EXPLORING THE USE OF NUTRITIONAL SUPPLEMENTATION AND NUTRITIONAL EDUCATION IN THE CHIROPRACTIC MANAGEMENT OF OSTEOARTHRITIS AMONGST PRACTICING CHIROPRACTORS IN SOUTH AFRICA

By

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I, Tiffany Grimett, do declare that this dissertation is entirely my own work in both conception and execution (except where acknowledgements indicate to the contrary)

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ABSTRACT

Background

Osteoarthritis (OA) is the most common form of arthritis, resulting in chronic joint pain and stiffness which may worsen overtime. Chiropractors treat all types of conditions, with osteoarthritis being one of the most common. Chiropractors provide patients with detailed plans of treatment to reduce pain and the increase movement of the affected joints; they also have the ability to provide the patient with nutritional counselling, advising the patient on which foods to avoid, suitable supplementation and the importance of physical activity for weight management.

This research study focused specifically on chiropractic healthcare providers and how they implemented nutritional education with regards to osteoarthritis within their practice. It focused on how often they prescribed nutritional supplementation and also looked at the outcomes of patient treatment with and without the use of nutritional supplementation for osteoarthritis. Due to the diversity of race, culture and nutrition choices, especially in South Africa, chiropractors have to deal with more broad-spectrum patients, thereby the use of nutritional supplementation and education may vary from patient to patient.

Aim of the study

The aim of the study was to explore the use of nutritional supplementation and education in the management of osteoarthritis by selected practicing chiropractors in South Africa.

Methodology

A qualitative exploratory design was utilised in this study. Semi-structured interviews via an online platform were utilised to conduct in-depth interviews with 12 registered chiropractors practising in South Africa. The interviews were conducted in English and were then transcribed. The data were analysed using Tesch's eight steps of thematic analysis to establish the themes and subthemes.

Results

There were seven key themes that arose from this study. The study highlighted the importance of including nutritional education and supplementation in conjunction to chiropractic care, noting that it does, in fact, play a role in improving the patient's outcomes. Practitioners aimed to manage patients with a holistic approach. Using this approach to healthcare, practitioners

were able to collaborate with other healthcare professionals to further improve patient outcomes.

Conclusion

The findings that emerged from this study indicate that the use of nutritional education and supplementation, in conjunction to chiropractic care, in the management of patients with OA, is vital. Patients showed greater improvement outcomes when the two were combined. Therefore, it is necessary that not only chiropractors but all healthcare professionals include the use of nutritional supplementation and educate the patient on the long term effects and the importance of nutrition for reduced symptoms to better manage their osteoarthritis.

DEDICATION

I dedicate this dissertation to my parents, Gabriel Joseph Grimett and Monica Ntomboswazi Grimett. Dad, I hope you are watching over me from above and feeling proud. I know you would have cherished being here to witness how far I have come. Mom, thank you so much for your unwavering patience, love and support throughout this journey. No words can describe how much I appreciate you!

"But as for you, be strong and do not give up, for your work will be rewarded"

2 Chronicles 15:7

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Osteoarthritis (OA) is the most common form of arthritis (Thomas 2023). Osteoarthritis is a degenerative joint disease that affects many tissues of the joint and it is the fastest growing cause of disability worldwide (Thomas *et al.* 2018). This disease results in the degrade of cartilage, a change in the bone shape and causes joint inflammation (Woodell-May and Sommerfeld 2019). An individual affected by OA is likely to feel pain in the affected joint, with stiffness and loss of range of motion (Duruöz *et al.* 2023). As a result of the degradation of tissue, OA is not a condition that can be cured, instead it can only be managed to minimise pain (Allen *et al.* 2022).

The diagnosis of OA is confirmed through a review of symptoms, physical examinations, X-rays and lab tests (Abramoff and Caldera 2019). The management of OA depends on the level of progression of the disease and the severity of pain. Although there is no cure for OA, the symptoms associated with the disease can be managed through a combination of therapies. These therapies include an increase in physical activity, physical therapy with the inclusion of muscle strengthening exercises, weight loss, medications, such as non-steroidal anti-inflammatory drugs (NSAIDs), and the use of supportive devices. When symptoms worsen and management options are not effective, surgery is considered (Quinn *et al* 2019).

Reichard *et al.* (2021) discussed the non-pharmacological treatment of OA, the use of joint mobilisation and manipulation was encouraged by recent clinical practice guidelines. These recent recommendations fall within the scope of practice for chiropractors (Reichardt *et al.* 2022). Chiropractic care is often used as a complementary treatment for OA (Stussman *et al.* 2020). A chiropractor will assess patients and provide them with the most suitable treatment. The treatment for OA may involve spinal manipulation, joint mobilisation, stretching and massage, heat/cold therapy, the use of transcutaneous electrical stimulation (TENs), therapeutic ultrasound and low-level laser (Langmaid 2022). In addition to these, chiropractors are also equipped to prescribe nutritional supplementation and provide nutritional education.

Chiropractic care strives to achieve holistic and long-lasting health in patients (Rasweswe *et al.* 2021). With nutrition being one of the key factors to aid in improving OA symptoms in

patients, chiropractors are well equipped with nutritional knowledge and are able to provide patients with nutritional education to assist with improving their daily diets and improve their nutrient levels. In conjunction to this, chiropractors are able to prescribe the nutritional supplementation that is most suitable to meet patients' nutritional and clinical needs (Allied Health Professionals Council of South Africa 2010).

1.2 CONTEXT OF THE STUDY

The most common form of arthritis affecting the world's population is OA, affecting 7% of the population worldwide (Hunter *et al*. 2020). This condition results in the degeneration of the cartilage and underlying bone of the joint, it is accompanied by pain and stiffness and most commonly affects the knee and hip (Whelan *et al.* 2021). Osteoarthritis is a condition that requires nutritional education and supplementation (Messina *et al.* 2019). Literature has revealed that nutritional supplementation and education plays a beneficial role in managing the condition (Vitaloni *et al.* 2019). Diet, supplementation and education play a major role in the progression of musculoskeletal diseases and, therefore, it is important that a patient consumes foods that contain the vitamins and minerals that are needed to maintain healthy bones and joints (Wei and Dai 2022; World Health Organization 2017). With OA being so prevalent, an exploration into the various ambits pertaining to its management is warranted.

A study conducted by Hunter *et al.* (2020) revealed that healthcare approaches neglect giving patients nutritional education and lifestyle advice and instead focus on treating the symptoms rather than the main cause associated with the chronic disease (Hunter *et al.* 2020). The symptoms associated with OA are modulated and are considered to be part of the normal process of ageing (Valdes and Stocks 2018). Chiropractors are healthcare providers that provide treatment to relieve symptoms of OA and include nutritional education and supplementation but the exploration of this said usage for OA has not been investigated (Lefebvre *et al*. 2012). This study served to further explore the inclusion of nutritional education and nutritional supplementation, in conjunction to chiropractic care and the benefits it has on patients in reducing the symptoms associated with OA.

Chiropractors treat OA across the musculoskeletal system and have the ability to prescribe supplementation for OA in private practice, as well as to provide nutritional education to patients (Allied Health Professionals Council of South Africa 2010). Exploring the use of nutritional education and supplementation by chiropractors in managing their patients provides a broader understanding on its role in managing patients presenting with OA symptoms and provide an

insight on how nutritional education and supplementation can affect the overall management outcomes of patients receiving chiropractic care for OA. Furthermore, the discipline of chiropractic is not widely known, although it is gaining popularity. An exploration into chiropractic management practices will provide knowledge and increase awareness of the benefits of chiropractic care.

A study conducted by Usenbo *et al.* (2015) revealed that, within South Africa, OA is the most prevalent form of arthritis, accounting for 55,1% in urban areas. In rural areas within South Africa the prevalence ranges from 29,5%, 29,7% and up to 82,7% in individuals 65 years and older (Usenbo *et al.* 2015). South Africa is described as a diverse “rainbow” nation" and consists of a variety of different nationalities. Therefore, the dietary requirements are diverse amongst the South African population (Sedibe *et al*. 2018).

For healthcare providers, it is important to assess patients’ diet because nutrition will vary from patient to patient and the predisposition of a patient developing OA must be taken into consideration (Weinrich, 2019). Due to the increased prevalence of obesity within SA and globally, OA has become the most common non-communicable disease, thus making the management of OA important (Schweda *et al.* 2021). Nutritional strategies and research surrounding nutritional management protocols in a South African context need to be further investigated.

This study was aligned with the third sustainable development goals (SDGs) of the World Health Organization (WHO) which states that people should “Ensure healthy lives and promote wellbeing for all at all ages”. Patients will benefit from this research in that it will ensure healthy living and promote the wellbeing of individuals of all ages, and it will improve patient’s nutrition and provide health related education to patients (World Health Organization 2017). This study has adhered to these guidelines and will further serve to provide a better understanding for chiropractors, as well as other healthcare providers, as to how nutrition can improve the outcomes of the treatment provided to a patient with regards to OA.

1.3 PROBLEM STATEMENT

Osteoarthritis is the most common degenerative form of arthritis which mainly affects the joints that are responsible for weight bearing (Jin *et al.* 2020). Chiropractors demonstrate the competency to identify other key determinants of health and are able to advise patients on nutrition, physical activity, psychosocial and the lifestyle factors that relate to musculoskeletal management. Osteoarthritis is commonly treated by chiropractors. Chiropractic treatment has

been documented to bring relief to several of the mentioned symptoms. Nutritional education is important because it can prevent the development of other health conditions, as well as improve the overall health of an individual and provide long term health care benefits (Crowley *et al.* 2019). Some chiropractors utilise nutritional education and supplementation in their treatment and management regimes and, therefore, this study emphasises the need for exploring nutritional supplementation and education for OA by chiropractors in South Africa.

1.4 AIM OF THE STUDY

The aim of this study was to explore the use of nutritional supplementation and education in the management of OA by selected practicing chiropractors in South Africa.

1.5 OBJECTIVES OF THE STUDY

The objectives of this study were to:

Objective 1: Explore the utilisation of nutritional supplementation in the chiropractic management of OA by practicing chiropractors in South Africa.

Objective 2: Explore the utilisation of nutritional education in the chiropractic management of OA by practicing chiropractors in South Africa.

Objective 3: Describe the perceived benefits of nutritional supplementation and education in the management of OA by practicing chiropractors in South Africa.

Objective 4: Describe the challenges associated with nutritional supplementation and education in the chiropractic management of OA by practicing chiropractors in South Africa.

1.6 OUTLINE OF THE DISSERTATION

Chapter 1: The background and context are defined. The problem statement, aims and significance of the study are also presented in this chapter.

Chapter 2: The literature review pertaining to the topic is broadly described in this chapter.

Chapter 3: In this chapter the conceptual framework and chosen models are discussed.

Chapter 4: The research methodology, research design, research setting, sampling, data collection and analysis are extensively described in this chapter. The chapter is concluded with the ethical principles followed in this study.

Chapter 5: The findings obtained from the thematic analysis of twelve structured interviews are presented in this chapter**.**

Chapter 6: In this chapter the results of the study are discussed and compared to previous studies that are relevant to this dissertation.

Chapter 7: The overall conclusions and limitations of the study are presented. The chapter ends with recommendations for future studies.

1.7 CONCLUSION

This chapter looked at the research topic under investigation by presenting the significance of the study, the aim and objectives, and an outline of the thesis. The next chapter will discuss the literature relevant to this study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will discuss the origin of chiropractic, examine the pathogenesis of OA, the global and local prevalence, and the associated risk factors of the disease. It will outline the impact of OA, as well as the treatment and management interventions from current literature.

2.2 CHIROPRACTIC

The profession of chiropractic dates back to the late 19th century and was founded by Daniel David Palmer. He was a self-taught healer who developed the principles and techniques of chiropractic through his observations and experiences (Ernst 2008; Johnson 2020). In the year 1897, the first chiropractic school, named the “Palmer School of Chiropractic”, was established. D. D. Palmer taught his techniques to others while promoting the profession. Later, his son Bartlett Joseph Palmer played a significant role in advancing chiropractic to be a recognised health profession (Homola 2006).

Chiropractic has evolved since then and diversified with different schools teaching various techniques (Johnson *et al.* 2022). The profession has grown internationally and chiropractic is now practiced in various parts of the world. Chiropractic over the years has undergone scientific research, development of educational standards, and it has also been integrated into the mainstream healthcare systems (LeFebvre *et al*. 2013).

A chiropractor is a doctor who focuses on health problems that are related to the muscles, nerves and skeletal system of the body (Hawk *et al.* 2020). Chiropractic treatment is used to treat a number of ailments, ranging from issues with mobility, central nervous system problems, and health conditions related to the joints, bones and muscles (Hartvigsen and French 2017). Chiropractors are well equipped to provide health promotion and clinical prevention services through the assessment of common lifestyle influences on health to prevent, manage and reverse the risk factors for the development of musculoskeletal conditions and chronic diseases (Lin et al. 2023).

Chiropractic care is based on the principle that the body has the inherent ability to heal itself and that proper alignment of the musculoskeletal system is important for the overall health and

wellbeing of an individual (Richards *et al*. 2023). Chiropractors believe that when the spine and joints are misaligned, or not functioning optimally, it can interfere with the nervous system and lead to various health issues. Chiropractic care is often sought for conditions such as neck pain, back pain, joint pain, headaches and musculoskeletal injuries (Yetman 2021).

