive influence on the economy as well. Vasoontara *et al.* (2017) mentioned the importance of implementing initiatives that includes well-integrated programs to prevent and manage LBP, including all other musculoskeletal conditions, alongside other diseases.

2.2 MANAGEMENT OF LOW BACK PAIN

Management of non-specific LBP includes a wide array of interventions including analgesics, non-pharmacological therapies, education and reassurance, and timely review of cases depending on the cause (Maher, Underwood and Buchbinder 2017). Investigating the different approaches of treatment in management of LBP will speak to the paucity in the body of knowledge, not only on the education of patients, but also to determine if they are adequately being managed.

Treating acute LBP should include reassuring the patient of a positive prognosis, advising the patient to stay active as well as avoiding bed rest, and taking medication such as NSAIDs and/or muscle relaxants (van Tulder *et al.* 2006). As well as the short-term use of a weak opioid, spinal manipulation therapy, and incorporating treatment programmes in their occupational setting (Airaksinen *et al.* 2006). Treatment of acute LBP is quite different from chronic LBP, according to van Tulder *et al.* (2006); Oliveira *et al.* (2018). Chronic LBP is more complex to treat, therefore it is advised to attempt to treat LBP in the acute phase (Oliveira *et al.* 2018).

Treating chronic LBP should include conservative treatment (i.e., manipulation, mobilisation, some auxiliary therapies, patient education, cognitive behavioural therapy, exercise therapy) and pharmacological treatments (i.e., NSAIDs, weak opioids, antidepressants, muscle relaxants and capsaicin plasters) (Airaksinen *et al.* 2006). If there is no improvement of the patient's LBP after conservative treatment or specific pathologies are suspected referral to a specialist is advised for invasive treatment which includes acupuncture, nerve blocks, epidural corticosteroids among other treatments (Maher, Underwood and Buchbinder 2017; Oliveira *et al.* 2018).

Pharmaceutical treatment

Maher, Underwood and Buchbinder (2017) noted that the overuse of opioids, surgery and imaging are still a major cause for concern in LBP management. While short-term use of opioids has analgesic benefits, the effectiveness of long-term opioid use for the management LBP remains unclear (Maher, Underwood and Buchbinder 2017). Adverse effects and concerns that should be considered with opioid use includes overdose, addiction, injuries such as falls, motor vehicle accidents, effects on mood and cognitive function, and reproductive implications like hypogonadism or sexual dysfunction (Deyo, Von Korff and Duhkoop 2015a; Maher, Underwood and Buchbinder 2017). The effect of opioid use on other

treatments are not well documented. Therefore, clinicians prescribing opioids need to carefully consider and monitor their patients before prescribing long-term opioid therapy, especially those with a history of substance abuse, incorporating psychological intervention in their management plan would be beneficial (Deyo, Von Korff and Duhrkoop 2015b).

Paracetamol is one of the most frequently prescribed medications for treatment of LBP, a study by Saragiotto *et al.* (2016) indicated that looking at immediate use and short-term paracetamol (4g per day) effects did not produce a better outcome compared to placebo in patients with acute LBP.

Non-pharmaceutical treatment

Oliveira *et al.* (2018) and Maher, Underwood and Buchbinder (2017) also suggested the assessment and treatment of the biopsychosocial model as a whole. It has been shown that mindful-based stress reduction could provide short-term relief of pain intensity and improve physical function (Anheyer *et al.* 2017). Saper *et al.* (2017) looked at yoga, physical therapy, and education as treatment options for chronic low back pain in a diversified population, although the study found all three interventions being similar, it was noted that results from a previous study on a largely white higher income population was different as they had more access to yoga classes and physical therapy.

Filipczyk, Filipczyk and Saulicz (2021) found that a regular exercise programme was more effective at reducing LBP for patients with higher mental stress and anxiety than the standard medical care. Even though Cimarras-Otal *et al.* (2020) were looking at factory workers, they found that an adaptive exercise programme worked better than a more general one at reducing LBP, it could possibly indicate that an adaptive exercise programme specifically for teachers could also be more beneficial.

Complimentary treatment

Brigitte *et al.* (2019) found that chiropractic treatment proves as a valuable form of conservative treatment for patients (n=67) that was referred to them as an alternative to surgery, with a reduction of pain of 23% in one week and 47% in one month (p=0.004). Furthermore, they found the positive impact of chiropractic on the bio-psycho-social model as well as highlighting the importance of interdisciplinary collaboration (Brigitte *et al.* 2019). Research suggested that chiropractic management is also a cost-effective alternative for physical therapy with greater improvement of daily adjusted life years (Nima 2020). Globe *et al.* (2015) found significant evidence that chiropractors can effectively diagnose, treat, and manage LBP with an increasing number of studies being done on the topic (Jenks *et al.* 2020).

Farah Dynah Daeq, Ario and Arifa (2019) reported that acupuncture delivered three times a week and herbal therapy with three grams of turmeric could significantly decrease LBP. Ultrasound therapy was shown to decrease a patient's level of disability and pain intensity (Cisowska-Adamiak *et al.* 2019). Haile, Hailemariam and Haile (2021) concluded from their systematic review that ultrasound therapy for non-specific LBP was statistically significant in reducing pain measure by the visual analogue scale.

Van Zundert *et al.* (2018) mentions that a multidisciplinary approach and improved support and training of primary care physicians, including chiropractors, would decrease the unnecessary burden on the

medical system. Interestingly, Louw *et al.* (2016) found the choice of words used while explaining treatment has an impact on the effectiveness. From the literature above, it can be concluded that there are a wide variety of effective treatment options available to people suffering from LBP, in all the stages of the disease.

2.3 SUMMARY

Chapter 2 looked at the current literature surrounding the incidence and prevalence of LBP in general and specifically teachers, risk factors that increase the possibility of LBP, how teachers are more susceptible to those risk factors, and the management options. It also highlighted the gaps in literature which prompted the questions that would be answered by the process in Chapter 3.

CHAPTER 3: METHODOLOGY

3.1 STUDY DESIGN

The study was a quantitative, descriptive, cross-sectional questionnaire-based study. A quantitative research design is a deductive theory-based research method that finds relationships and differences using statistical methods and numeric data to derive a conclusion (Ingham-Broomfield 2016). Descriptive statistics describe the main features of a collection of data, summarise a data set, and depict patterns in the collected data by running the data through specific statistical tests such as binominal test, chi-square test, one-sample t-test and Fischer's exact test (Byrne 2001; Kaur, Stoltzfus and Yellapu 2018). Cross-sectional studies are typically used when a study is descriptive, the outcome of this type of research is broad as you can obtain numerous amounts of information on the topic such as risk factors and prevalence by using questionnaires as its inexpensive, takes a short time to conduct and there are no follow-ups (Levin 2006). This design was chosen for this study because an attempt will be made to draw conclusions about the relationships and differences between the prevalence, incidence and risk factors associated with LBP.

3.2 SAMPLING

3.2.1 Study location and population

The study location was schools in the Greater Tzaneen Municipality, Limpopo. The population was primary and high school teachers that met the inclusion criteria, in the GTM. Permission from the Limpopo Provincial Department of Basic Education (Appendix A) as well as the principals (Appendix B) of all the selected schools was obtained. A list of schools was obtained from the Department of Basic Education. Permission from the Limpopo Provincial Department of Basic Education was granted (Appendix K).

3.2.2 Sample size and recruitment

The population of teachers in GTM totals to 2278 and these come from 144 schools in 6 districts (Anon 2018). In an email communication on 12th of May 2020 Dr Gill Hendry indicated the minimum sample required such that we assume an alpha level of 0.5 and a margin of error of 0.5 is 329. This is the minimum responses needed for each question in the questionnaire for the results to be able to be

projected onto the full population. Therefore, adding 10% accommodated for non-response which lead to a final sample size calculation of 362.

A stratified random sampling method was used to ensure all the circuits, which form part of the Mopani District, viz. Nkowankowa, Nwanedzi, Shiluvane, Thabina, Tzaneen and Xihoko were represented. Therefore, schools in each circuit were randomly selected, by ballot method, until the required sample size was reached. All the teachers from a selected school were approached to participate. Tzaneen, Heanertsburg, Nkowankowa, Letsitele are considered urban areas and the remaining areas are rural. Random sampling is a method used to select a sample from a population in a way that the entire population has an equal probability of being selected (Byrne 2001: 494).

3.2.3 Inclusion criteria

- Full-time teachers to ensure homogeneity.
- Participants between the age of 23 and 65, to ensure accurate representation of the study population (Elias, Downing and Mwangi 2019: 5)
- Participants that sign the informed consent forms
- Participants able to read and understand English, as the informed consent form and questionnaire is presented in English.

3.2.4 Exclusion criteria

- Participants participating in the pilot study and focus group
- Participants who did not sign the informed consent forms

3.3 METHOD

Following approval from IREC (IREC 024/21) to conduct the study, the pre-focus questionnaire (Appendix I) needed to be discussed by the focus group, after the necessary changes were made (Appendix L) then the final questionnaire (Appendix M) was sent to the participants of the pilot study. Subsequently the main study commenced. The data was captured, and analysis was done by the biostatistician.

3.3.1 Focus group discussion

A Focus group is a small group of individuals that take part in an interactive discussion on a topic of common interest (Greenbaum 1998: 2). The focus group in this study consisted of seven participants. The participants that were included was the researcher, the co-supervisor, two teachers – one from an urban setting and one from a rural setting, a chiropractor versed in questionnaire research and a master's student currently conducting questionnaire-based research.

The participants of the focus group were contacted and invited to review the questionnaire. The researcher explained the purpose, attached the information letter (Appendix E), informed consent letter (Appendix F), the questionnaire (Appendix I) and feedback form (Appendix H) to an email that was sent to each participant. The participants were asked to read the information letter (Appendix E), sign the informed consent letter (Appendix F).

Feedback was provided during a Microsoft Teams meeting, and changes were made to the pre-focus questionnaire.

Inclusion criteria:

- Participants that agree to and sign the informed consent forms

Exclusion criteria:

- Participants who did not sign the informed consent form

The suggested changes were noted and explained before submitting it to the DUT IREC (Appendix L).

3.3.2 Pilot study

A pilot study is a small scale preliminary study done to evaluate the specificity, sensitivity and feasibility of a study before it is done on a larger scale (In 2017: 601). Two schools within the GTM, one urban and one rural, were approached to take part in the pilot study. Permission was obtained and the two teachers from each school were asked to read the information letter (Appendix D) and complete the informed consent form (Appendix F) as well as the questionnaire (Appendix I). Two teachers completed the questionnaire online, one from the urban school and one from the rural school, and the remaining two teachers completed physical copies of the questionnaire to ensure both options of data collection was viable.

Inclusion criteria:

- Full-time teachers in a GTM school
- Participants between the age of 23 and 65
- Participants that agree to sign the informed consent forms
- Participants able to read and understand English, as the informed consent form and questionnaire is presented in English.

Exclusion criteria:

- Participants who do not teach on a full-time basis - Part-time teachers, student teachers and substitute teachers (teaching for a limited amount of time only)
- Participants who did not sign the informed consent form
- Participants participating in the focus group

There were no significant comments following the pilot study.

3.3.3 Permissions

The Limpopo Department of Education granted permission to the researcher to complete the study via email (Appendix K). The principals of all the participating schools were approached in person, the researcher explained the study and purpose following which they agreed to have the researcher complete the data collection at their schools.

3.3.4 Ethical approval

Full ethical approval was obtained from the Durban University of Technology's Independent Research Ethical Committee (IREC) on the 24th of May 2021. Ethical Clearance number: IREC 024/21 (Appendix N).

3.3.5 Ethical considerations

Within research, there are four principles of ethics that must always be upheld, these include autonomy, justice, non-maleficence and beneficence (Gillon 2003). This study upheld these principles as follows:

Autonomy

- Participation in the study was voluntary and any participant were free to refuse or withdraw from participating at any time and any reason, without explanation.

Justice

- Participants were not excluded based on their race, culture, or gender.
- Ethical approval was obtained from IREC.

Non-maleficence

- Participants were not harmed in any way during the course of this study.
- Completion of the questionnaires did not impede on teaching time of scholars.
- Only the researcher, supervisors and statistician had access to the data. The hard copies will be shredded, and electronic data deleted after five years of storage at DUT.
- The data was analysed and reported on objectively.

Beneficence

- The wellbeing of the participant was ensured during the entire course of the study.
- Participants signed a letter of consent form that was kept separate from questionnaires to ensure anonymity of the participant as well as the school.
- Permission letters from the Limpopo Department of education (Appendix A) as well as Principals of the selected schools were obtained (Appendix B).

3.4 DATA COLLECTION MEASUREMENT TOOL

A self-administered questionnaire adapted from a previous study (Eggers 2016) was used, permission requested to use the questionnaire (Appendix G) and informed consent letter (Appendix F) was sent to Dr Eggers who granted permission to use questionnaire (Appendix J). The questionnaire (Appendix I)

includes the following sections: demographics and personal information, physical activity, medical history, teaching history and LBP. Self-administered questionnaires are questionnaires that were designed in a way to allow the respondent to complete the questionnaire without the intervention of the researcher (Wright, Aquilino and Supple 1998: 332). The questionnaire went to a focus group and pilot study to ensure it was effective. The final questionnaire (Appendix M) was printed and put on QuestionPro. The hard copies were delivered by the researcher and an email with a link to the QuestionPro online questionnaire was sent to the to the schools who preferred the online option.

3.5 STATISTICAL ANALYSIS

Descriptive statistics, in the form of tables and graphs, were used to describe the data graphically. In order to test for significant trends in the data, inferential statistics were implied. This included Pearson's correlation, t-test, binominal, and chi-square tests. Throughout a p-value of 0.05 was used to indicate significance. The analysis was carried out using SPSS (Statistical Package for Social Sciences) (Dr Gill Hendry in email 12 May 2020).

3.6 SUMMARY

The methodology presented above provided the process in which the data would be collected in sufficient way to address the gap in literature highlighted in Chapter 2. The processing and analysis of the data captured using the process from Chapter 3 will be presented in Chapter 4.

CHAPTER 4: RESULTS

A total of 400 questionnaires were distributed among 28 schools in the different circuits. Of 400 questionnaires distributed, 294 were completed and correct. The remaining questionnaires were not completed, or consent was not signed. The online completed questionnaires amounted to 79 of which only 51 were completed in full. Thus, the total completed questionnaires were 345 (N=345). The minimum required amount to adequately represent the population was 329 samples. A response rate of 69.0% was achieved. Having a sample size bigger than the minimum requirement ensures that this study presents the study population.

4.1 DEMOGRAPHIC DATA

The data revealed that 67.8% (n=234) of the population was female and 32.2% (n=111) male. The mean age among the participants were 43.97 years. The data on the body composition of the participants illustrated that the average height was 165.2cm and weight 75.8kg, as shown in table 2.

	Age	Height (cm)	Weight (kg)
Mean	43.97	165.2	75.8
Median	45	167	76
Standard deviation	11.3	16	14.4

Table 2: Demographics of participants

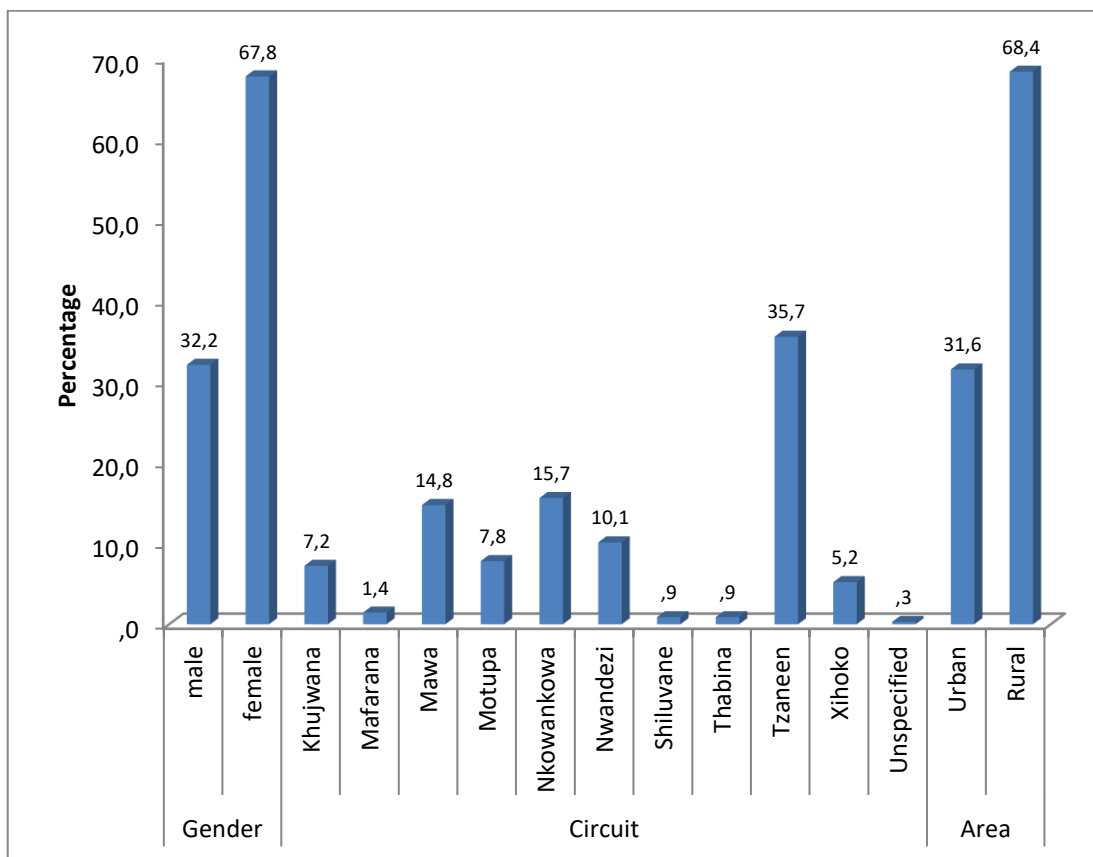


Figure 2: Demographics of Participants

The participants working in rural communities amounted to 68.4%, while the remaining 31.6% taught in the urban area. Interestingly, Tzaneen and Nkowankowa are urban areas and combined 51.4% of the participants live in those areas. Suggesting that regardless of where the participants were teaching, they travel outside their residential area. The figure 2 shows the distribution of participants in each circuit, whether they work in rural or urban areas, and the distribution of male and female participants.

Mode of transport used to go to work	Frequency (%)		N	p-value
	Yes	No		
Walk	130 (37.7)	215 (62.3)	345	<.001*
Private transport	189 (55)	156 (45)	345	.085
Public transport	76 (22)	269 (78)	345	<.001*

Table 3: Modes of Transport used by Participants

The table above depicts the distribution of the modes of transport used by the participants. Results from a binominal test show that 62.0% do not walk to work; and a statistically significant 78.0% do not use public transport. On average it took them 34.06 minutes to get to work from their residence.

4.2 HEALTH STATUS OF PARTICIPANTS

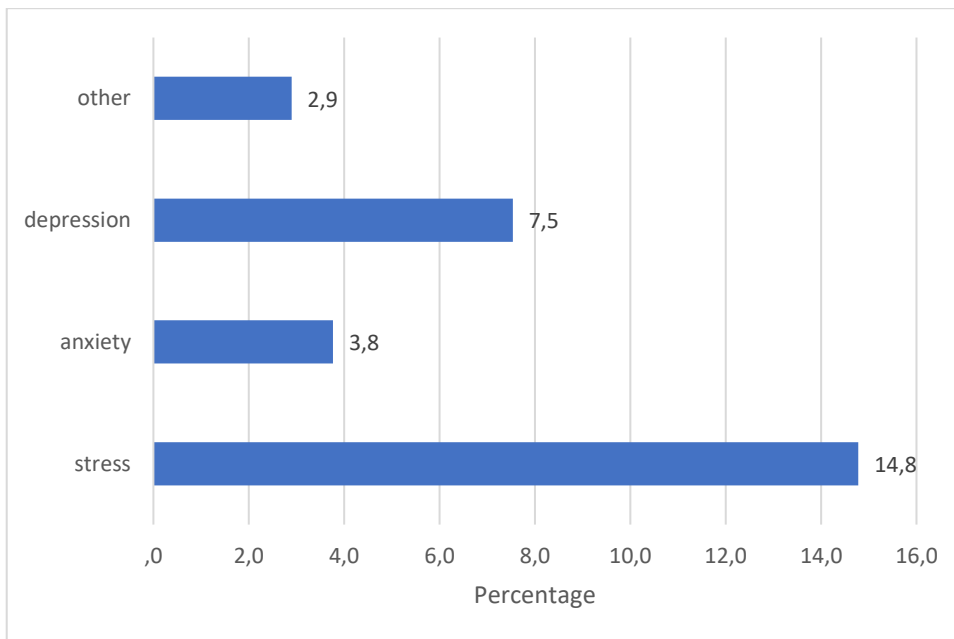


Figure 3: Percentage of Participants receiving treatment for the mentioned illnesses

A significant number ($n=206$) of the participants did not consider themselves under a high level of stress ($p<.001$). Figure 3 indicates the percentages of participants receiving treatment for the mentioned illnesses, but in each case a significant number of participants are not receiving any treatment for the mentioned illnesses, $p<.001$.