During a chiropractic session, a chiropractor will perform thorough examination of a patient, including a medical history review, physical assessments and diagnostic imaging, if required. Based on the findings, the chiropractor will formulate a treatment plan that may include spinal adjustments, mobilisation techniques, therapeutic exercises, soft tissue therapies, as well as lifestyle recommendations (Cleveland Clinic 2022).

2.3 OSTEOARTHRITIS

Osteoarthritis (OA) is the most common arthritic condition worldwide (Hawker 2019). It is a disease that commonly affects the knee joint but can affect any other weight bearing joint in the body. The disease affects an average of 1 in 3 people over the age of 65 years (Hamood *et al.* 2021). Osteoarthritis is classified as a degenerative joint disease and is characterised by subchondral bone sclerosis, synovial inflammation, osteophyte formation and the progressive loss of articular cartilage (Jin *et al.* 2020).

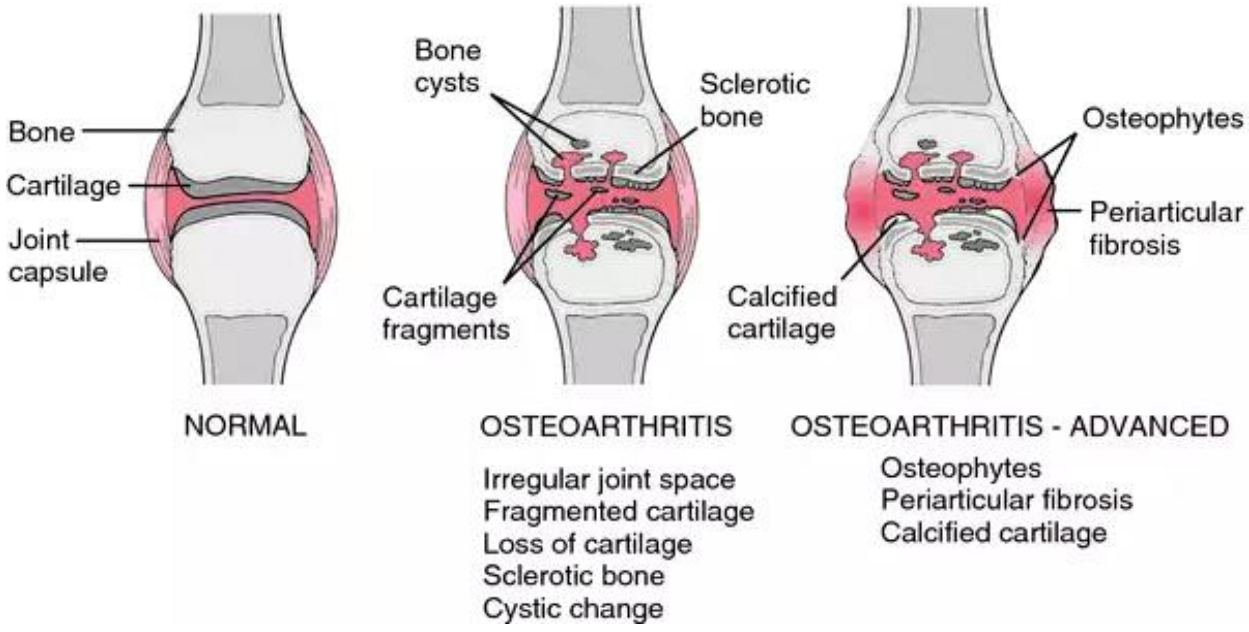

Figure 2.1: Depicts the normal joint versus the changes that occur with OA as it progresses

(Source: www.thefreedictionary.com)

The pathophysiology of OA involves multiple factors that contribute to the development and the progression of the condition.

These factors include:

1. Cartilage degeneration: Joints are supported by a smooth rubbery tissue that covers the end of the bones in a joint; it provides the joint with cushioning and allows for smooth movement. In OA, the cartilage is degraded and cartilage loss occurs (McClurg *et al.* 2021). The exact mechanism of cartilage breakdown is unknown; however, it can be attributed to mechanical and biomechanical factors. The increase in mechanical stress on the joint, together with genetics and biochemical factors, lead to an imbalance between cartilage degradation and the repair process (Ralston *et al.* 2018).
2. Joint inflammation: There is initially low-grade chronic inflammation within the joint. This inflammation is characterised by the release of inflammation mediators such as cytokines and enzymes. The inflammation can add to cartilage damage and stimulate the release of more inflammatory molecules, continuing a cycle of inflammation and tissue breakdown (Bosch 2019).
3. Synovial changes: The synovium is a membrane that lines the joint and produces a fluid called synovial fluid. This fluid plays a role in lubricating and nourishing the joint. In OA, changes occur in the synovial membrane and lead to an increase in the production of inflammatory substances. The change in the composition of the synovial fluid may contribute to cartilage degradation (Sanchez-Lopez *et al.* 2022).
4. Subchondral bone changes: The subchondral bone which is located beneath the cartilage undergoes structural and metabolic changes in OA. The loss of cartilage at the joint results in an increased pressure on the joint, which can cause thickening and sclerosis of the subchondral bone. This can lead to the formation of bone spurs known as osteophytes; these osteophytes can affect joint function and contribute to pain (Hu *et al.* 2021).
5. Imbalance in matrix metabolism: The extracellular matrix is made up of proteins such as collagen and proteoglycans. These proteins provide structural integrity and resilience. In OA an imbalance between the breakdown and synthesis of these matrix components occurs. There is an increase of enzymes that degrade cartilage, such as matrix metalloproteinases (MMPs), and a decrease in the cartilage repair mechanisms. In turn this can disrupt the normal matrix turnover and lead to cartilage degeneration (Grässel and Aszodi 2019).

6. Altered joint mechanics: Joint instability or misalignment can contribute to the development and progression of OA. Repetitive stress, joint injuries and malalignment can result in uneven distribution of force within the joint and lead to increased wear and tear on the cartilage (Ralston *et al*. 2018).

Other factors that influence the development and progression of OA include genetics, age, obesity and previous joint injury. Osteoarthritis results in damage to the tissues of the joint which causes the joint to become active and change in structure, which causes pain, stiffness and restricted range of motion. Within the joint itself there may be crepitus and muscle wasting around the joint as the disease progresses (Rangiah *et al.* 2020).

2.4 THE PREVALENCE OF OA

2.4.1 Global Prevalence of OA

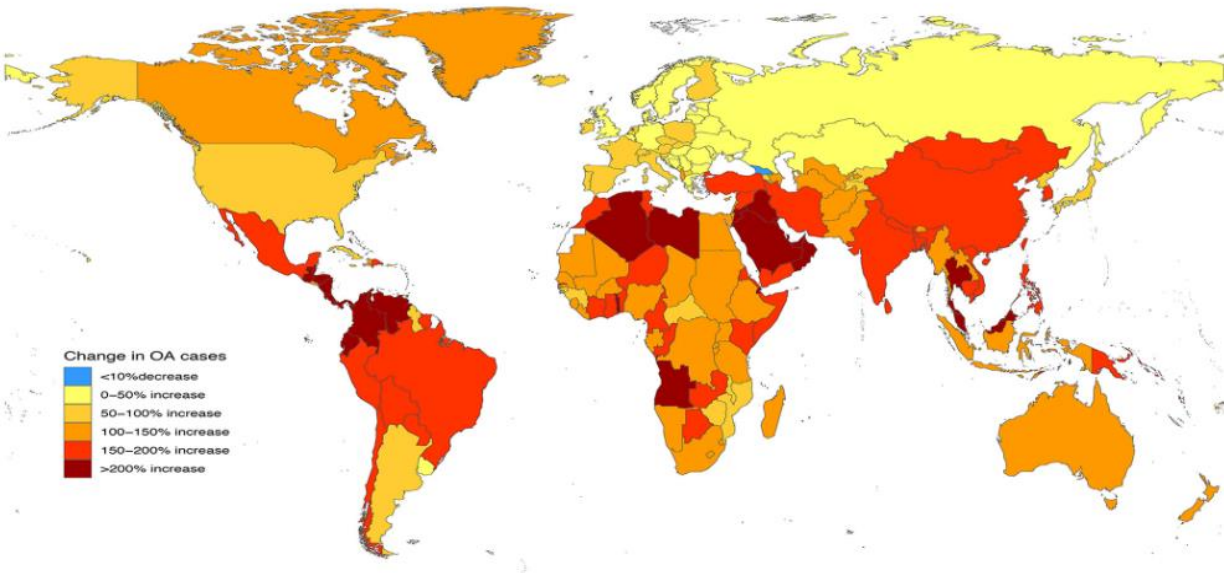

Figure 2.2: Depicts the change in percentage of the prevalent cases of OA between years 1990 and 2019 (George and Ofori-Atta 2019)

According to Hunter *et al.* (2020), OA affects an average of 7% of the population on a global scale, with more than 500 million people being affected worldwide. Between the years 1990 to 2019 there was a 48% rise in the number of individuals affected by the disease globally (Hunter *et al.* 2020). The study revealed that OA was rated as the 15th highest cause of years lived with disability and contributed 2% to the global disability total.

A study conducted by Hall *et al.* (2022) revealed that hip OA is less prevalent than knee OA, with knee OA affecting approximately 16% of the population aged 45 years and above,

compared to hip OA, which affected 10% of the population aged 45 and above. Individuals 55 years and older are most likely to experience problems in multiple joint sites. Furthermore, one in eight people are likely to experience problems in a single joint (Hall *et al*. 2022).

Population based studies on the prevalence of OA revealed that individuals 50 years and older in England indicated having OA in at least one joint, whereas a study conducted in Spain on individuals 20 years and older found that at least 29% of individuals had OA in one or more joints (Allen *et al.* 2022).

Safari *et al.* (2017) examined the prevalence of OA globally by using the sociodemographic index (SDI) of a region, this was based on the average income per person, educational attainment and total fertility rate. Studies established that OA prevalence increases with SDI score, resulting in a higher burden of OA in countries with established markets such as the USA (Leifer *et al.* 2022). The study also revealed that there is increased prevalence of OA in countries with middle SDI levels and increasing life expectancy, these are countries such as Egypt and American Samoa. These differences can be linked to a number of things including differences in lifestyle and environmental factors, access to healthcare, and variation in population demographics (Hamood *et al.* 2021).

There are differences between the prevalence of OA by gender. Studies consistently show that women experience more OA symptoms than men do, especially as they get older. A study revealed that men and women aged 60 years and older experience symptomatic OA with a percentage of 10% and 18% respectively (Allen *et al.* 2022). This gender disparity may be influenced by hormonal considerations, variances in joint architecture, and variations in employment and physical activity habits (Peshkova *et al.* 2022).

2.4.2 Prevalence of OA in Africa

Epidemiological investigations into OA have been performed but specific studies pertaining to prevalence are limited. There is a lack of comprehensive and standardised data on the prevalence of OA with African studies. A study conducted by Yahaya *et al.* (2021) calculated the prevalence of OA in Sub-Saharan Africa to be 14,2%. The study suggested that the prevalence of OA in Africa was only reported in seven epidemiological studies (Yahaya *et al.* 2021). Al Saleh *et al.* (2023) investigated the prevalence of symptomatic knee OA through a systematic review and discovered that the prevalence ranged from 11,5% in Nigeria and 9% in Cameroon (Al Saleh *et al.* 2023).

Due to the cultural diversity that exists in South Africa, diet amongst the population ranges in nutritional benefits. Studies have shown that there is a low dietary variety within the South African population (Labadarios *et al.* 2011); this indicates that nutritional supplementation and education is insufficient and, in-turn, has an impact on individuals' health, which can affect the healthcare treatment that they receive from healthcare providers such as chiropractors. As a result, the prevalence of OA is high.

In a South African context, it was suggested by Usenbo *et al.* (2015) that the prevalence of OA varies between urban and rural areas. In the adult population 65 years and older, the prevalence rate in urban areas was 55,1% and ranged between 29,5% to 82,7% in rural areas (Usenbo *et al.* 2015). Although the prevalence of OA in Africa is not clearly delineated and widely researched in the literature, these recent studies show that it is highly prevalent and important to understand and research.

2.5 RISK FACTORS OF OA

Recent research has shed light on the potential benefits of certain vitamins and minerals in managing osteoarthritis (OA). A randomized controlled trial (RCT) by Jin *et al.* (2016) revealed promising outcomes with vitamin D supplementation, showing significant improvements in pain and function scores among knee OA patients. Additionally, a study conducted by Dunlap *et al.* (2021) demonstrated the positive impact of vitamin C supplementation on reducing pain and enhancing function in OA patients. However, conflicting results were observed in a recent RCT led by Chaganti *et al.* (2014), which found no significant difference in pain reduction or functional improvement between the vitamin E and placebo groups among symptomatic knee OA patients. Furthermore, a systematic review and meta-analysis by Bahamondes *et al.* (2021) highlighted the efficacy of omega-3 fatty acid supplementation in reducing pain and stiffness in patients with hip and knee OA. These findings collectively suggest that while some vitamins and minerals show promise in managing OA symptoms, further research is warranted to elucidate their optimal dosages, mechanisms of action, and long-term effects.

Osteoarthritis is a complex interplay of mechanical, biological and metabolic factors that lead to the development of the disease. Different risk factors acting together may result in the onset of OA in an individual (Johnson and Hunter 2014). These factors can increase the likelihood of an individual developing OA and thus need to be addressed. Johnson and Hunter (2014) conducted a review on literature to demonstrate how risk factors for OA interact together. The risk factors identified for OA were divided into two categories — first, person-level factors, which

included age, sex, obesity, genetics, race and diet and second, joint level factors, such as injury, malalignment and abnormal joint loading (Johnson and Hunter 2014).