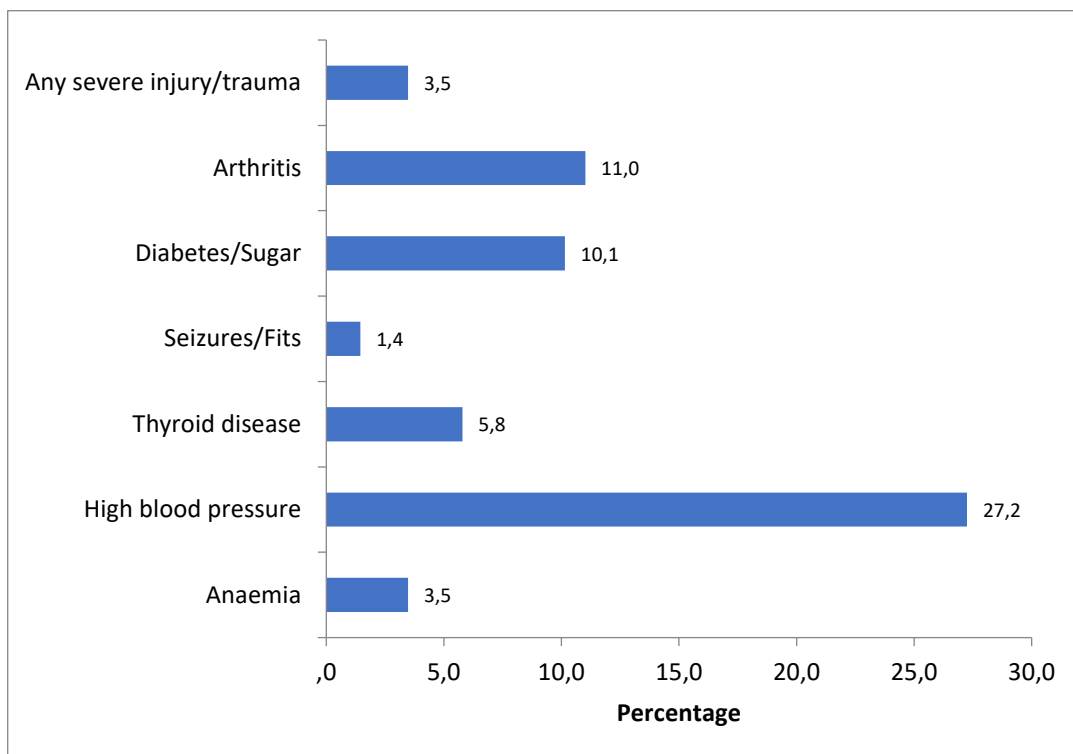


Figure 4: Percentage of Participants with the mentioned disease

Figure 4 illustrates the percentage of participants that suffer from the various illnesses. All seven of the diseases were presented among the sample. However, while high blood pressure was most prevalent, a significant proportion of the respondents do not suffer from it, $p < .001$.

	Frequency (%)		p-value
	Yes	No	
Increased LBP before or during menstrual cycle	84 (43)	112 (57)	.054 ^a
Debilitating LBP during menstrual cycle	35 (18)	161 (82)	<.001*
Increased LBP before/during/after pregnancy	53 (30)	125 (70)	<.001*
Reproductive system conditions	6 (3)	173 (97)	<.001*

Table 4: Female Reproductive System Data

A significant proportion ($p < .001$) of the female participants ($n=196$) reported having no debilitating LBP during their menstrual cycle, no increased LBP associated with pregnancy, and no diagnosed

reproductive system conditions. As illustrated in table 4, 82% of the females did not suffer from debilitating LBP during their menstrual cycle, 70% did not experience an increase in LBP before/during/after their pregnancy, and 97% were not diagnosed with any reproductive system conditions, $p < .001$.

4.3 TEACHING HISTORY

Looking at years teaching, it ranged from one year to 45 years, with a standard deviation of 10.3. The average amount of hours teaching in a week was 28.4 with a standard deviation of 15.28. The minimum hours spent marking in a week was zero hours, and maximum was 110.

Three categories of grades taught was made:

- category one was foundation phase,
- category two included grade four to grade seven, and
- category three was high school teachers exclusively.

Category one accounted for 29.6% ($n=102$), 42.9% ($n=148$) made up category two, and the remaining 27.5% ($n=95$) was category three. Meaning 72.5% ($n=250$) of the sample size was primary school teachers and 27.5% ($n=95$) was high school teachers.

Item	Responses as Frequency (%)					N	Mean (SD)	t	df	p-value
	Decreased a lot	Decreased a bit	Stayed the same	Increased a bit	Increased a lot					
Since COVID-19, the time I spend at the computer has:	6 (2.9)	9 (4.3)	47 (22.6)	77 (37.0)	69 (33.2)	208	3.93 (0.995)	13.515	207	<.001*

Table 5: Data regarding time spent on the computer

* Indicates significant at the 95% level

Majority (60,3% ($n=208$)) of the teachers reported that they do work at a computer, which is statistically significant ($p < .001$). The average amount of hours spent working at a computer for teaching purposes only was 7.1 with a standard deviation of 8.1, $p < .001$. Analysis revealed that there was a substantial increase in time spent at the computer since the start of COVID-19. Table 5 illustrates the data regarding the previous statement.

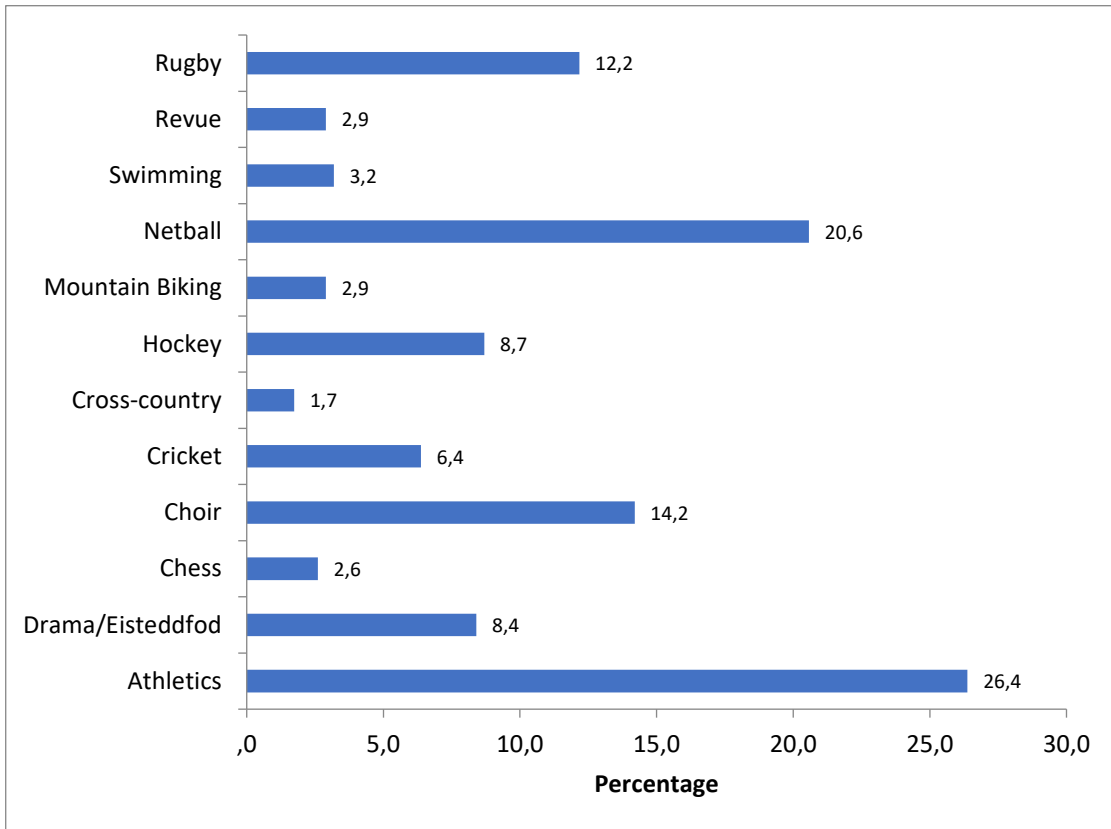


Figure 5: Percentage of Participants who coached extra mural activities

The above figure illustrates the extra mural activities the sample population were coaching. A total of 139 (39.7%) of the entire sample were coaching extra mural activities, of which the average amount of hours spent per week coaching was 4.9 hours with a standard deviation of 5.1.

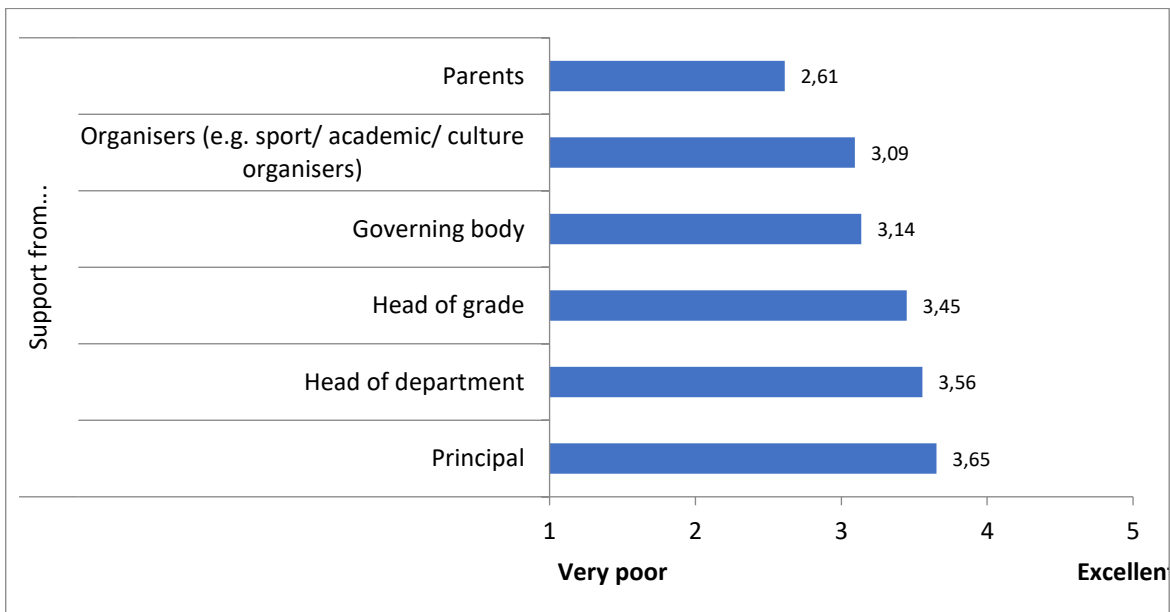


Figure 6: Support from different entities

Perceived support by the participants was significantly ($p < .001$) above average from the principal, Head of Department, head of grade and Governing Body; Support from parents was significantly poor (below average) as shown in figure 6.

Item	Responses as Frequency (%)					X ²	df	p-value
	Never	Rarely	Some of the time	Often	Most of the time			
Stand for a prolonged period of time	5 (1.4)	9 (2.6)	50 (14.5)	102 (29.6)	179 (51.9)	307.91 3	4	<.001*
Sit for a prolonged period of time	22 (6.4)	91 (26.4)	121 (35.1)	96 (27.8)	15 (4.3)	131.04 3	4	<.001*
Walk for a prolonged period of time	8 (2.3)	69 (20.0)	104 (30.1)	131 (38.0)	33 (9.6)	146.17 4	4	<.001*
Stoop for a prolonged period of time	27 (7.8)	95 (27.5)	148 (42.9)	56 (16.2)	19 (5.5)	164.49 3	4	<.001*
Bend frequently with your torso	29 (8.4)	87 (25.2)	98 (28.4)	119 (34.5)	11 (3.2)	125.41 9	4	<.001*
Twist frequently with your torso	37 (10.7)	91 (26.4)	99 (28.7)	107 (31.0)	11 (3.2)	104.58 0	4	<.001*
Bend and twist with your torso	39 (11.3)	87 (25.2)	111 (32.2)	98 (28.4)	10 (2.9)	105.94	4	<.001*
Work frequently in a bent posture for a prolonged period of time	44 (12.8)	88 (25.5)	113 (32.8)	87 (25.2)	13 (3.8)	92.493 ^a	4	<.001*
Work frequently in a bent and twisted posture for a prolonged period of time	52 (15.1)	94 (27.2)	102 (29.6)	83 (24.1)	14 (4.1)	75.710 _a	4	<.001*
Work in uncomfortable postures	64 (18.6)	87 (25.2)	114 (33.0)	66 (19.1)	14 (4.1)	78.377 _a	4	<.001*
Work in repetitive postures	41 (11.9)	75 (21.7)	130 (37.7)	69 (20.0)	30 (8.7)	87.855 _a	4	<.001*

Table 6: Responses of Frequency of actions shown as percentages

Table 6 represents the postures in which the teachers frequently found themselves. Standing for a prolonged period was found to be more often. Sitting for a prolonged period was distributed between rarely, some of the time and often, with some of the time being the highest. A statistically significant,

38.0% (n=131), number of the participants reported that they walk for prolonged periods. Stooping was reported being rare to some of the time.

Bending frequently with your torso, twisting frequently with your torso, bend and twist with your torso, work frequently in a bent posture for a prolonged period of time, and work frequently in a bent and twisted posture for a prolonged period of time all showed significant numbers in the rarely, some of the time, and often category with varying percentages, as seen in the table above. The participants reported only working in uncomfortable postures and working in repetitive postures rarely and some of the time.

4.4 PREVALENCE AND OCCURRENCE OF LOW BACK

Of the 345 participants, 231 (67%) has had LBP. The average amount of days that the participants' LBP lasted was 8.8 days, with a standard deviation of 29.1, and maximum of 365 days. For a significant 61% of these respondents, the LBP has stayed the same over the past year ($p < .001$).

Further, from the 231 participants with LBP a significant 59% (n=137) of participants described their LBP as intermittent, and 142 (61%) of those who do suffer from LBP did not injure their back, $p < .001$. No concessions were requested by a substantial 177 (77%) of the LBP suffering participants due to their LBP.

The respondents were asked to rate their agreement, on a scale from 1 = strongly disagree to 5 = strongly agree, that certain activities aggravated their LBP. The table 5 illustrates these aggravating factors and the responses of the participants.

Item	Responses as Frequency (%)					Mean (SD)	t	df	p-value
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree				
Bending/twisting body	14 (6.1)	23 (10.0)	50 (21.6)	116 (50.2)	28 (12.1)	3.52 (1.029)	7.735	230	<.001*
Lack of sleep	18 (7.8)	27 (11.7)	70 (30.3)	97 (42.0)	18 (7.8)	3.30 (1.038)	4.447	229	<.001*
Lying down	23 (10.0)	52 (22.5)	95 (41.1)	52 (22.5)	9 (3.9)	2.88 (.997)	-1.848	230	.066
Reaching overhead	22 (9.5)	38 (16.5)	59 (25.5)	74 (32.0)	38 (16.5)	3.29 (1.201)	3.724	230	<.001*
Sexual activity	36 (15.6)	36 (15.6)	84 (36.4)	65 (28.1)	8 (3.5)	2.88 (1.096)	-1.628	228	.105
Sitting	14 (6.1)	23 (10.0)	81 (35.1)	89 (38.5)	23 (10.0)	3.37 (1.001)	5.535	229	<.001*
Standing	8 (3.5)	16 (6.9)	50 (21.6)	122 (52.8)	35 (15.2)	3.69 (.931)	11.312	230	<.001*
Stress/tension	13 (5.6)	15 (6.5)	42 (18.2)	108 (46.8)	53 (22.9)	3.75 (1.058)	10.759	230	<.001*
Sneezing/coughing	26 (11.3)	45 (19.5)	74 (32.0)	69 (29.9)	17 (7.4)	3.03 (1.115)	0.354	230	.724
Walking	23 (10.0)	30 (13.0)	93 (40.3)	78 (33.8)	7 (3.0)	3.07 (.993)	1.060	230	.290
Weather changes	28 (12.6)	29 (12.6)	112 (48.5)	53 (22.9)	8 (3.5)	2.92 (.997)	-1.188	230	.236

Table 7: Aggravating Factors with Responses as Frequency (%)

From the table above it can be deduced that the participants' LBP are aggravated significantly by bending/twisting their body, a lack of sleep, reaching overhead, sitting, standing, and stress/tension. Stress and tension being the factors that are the most strongly agreed with.

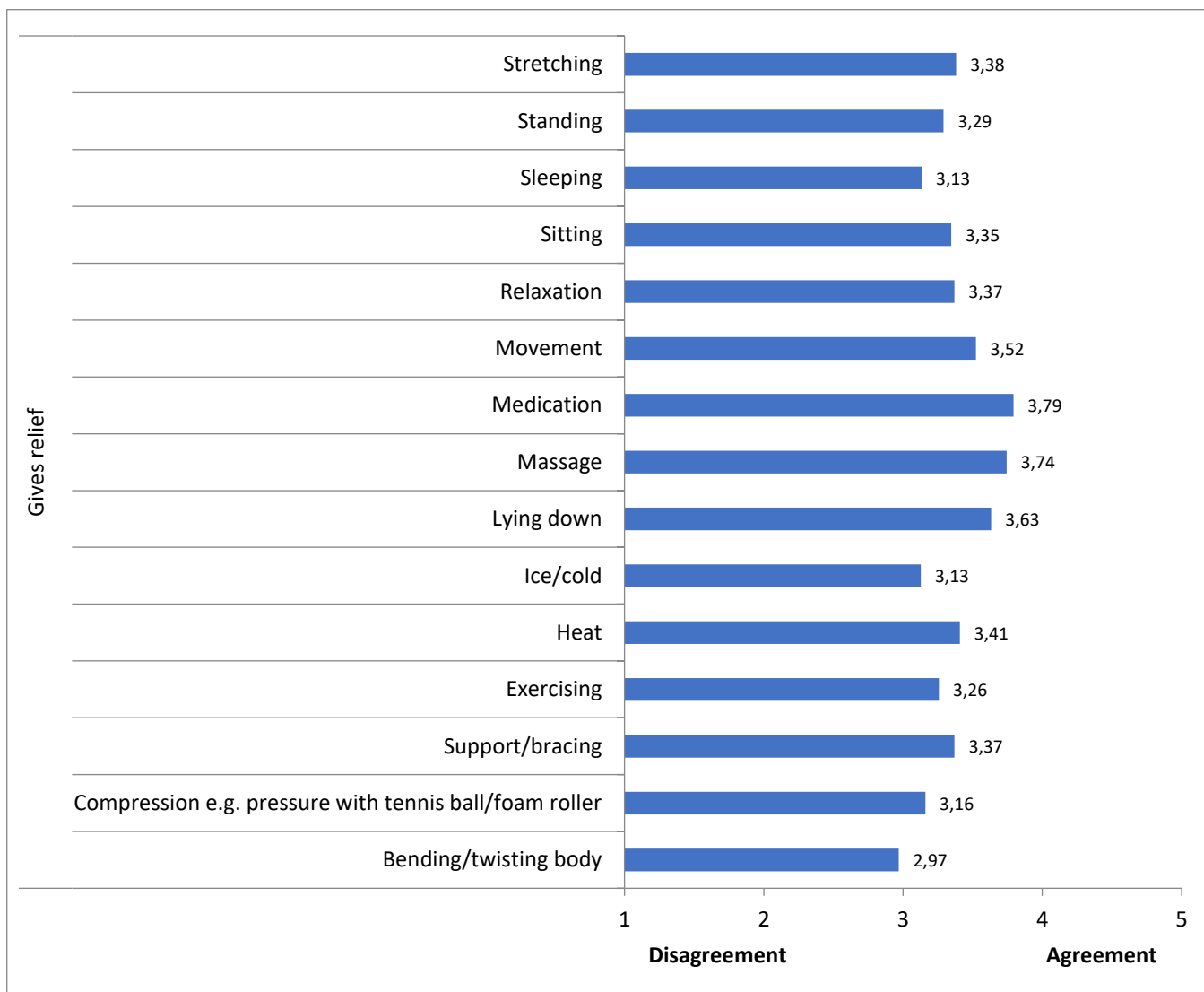


Figure 7: Level of Agreement with Factors giving relief

Figure 7 provides an illustration of the average agreement of types of relief used by the participants. All, except bending/twisting body, ice/cold, and sleeping provided a significant amount of relief, $p < .001$.