O' Neill *et al.* (2020) reviewed the occurrence and risk factors for OA, in which the patients reported outcome measures which were used for the assessment of the disease. The study found that genetics contributes significantly to OA, with a contribution of 70% to hip and knee OA, 65% to knee OA and a 40% to hand OA in females (O'Neill *et al.* 2018). The study further showed that there is a 50% chance of OA inheritance and that nutritional factors, such as a deficiency in vitamins D, C, K and selenium, have been linked to the likelihood of developing OA. Gender is another factor as the risk of developing OA is greater in females; this may be linked to the sex hormones produced by females (O'Neill *et al.* 2018).

In 2019 Georgiev and Angelov discussed the main categories of risk factors associated with OA. A narrative review was conducted to identify and summarise the modifiable risk factors for knee OA. For that study, they utilised databases such as PubMed and Scopus. From that review six main categories of risk factory were identified, namely obesity, comorbidities, occupational factors and dietary exposure (Georgiev and Angelov 2019).

Table 2.1 depicts studies that have highlighted risk factors as contributors to OA.

Table 2.1: Literature studies

Author	Title	Study Objectives	Outcome
J. B. Driban *et al.* (2017)	Risk Factors Can Classify Individuals Who Develop Accelerated Knee Osteoarthritis: Data from the Osteoarthritis Initiative	The study assessed which combination of risk factors can classify adults who develop knee OA or not and which factors are most important.	BMI, age, fasting glucose concentration and static femorotibial alignment may enable the classification of an individual's risk for the development of OA, of these risk factors age is seen as the most important. Identifying risk factors or high-risk groups of adults can enable suitable preventions strategies.
M. J. Lespasio *et al.* (2018)	Hip Osteoarthritis: A Primer	Deliver concise up-to date review on hip OA. The study/article discusses the epidemiology, associated risk factors, symptoms, diagnosis and treatment options available for hip OA.	Aging and genetics are the most important contributing risk factors for hip OA.
T. W. O'Niell *et al.* (2018)	Update on the epidemiology, risk factors and disease outcomes of osteoarthritis	Provide knowledge on the occurrence and risk factors for OA to assist in the development of population-wide prevention strategies.	The risk factors for OA can be classified as systemic which includes age, gender, genetics and ethnicity or mechanical which include joint structure/alignment, trauma, physical activity and occupation. However, some factors such as increased BMI increase the risk for the development of OA through local and systemic mechanisms.
A. Bartoluzzi *et al.* (2018)	Osteoarthritis and its management - Epidemiology, nutritional aspects and environmental factors.	Summary of the evidence on epidemiology and classical risk factors of OA. An exploration into recent evidence on metabolic changes and Mediterranean diet for OA.	Noting nutritional and environmental modifiable risk factors is a safe strategy and may help in the prevention and limit the consequences of OA.
I.W Ahmad *et al.* (2018)	Demographic Profile, Clinical and Analysis of	Determine the profile of patients with OA in Dr Soetoma General Hospital Sarabaya.	The study concluded that patients in the General Hospital had the following risk factors for OA: age-mostly affecting older population, sex-

	Osteoarthritis Patients in Surabaya		mostly affecting females, and increased BMI, which are all consistent with previous literature.
B. Schram *et al.* (2019)	Risk factors for development of lower limb osteoarthritis in physically demanding occupations: A narrative umbrella review	Synthesise the key findings in the risk factors for the development of lower limb OA.	Individuals whose occupation involves heavy physical workloads can increase the risk of developing lower limb OA. Movements such as heavy lifting, squatting, knee bending, kneeling and climbing may increase the risk for the development of OA in both the knees and hips.
G. A. Hawker (2019)	Osteoarthritis is a serious disease	The study discusses the prevalence of OA, the prevalence of OA risk factors, as well as the burden and impact of OA on individuals and the economic burden accompanied with it.	OA has been described as a serious disease due to the substantial, persistent morbidity from pain, fatigue, depression, sleep disturbances and disability, thus affecting an individual's quality of life – obesity, physical inactivity and joint injury are risk factors contributing to the development of OA.
B. Snoeker *et al.* (2019)	Risk of knee osteoarthritis after different types of knee injuries in young adults: a population-based cohort study.	The study aimed to estimate the risk of clinically diagnosed knee OA after different types of knee injuries in young adults.	The study revealed that the risk of clinically diagnosed knee OA at a young age increased six fold after knee injury compared to those with no injury. The study also revealed that OA development was 7–9 months shorter in knee injured individuals compared to other individuals who had developed OA at a young age.

Table 2.1 continued: Literature studies

Georgiev and Angelov (2019)	Modifable risk factors in knee osteoarthritis: treatment implications	The objectives of the study were to identify, summarise and cluster all the potentially modifiable risk factors that influence knee OA. Also, to discuss the susceptibility to alteration through personal, clinical and public strategy.	Six main categories of modifiable risk factors were noted (1) obesity and overweight (2) comorbidities (3) occupation (4) physical activity (5) biomechanical factors (6) dietary exposure.
N. I. Sheikh *et al.* (2020)	Risk Factors for Osteoarthritis of Knee Joint among Pakistani Population	The aim of the study was to discover the factors associated with knee OA in patients that presented to the tertiary care hospital in Islamabad complaining of knee pain.	The study discovered that knee OA was most common in females residing in rural areas. An increase in age and a rural background were other factors associated with knee OA in the county of Islamabad.
Y. He *et al.* (2020)	Pathogenesis of Osteoarthritis: Risk Factors, Regulatory Pathways in Chondrocytes, and Experimental Models.	A review that provides an update of the known OA risk factors and relevant mechanisms of action.	The study discussed the factors contributing to OA and their mechanism of action. The risk factors for OA discussed included aging, trauma, obesity, chronic mechanical overload/overuse and genetics.
J. L. Whittaker *et al.* (2021)	A lifetime approach to osteoarthritis prevention	A discussion on what is known about OA prevention, provision of guidelines on the prevention strategies related to obesity and joint injury that have been noted as important modifiable risk factors.	The prevention of OA is more achievable that the reversal of the disease due to the limited regeneration capacity of cartilage. Modes of interventions that exist should be considered for the prevention of OA. Obesity/weight and joint trauma have been noted as major risk factors for OA. However, risk factors in post-industrial eras should be identified and interventions should take priority.
C. T. J. Hulshof *et al.* (2021)	The effect of occupational exposure to ergonomic risk factors on osteoarthritis of hip or knee and selected other musculoskeletal diseases: A systematic review and meta-analysis from the WHO/ILO Joint estimates of the work-related burden of disease and injury.	A systematic review and meta-analysis to estimate the effects of occupatioal exposure to ergonomic factors on musculoskeletal disorders and OA.	The study found that occupational exposure to ergonomic risk factors increase the risk for the development of OA of the knee and hip.
K. D. Allen *et al.* (2022)	Epidemiology of osteoarthritis	Summarise current evidence on the prevalence, incidence and risk factors of OA on a person-level and joint-level.	Risk factors of OA with the strongest evidence are obesity and joint injury. Emerging evidence of high interest with a link to OA risk or progression include specific vitamins/diets, high blood pressure, genetic factors, use of metformin, bone mineral density, abnormal joint shape, malalignment and lower muscle strength and quality.

Based on literature that has been explored, the most common risk factors for the development of OA are genetics, obesity, dietary factors, joint injury, aging, gender, increased mechanical overload/overuse.

Within South Africa, there has been limited to no population-based studies on the risk factors for the development of OA.

2.6 THE IMPACT AND BURDEN OF OA

OA is a prevalent, incapacitating condition that places a heavy burden on society and the economy in addition to the physical and psychological effects it frequently has on an individual (Raposo *et al.* 2021). The pain caused by OA can result in poor sleep, depression, loss of independence and functional limitations, all of which result in a negative impact on daily living. Individuals with OA tend to have a minimum of one other chronic condition with most being cardiac related (Safiri *et al.* 2020). According to Hawker (2019), people with OA are not likely to receive a diagnosis or the recommended treatment. When treatment of knee OA is avoided or inadequately treated, individuals avoid physical activities as this increases their level of pain, this creates an issue as exercise has been proven to be an effective non-surgical approach for the treatment of OA (Marks 2018)

The physical effects of OA can vary depending on the severity and which joint is involved. The affected joint may be painful during certain movements and stiffness may occur after a long day of activity. Some individuals may experience a grating sensation accompanied by popping or cracking in the joint. Overtime there is a loss of flexibility in the joint which affects the range of motion of an individual (Wilkinson *et al.* 2017). This can result in difficulties performing activities of daily living.

Shalhoub *et al.* (2022) conducted a cross sectional study on OA patients from an orthopaedic outpatient clinic from four hospitals in Palestine. This study assessed the impact of pain on the quality of life in patients with OA using the brief pain inventory scale and the five dimensions quality of life scale with the visual analogue scale of the European quality of life to assess the health-related quality of life (HRQOL). Individuals who were older, unemployed, had a lower educational level, a higher number of joints affected, a longer duration of OA and individuals who had multiple comorbidities were at an increased risk of having lower HRQOL (Shalhoub *et al.* 2022).

Mahir *et al.* (2016) conducted a descriptive prospective study on patients with knee OA over a period of six months in Morocco; the study revealed that the knees are the most affected arthritic location (Mahir *et al.* 2016). Knee OA limits movement of patients in 80% of cases, of this 25% of patients find themselves unable to perform activities of daily living. Most individuals affected by knee OA had pain which manifested with walking, climbing stairs and performing household chores (Clynes *et al.* 2019). The lack of the ability to perform day to day activities resulted in a decrease in quality of life and had a psychological impact on patients (Mahir *et al.* 2016).

It is widely accepted that pain has a negative effect on sleep quality. Allen *et al.* reported that patients with hip or knee OA had higher likelihood of experiencing sleep problems (Riley Martinez *et al*. 2019).

Osteoarthritis is thought to impose a greater burden for those living in low- and middle-income countries (LMICs) by creating a vicious cycle of pain and disability that subsequently worsens these outcomes (Eyles *et al.* 2022). A cross-sectional study conducted by Yaya *et al.* (2020) assessed the self-reported activities of daily living, health and the quality of life amongst older adults in South Africa and Uganda. The study found that a low percentage of men and women in Uganda and South Africa reported having good health and quality of life. The majority of participants reported difficulties in carrying out basic activities such as washing, cooking and walking. This affected their general health and quality of life, thus increasing their dependency on care (Yaya *et al.* 2020). Although OA is more prevalent in older individuals, it can occur at any age (Ralston *et al.* 2018). The presence of OA can affect an individual's ability to work and increase absenteeism, thus affecting personal earnings, activity of daily living and overall lead to a decrease in personal and societal productivity (Yahaya *et al*. 2021). Laires *et al.* (2018) revealed that half of the population between 50–64 years were paid out of work and had an OA prevalence of 30% (Laires *et al.* 2018).

An increase in the presence of OA in the population places an economic burden on individuals, a healthcare system and society. The direct costs of medications, treatments, surgical interventions and assistive devices can be substantial. The indirect costs such as work absenteeism, productivity and caregiver further contribute to the economic impact of OA (Xie *et al.* 2016). The management of OA also requires regular healthcare visits and diagnostic tests resulting in increased healthcare utilisation. This includes visits to primary care physicians, specialists and other healthcare professionals. The burden of OA on the healthcare system contributes to the overall healthcare costs and resource allocation (Dantas *et al.* 2021).

Access to healthcare in South Africa is particularly limited in rural regions, where health workers are generally limited to students, recent graduates, and medical aids. South African provinces are ruled by various political parties, which has an influence on the care accessible in each region, resulting in health service fragmentation. Although public primary health clinics offer the majority of OA care in South Africa, there are high wait times and insufficient assistance to help patients manage their OA (Eyles *et al.* 2022).

Chiropractic care, together with nutritional education and supplementation, play a significant role in reducing these burdens thus improving an individual's quality of life and reducing financial burden that occurs with OA (Hawker 2019).

2.7 THE TREATMENT AND MANAGEMENT OF OA

The treatment and management protocols for OA are similar for any joint that may be affected by the disease process (Schwellnus *et al.* 2010). The treatment options include pharmacological and non-pharmacological interventions to assist in pain reduction and the improvement of the quality of life and function (Magni *et al.* 2021). To achieve the best treatment outcomes for OA a combination of pharmacological and non-pharmacological interventions should be utilised.

2.7.1 Pharmacological

Ghouri and Canaghan (2021) conducted a narrative review based on a PubMed search, which included pharmacological trials in OA from 2017–2018, drugs such as colchicine, hydroxychloroquine, tumour necrosis factor inhibitors, and injectable corticosteroids were analysed. The study concluded that the disease-modifying antirheumatic drugs have not demonstrated any benefits in the management of OA symptoms (Ghouri and Conaghan 2021).