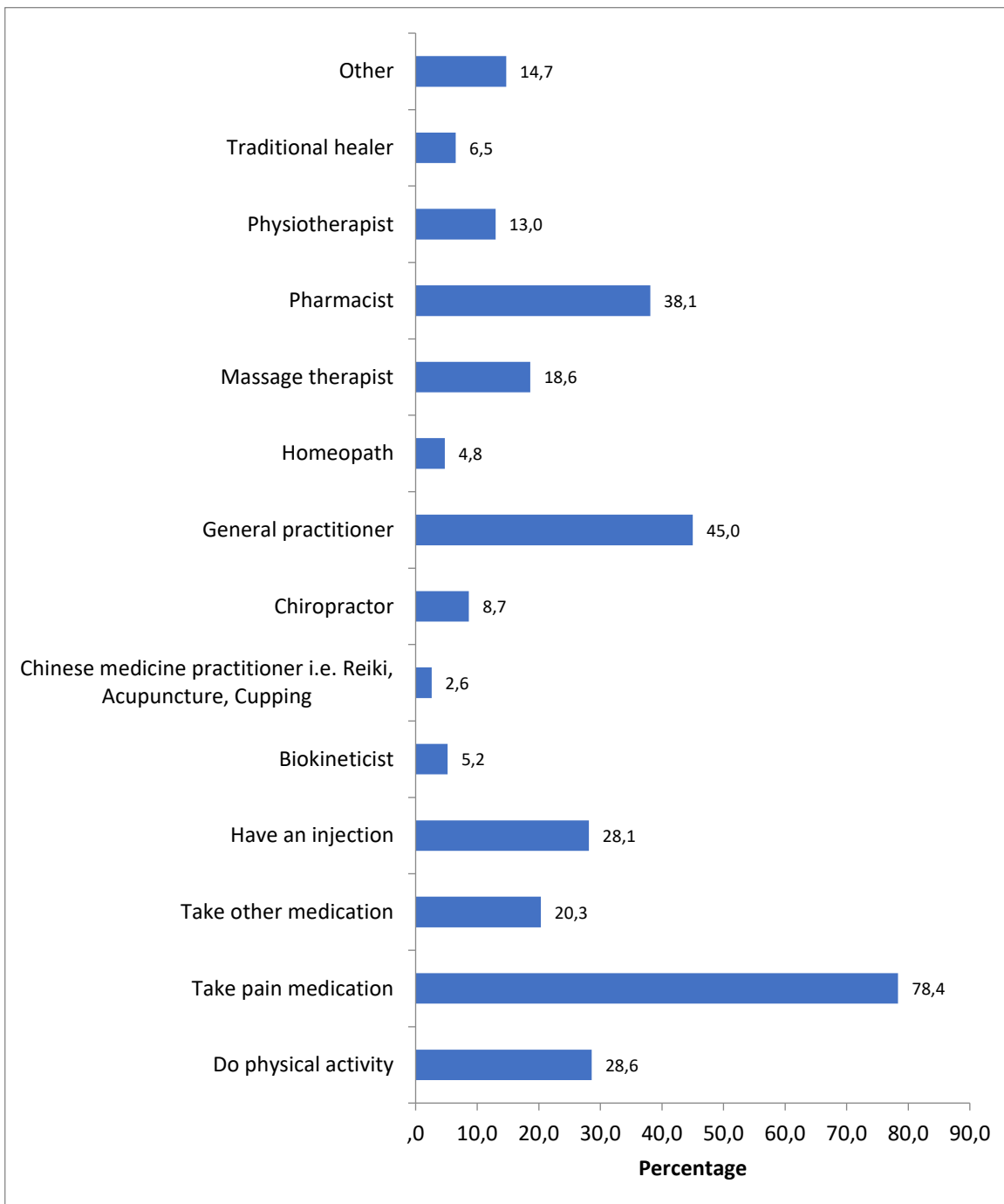


Figure 8: Percentages of Types of Management used

Figure 8 depicts the percentages of methods used to treat the participants' LBP. The majority 78.4% (n=181) of the LBP suffering participants take pain medication ($p < .001$) to relieve their LBP. A portion of the participants (n=27 (11.7%)) attended their local clinic to assist with LBP management.

4.5 ASSOCIATIONS BETWEEN THE PREVALENCE AND RISK FACTORS OF LOW BACK PAIN

		Responses as Frequency (%)		X ²	df	p-value
		Do you consider yourself under a high level of mental stress?				
		Yes	No			
Low back pain	Yes	119 (51.5)	112 (48.5)	36.617	1	<.001*
	No	20 (17.5)	94 (82.5)			
	TOTAL	139 (40.3)	206 (59.7)			

Table 8: Mental stress as a Risk Factor of LBP

Considering the participants who reported feeling under a high level of mental stress, 51.5% reported having LBP. Simultaneously, a significant number of participants who did not experience a high level of stress, also did not suffer from LBP ($p < .001$). This is illustrated in table 8.

Other noteworthy associations that were found included a comparison between those with LBP and those without LBP. The participant with LBP is on average heavier ($p = .010$); have been teaching for longer, ($p = .049$); and spends more time working at a computer, $p < .001$.

CHAPTER 5: DISCUSSION

5.1 DEMOGRAPHIC PROFILE

This study found that majority of the participants were female (67.8%) with males only accounting for 32.2%. Solis-Soto *et al.* (2017) similarly found that females made up majority of the teaching population in Bolivia in both rural (76.5%) and urban schools (68.4%). Therefore, making this study consistent with previous studies done.

The mean age of Greater Tzaneen Municipality teachers was 43.97 years overall with the median being 45 years of age. Eggers, Pillay and Govender (2018) reported that 47.8% of their population in eThekweni Municipality, South Africa, fell into the 45-54 years bracket, making our average slightly lower, but our median equivalent to this. This could be due to both studies having an inclusion criterion of being younger than 65 years of age, as older participants would possibly have skewed the data on LBP.

Teachers from the rural area made up 68.4% of the sample and urban area teachers 31.6%. In Bolivia it was more equal with rural area being 59% and urban area 41% (Solis-Soto *et al.* 2017). This difference can be attributed to different sampling techniques or that their educational system is more indistinguishable compared to the South African educational system.

Regardless of the participants largely teaching in rural area, a substantial 62% do not walk to work; and a statistically significant 78% do not use public transport. The average time spent on the road amounted to 34.06 minutes, between their place of employment and their residence. Therefore, public transport cannot be blamed for a higher prevalence of LBP, in this community. Which is in congruence with the average of 35 minutes for South Africa that was reported by Bogetić and Fedderke (2006). This is interesting as some of the participating schools still had dirt access roads leading to it with only the national road being tarred.

5.2 HEALTH STATUS OF PARTICIPANTS

A noteworthy 59.7% (n=206) of the participants did not consider themselves under a high level of stress, $p < .001$. Of the remaining 40.3% (N=345) who are under a high level of stress, only 14.8% of them are receiving treatment for it. Previously, Ng, Voo and Maakip (2019) reported a positive association between teachers under mental strain and the prevalence of LBP. Scorza *et al.* (2018) reported the prevalence of depression is remarkably different in different in New Zealand, the United States, South Africa, and Nigeria. The two African countries were more similar compared to the other two based on the measurements and criteria which affected the prevalence estimates (Scorza *et al.* 2018). Therefore, we can deduce that in the GTM population mental strain and LBP does not have such a notable link.

Possibly due to the community's approach to mental health being different than that of the Malaysian community as mental health approaches are different in regions and cultures.

The reproductive system of any patient is investigated when they suffer from LBP. In this study 83.8% (n=196) of the females reported having no debilitating LBP during their menstrual cycle, no increased LBP associated with pregnancy, and no diagnosed reproductive system conditions. A study in Yemen reported that reproductive symptoms and disorders were significantly associated with LBP (Ghilan *et al.* 2013). This might disagree with our study population, as it is a different ethnic and cultural group, their opinions on reproductive health may not be like other groups. Govender, Naidoo and Taylor (2019) reported that even after multiple pregnancies the participants in their South African study still had inadequate knowledge about reproductive health. Tripathi (2021) highlighted the importance of cultural appropriate education of reproductive health. This shows that the current study might not have adequately represented the link between LBP and reproductive health considering the paucity in education of reproductive health issues in South Africa.

5.3 TEACHING HISTORY

Considering work experience, the population reported a median of 15 years teaching, with a minimum of one year and maximum of 45 years. This falls in the same bracket that Kebede *et al.* (2019) in Northern Ethiopia and Ojukwu, Anekwu and Onanike (2017) in Nigeria reported being the most common, 10-15 years. We can conclude that generally teachers have 15 years experience, the rest potentially change careers or retire as this profession imposes a high demand on their time, mental and physical health.

In our study the average amount of hours spent teaching in a week was 28.41 with a standard deviation of 15.282. The minimum hours spent marking in a week was zero hours, and maximum was 110 with an average of 11.01 hours. In concordance with the results from Eggers, Pillay and Govender (2018), who found that 65.2% (n=45) spent between 20-29 hours teaching, but our study revealed a slightly higher amount of time spent marking while their data revealed majority being in the 6-10 hours bracket. Different class sizes could explain the increase of marking as the population Eggers, Pillay and Govender (2018) chose to investigate was an urban area, compared to our largely rural area. Thus, the number of hours spent teaching remain the same as the school day in South Africa is generally similar across provinces, but rural schools tend to have more students in one class leading to an increase in marking time.

The population consisted of 29.6% (n=102) foundation phase teachers, 42.9% (n=148) senior primary teachers, and 27.5% (n=95) secondary teachers to accurately represent the population. Illustrating that 72.5% of the teaching population in GTM are primary school teachers. This is almost double of what Mohseni Bandpei *et al.* (2014) found among their 586 (38%) participants in Iran. The difference is that

the Iranian study included nine primary schools and twelve high schools in their sample, but necessary as that is what would have represented their population. Irrespective of other studies, to ensure our study population was statistically accurate we had to approach more primary schools to participate in this study as there are more primary schools in the area than high schools.

Several teachers (60,3%) reported that they do work at a computer with an average of 7.13 hours spent for teaching purposes in a week. Analysis revealed that since the start of COVID-19 there was a significant increase. Mohseni Bandpei *et al.* (2014) mentioned 21.2% (n=124) of their population used computers for work purposes. De', Pandey and Pal (2020) reported that internet usage increased from 40% to 100% and services like Zoom saw an increase in usage with the inevitable surge of online platforms used while countries across the world were in lockdown. Although not frequently researched, teachers often use computers for work purposes. Since the start of the COVID-19 pandemic it has increased significantly as they had to revert to online teaching platforms. This also indicates to us that both rural and urban schoolteachers use computers.

A total of 139 (39.7%) of the total sample were participating in the extra mural activities, of which the average amount of hours spent per week was 4.90. Kebede *et al.* (2019) reported that 78.35% (n=478) of their study population are involved with extracurricular activities. The impact of COVID-19 has been evident. At the time of data collection South Africa was in between its third and fourth wave of COVID-19 infections, therefore the Minister of Basic Education, Mrs Angie Motshekga, suspended all contact sports, extra-mural activities, non-contact sport related activities as well as school-based art and cultural activities (Department of Basic education 2021). This potentially impacted the data greatly.

Our data revealed perceived support was above average from the principal, Head of Department, head of grade and Governing Body; support from parents was significantly poor (below average). A study in rural Kenya reported that 54.1% (n=216) felt supervisor support was poor (Elias, Downing and Mwangi 2019). Solis-Soto *et al.* (2019) concluded that poor working conditions are associated with a high prevalence of mental and physical stress, especially in the rural areas of Bolivia. Regardless of the prevalence of LBP in our sample being 67%, they did not report poor supervisor support like in previous studies. This might be due to fear of repercussions or their unwavering respect for their superiors.

Solis-Soto *et al.* (2017) highlighted that the role teachers play in rural communities are generally higher as there is inadequate support from parents. This is reiterated by our data, revealing that support from parents are significantly average. It may be due to busy working schedules of the parents, multiple children, or in the deeper rural areas it is possibly the first child that attends school, diminishing confidence of the parent's involvement or support they are expected to give.

Actions that the participants reported doing regularly included standing for a prolonged time, walking for a prolonged period, bending with their torso, and twisting with their torso. This is concordance with multiple other studies, with the odd addition of actions like sitting and heavy lifting being significant in

their studies (Silva and Almeida 2012; Mohseni Bandpei *et al.* 2014; Ojukwu, Anekwu and Onanike 2017; Eggers, Pillay and Govender 2018). The similarities confirm that teachers are bound to certain work-related postures, the differences highlight that teaching environments do vary, not only across continents but locally between provinces as well.

5.4 PREVALENCE OF LOW BACK PAIN

Majority of the participants (67%) reported having LBP in the Greater Tzaneen Municipality, Limpopo. An eThekweni Municipality, KwaZulu-Natal, based study by Eggers, Pillay and Govender (2018) reported 71.0% of the teachers suffered from LBP. A study conducted in China found the prevalence of LBP being 45.6% (Yue, Liu and Li 2012) which is lower than what was found in both the South African studies. Considering that South African teachers have a higher prevalence of LBP, it potentially highlights poor ergonomics or insufficient treatment by our health system, seeing as South Africa is categorised as a low-socioeconomic country with decreased resources (Niessen *et al.* 2018).

According to 61% of the participants respondents who suffer from LBP, the pain has stayed the same over the past year. At the time of this study there seemed to be a paucity in research on the progression or regression of LBP. Wong, Karppinen and Samartzis (2017) explained that the perception of pain intensity and self-reporting of pain by patients are limiting. Considering that 78.4% of the participants took pain medication and minority of them received physical treatment for the LBP, it is understandable that there was no improvement.

Kebede *et al.* (2019) reported 67.6% (n=413) of the teachers in Mekele City did not have a history of low back injury. This was reiterated by the current study as a substantial 142 (61%) also reported not having a history of low back injury. Therefore, we can conclude that their LBP is mostly not due to a previous injury, regardless of if it predisposes them to developing LBP.

Aggravating factors that were noteworthy, included bending/twisting the body, lack of sleep, reaching overhead, sitting, standing, and stress/tension. The strongest corresponding factor being stress and tension. Similarly, studies from various countries agree with what was found in our study. Kebede *et al.* (2019) found stress being 81.2% positively associated with LBP, sleep disturbances 85.6%, and prolonged standing 77.7%. de Souza *et al.* (2020) based their research on the impact of poor sleeping habits on MSD, they found 82.4% of their participant who suffered from LBP also had sleep disturbances. All the factors mentioned are significant as it places cumulative strain on the body, predisposing participants to more injuries.

The current study revealed that the participants who do suffer from LBP have a higher BMI ($p=.010$); have been teaching for longer, ($p=.049$); and spend more time working at a computer, $p<.001$. Eggers, Pillay and Govender (2018) reported the similar findings in their study. Thus, proving that there might

not be such a big difference between teachers within South Africa, but more so South African teachers compared to the rest of the world. This relates to the systematic review by Morris *et al.* (2018) that suggested that the entire African population have a higher prevalence of LBP compared to other continents. A study by Gustavo *et al.* (2021) in Chile revealed that in their study population that the prevalence of concomitant LBP and obesity was 70.7% in urban teachers and 42.3% in rural teachers.

5.3 COMPARISON OF PREVALENCE BETWEEN URBAN SCHOOL TEACHER VERSUS RURAL SCHOOL TEACHER LOW BACK PAIN

There were no significant differences between any of the risk factors or demographic information within this study population. This is not in concordance with other studies, as seen in the study by Gustavo *et al.* (2021) where there was a clear difference between urban and rural school teacher, urban having a higher prevalence of LBP. Whereas Solis-Soto *et al.* (2017) reported rural schoolteachers having a higher prevalence of LBP. A potential reason why the current study did not reveal a significant difference could be that the study population might have been too secluded.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 MAIN FINDINGS

- There was an increase in computer usage since the start of COVID-19, which increased the participants' time in a seated position.
- The lifetime prevalence of LBP was 67.0%, showing that teachers in Limpopo are substantially affected by LBP.
- Several participants who considered themselves under a high level of mental stress concomitantly suffered from LBP (51.5% (n=119)). Likewise, 82.5% (n=94) of those who did not consider themselves under mental stress also did not suffer from LBP.
- There was no significant association between increased or decreased LBP in either of the rural or urban groups.

6.2 LIMITATIONS AND RECOMMENDATIONS

Recall bias is one of the main limitations as the participants might not accurately recall factors that influenced their LBP or how regularly they had LBP.

Time consumption of filling out a questionnaire, physically and online, played a role in the response rate as a lot of the teachers were extremely busy and did not want to take the time to fill out the questionnaire.

Fear of being disrespectful came in to play with the question regarding support structure, as this community regards being respectful of authority very high, regardless of the anonymity.

Due to the inclusion criteria, the years spent teaching and age of the participant were limited, meaning we only had a specific age range. This was done to minimise the effect of underlying degeneration that are more prevalent among older people (Swain 2021).

Retrospectively, it would be recommended to do a qualitative study on the teachers to understand their occupation and the physical and emotional demands of the profession. As it plays a role in the way they perceived their LBP and how work impacts it.

Another recommendation would be to have a medically trained translator do the questionnaires with them to explain all the jargon the public might not have entirely understood.

Increasing the sample size would also give you a more accurate representation of the population.

Looking specifically at 1-week or 1-month prevalence of LBP might give you clearer data as it would inhibit the effect of recall bias.

Using two distinct populations for rural compared to urban might reveal a greater difference, opposed to this study where the two population were potentially too similar, both being in the same district.

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APPENDICES

Appendix A



2020/10/20

Ms Pulane Modika
Limpopo Department of Education
District Director – Mopani West
0828182511

Request for Permission to Conduct Research

Dear Ms Modika

My name is Ime Mari Prinsloo, a Master of Health Science in Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

I am hereby seeking your consent to approach schools within the Greater Tzaneen Municipality to participate in my study. This will require teachers from the randomly selected schools to complete a questionnaire.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Institutional Research Ethics Committee (IREC).

If you require any further information, please do not hesitate to contact me at *iprinsloo1997@gmail.com* or 09832692169. Thank you for your time and consideration in this matter.

Yours sincerely,

Ime Prinsloo

Durban University of Technology

Appendix B



[Date]

[Details of addressee]

Request for Permission to Conduct Research

Dear Principal

My name is Ime Mari Prinsloo, a Master of Health Science in Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

I am hereby seeking your consent to approach the teachers from your school to participate in my research study. This will require them to complete a questionnaire that can be done at home or whenever they have a free moment and shouldn't take more than 10 min.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Institutional Research Ethics Committee (IREC).

If you require any further information, please do not hesitate to contact me at iprinsloo1997@gmail.com or 09832692169. Thank you for your time and consideration in this matter.

Yours sincerely,

Ime Prinsloo

Durban University of Technology



LETTER OF INFORMATION:

Participating teacher

Title of the Research Study : An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

Principal Investigator/s/researcher: Ime Prinsloo, B.Tech: Chiropractic

Co-Investigator/s/supervisor/s: Dr A Docrat, M.Tech: Chiropractic; Dr C Prince, M.Tech Chiropractic

Brief Introduction and Purpose of the Study: The study I am doing, with permission from all the required parties, will look at low back pain in the teachers currently teaching in the Greater Tzaneen municipality. It will look at how many teachers currently have or had low back pain and what risk factors there are amongst them, then comparing these risk factors between rural school teachers and urban school teachers as they potentially face different challenges. As well as how the low back pain sufferers manage their pain.

Greeting Good day Mr/Ms. I trust you are well.

Introduce yourself to the participant I am a master's student at the Durban University of Technology, completing this research project as a key component of my final year studies before graduating and perusing a career as a registered Chiropractor.

Invitation to the potential participant I would like to invite you to participate in this research study, because your input is valuable.

What is Research Research is a systematic search or enquiry for generalized new knowledge. Participation in this research study will broaden the understanding of how teachers are affected by low back pain, what risk factors could predispose them to low back pain, and what strategies they have been using to manage their low back pain. This knowledge will then in turn help educate health practitioners

on more specific approaches of care to a specific population to help lessen the burden of low back pain. As well as provide research to help educate teachers on ways to decrease potential low back pain. You are welcome to take this letter of information home and discuss it further with your trusted peers.

Outline of the Procedures: Teachers will be approached in randomly selected schools within the Greater Tzaneen Municipality with permission from the Department of Education and the principal of the school. After reading the information letter provided and signing the informed consent form, you will be given a questionnaire to complete that would take about 10 minutes of your time, this can be done after school or whenever you have a few minutes. There are an option of completing the questionnaire online or a physical copy. The paper completed questionnaires will be collected, within two weeks from distribution, separately from the consent forms and data will be drawn from it. The online questionnaires will be directly available to the researcher on a secure database. Participants that can be included are full time teachers between the ages of 23 and 65 that completed the consent form and that understand English. Participants that will not be included are part-time teachers, student teachers and substitute teachers as well as participants that did not complete the consent form or were a part of the focus group or pilot study. For this study to represent the population accurately, 362 teachers need to participate.

Risks or Discomforts to the Participant: There are no risks or discomforts to you for being involved in this study.

Explain to the participant the reasons he/she may be withdraw from the Study: In the case of non-compliance, injury, or illness you may be withdrawn from the study. There will be no consequences for you should you choose to withdraw, as you are free to do so at any point during the study.

Benefits: This study will lead to a publication that could help with prevention and management of low back pain in teachers from different areas in South Africa. Therefore this study could not only benefit you directly, but also the global knowledge of low back pain.

Remuneration: No remuneration will be given to you.

Costs of the Study: There will be no cost involved to participate in this study.

Confidentiality: Confidentiality is ensured by not including names on the questionnaire as well as collecting and keeping the consent forms separate from the questionnaire. Only the researcher and supervisors will have access to the forms.

Results: The data from the questionnaires will be extracted by the researcher and processed by a biostatistician, after which results, and a conclusion will be drawn. This will be available in a hard copy as well as a published article.

Research-related Injury: There are no risk of research-related injuries in this study.

Storage of all electronic and hard copies including tape recordings All hard copies and electronic copies, which will be stored on a password protected USB, will be stored at DUT in the Chiropractic Department for five years before it will be destroyed.

Persons to contact in the Event of Any Problems or Queries: Please contact the researcher (0832692169), my supervisors Dr Docrat (0313732589) or Dr Prince (0313733005) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.



LETTER OF INFORMATION:

Pilot study participant

Title of the Research Study : An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

Principal Investigator/s/researcher: Ime Prinsloo, B.Tech: Chiropractic

Co-Investigator/s/supervisor/s: Dr A Docrat, M.Tech: Chiropractic; Dr C Prince, M.Tech Chiropractic

Brief Introduction and Purpose of the Study: The study I am planning to do will look at low back pain in the teachers who is currently teaching in the Greater Tzaneen municipality. It will look at how many teachers currently have or had low back pain and what risk factors there are amongst them, then comparing these risk factors between rural school teachers and urban school teachers as they potentially face different challenges. As well as how the low back pain sufferers manage their pain.

Greeting Good day Mr/Ms. I trust you are well.

Introduce yourself to the participant I am a Masters student at the Durban University of Technology, completing this research project as a key component of our final year studies before graduating and perusing a career as a registered Chiropractor.

Invitation to the potential participant I would like to invite you to participate in the research

What is Research Research is a systematic search or enquiry for generalized new knowledge. Participation in this research study will broaden the understanding of how teachers are affected by low back pain, what risk factors could predispose them to low back pain, and what strategies they have been using to manage their low back pain. This knowledge will then in turn help educate health practitioners on more specific approaches of care to a specific population to help lessen the burden of low back pain. As well as provide research to help educate teachers on ways to decrease potential low back pain. The participant will be able to take this letter of information home and discuss it further with their trusted piers.