Oral NSAIDs are the most commonly used oral pharmacological agents in the treatment of OA. A meta-analysis carried out by da Costa *et al.* (2022) assessed the effectiveness and safety of NSAIDs in the treatment of patients with knee and hip OA. The trial consisted of NSAIDs, opioids, paracetamol and an oral placebo; the study concluded that oral NSAIDs were most effective for pain associated with OA. The study also revealed that the use of oral NSAIDs may not be appropriate in the presence of comorbidities. In this case, the use of topical NSAIDs should be considered as a safer effective option (Costa *et al.* 2021). Similarly, a narrative review by Hawthorn (2020) looked into the effectiveness of the use of topical NSAIDs for the treatment of knee OA. This study was carried out using online resources such as PubMed, Cochrane library, Google Scholar, Medline and relevant clinical and commissioning guidelines. The study concluded that topical NSAIDs are a safer, more effective treatment option as they reduce the risk of systemic reaction, overdose and drug interactions (Hawthorn 2020).

Park *et al.* (2017) conducted a study which identified the patterns of medications used by patients affected by knee OA using the Korean nationwide claims database The findings revealed that most patients had been treated with NSAIDs and half of those patients continued to use NSAIDs on a regular basis. The use of oral corticosteroids was also high in patients

affected by knee OA. The use of medication by patients in Korea differed from those in other countries, in Korea, NSAIDs use had a prevalence of 82,5%, compared to the USA which had a prevalence of 26%–58%. The regular use of NSAIDs in Korea was 48,8%, compared to the reported percentage of 14,4% in Spain (Park *et al.* 2019).

Treister *et al.* (2019) conducted a randomised, double-blinded controlled trial of Naproxen in OA of the knee; one group was given a placebo and the other group was given Naproxen Patients in the study responded significant to the Naproxen (Treister *et al*. 2019). Holt *et al.* (2015) conducted a placebo trial of naproxen/esomeprazole combination and celecoxib; the study also revealed that participants who took the naproxen/esomeprazole combination had a significant decrease in pain compared to the placebo.

2.7.2 Non-Pharmacological Interventions

Non-pharmacological interventions for OA include education on arthritis, exercise programmes to provide weight reduction, manipulation, massage and diet modifications (Ferreira *et al.* 2018). Special attention to footwear is also important — the recommendations for footwear in patients with OA are the use of a shoe with a soft, thick and shock absorbing soles with a minimal heel (Schwellnus *et al.* 2010). The use of acupuncture, cupping therapy, laser and kinesio-taping have also shown to be effective in reducing pain associated with OA (Ferreira *et al.* 2018).

Amaral *et al.* (2018) conducted a clinical trial to evaluate the use of assistive devices as a strategy in non-pharmacological treatments of patients with hand OA. Assistive devices are commonly used in individuals with hand OA, with the purpose of promoting alignment and reducing stress on the joint during activity. Individuals in this study reported limitations in 60 different activities, the most frequent were cutting using a knife, hand washing clothes, sweeping, washing dishes, handling zips, buttons or belts and opening bottles or cans. Each individual was assigned an assistive device most suitable to the complications they had. Participants showed a gain in occupation performance and hand function with a reduction in pain, thus supporting the use of assistive devices as an effective non-pharmacological treatment for hand OA (Amaral *et al.* 2018).

Castrogiovnni and Musumeci (2016) conducted a review which aimed to evaluate the management of OA through physical therapy treatments. The data were analysed from recent supporting literature to investigate the effects of exercise on patients with mild OA symptoms. The exercises investigated were anaerobic training, aerobic training, flexibility training and

aquatic training. The data obtained revealed that there is limited evidence on which type of exercise has greater benefits for the patient; however, exercise treatments that combine strengthening exercises with flexibility training were the best option for patients with mild OA symptoms (Catrogiovanni and Musumeci 2016).

Ferreira *et al.* (2019) conducted a systematic review and meta-analysis on available randomised controlled trials on the non-pharmacological interventions for knee OA. Exercise proved to have a positive impact on knee OA with resistance training showed greater improvements on pain, strength and function. The study also revealed that pulsed electromagnetic field therapy (PEMF) and moxibustion (a form of therapy that involves the burning of mugwort leaves) had positive effects on patients with knee OA. Diet, hydrotherapy, high level laser, interferential current (IFC), shockwave and transcutaneous electrical stimulation (TENs) also showed positive effects. However, there are limited studies supporting this and, thus, more studies are needed to fully recommend their use (Ferreira *et al.* 2019).

Lim *et al.* (2022) systematically reviewed 15 current OA clinical practice guideline recommendations and approaches for weight management. From these 15 guidelines most recommended weight loss for patients with knee and hip OA but not for hand OA, most guidelines do not provide advice on how to lose weight effectively or maintain weight loss. The main strategies for weight loss included a combination of approaches, such as diet, an exercise programme and general advice. From the study, only one guideline included strategies to assist with maintenance of weight and weight loss (Lim *et al.* 2022). According to WHO (2021), preventing weight gain is just as crucial as encouraging weight loss in order to combat the rising incidence of obesity because gradual weight gain results in people moving from normal to overweight to obese.

Several studies have investigated the impact of nutritional interventions on osteoarthritis (OA) outcomes, focusing on weight-loss diets, anti-inflammatory foods, and vitamin and mineral supplementation. Messier *et al.* (2013) conducted a randomized clinical trial (RCT) demonstrating that intensive diet and exercise interventions resulted in reduced knee joint loads, inflammation, and improved clinical outcomes among overweight and obese adults with knee OA. Zeng *et al*. (2023) conducted a systematic review and meta-analysis which suggested a potential protective effect of fruit and vegetable consumption against the development of symptomatic knee OA. Furthermore, Arden *et al.* (2016) conducted an RCT investigating the effect of vitamin D supplementation on knee OA and found that it had no significant effect on knee pain or structure. These findings collectively suggest that while some dietary interventions

may hold promise in managing OA symptoms, further research is needed to elucidate their effectiveness and optimal implementation.

2.7.3 Complementary and Integrative Treatment

The most common holistic/integrative intervention for OA are natural products, such as supplements and herbal remedies. The most popular natural products for OA of the knee include glucosamine, chondroitin and fish oil/omega 3 (Brown 2020). A Cochrane review consisting of 49 randomised controlled clinical trials on mild to moderate OA of the hip and knee found moderate quality evidence that *boswellia seratta* (herbal extract from the *boswellia seratta* tree used to treat inflammatory diseases) slightly improved pain and function (Brown 2020).

Guven *et al.* (2020) investigated the use of complementary and alternative medicine in patients with OA. A total of 77 patients at physical therapy polyclinics were administered a survey questionnaire. The study found that 23,4% of OA participants used complementary therapy and, of those, 66% used massage, 38,8% used diet and 33% used music (Guven and Unsal 2020).

A qualitative study conducted by Ali *et al.* (2017) explored the benefits of massage for patients with knee OA, specifically Swedish massage. The study had 18 participants — 10 from New Jersey and eight from Connecticut. All participants received a Swedish massage. Participants experienced a relaxation effect, improved quality of life and symptomatic relief (Ali *et al.* 2017).

Yu *et al.* (2020) conducted a systematic review and meta-analysis which compared complementary and alternative treatment for OA. These treatments included acupuncture, moxibustion, Chinese herbal medicine, yoga, baduanjin, Tui Na and Tai Chi. This study consisted of participants 18 years and older with diagnosed knee OA, literature revealed that complementary and alternative medicine has their strengths and also carry a reduced risk of side effects compared to pharmacological intervention (Yu *et al.* 2020) (Irnich and Baumler 2023).

A clinical trial carried out by Wang *et al.* (2016) compared the effectiveness of Tai Chi and physical therapy for knee OA. The study consisted of 204 participants with symptomatic OA. Overall, both Tai Chi and standard physical therapy had beneficial effects in the treatment of knee OA. However, Tai Chi showed greater improvement in depression and the physical component of quality of life (Wang *et al.* 2016).

Selehi *et al.* (2023) carried out a randomised controlled trial on 56 patients with knee OA. Participants in both groups received electroacupuncture and exercise therapy programmes, while the intervention group received cupping after electroacupuncture plus exercise therapy. The study found that acupuncture and electroacupuncture improved pain and knee function in OA. Those results aligned with previous clinical studies which noted cupping therapy to be effective in pain reduction in OA, even though the mechanism of cupping is not fully understood. In that study, the addition of cupping therapy to acupuncture together with exercise therapy on knee OA pain and function showed promising outcomes (Salehi *et al.* 2023).

2.8 NUTRITION AND OSTEOARTHRITIS

Nutrition which involves dietary modifications goes back thousands of years to Indian Ayurvedic and traditional Chinese medicine dietary practice (Jana 2020). These practices addressed arthritis through the elimination of foods that produced heat in the body and put emphasis on cooling foods (Schepker 2018). Diet, supplementation and education play a major role in the progression of musculoskeletal diseases and, therefore, it is important that a patient consumes foods that contain the vitamins and minerals that are needed to maintain healthy bones and joints (Rosetibaum *et al.* 2010).

Literature has revealed that there is no specific cure for degenerative joint disease but diet has been shown to reduce symptoms, slow down the progression of disease, as well as improve overall joint health (Messina *et al.* 2019). Nutrition plays an important role in OA; maintaining an ideal weight is of importance in individuals with OA. An excess in weight adds more pressure on the joint, especially weight bearing joints, such as the knees and hips. Various studies have revealed that weight loss can reduce pain and improve function in individuals suffering from OA (Buck *et al.* 2022).

Within the progression of OA, a chronic low-grade inflammation can be noted. This is why consuming an anti-inflammatory diet is essential. An anti-inflammatory diet can help reduce inflammation in the body including the joints (Cooper *et al.* 2022). An anti-inflammatory diet includes foods rich in omega 3 fatty acids, that is fatty fish, such as salmon, fruits and vegetables; nuts; seeds; wholegrains; and healthy fats, such as olive oil. Omega 3 fatty acids have anti-inflammatory properties that may assist in relieving symptoms of OA. Studies suggest that omega 3 supplementation may reduce joint pain and stiffness (Cordingley and Cornish 2022). Antioxidants play a role in reducing oxidative stress which may play a role in the development and progression of OA. Foods rich in antioxidants include colourful fruits and

vegetables, such as berries, citrus fruits, and green leafy vegetables. These foods can help reduce joint pain and inflammation (Tudorachi *et al*. 2021).

A deficiency in vitamin D has been linked to the risk of developing OA and health related issues. Vitamin D is essential for maintaining healthy bones and joints and therefore, it is of importance to maintain adequate vitamin D levels. Natural sources of vitamin D can be obtained through sunlight exposure and certain foods, such as fatty fish, fortified dairy products and egg yolk (Thomas *et al.* 2018).

Vitamin C is important for the synthesis of collagen. Collagen plays a crucial role in maintaining the integrity of cartilage at a joint. Some studies have suggested that vitamin C supplementation may play a role in preventing the progression of OA. The dietary sources of vitamin C include citrus fruits, strawberries, kiwi, bell pepper and broccoli (Dunlap *et al.* 2021).

Calcium and vitamin K also play a role in maintaining hone health, even though OA affects the joints it can also lead to changes in the underlying bone (Chen *et al.* 2021). Therefore, maintaining health levels of vitamin K and calcium is important for supporting overall bone health (Chin 2020). Calcium food sources include dairy products, leafy greens and fortified foods. While vitamin K can be sourced from foods such as broccoli, leafy greens and vegetable oils (WebMD 2022).

A meta-analysis by Mathieu *et al.* (2022) analysed the impact of nutritional supplementation on OA symptoms. This study revealed that curcumin or ginger supplementation have shown great results in the improvement of OA symptoms but studies carried out on the impact of nutritional supplementation are limited. In order to obtain more accurate results, further clinical trial studies need to be conducted (Mathieu *et al.* 2022). Glucosamine and chondroitin are commonly used for supplementation in OA; they have been linked with supporting joint health through cartilage repair and inflammation reduction. Several studies have revealed positive effects in pain reduction and improved function in individuals with OA (Meng *et al.* 2023). Studies also suggest that omega 3 supplementation can reduce joint pain and stiffness, as well as an individuals need for pain medication but this still requires further exploration (Cordingley and Cornish 2022).

Literature has revealed that vitamin D deficiency has been associated with OA progression and an increase in pain. Supplementing with vitamin D might help improve symptoms and slow down the progression of the disease especially in individuals with low vitamin D levels (Mathieu *et al.* 2022). The supplementation of vitamin C may have protective effects on cartilage and slow down the progression of OA but literature has revealed mixed results on the effectiveness

of vitamin C as a stand-alone treatment (Dunlap *et al.* 2021). There has been limited and inconsistent research on the effectiveness of antioxidant supplementation, such as vitamin E and selenium, and their benefit in reducing oxidative stress and inflammation associated with OA (Qu *et al.* 2021).

2.9 CHIROPRACTIC AND OA TREATMENT AND MANAGEMENT

Manual therapies including joint mobilisation, manipulation and muscle strength exercises for the neck. Back and extremity joints are non-pharmacological pain management treatments that fall within the scope of chiropractic practice (Reichardt *et al.* 2021). Beyerman *et al.* (2006) clearly defined chiropractic manipulation as “a passive, manual manoeuvre where the three-joint complex is suddenly carried beyond normal physiological range of movement without exceeding the boundaries of anatomical integrity” (Beyerman *et al.* 2006).

Various clinical trials, case reports and systematic reviews have investigated the benefits, treatment outcomes and management protocols for OA by chiropractors. A case report by Law (2001) evaluated the effectiveness of conservative treatment for the relief of pain and dysfunction in knee OA patients. The study followed a 54-year-old female with bilateral moderate knee pain for a three year duration. The management plan for the patient included passive therapies, such as IFC and pulsed ultrasound; active therapies which involved manipulation and mobilisation of the knee; and the use of nutritional supplementation, in conjunction with a home-based exercise programme. The knee manipulation and mobilisation were to restore mobility to the fixated joint. The study concluded that the combination of conservative therapy showed improvement in knee range of motion (Law 2001).