Outline of the Procedures: Participants of the pilot study are given a chance to read the letter of information and complete the informed consent form that will be emailed to them along with the questionnaire. All the forms will be emailed back to the researcher upon completion. The questionnaire is a self-administered questionnaire meaning the participant will complete it on their own, which will take about 10 minutes. Data will be drawn from the answers of the questionnaires to make amendments if necessary. If the pilot study is successful, then the main study will take place as planned.

Risks or Discomforts to the Participant: There are no risks or discomforts to the participant involved in this study.

Explain to the participant the reasons he/she may be withdraw from the Study: In the case of non-compliance, injury, or illness the participant may be withdrawn from the study. There will be no consequences for the participant should they choose to withdraw, as they are free to do so at any point during the study.

Benefits: This study will lead to a publication that could help with prevention and management of low back pain in teachers from different areas in South Africa. Therefore this study will not only benefit the participant directly, but also the global knowledge of low back pain.

Remuneration: No remuneration will be given to participants.

Costs of the Study: There will be no cost involved to participate in this study.

Confidentiality: Confidentiality is ensured by not including names on the questionnaire as well as collecting and keeping the consent forms separate from the questionnaire. Only the researcher and supervisors will have access to the forms.

Results: The data from the questionnaires will be extracted by the researcher, and a conclusion will be drawn. The results of the main study will be available in a hard copy and published article.

Research-related Injury: There are no risk of research-related injuries in this study.

Storage of all electronic and hard copies including tape recordings All hard copies and electronic copies, which will be stored on a USB, will be stored at DUT for five years before it will be destroyed.

Persons to contact in the Event of Any Problems or Queries: Please contact the researcher (0832692169), my supervisors Dr Docrat (0313732589) or Dr Prince (0313733005) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.



LETTER OF INFORMATION:

Focus group participant

Title of the Research Study : An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

Principal Investigator/s/researcher: Ime Prinsloo, B.Tech: Chiropractic

Co-Investigator/s/supervisor/s: Dr A Docrat, M.Tech: Chiropractic; Dr C Prince, M.Tech Chiropractic

Brief Introduction and Purpose of the Study: The study I am planning to do will look at low back pain in the teachers who is currently teaching in the Greater Tzaneen municipality. It will look at how many teachers currently have or had low back pain and what risk factors there are amongst them, then comparing these risk factors between rural school teachers and urban school teachers as they potentially face different challenges. As well as how the low back pain sufferers manage their pain.

Greeting Good day Mr/Ms. I trust you are well.

Introduce yourself to the participant I am a Masters student at the Durban University of Technology, completing this research project as a key component of our final year studies before graduating and perusing a career as a registered Chiropractor.

Invitation to the potential participant I would like to invite you to participate in the pilot study

What is Research Research is a systematic search or enquiry for generalized new knowledge. Participation in this research study will broaden the understanding of how teachers are affected by low back pain, what risk factors could predispose them to low back pain, and what strategies they have been using to manage their low back pain. This knowledge will then in turn help educate health practitioners on more specific approaches of care to a specific population to help lessen the burden of low back pain. As well as provide research to help educate teachers on ways to decrease potential low back pain. The participant will be able to take this letter of information home and discuss it further with their trusted piers.

Outline of the Procedures for the focus group: Participants of the focus group are given a chance to read the letter of information and complete the informed consent form, which will be emailed by the researcher. If the participant chooses to proceed, the questionnaire and feedback form will be sent to them. You will be required to comment on each question to ensure the questions are understood correctly and answered appropriately to generate the appropriate data for observations to be made. Following a successful focus group the questionnaire will be administered to a pilot study group. If that is successful, the main study can begin.

Risks or Discomforts to the Participant: There are no risks or discomforts to the participant involved in this study.

Explain to the participant the reasons he/she may be withdraw from the Study: In the case of non-compliance, injury, or illness the participant may be withdrawn from the study. There will be no consequences for the participant should they choose to withdraw, as they are free to do so at any point during the study.

Benefits: This study will lead to a publication that could help with prevention and management of low back pain in teachers from different areas in South Africa. Therefore this study will not only benefit the participant directly, but also the global knowledge of low back pain.

Remuneration: No remuneration will be given to participants.

Costs of the Study: There will be no cost involved to participate in this study.

Confidentiality: Confidentiality is ensured by not including names on the questionnaire as well as collecting and keeping the consent forms separate from the questionnaire. Only the researcher and supervisors will have access to the forms.

Results: The data from the questionnaires will be extracted by the researcher, and a conclusion will be drawn. The results of the main study will be available in a hard copy and published article.

Research-related Injury: There are no risk of research-related injuries in this study.

Storage of all electronic and hard copies including tape recordings All hard copies and electronic copies, which will be stored on a USB, will be stored at DUT for five years before it will be destroyed.

Persons to contact in the Event of Any Problems or Queries: Please contact the researcher (0832692169), my supervisors Dr Docrat (0313732589) or Dr Prince (0313733005) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.

Appendix F



INFORMED CONSENT FORM

Full Title of the Study: An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

Names of Researcher/s: Ime Prinsloo

Statement of Agreement to Participate in the Research Study:

I hereby confirm that I have been informed by the researcher, Ime Mari Prinsloo

, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance

Number: _____,

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, _____ (name of researcher) 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 G



LETTER TO REQUEST PERMISSION TO ADAPT QUESTIONNAIRE

Dear Dr Eggers

Title of the Research Study: An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa.

Principal Investigator/s/researcher: Ime Prinsloo, B.Tech
Chiropractic

Co-Investigator/s/supervisor/s: Dr A Docrat, M.Tech
Chiropractic; Dr C Prince, M.Tech Chiropractic

Brief Introduction and Purpose of the Study:

Outline of the Procedures: Teachers will be approached in randomly selected schools within the Greater Tzaneen Municipality upon permission. After reading the information letter and signing the informed consent form the participating teachers will be given a questionnaire to complete that would take about 10 minutes of the participant's time. The completed questionnaires will be collected and data will be drawn from it. Participants that can be included are full time teachers between the ages of 23 and 65 that completed the consent form and that understand English. Participants that will not be included are part-time teachers, student teachers and substitute teachers as well as participant's that did not complete the consent form or were a part of the focus group or pilot study.

Permission to use and amend your questionnaire: I hereby request your permission to use the questionnaire that you formulated when you conducted your study titled "Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area

– a cross-sectional study”, and amend the questionnaire to be suitable to the study that I will be conducting.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (0832692169), my supervisors Dr Docrat (0313732589) or Dr Prince (0313733005) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Dr Lingasano on 031 373 2577.

Appendix H



FEEDBACK FORM

Your participation and feedback are highly appreciated.

Appendix I

PRE-FOCUS GROUP QUESTIONNAIRE

Section A Demographics and Personal information

1 Gender	Male	Female
2 Age		
3 Height (m)		
4 Weight (kg)		
5 In which area do you live?	Urban	Rural

Section B Physical activity

6 Which of the following modes of transport do you use <u>to get to work</u> on a normal day? <u>Tick all that apply if you use multiple modes of transport for the journey</u>	Walk	Private transport	Public transport
7 How long on average (e.g. 1 hour 10 minutes) does it usually take you to get from your residence to work?	_____hours _____mins		
8 Do you exercise (over and above your normal walking from A to B)?		Yes	No

9 For how long, on average, do you exercise in a week?	_____hours _____mins
10 Approximately how many hours do you exercise, on average, in a week?	_____hours

Section C Medical history

11 Do you consider yourself under a high level of stress?

Yes	No

12 Indicate if you are currently receiving treatment medication/counselling for any of the following: **(Tick all that apply)**

12.1 stress	
12.2 anxiety	
12.3 depression	
12.4 no treatment	
12.5 other	

13 Have you ever suffered from any of the following conditions? **(Tick all that apply)**

13.1 Anaemia	
13.2 High blood pressure	
13.3 Thyroid disease	
13.4 Seizures	
13.5 Diabetes	
13.6 Any severe injury/trauma	

13.1 **If YES to any of these conditions**, do/did you receive treatment?

Yes	No

14 Do you suffer from any psychiatric condition(s)?

Yes	No

14.1 **If YES to q14**, what condition(s) do you suffer from?

14.2 **If YES to q14**, what medication(s) do you take or have you been prescribed?

Section D Teaching history

15 For how many years have you been teaching? _____ years

16 How many hours in a week do you spend teaching? _____ hours

17 How many hours a week, on average, do you spend marking? _____ hours

18 Which grade(s) do you teach? _____

19 Do you work at a computer?

Yes	No

19.1 **If YES to q19**, how many hours do you spend, on average, working at the computer?

_____hours

20 Are you involved in extramural activities?

Yes	No

20.1 **If YES to q20**, what extramural activities are you involved in?

20.2 **If YES to q20**, for how many hours per week, on average, do you do these extramural activities? _____hours

Section E Low back pain

21 Have you experienced low back pain in the past 12 months?

Yes	No

If NO to q21, please continue at question 30

22 What is the total length of time that you have had low back pain in the last year? (Tick **ONE** option only)

Up to 30 days	31 – 60 days	61 – 90 days	More than 90 days	Every day

23 Have you ever injured your low back?

Yes	No

24 Has your low back pain ever caused you to change jobs?

Yes	No

25 Does the pain occur at certain times of the day, week or month?

Yes	No

25.1 If YES to q25, at what time does the pain occur?

26 Indicate which **ONE** of the following best describes your low back pain over the past year:

It has worsened	It has stayed the same	It has improved

27 Indicate your agreement that the following factors **AGGRAVATE** your low back pain:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
27.1 Bending/twisting body					
27.2 Lack of sleep					
27.3 Lying down					
27.4 Reaching overhead					
27.5 Sexual activity					
27.6 Sitting					
27.7 Standing					
27.8 Stress/tension					
27.9 Sneezing/coughing					
27.10 Walking					
27.11 Weather changes					
27.12 OTHER – Please specify _____					

28 Indicate your agreement that the following factors **RELIEVE** your low back pain:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
28.1 Bending/twisting body					

28.2 Compression					
28.3 Exercising					
28.4 Heat					
28.5 Ice/cold					
28.6 Lying down					
28.7 Massage					
28.8 Medication					
28.9 Movement					
28.10 Relaxation					
28.11 Sitting					
28.12 Sleeping					
28.13 Standing					
28.14 Stretching					

29 When experiencing low back pain, what do you do to manage the pain:

Physical activity		Take medication		See a specialist, i.e. a Chiropractor	
Yes	No	Yes	No	Yes	No
Explain:					

30 Indicate how often your job description requires you to do the following:

	Never	Rarely	Some of the time	Often	Most of the time
30.1 Stand for a prolonged period of time?					
30.2 Sit for a prolonged period of time?					
30.3 Walk for a prolonged period of time?					

30.4 Stoop for a prolonged period of time?					
30.5 Bend slightly with your trunk?					
30.6 Bend heavily with your trunk?					
30.7 Twist slightly with your trunk?					
30.8 Twist heavily with your trunk?					
30.9 Bend and twist with your trunk?					
30.10 Work in a slightly bent posture for a prolonged period of time?					
30.11 Work in a heavily bent posture for a prolonged period of time?					
30.12 Work in a bent and twisted posture for a prolonged period of time?					
30.13 Work in uncomfortable postures?					
30.14 Work in the same postures?					
30.15 Make the same movements repeatedly with your trunk?					
30.16 Make the same movements repeatedly with your legs?					