Beyerman *et al.* (2006) conducted a clinical trial in which the efficacy of chiropractic spinal manipulation, manual flexion/distraction and hot packs in the treatment of lower back pain in OA compared to moist heat alone. The treatment group had 124 participants and the moist heat group had 93. Each participant received 20 sessions of treatment over a period of 2–3 weeks. The study found that chiropractic care was more effective than the heat treatment alone in pain reduction Chiropractic care combined with heat alone proved to be effective in improving range of motion (Beyerman *et al*. 2006).

A case series conducted in Australia by de Luca *et al.* (2010) assessed the treatment of chiropractic management in patients with hip OA. The sample consisted of four participants who received nine sessions of chiropractic treatment. The treatment included pre-adjustive stretches for the hip muscles and high velocity, low amplitude long axis traction of the hip. The

adjustments included internal rotation and or abduction. After treatment the patients were provided with post-adjustive stretches for the hip muscles. The study concluded that all four participants had an increase in hip range of motion and a reduction in pain and disability score (Luca *et al.* 2010).

Another study by Thorman *et al.* (2010) assessed the effects of chiropractic care on pain and dysfunction in patients with hip OA. That study had a greater sample size that the study by de Luca *et al.* (2010). The sample size consisted of 14 patients with hip OA awaiting arthroplasty. Interventions included high velocity, low amplitude adjustments to the hip, spine and lower extremities in combination with soft tissue or myofascial techniques, arthrokinematics stabilising exercises or a combination if necessary. The study showed that patients who received chiropractic care improved compared to the control group after the three weeks of treatment and patients experienced a reduction in pain and increased quality of life.

A Canadian study carried out by Stuber *et al.* (2013) revealed that providing nutritional education and supplementation play a huge part of patient care (Stuber *et al.* 2013). Chiropractors who prescribe the use of dietary supplementation mainly focus on conditions related to their scope of practice. These include general wellness, musculoskeletal, arthritic and degenerative conditions. The dietary supplements that are mostly recommended by chiropractors are multivitamins, vitamin C, vitamin D, calcium, probiotics, glucosamine sulfate and omega 3 fatty acids (Mathieu *et al.* 2022). Nutritional intervention in chiropractic care is based on the understanding of biochemistry, physiology, nutrition as well as the chiropractor's capacity to evaluate a patient's state of health (Holtzman and Burke 2007). The holistic approach used by chiropractors and the intimate doctor-patient relationship provide a platform for nutritional supplementation. The combination of these factors produces a special circumstance for meeting the publics' nutritional needs (Lefebvre *et al.* 2012). All interested professions can collaborate to advance the welfare of the public because there is so much work to be done in the field of nutrition (Lee *et al.* 2018).

Villacorta *et al.* (2020) noted that a gap exists in nutritional education amongst healthcare providers, especially when it comes to chronic diseases (Villacortal *et al.* 2020). However, nutritional education is important because it can prevent the development of health conditions, such as OA, as well as improve the overall health of an individual and provide long term health care benefits (Crowley *et al.* 2019). Chiropractors can be described as musculoskeletal specialists and the importance of nutritional education and supplementation is pivotal (Glucina *et al.* 2020).

Within South Africa there is limited literature on the use of nutritional education and supplementation by chiropractors in the management of OA. This study will serve to highlight this gap in literature and provide an understanding on how chiropractors in South Africa provide and utilise nutritional education and supplementation in the management of OA patients.

CHAPTER 3

CONCEPTUAL FRAMEWORK

3.1 CONCEPTUAL FRAMEWORK

Ritchie and Spencer (1994) explored multiple methods and traditions in qualitative research to develop a framework. The framework was intended to be an approach to qualitative data analysis that provides specific answers about a topic being researched. The main objectives of the framework analysis were to identify, describe and interpret key factors and themes within a phenomenon of interest (Goldsmith 2021).

The use of conceptual frameworks was defined by Miles *et al.* (2014) as a means of explaining the main thing to be studied, that is the key factors, constructs and variables, as well as the presumed relationship amongst them (Gregory 2020). The conceptual framework has grown in research across a range of disciplines over the years. In some literature, the terms conceptual and theoretical framework are used interchangeably (Gregory 2020). Grant and Osanloo (2014) stated that a conceptual framework provides a “logical structure of connected concepts that help provide a picture or visual display of how ideas in a study relate to one another” (Grant. and Osanloo 2014).

A conceptual framework focuses on the following (Adom *et al.* 2018):

- Concepts from different theories, limited to a specific research problem.
- It is created with a variety of conceptual and theoretical ideas.
- A conceptual framework describes the state of known knowledge usually through a literature review.
- Identifies gaps in the understanding of a phenomenon/problem.
- Outlines the methodological underpinnings of research projects.
- It is constructed to answer two questions:
    1. Why is the research important?
    2. What contributions might these findings make to what is already known?

Conceptual frameworks mostly align with qualitative research methods. This framework is important to attain rigor and quality. It also provides guidance for the development of

predetermined plans for what to observe, how to record and to minimise potential bias in a research study (Johnson *et al.* 2020).

3.2 DONABEDIAN MODEL

The Donabedian model was proposed by Avedis Donabedian and has since been widely accepted as a method to design the main dimensions of healthcare quality. Avedis Donabedian described a conceptual model that provides a framework for examining health services and the quality of healthcare. He based healthcare qualities on the three components of structure, process and outcomes, noting that each component has an effect on the next one (Haj *et al.* 2013).

1. Structure refers to the characteristics of the individual who provides care, as well as the setting in which the care is being delivered.
2. Process refers to the activities that take place during the delivery of care to the patient, which includes the diagnosis, treatment, preventative care and patient education.
3. Outcome refers to the effects of healthcare on the patient, the goal of this step is to consider if the goals of the care provided were achieved. Outcome is indicated through changes to health status, behaviour or knowledge, as well as patient satisfaction and health related quality of life (Tossaint-Shoenmakers *et al.* 2021).

In this study, the structure refers to the chiropractor because they are providing healthcare services to patients presenting with OA. The process is the treatment and management provided by the chiropractor, which includes chiropractic specific techniques, such as joint manipulation and mobilisation, along with various other treatments. In addition, chiropractors also provided patients with education on nutrition and nutritional supplementation. The outcome was assessed through the practitioners' feedback on the treatment and management protocols utilised.

3.3 HOLISTIC CARE MODEL

The holistic care model was proposed by the Ministry of Health and Welfare (Taiwan) in 2005 (Tsai and Yan 2021). The holistic care concept is based on the premise that numerous linked variables impact health and well-being: physical, mental, emotional, social, and even spiritual. In contrast to a restricted focus on individual symptoms or disorders, a holistic approach takes into account the entire person (Jasemi *et al.* 2017). This concept understands that treating the underlying causes of a problem and creating general balance can result in improved health

outcomes. It frequently entails collaboration among many healthcare providers and may include complementary and alternative therapies in addition to regular medical treatments (Tsai and Yan 2021). The holistic care paradigm also emphasises patient empowerment and participation in their own healthcare decisions. This approach is consistent with the wider concept that health is a state of complete physical, mental, and social well-being, rather than the absence of sickness (Papathanasiou *et al.* 2013).

The following principles have been highlighted by the American Holistic Medical Association (Ventegodt *et al.* 2016):

- Holistic healthcare providers prioritise tailoring patient care to the individual's unique needs and nature, emphasising the person over the illness.
- Practitioners should recognise the inherent healing capacities within every individual—body, mind, and spirit—and actively work to evoke and assist patients in utilising these innate powers for the healing process.
- Practitioners must integrate a broad spectrum of healing systems, constantly learning about safe and effective options from various traditions. Treatment choices, ranging from lifestyle adjustments to conventional medicine, are carefully selected to best address the distinct requirements of each patient.
- Life experiences, including moments of joy, suffering, and the end of life, should be seen as profound learning opportunities for both patients and healthcare providers.
- The ultimate goal of holistic medical practice is optimal health, a conscious pursuit of balance across physical, environmental, mental, emotional, social, and spiritual aspects of human experience. This pursuit leads to a dynamic state of being fully alive and well, irrespective of the presence or absence of disease.
- Holistic practitioners must focus on promoting health, preventing illness, and raising awareness of disease, rather than merely managing symptoms. Their approach addresses symptoms, modifies contributing factors, and enhances the patient's overall life system to optimise future well-being.
- In the practitioner-patient relationship, an ideal partnership is encouraged, valuing the autonomy and insights of both parties. The quality of this relationship is deemed crucial to the healing process.

- Holistic healthcare providers should lead by example, incorporating the principles of holistic health into their own lives, thereby profoundly influencing the quality of the healing relationship.
- Holistic practitioners should aim to meet patients with grace, kindness, acceptance, and unconditional spirit, acknowledging love as life's most potent healer.
- Viewing individuals as whole beings—unifying body, mind, spirit, and their living systems—defines the holistic approach to healthcare.

Chiropractors as healthcare providers utilise a holistic healthcare approach with treatment and management of patients using a multidisciplinary approach. In this study, practitioners emphasised the importance of managing the patient as a whole and referring a patient to the appropriate healthcare professional, when necessary, in order to achieve the overall wellness of the patient.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

This chapter describes the methodology and research design that was used to conduct this study. It includes the research procedure, sample population and size, as well as the ethical considerations and the process of data collection utilised throughout this study.

4.2 RESEARCH DESIGN

4.2.1 Qualitative Research

A qualitative, exploratory approach was utilised in this study. Hunter *et al.* (2019) suggested that a qualitative exploratory design allows a researcher to explore a topic that may have little coverage in existing literature. This allows for the participants in a study to aid in the contribution of development of new knowledge in the area being researched (Mezmir 2020). This study design was appropriate for this study because it allowed for a broader insight into the use of nutritional education and nutritional supplementation in the chiropractic management of patients with OA. The use of this study design has become popular in the field of health science (Klopper 2008).

4.3 POPULATION

The population of this study was registered, practicing chiropractors in South Africa. A chiropractor is a healthcare professional specialising in the treatment of musculoskeletal conditions most often related to the spine through the use of spinal manipulation, mobilisation and a variety of other treatment techniques, with the goal of restoring proper joint, muscle and nervous system function to provide pain relief, increased range of motion and improve the overall quality of life (Hartvigsen and French 2020).

4.4 SAMPLING TECHNIQUE

Purposive sampling, which is often used for exploratory research designs, were used in this study. Purposive sampling is a frequently used, conceptually driven strategy in which participants are selected deliberately in order to provide information that can only be obtained

from that group of individuals (Bhardwaj 2019). Consideration of the factors or characteristics of possible participants that affect the contribution they could make to the study can serve as a guide for this selection process. These elements could be straightforward demographics such as age, gender, and socioeconomic level, but they can also take into account more complex factors such as specific views or attitudes (Farrugia 2019). In this study, 12 participants were purposively sampled based off the inclusion and exclusion criteria to ensure the reliability of conclusions that were drawn. Data saturation was reached at 10 participants, however a minimum sample size of 12 guided the study and reconfirmed saturation.

4.5 SAMPLE SIZE

The 12 participants recruited to participate in the study are practicing chiropractors in South Africa. It has been recommended that qualitative research requires a minimum sample size of at least 12 (Vasileiou *et al.* 2018). Data collection was guided by data saturation. Saturation refers to no additional data being found. It is the idea that sampling is guided by the necessary similarities and contrasts required by the obtained information (Saunders *et al.* 2017).

4.5.1 Inclusion Criteria

1. Participants who were available and willing to give consent to participate in the research study.
2. The participants were registered with the AHPCSA and practising within South Africa.
3. Practitioners who had been in practice for more than 2 years.

4.5.2 Exclusion Criteria

1. Participants who were reluctant to be recorded and did not sign the informed consent forms.
2. Those who were registered with the AHPCSA but were not currently practising.

4.6 PARTICIPANT RECRUITMENT

Participant recruitment commenced after full DUT-IREC (029/23) approval had been granted. An advertisement (Appendix D) and letter of information (Appendix A) were sent to the Allied Health Professionals Council of South Africa and the Chiropractic Association of South Africa to distribute to chiropractors in order to assist with the recruitment. The advertisement was also placed on chiropractic groups on various social media platforms. When a participant expressed

interest from seeing the advertisement (Appendix D), a date and time for a Microsoft Team's meeting was confirmed via email and a Team's meeting link followed after.

4.7 RESEARCH SETTING

Data were collected from selected practicing chiropractors in South Africa online via the Team's platform. All interviews were recorded.

4.8 STUDY PROCEDURE

4.8.1 Prior to Interviews

1. The purpose of the study was explained to the participating chiropractors, as well as their role in the study.
2. The letter of information (Appendix A) and informed consent form (Appendix B) were sent out to the participating chiropractors.
3. The aim of the interview was explained to each participant. The interviewer was to use their information for research purposes only.
4. The points were explained to participants in detail to inform the participants throughout the study and to make sure that the participating chiropractors understood their role in the study as well as their rights as the participants.

4.8.2 Data Collection

When participants responded to the advertisement and an interview time and date were confirmed, semi-structured online interviews took place. A letter of information (Appendix A) and an informed consent form (Appendix B) were signed by each participant prior to the interviews. Each interview on Teams was recorded with permission from the participants. An interview guide of open-ended questions was utilised to obtain data (Appendix E).

The intention of the interviews was to explore the use of nutritional supplementation and nutritional education in the chiropractic management of OA amongst practicing chiropractors in South Africa. The researcher conducted semi-structured online interviews with the participants via the MS Teams platform.

Semi-structured interviews were utilised in this study. This allowed for the elaboration on information that was considered important. Interviews allow for a more in depth understanding on the research topic (Gill *et al.* 2008). The researcher used an interview guide (Appendix E) which consisted of open-ended questions on the role of nutritional education and

supplementation in the management of OA, the barriers encountered, and also the influence and impact of nutritional education and supplementation in their management of patients with OA. The interviews were recorded on MS Teams and thereafter they were transcribed and additional notes were taken down during the interview to ensure no information was excluded.

4.8.3 Open-Ended Questions

The open-ended questions used in qualitative research allowed the researcher to take a "holistic and comprehensive" look into the topic being researched. Open-ended questions were asked in the interview process of this study as they provided participants with the opportunity to voice their own opinions or perspectives on a topic of interest instead of responding to a pre-determined set of answers (Elliot 2022). These types of questions reduce the likelihood of a participant guessing the correct answer and tend to provide information that is more trustworthy.

Some of the disadvantages associated with open-ended interviewing include the process of analysing data can be lengthy, as the responses from each participant have to be analysed individually, coding schemes need to be developed, and the responses need to be coded for manually; this can be a very time-consuming process (Neuert *et al.* 2021)

Chiropractors practising in South Africa were interviewed using a list of open-ended questions to obtain information regarding their use of nutritional education and nutritional supplementation in the management of patients with OA. These questions proved to be beneficial in obtaining an in depth understanding of the research topic.

4.9 TRANSCRIPTION OF DATA

Data transcription is the process of translating spoken text into written text for documentation or analysis. The transcription of data is the first and most significant phase in a qualitative research project (Adeagbo *et al.* 2021).

4.9.1 Process of Transcription of Interview Data

The transcription of the data from audio recordings into word documents was done by the researcher by carefully listening to the original interview audio recordings, and going back and forth to verify the original interview. All audio recordings and transcriptions were sent to the researcher's supervisors to verify the original interviews to ensure that no valuable information was omitted.

4.9.2 The Coding of Subjects

Each interview subject was coded to facilitate representation of their words in writing, while protecting their identities and maintaining participant confidentiality. The coding utilised reflected the chiropractors and their placement within the sequence of 12 interview pairs. The coding sequence was:

1. Participating chiropractors (P = participant).
2. Number of years in practice.
3. Average number of OA patients seen.

4.10 DATA INTERPRETATION

Data can be defined as raw materials or information that have been collected, generated or observed in order to validate research findings (Olsen, 2021).

4.10.1 Data Analysis

The data in this study were analysed using Tesch's approach. This approach allows for data to be categorised into themes and subthemes. The interview questions of this research study were aimed at exploring the use of nutritional supplementation and nutritional education in the chiropractic management of OA amongst practicing chiropractors in South Africa. The data collected during the interviews, through team recordings, were transcribed into a Microsoft Word document. Only the researcher and supervisor had access to the collected data.

Tesch's approach is made up of eight, which are as follows (Theron 2015):

Step 1: Reading through the data to gather a sense of the data on a whole.

Step 2: Beginning with one document.

Step 3: Writing down topics that occur in each research document, compare all topics and group those that are similar.

Step 4: Create codes by abbreviating the topics.

Step 5: Find the most descriptive words for each topic and create different categories.

Step 6: Making a final decision on the abbreviations and alphabetise the codes.

Step 7: Placing the data in their respective categories and draw conclusions from the coded data

Step 8: Recoding the data if necessary.

4.11 DATA STORAGE

The data were stored on a portable digital storage device and are kept in locked storage within the research supervisors' archive for five years, after which it will be physically deleted. The data were only accessed by the researcher and the study's supervisors. Physical transcripts and audio recordings will be kept with the researcher's supervisor's archive for five years, after which it will be physically shredded.

4.12 TRUSTWORTHINESS

In qualitative research, trustworthiness refers to how researchers build trust and or confidence throughout their research findings (Connelly 2016). For this study, trustworthiness was obtained through the following components which were proposed by Lincoln and Guba (1980).

4.12.1 Credibility

Also referred to as confidence in the truth of the study, credibility is the most important criteria for the trustworthiness of qualitative research (Connelly 2016). The techniques used to achieve credibility include sufficient engagement with a participant, which is achieved through spending extended time with the participant to gain sufficient information. Other techniques include peer debriefing, member checking and reflective journaling (Amankwaa 2016).

Credibility was ensured in this study by issuing a letter of informed consent to the participants; participation was voluntary and the participants were able to withdraw from the interview process at any time.

4.12.2 Transferability

Transferability refers to a form of external validity (Connelly 2016). Research should provide evidence to show that the findings from the study could be applicable to other populations, situations, contexts and times. Lincoln and Guba (1980) stated that "it is the researcher's responsibility to provide a data base that makes transferability judgements possible on the part of the potential appliers" (Amankwaa 2016). Transferability was ensured by the researcher through the provision of a detailed description of the research procedure and methods. A description of the methods findings was also provided.

4.12.3 Dependability

Dependability refers to the stability of a study. Dependability is maintained through the maintenance of an audit trail of process logs. Process logs refer to a researcher's notes of on

all activity that occurred during the study (Amankwaa 2016). A researcher ensures dependability by maintaining an audit trail through safe keeping of the recorded interviews and transcripts. The findings and deductions need to be examined by the supervisors.

4.12.1 Confirmability

Confirmability refers to the neutrality of the study. It examines the degree of findings and if they are consistent or repeated. Data are reviewed to ensure that there is no bias on the researcher's perspective (Amankwaa 2016). In this study, confirmability was ensured by the researcher maintaining subjectivity to the data, the voice recordings were listened to several times to ensure that the correct data were obtained and utilised.

4.13 ETHICAL CONSIDERATIONS

The principles of ethics, which include autonomy, justice, maleficence, beneficence and confidentiality, need to be considered and maintained throughout a study.

Autonomy is the principle of respect for individuals by honouring the participants' right to self-determination or to make their own informed choices. Participation in this study was voluntary. The participants who took part in the study were allowed to withdraw at any time. If a participant was not comfortable with answering any given question, at any time, they were not obligated to.

Justice is described as fairness. In this study, the researcher's actions towards the participants was fair and every participant was treated in the same manner, with respect.

Beneficence is the principle of not imposing any harm to the participants and to maximise benefit. It consists of not acting against the participants' best interests or wellbeing, even when they conflict with the researcher's own opinion. The participants were asked for consent before the interviews were recorded.

Confidentiality was maintained through the use of alphanumeric coding of thus participants, which means that names were not disclosed in the study to ensure the participants' privacy. All interviews were stored on a password protected portable storage device for a period of five years and will then be deleted. Only the researcher and supervisors have access to the data.

4.14 CONCLUSION

This chapter explained the research methodology utilised in this study, including the method of data collection and data analysis. In the next chapter, the findings of the study will be presented.

CHAPTER 5

RESULTS

5.1 INTRODUCTION

This chapter presents the results obtained from the thematic analysis of 12 semi-structured interviews of registered chiropractors practising in South Africa who participated in this study. The aim of this study was to explore the use of nutritional supplementation and education in the management of OA by selected practicing chiropractors in South Africa. The data obtained from the interviews were analysed relative to the objectives from which the themes and subthemes emerged.

5.2 DESCRIPTION OF THE STUDY PARTICIPANTS

The participants who took part in this study were all registered chiropractors, practising within South Africa who met the inclusion criteria of the study. Most of the participants were female (*n*=8); the remainder of the participants were males (*n*=4). The mean age of participants was 29,5 years, while the range was 25–36 years. The mean number of years spent in practice by the participants was 4.3 years and the range was 2–13 years.

5.2.1 Demographics of Study Participants

Table 5.1 represents the demographic data obtained from each participant.

Table 5.1: Age, gender, number of years in practice and number of OA patients seen in a week

Participant Number	Age	Gender	Number of years in practice	Number of OA patients seen in a week
1	27	Female	2	10–15
2	32	Male	3	5
3	29	Male	2	30–40
4	31	Male	3	5–10
5	29	Female	3	12–15
6	30	Female	7	2–3
7	36	Female	12–13	20–30
8	25	Female	2	30
9	34	Female	9	4
10	27	Female	3	3–4
11	25	Male	2	2
12	29	Female	3	10

5.3 CONCEPTUALISATION OF THE THEMES

Semi-structured interviews were conducted with 12 registered practicing chiropractors in South Africa. Each interview was transcribed verbatim and analysed, from the analysis six themes and three subthemes emerged. **Figure 5.1** presents the themes and subthemes that were used to explore the use of nutritional education and supplementation in the management of OA.

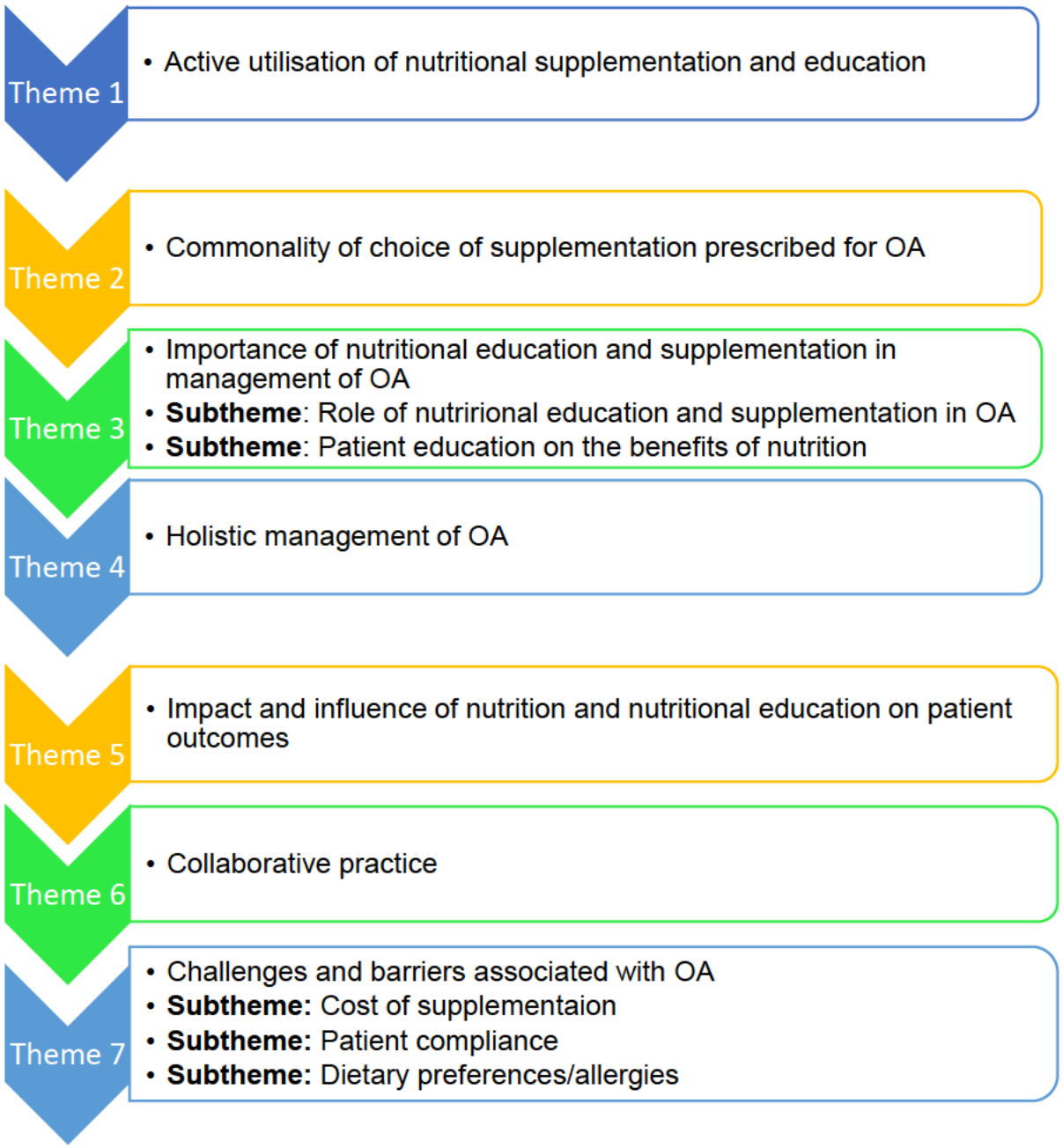

Figure 5.1 depicts the main themes and subthemes

5.4 DESCRIPTION OF THE THEMES

Discussed below are the themes that emerged from this study

5.4.1 Theme One: Active Utilisation of Nutritional Supplementation

When exploring and discussing the utilisation of nutritional supplementation with the participants, the majority of the participants mentioned that supplementation was actively utilised by them in clinical practice for the management of OA. The active utilisation of nutrition by chiropractors was made evident by the following extracts from the data obtained:

> "*Every OA patient I always give nutritional advice, that's why I say there's a difference between nutritional advice, as in are we encouraging them to lose weight to put less mechanical stress on the joints? Of course, those patients you're only going to be counselling your overweight patients or your underweight patients that need more support for the joints. But every single patient I will educate on natural anti-inflammatory foods and natural inflammatory foods to avoid so every OA patient will get a lecture from me saying these are your triggers, this is what will flare it up. These are things that you should include as a lifestyle change, because that's not necessarily focused on the mechanical risk factors associated with OA, but more just like I say, systemic so your body's ability to at least just cope with the degeneration better".* (Participant 8)
>
> *"I would say daily; I mean I'm constantly giving nutritional advice. It's a communication advice. At the same time, I would say it's across the board. I've, yeah, so I try and incorporate it extensively throughout the practice whether I've got pediatric patients or my geriatric patients, irrelevant as to whether they're dealing with OA I mean there's lots of other conditions that obviously are supported nutritionally. So yes, that's on a daily basis and not specific to a demographic or an age range or anything to that effect".* (Participant 7)
>
> *"Yeah, and if it's necessary for a certain patient, I'll give it to them. I wouldn't give advice to everyone".* (Participant 2)
>
> *"I probably gave nutritional information 98% of the time. Not at every session obviously you bring it up once and if they you know and so I bring it up once if we discuss it and then obviously, I'll discuss it with them if they ever bring it up again. But yeah I definitely introduce it probably at 98% of the time unless the person is".* (Participant 3)

“I think sometimes it can be biased, but like I said, I'm not a dietician or a nutritionist, so I can't give them the amounts that they probably need. But I advise pretty much 99% of my patients on nutrition and eating in the right way because I find it important not just for OA patients, for everyone”. (Participant 5)

“OK, so definitely not every single patient I think that you know, as chiropractors our role in nutritional education is important but it's also limited because there's only so much, we can we can do in the session. If we had to then sit down with the patient and try and like with every single patient and then try and give them you know, tailor made nutritional advice for their specific condition, it wouldn't be practical in a chiropractic setting. So you have to then decide whether it's applicable to the case or not. So, patients with comorbidities, patients with severe, you know severe types of arthritis and also you know pre premenopausal menopausal patients and also sort of young females who you know may be prone to things like iron deficiency anaemia, vitamin D deficiencies. So definitely case-based approach to nutritional education, nutritional advice”. (Participant 6)

5.4.2 Theme Two: Commonality in Choice of Supplementation Prescribed for OA

The analysis of the data received from the participants revealed a commonality in the choice of supplementation. This shows that the participants shared a common choice. The majority of the participants prescribed supplementation that contained key ingredients, such as chondroitin sulfate and glucosamine. A commonality in the choice of supplementation emerged, this theme was depicted by the following extracts from the data:

“There's a couple options I give to patients, some of them say they get benefits, so. Like the free cheap option, I recommend gelatine because gelatine has collagen 1-2 and three in it. Chirogenix has a nice bone supplement. OsteoEze Premium is a good one. Apparently, the gold is not strong enough or effective enough. Yeah, that's sort of my regime when it comes to supplements. Or I prescribe a collagen supplement”. (Participant 2)

“I usually say OsteoEze is a good one or the vitamin D vitamin, calcium complexes, magnesium, Honestly, it just depends on the patient. So it's very much patient dependent that they struggle from any underlying conditions and what we could work with the dietician to supplement them with”. (Participant 10)

“So I typically like to use OsteoEze because it has glucosamine sulfate in it and chondroitin and the studies show that that that helps with promoting bone growth and bone integrity and also helping decrease the pain. More natural, on the natural side, I like to kind of give ginger and turmeric or curcumin because they have shown especially the studies showing that they have great anti-inflammatory and antioxidant properties. Collagen is another big one that I use. I think it's just a nice support for bone and cartilage integrity and it also I think it benefits patients. Omega 3 is another good one for the anti-inflammatory properties that I'd like to prescribe and then vitamin D as well for bone support”. (Participant 11)

“Obviously I think it's quite important in, in terms of obviously omega 3 and stuff like that to try to reduce inflammation but then also you know joint support supplements. So at the moment I'll stock the chirogenix stuff which has got you know MSM and what's the, what's the other things that's got in it is MSM and chondroitin sulfate and glucosamine sulfate and stuff like that. So I do, I do prescribe them to some patients”. (Participant 3)

“So things like omega 3 and I always, I'm always careful of the advice that I do give. I ask them to always just do extra research and chat to their doctors and but something like omega 3 which is off the shelf and then chondroitin and glucosamine is another one”. (Participant 12)

“*Yeah. I mean, it's hard to say, I would say 1 aspect is an anti-inflammatory role in terms of turmeric. So like the curcumin and stuff that would be for as an anti-inflammatory thing and then the glucosamine and chondroitin type stuff would be to build up the cartilage I suppose”.* (Participant 9)

5.4.3 Theme Three: Importance of Nutritional Education and Supplementation in Management of OA

With nutrition being an important aspect in the management of OA, the participants in this study were asked to discuss the role of nutritional supplementation and education in their management of patients with OA. From these subthemes arose from the main theme: the role of nutritional education and supplementation in OA and patient education on the benefits of nutrition.

5.4.3.1 The Role of Nutritional Education and Supplementation in OA

This study’s results and responses of the participants displayed that nutritional education and supplementation is actively utilised in clinical practice when managing OA. The participants

further emphasised the key importance and benefits of including education in the management regimes. The majority of the participants in this study utilised nutritional education and supplementation in the management of patients with OA. The importance of the utilisation of nutritional supplementation and education included assisting patients in alleviating the inflammatory process associated with OA and to assist in maintaining joint health. The responses are aligned and depict this key theme:

> *"All right. I do think that it's incredibly important because osteoarthritis is one of those conditions that we definitely can help with but if you're actually not telling the patient to take in supplements that are gonna help with the joint health then there's only so far that you can get. Another thing is that it really helps just to manage the pain that the patient or pain and discomfort really as well as any disability that may be associated with the condition. So yeah, it is incredibly important".* (Participant 4)

> *"So, I don't know if I'm going to answer this right, but I feel that nutrition just in general is really, really important for patients in general, but also for OA because you're on that. But I think it is really important because certain foods cause inflammation, certain foods work with some people and don't with others. So, like lactose intolerance, things like that. So, I think it's really, really important to make sure that you're eating properly in order for your body to help it heal itself, because if you only eat rubbish, you know, like McDonald's, things like that, your body can't really get enough nutrients because it's not nutritional calories in that food. So, I feel like you've got to eat right to help your body absorb all those nutrients so that it can help heal itself".* (Participant 5)

> *"Okay, so nutritional supplements, obviously they are not the, the primary focus of our management as chiropractors. We are more focused on the, you know, the musculoskeletal aspect of it, you know, reduction of pain, increasing joint mobility, maintaining functionality, but the nutritional supplements come in under you know patient education and sort of your long-term management and they are quite important for the holistic management of the patients. So, you know to approach the case in a holistic way we do need to consider the patients diet and lifestyle. And then of course what can be done to, you know, reduce some of the effects of inflammation and that's where the nutraceuticals come in, things like, you know, curcumin, turmeric, fish oils, they have a not a significant role, but they have a role in the management of OA".* (Participant 6)

“So basically, we use nutrition quite often in our osteoarthritis patients obviously because the osteoarthritis that's there is not necessarily something we can take away. So, we use nutrition quite a lot, not necessarily to cure the disease, but to prevent inflammatory triggers and things like that. So, we really place a huge emphasis on nutrition in terms of supplementation”. (Participant 8)

“I definitely think it's needed, um, I think that a lot of people underrate how important it is to take supplements, especially with older patients who suffer from OA, I think that it just provides an extra barrier of prevention and support. But I think it's important to also work with a dietician when prescribing these supplements”. (Participant 10)

Some participants specified that they use nutritional supplementation as an adjunct or secondary to their treatment. The first step was dietary improvements as well as exercise therapy to assist in patients’ pain management. Extracts from the data are depicted as follows:

“Yeah. So, I think, yeah, nutritional supplementation is obviously really important. So I mean, so supplementation is probably not my first line of nutritional protocol to use. But yeah, like I, I do use it. I do advise some patients to take them but normally what I do is I try to improve diet quality as a first line measure because I think that's more effective than actual supplementation and in terms of what is my main or, but what I feel is the most important thing to be supplementing”. (Participant 3)

“So, for me it it's sort of just an adjunct as a sort of multi approach when it comes to treating patients. So, in addition to treatment in addition to exercise therapy in addition to everything else with treatments I use supplementation as an adjunct to assist patients with pain management with just general life improvement as well if that makes sense”. (Participant 7)

“So, for me personally, I would say it's secondary. My main goal is to try and get patients moving and get them strengthened, specifically targeted strengthening. So it's definitely secondary. My goal is to try and maintain bone integrity and support, especially for cartilage and bone growth”. (Participant 11)

5.4.3.2 Patient Education on the Benefits of Nutrition

Further to beneficial education on nutrition for OA, the participants emphasised the importance of explaining nutritional education to a patient in order to help them understand how different foods might play a role in aggravating the pain associated with OA.

The participants' responses are depicted as follows:

"I suppose it's important to educate patients on the fact that their nutrition and what they put into their body and can help slow down I would say the progression of OA and then you know some of some of the pain management and the management of their condition is in their hands because in terms of reducing inflammation, there are foods that they can eat and they can take nutritional supplements to help that. So I would say education is really important, but I also like to thoroughly explain everything that I recommend to patients and even explain their treatment to them very well. So I think it is the education aspect is really important just to teach them that they can play an active role in managing their condition and their pain". (Participant 9)

"So obviously educating your patient is very important because there's a fine line between, how can I say it, telling the patient what they should eat and almost offending them and

emphasising the importance of the nutrition in terms of helping the bigger picture, but education is super important because it's one thing to just say go get some turmeric, go get some vitamins and start your joint supplements. But the way you get that message across to patients is super important. So basically, explaining to them that the OA is a lifestyle condition, therefore we need to adjust your lifestyle long term and why nutrition is so important because you want it to be something that the patient commits to. So generally, what we do instead of just counselling the patient in terms of what you recommend, I always have food lists and suggestions. You know, what things do you like to eat? What don't you like eating? And we kind of try not necessarily give them a meal plan because that's not in our scope. But then I give the patients a few recipes and list of recommendations on what they can consider introducing into their diet, especially things like your natural anti-inflammatory foods". (Participant 8)

"So it's quite an important aspect of managing patients right from the onset with their diagnosis, the role that the nutritional education aspect that our patients like I say is from the onset and throughout and changes with the patient's treatment protocol as we go to see what works for patients and what doesn't work for patients, I'm quite detailed with how I manage that nutritional information with patients, if that makes sense". (Participant 7)

"Again, nutritional education is very important as well because thing is that if the patients are eating or putting in foods that are pro inflammatory then it does tend to make the situation worse. So, eating healthy, getting the right, the right nutrients in their diet is something that we also cover as well. Yeah. Just to make sure that we've got a holistic point

of view. For me, health always begins from the gut. So, if you're putting in the right foods and the right nutrition, then you can help with most conditions". (Participant 4)

"Yeah, so for me you know that the, the, the two things that I focused on in terms of the management is improving well, I like. Yeah. So, improving the diet of the patient, OK. So trying to encourage them to eat a, you know, a whole food diet, move away from processed, refined foods, be that processed, refined carbohydrates or processed meats or you know, move away from pro inflammatory foods and then move more towards a whole foods diet and then increasing protein that I find is in terms of nutrition is the most important thing I've yeah, it's definitely got the what I've found has the best benefit especially if you combine it with exercise you know so for myself I think those are the two cornerstones of the management I have is exercise and particularly strength training". (Participant 3)

"It plays a huge role because so apart from the Muslim people that can't take the supplements, I also treat a lot of underprivileged people that can't afford to buy the supplements. So basic things, basic dietary advice goes a long way with them as well as it helps them preventative and then they tell their friends and it's just like spread throughout the community". (Participant 1)

5.4.4 Theme Four: Holistic Management of OA

Chiropractic care typically involves manual therapy but an emphasis on holistic management of patients emerged amongst the participants. This included patient education, home exercise regimens, nutritional education and referral to other practitioners where necessary. The following excerpts of data reflect this:

"That's kind of big question. I think that in terms of practice, I think it's more of a holistic approach to treatment and patient care. So, I would say that patients appreciate that more. When they think that they're getting a more holistic approach to their healthcare instead of just coming in and being clicked and prodded and you know moved. So I think that patients appreciate it more. I don't know if that makes sense". (Participant 10)

"So buy in for homework with patients is always a challenge because it's the same concept as giving them food suggestions. Go buy these supplements. OK, great doctor, I'll do it and then they'll even forget about it. Just like when you give them rehab exercises. So the impact of it, you know, the patients who do it jump leaps and bounds. Those are my patients that once those inflammatory phases are settled, I see as a maintenance every four to six months. So financial impact is great because not only are

they now avoiding triggers that flares up the OA more, but they know how to supplement it at home. So financial one is a huge one. Also saves them from seeking help otherwise from other places. And generally, when that nutrition and supplementation, natural supplementation is in order, these patients will then eventually slack down on their chronic meds that they perhaps have from their GP. So, like your synaleves and your arcoxia and all those meds, those patients will eventually end up going off of that. And that is just again another financial relief for the patient. So finances would be the bigger one. Obviously on top of overall health and increased immunity, immune system and all of that". (Participant 9)