Thank you for your time

Appendix J

Permission from Dr Eggers per email.

Lindy Eggers

Tue, 6 Oct, 16:31

to me

Hi Ime

Gosh, I am so sorry - I must have opened your email and forgot to respond! I apologise!

Yes, of course you may use my questionnaire. Let me know if there is anything else you need from me.

All the best for your dissertation!

Kind regards,

Lindy

Appendix K

Permission from the Limpopo Department of Education per email.



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

Ref: 2/2/2 Enq: MPENYANA M. B Tel: 015 306 680 Cell: 082 954 0919

To : Ms PRINSLOO IME

**SUBJECT: PERMISSION TO CONDUCT RESEARCH: AN EPIDEMIOLOGICAL
INVESTIGATION INTO LOW BACK PAIN IN SCHOOL TEACHERS WITHIN THE GREATER
MUNICIPALITY IN LIMPOPO, SOUTH AFRICA.**

1. The above matter refers.
2. The Department wishes to inform you that your request to conduct research on the above mentioned topic has been approved.
3. Your focus should only be limited to the teachers of the selected schools in Greater Tzaneen Municipality.
4. The following conditions should be considered:
 - 4.1 Arrangements should be made with the principals and teachers of the selected schools in Greater Tzaneen Municipality.
 - 4.2 The research should not be conducted during examinations.
 - 4.3 During research, applicable research ethics should be adhered to, in particular the principle of voluntary participation in the study.
 - 4.4 Upon completion of the research study, the researcher shall share the findings and recommendations with the Department.
5. The research should not have any financial implications to the Department of Education: Limpopo Province.
6. You are expected to produce this letter to the circuit and schools you intend to conduct your research.
7. The Department appreciates the contribution that you wish to make and wishes you success in your research.

DISTRICT DIRECTOR

29/10/2020
DATE

PTVVER DAG 24032 LIZANEEN, 0830 181 013 306 680 FAX NO. 080317/032

The heartland of South Africa- development is about people!

APPENDIX L

CHANGES MADE TO QUESTIONNAIRE

Pre-focus questionnaire	Final questionnaire	PAGE NO. WHERE CHANGE WAS MADE
Question 1 – 4, 7	Remained the same	1
Question 5	The responses was made more specific, listing the possible circuits	1
	Question 6 was added in to include area they live with examples	1
Question 6	Examples were added to responses (new Q7)	1
Question 8	Wording of question was corrected to prevent confusion (new Q9)	1
Question 9 and 10 was removed	Q9a-c were added to replace pre-focus question 9 and get more specific answers As well as option to skip ahead if answered NO to new Q9	1
Question 11	Wording changed (new Q10)	2

Question 12	12.4 no treatment was removed and specify option was added for other (new Q11)	2
Question 13	Arthritis was added and more common terms (new Q12)	2
Question 13.1	Changed to include any medication for any diagnosed treatment (new Q13)	2
Question 14 – psychiatric questions were removed	New Q14 – questions relating to menstrual health and low back pain were added	2
Question 15 – 19 remained the same	Question 19.2 were added to include increase in computer use since COVID-19	3
Question 20	Was restructured to include a variety of possibilities and space to indicate amount of hours	3
	New Question 21 – question on perceived support was added in	4
Question 30 changed to Q22, repeating questions were removed	New question 22, some question wording changed	4
Question 21	New Q23, wording changed If NO – questionnaire changed	4
Question 22	New Q24 – changed to short answer instead of multiple choice	5
	Q25 added – new question on continuity of pain	5
Question 23	New Q26	5
Question 24 question changed	New Q27 – about request for concession	5
Question 25	Removed	5
Question 26 moved to 31	New Q31	6
Question 27	New Q28	5

Question 28	New Q29	6
Question 29	New Q30 – restructured and examples added	6

APPENDIX M

FINAL QUESTIONNAIRE

QUESTIONNAIRE

Please respond to each question and answer as honestly as possible. Your answers will remain anonymous.

Section A Demographics and Personal information

1 Gender	Male		Female		
2 Age					
3 Height (cm)					
4 Weight (kg)					
5 In which circuit do you live?	Khujwana	Mafarana	Mawa	Motupa	Nkowankowa
	Nwandezi	Shiluvane	Thabina	Tzaneen	Xihoko
6 In which area do you teach?	Urban (e.g. Tzaneen, Heanertsburg, Nkowankowa, Letsitele)			Rural (e.g. other than urban)	

Section B Physical activity

7 Which of the following modes of transport do you use <u>to get to work</u> on a normal day? <u>Tick all that apply if you use multiple modes of transport for the journey</u>	Walk	Private transport (e.g. own car/lift club)	Public transport (e.g. bus/taxi)
8 How long on average does it usually take you to get from your residence to work? (e.g. 1 hour 10 minutes)	_____hour _____min		
9 Apart from walking/cycling as a means of getting from A to B, do you do any other physical exercise (e.g. running, gym, swimming)?	Yes	No	
<u>IF YOU ANSWERED NO TO Q9, SKIP TO Q10</u>			
9a Please specify WHAT other exercise you do			
9b On how many days in a week do you do this exercise?	_____days		
9c Approximately how many minutes, on average, do you do this exercise on a single exercise day?	0-30 min	31-60 min	61-80 min >90 min

Section C Medical history

10 Do you consider yourself under a high level of mental stress?

Yes	No

11 Indicate if you are currently receiving treatment medication/counselling for any of the following: **(Tick all that apply)**

11.1 stress	
11.2 anxiety	
11.3 depression	
11.4 other	
Specify:	

12 Have you ever suffered from any of the following conditions? **(Tick all that apply)**

12.1 Anaemia	
12.2 High blood pressure	
12.3 Thyroid disease	
12.4 Seizures/Fits	
12.5 Diabetes/Sugar	
12.6 Arthritis	
12.7 Any severe injury/trauma	

13 Do you take any medication for any diagnosed medical condition?

Yes	No
List:	

14 Indicate whether you suffer from the following:

	Yes	No	Not applicable
14.1 Increased low back pain before or during menstrual cycle			
14.2 Debilitating low back pain during menstrual cycle			
14.3 Increased low back pain before/during/after pregnancy?			

14.4 Reproductive system conditions/illnesses Please specify:			
--	--	--	--

Section D Teaching history

15 For how many years have you been teaching?
_____years

16 How many hours in a week do you spend teaching?
_____hours

17 How many hours on average do you spend marking in a week?
_____hours

18 Which grade(s) do you teach? _____

19 Do you work at a computer?

Yes	No

19.1 **If YES to q19**, how many hours per week do you spend, on average, working at the computer **for teaching/teaching-related purposes?**
_____hours

19.2 Since COVID-19, the time I spend at the computer has:

Decreased a lot	Decreased a bit	Stayed the same	Increased a bit	Increased a lot

20 Indicate which of the following extramural activities (if any) you are involved in as part of your teaching responsibilities?

Extramural Activity	Yes	No	Number of hours per week
20.1 Athletics			
20.2 Drama/Eisteddfod			
20.3 Chess			
20.4 Choir			
20.5 Cricket			
20.6 Cross-country			
20.7 Hockey			
20.8 Mountain Biking			

20.9 Netball			
20.10 Swimming			
20.11 Revue			
20.12 Rugby			
20.14 Other, specify:			

21 Rate (from 1 = very poor to 5 = excellent) the level of perceived support that you receive at work from the following sources?

	Very poor 1	2	3	4	Excellent 5
21.1 Principal					
21.2 Head of department					
21.3 Head of grade					
21.4 Governing body					
21.5 Organisers (e.g. sport/ academic/ culture organisers)					
21.6 Parents					

22 Indicate how often your job description requires you to do the following:

	Never	Rarely	Some of the time	Often	Most of the time
22.1 Stand for a prolonged period of time?					
22.2 Sit for a prolonged period of time?					
22.3 Walk for a prolonged period of time?					
22.4 Stoop for a prolonged period of time?					
22.5 Bend frequently with your torso?					
22.6 Twist frequently with your torso?					
22.7 Bend and twist with your torso?					
22.8 Work frequently in a bent posture for a prolonged period of time?					
22.9 Work frequently in a bent and twisted posture for a prolonged period of time?					
22.10 Work in uncomfortable postures?					

22.11 Work in repetitive postures?					
------------------------------------	--	--	--	--	--

Section E Low back pain

23 Have you ever had low back pain?

Yes	No

If NO to q23, you have completed the questionnaire! Thank you for your time

24 How long (in days) has your most recent episode of low back pain lasted?

_____ days

25 Which of the following best describes your low back pain?

Continuous	Intermittent

26 Have you ever injured your low back?

Yes	No

27 Have you requested any concessions due to your low back pain? For example a ground level class room, being excused from examination invigilating or extramural activities, etc?

Yes	No

28 Indicate your agreement that the following factors **AGGRAVATE** your low back pain:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
28.1 Bending/twisting body					
28.2 Lack of sleep					
28.3 Lying down					
28.4 Reaching overhead					
28.5 Sexual activity					
28.6 Sitting					
28.7 Standing					
28.8 Stress/tension					

28.9 Sneezing/coughing					
28.10 Walking					
28.11 Weather changes					
28.12 OTHER – Please specify _____ _____					

29 Indicate your agreement that the following factors **RELIEVE** your low back pain:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
29.1 Bending/twisting body					
29.2 Compression e.g. pressure with tennis ball/foam roller					
29.3 Support/bracing					
29.4 Exercising					
29.5 Heat					
29.6 Ice/cold					
29.7 Lying down					
29.8 Massage					
29.9 Medication					
29.10 Movement					
29.11 Relaxation					
29.12 Sitting					
29.14 Sleeping					
29.14 Standing					
29.15 Stretching					
Other					

30 When experiencing low back pain, what do you do to manage the pain? (Tick ALL that apply)

	Yes	No	Specify
30.1 Do physical activity			
30.2 Take pain medication			

30.3 Take other medication			
30.4 Have an injection			
Consult:			
30.5 Biokineticist			
30.6 Chinese medicine practitioner i.e. Reiki, Acupuncture, Cupping			
30.7 Chiropractor			
30.8 General practitioner			
30.9 Homeopath			
30.10 Massage therapist			
30.11 Pharmacist			
30.12 Physiotherapist			
30.14 Traditional healer			
30.14 Other			

31 Indicate which **ONE** of the following best describes your low back pain over the past year:

It has worsened	It has stayed the same	It has improved

Thank you for your time

APPENDIX N

IREC Clearance

24 May 2021

Miss I M Prinsloo

30 Mount Argus Road

Durban North

4001

Dear Miss Prinsloo

An epidemiological investigation into low back pain in school teachers within the Greater Tzaneen Municipality in Limpopo, South Africa. Ethical Clearance number IREC 024/21

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,

Dr K Padayachy

Deputy Chairperson: IREC