"Yeah, it's been huge. And I feel like, you know, I've had patients, you know, with chronic pain and you know, so chronic pain for a couple of years and you know and their knees or their lower back or they hip or you know wherever it is or shoulder, you know shoulders are the ones that give a lot of issues also knees, shoulders and low back seems to be my most common. And then you know I've had quite a few patients being in as I said being in an area of poor demographics you come in given them lifestyle management, we've treated them once. And then I always allow my patients to WhatsApp me at any point for if they have any questions or queries, they can always WhatsApp me and I get back to them and then, yeah, and then kind of they've made the nutritional changes together with r with adding exercise, etc. into the lifestyle particularly strength training. And it's been incredible. I've had, you know, patients after one session and you know, after 8 to 12 weeks of doing the exercise, together with the diet, they, you know, you had someone who couldn't bend their knee more than 50 degrees and he's doing a full squat. You know, after 8 to 12 weeks, he's literally back into a full squat. Even though the orthopaedic surgeon said he needed knees, he needed knee replacements. You know, So I feel like lifestyle intervention is yeah, you know it's and 50% of lifestyle intervention I feel is diet and nutritional supplementation etc. And I feel that yeah that is the need, it should be the main focus of the management and treatment for someone with OA and yeah, you know, it's being incredible to see people after one session. You know, they're just you're just in communication or both WhatsApp and they're showing you how they've how they've improved and they're wanting harder exercises and more exercises and you know, and stuff like that, which is really, which is always nice to see that, you know, you get the patients that do everything, everything you've said and then it's really worked out well for them". (Participant 3)

“Honestly, it's had a positive impact because when like I said as chiropractors there's only so much that we can do this, only so much that an adjustment can help with but. Well, in terms of managing pain and discomfort, I always believe that like for long term results we do need to have a lifestyle change and in that lifestyle change nutrition and supplementation will definitely come in there. So, for more long-term results and to get those patients smiling for longer, it's it, it will, it definitely had a positive impact in the practice”. (Participant 4)

“Yeah, yeah. So, it has had a big influence. A lot of my patients then complain of less inflammation, less pain, they’re able to move their body more because they are now providing their body with what it needs”. (Participant 5)

I'd say it's had a positive impact, if anything I have always incorporated nutrition and supplementation for patients battling with osteoarthritis. I'd say it's influenced it in a in a positive light. (Participant 7)

“So, like I said firstly in university I feel like we don't cover enough nutrition like that little bit that you do is not enough. You need to do way more reading and things like that. But it really has a huge impact because patients come to you and they trusting you. You're their doctor, they’re coming to you with the osteoarthritis and you have to help them with that. So, you can't just adjust. That's not what they want. They need more from you. So I work in conjunction with a dietitian and we really like put them on good eating plans and things like that”. (Participant 1)

5.4.5 Theme Five: Impact and Influence of Nutrition and Nutritional Education on Patient Outcomes

The participants of the study all found beneficial treatment outcomes in their patient’s objective and subjective clinical findings and assessments when nutritional education and supplementation was included in the treatment and management. This feedback was distinctly mentioned by all participants and included increase in range of motion, a reduction in stiffness and also reduced pain, indicating that nutritional education and supplementation does in fact influence the outcomes of OA patients. The extracts that follow are reflective of these outcomes:

“It's been, it's been good outcomes like obviously with the OA patient we're not looking for instant results. So, over a period of time, you do notice that the patient starts to move better. Starts to feel better and just the pain levels do come down. They become a bit more functional or actually even a lot more functional. But the problem with OA is that

it depends on how bad or how much it's progressed. So, if it's the early osteoarthritic changes, then they tend to be good for quite some time. To the point where like some of these patients you don't see them again because they fine you know and you've given them all the advice that that they need. So, they fine. But if it has progressed quite a bit, then it helps to manage the symptoms for as long as possible and keep them out of the surgical type of environment where they don't have to go for surgery for as long as possible. When it gets to a point where now they do require surgery, then we discuss that as well". (Participant 4)

"Definitely increased range of motion. Your OA patients, all of them, the first thing they report is less morning stiffness, which is one of the most common OA symptoms is that early morning stiffness as they get out of bed and then just an increased quality of life because with that increased range of motion, they become a lot more active. So, they then have less pain and are able to go for their walks or their cycles or their swimming which then increases cardiovascular health and just overall psychological health as well. So, I would definitely say that increased range of motion and morning stiffness just has a ripple effect on the whole holistic picture". (Participant 8)

"I think from a holistic perspective, I think that patients appreciate you more as a practitioner because you're working, you're going further into their health, you're not only there as the chiropractor, you are there as a healthcare practitioner. So, you invested in their health fully. So, I think that they appreciate that more. So, I think patient confidence in your treatment general symptom wise I think patients become more compliant with treatment. So, they're more willing to get treated by you because they are doing more for their health. Symptom wise, I think that it's difficult to say because you need to use supplements for a long period of time. So yeah, but I think that it's generally good for the overall health". (Participant 10)

"Very favourable outcomes in most cases, like I say, provided the patients have been compliant and they have been sticking to the protocol that's been given to them and they have been very favourable outcomes". (Participant 7)

"I've seen decrease in pain, I've seen decrease in stiffness in the morning, I think with the ginger and the turmeric I've seen an overall decrease in inflammation throughout the body which is beneficial for both bodies so I can get my treatment more effective and they also experiencing pain free life. Apart from that I'll say just decrease

inflammation in slight decrease in stiffness and decrease in pain in the mornings". (Participant 11)

"Yeah. Some people, they say it doesn't really make a difference. Other people say they have less pain, less stiffness". (Participant 2)

"Yeah, I've had really good outcomes, Like, yeah, like, yeah, I've had some really good outcomes not just in OA, but in autoimmune conditions and stuff like that. There's been some really No, no miraculous cases almost like that. It's yeah very encouraging. And so yeah, it works right. People eat a most people eat a really terrible diet. You know they have deficiencies somewhere in their diet and you know you have our body requires fuelling and if you feel properly, you definitely people respond well to it, eh". (Participant 3)

"OK. So, this is a difficult question because it's only a few patients and it's few and far between. Some of the patients who you know have used things like the OsteoEze, I don't know whether necessarily it's you know a kind of placebo effect or if they really then felt any difference, it's very hard to say because it cannot be sort of objectively quantified. But those patients who sort of stuck to the, the supplement plan did then report you know, reduction of symptoms or you know, maybe a little like easing of you know, functional activities. But I would say maybe that is approximately 5 to 10% of you know the total patient population of OA cases that I've treated". (Participant 6)

5.4.6 Theme Six: Collaborative Practice

When dealing with nutritional education and supplementation, collaborative practice in the management of OA is always necessary. This theme emerged when practitioners were asked to elaborate on their relationship with other healthcare providers and the benefits of such a relationship. Data collected from the interviewed participants also showed that the majority of the participants had established a relationship with other healthcare providers which allowed for collaborative practice in managing patients with OA. Most participants had established relationships with dieticians; this allowed patients to have more information on the importance of nutrition and the role it plays in managing the progression of their OA. Some of the participants' responses are depicted as follows:

"So I like to refer out quite a bit, dieticians, excellent for nutritional value, I feel like with patients lacking in their diet, I like to delve quite deep into that in the history taking. Although I don't give much advice, I'd rather leave that to the dietitian because I feel like

it's outside my scope. I work with biokineticists, especially with osteoarthritis. I feel that getting movement and targeted strengthening, so let's say we take the knee for example, strengthening of the vastus medialis obliquus, the whole quadriceps and hamstring and the gastrocnemius targeting that as a whole, I've seen great results with decreasing pain and just increasing quality of life with knee osteoarthritic patients so biokinetist is a good one. Homeopath, I like to send for biopunctures, especially if it's very acute flare ups those biopunctures work wonders for decreasing pain and then also helping the body's ability to heal itself. And then if it's really, really bad, I will send to a GP for a cortisone injection of the bum, I've seen great results with that just decrease like general inflammation and pain. I mean I've seen patients that like couldn't walk properly on their knees, walk fine, but that's also quick fix that stays about 3 months and then depending on the severity of it, it will be a referral out to the orthopaedic surgeon". (Participant 11)

"I've got quite an extensive sort of range of people that I refer to but on different things whether it be for dietetics, there are dieticians that we referred to as well as biokineticist for OA patients. So, it's quite an integral part of the treatment protocol that I use in order to assist patients with OA". (Participant 7)

"I have really good relationships with quite a few practitioners. I think it's really, really important to have that because we don't get taught a lot of these things or get taught that in depth as other practitioners. So I feel it's really, really important to be able to have that relationship with them and then being able to send your patient there so that they can get that extra advice and help from someone who is more qualified in that field". (Participant 5)

"Actually, because of where I work and where I live, it's a bit difficult for me because I work in Centurion and I live in Johannesburg South. But I grew up in Johannesburg South and I live now in Johannesburg West, so it's quite a distance from each other. So, where I work I don't actually really know the healthcare professionals that side, but I do work with a biokineticist and we have been discussing getting a dietician to come and work with us because we do see the need of having a qualified dietician that's gonna work with patients because we do talk about it. But then at the end of the day, a dietician can really dive deep into it. You know, especially with these OA patients that we see that have never taken supplements and all people that come in and they've got

OA and osteoporosis at the same time, it becomes a bit tricky, because now you have to dive into their diet, basically". (Participant 4)

"To have a relationship with the dietitian is so beneficial because you can co-manage like with osteoarthritis it is so easy to co-manage based on a diet that they've given them. Even with diabetes they come in with like nerve pain and things like that and as long as they on the correct eating plan and know how to manage it, it takes so much of pressure away from you solely managing this patient just their nerve pain it's it helps it helps so much". (Participant 1)

5.4.7 Theme Seven: Challenges and Barriers Associated with OA

When working in a practice setting with patients, challenges and barriers will occur as each patient is different. The participants were asked to discuss any challenges and barriers they had experienced with nutritional supplementation and education pertaining to OA, from this subtheme arose from the main theme: cost of supplementation, patient compliance and dietary preferences/allergies.

5.4.7.1 Cost of Supplementation

The cost of supplementation has increased significantly over the years and the participants in the study noted that this causes a challenge in patient management in terms of prescribing the most suitable supplementation for OA. Apart from the increasing prices, patients tend to be reluctant to follow the nutritional advice provided. The majority of the participants expressed concerns on the increasing cost of supplementation, with a few finding it difficult to get patients to be active in their own healthcare. Extracts from the interviewed participants displaying this commonality amongst patients are depicted:

"The cost factor of supplements". (Participant 7)

"Ironically finances most patients cannot afford to consider the foods that are recommended whether it's supplements or whether it's including whole foods. I do live in an area where it's a bit more of a lower income area. So that is something one needs to take into consideration. That's the first challenge". (Participant 8)

"Yeah, definitely cost of all these things. I mean OsteoEze I think is sitting at 3 or 400 rand at the moment at clicks. Collagen is also expensive. Omega 3's is relatively expensive. So, I'd say it's definitely the cost of patient actually going there and buying

all the supplementation and implementing it into their diet on top of my consultation, on top of the biokineticist consultation. (Participant 11)

"Probably just the cost of the better recommended supplementation and the population that I see their funds are quite limited. So that would be the biggest challenge I would say". (Participant 12)

5.4.7.2 Patient Compliance

Another challenge that the participants mentioned was patient compliance. Practitioners gave the patients at home advice which included dietary changes and daily exercises as well as the use of nutritional supplementation where necessary but patients were reluctant to implement these changes at home. This is depicted by the following extracts:

"Just patient compliance buy in and like I say most patients when it comes to homework and doing stuff at home it seldomly happens. So, the biggest challenge is getting that across. And the demographics of the patients are work with majority are geriatrics. So, half of them are in old age homes where meals get prepared for them, food gets cooked for them. So, they aren't necessarily always able to adjust their meals accordingly or you know avoid triggers accordingly because it's not in their budget or in their means to alter it". (Participant 8)

"Compliance patients with taking the supplementation". (Participant 7)

"I've had a lot of patients question if like going in, I'd say more herbal route especially with ginger and turmeric is actually beneficial. People don't really believe that. So, you kind of have to educate them on how actually has anti-inflammatory and antioxidant properties and how they will benefit them. But apart from that I haven't, that's probably one of the two boundaries that I've faced". (Participant 11)

"People being consistent with their supplementation, that's another challenge". (Participant 12)

5.4.7.3 Dietary Preferences/Allergies

The participants highlighted that their patient base was not all able to consume certain recommended supplementation due to allergies, religious barriers and dietary preference. This made it difficult and posed as a challenge in patient management.

Extracts from participants are displayed highlighting this challenge.

> *“I mean, I don't know if this would count, but my one patient is allergic to shellfish and so he said he was going to buy, he was going to buy some supplements from me and then he remembered that he actually can't take them”.* (Participant 9)

> *“Yeah, I feel like the biggest barrier is people not wanting to consume animal products. I feel like you're the biggest barrier I've come across is people you know people that are very strict onto a plant-based diet because you know even something like chirogenix has essentially got compounds from animal in it or like you know like you got the you know they won’t do collagen powders they won’t do omega 3 they won't you know it's like so it becomes really difficult”.* (Participant 3)

> *“Like I said, it's just my Muslim patients that can't take a lot of the supplements because it's not halal. And then you also get vegetarian people that can't take them because a lot of the OsteoEze and things like that are encapsulated with, I think it's crayfish or shellfish or something like that. The capsule is made out of”.* (Participant 1)

5.5 CONCLUSION

The themes are a presentation of the responses of chiropractors practising in South Africa who are registered with AHPCSA. The responses from each practitioner were similar when it came to how they treat and manage patients who presented with OA in terms of the use of nutritional education and nutritional supplementation. All the practitioners who took part in the study noted that they do incorporate nutrition into their management of a patient who presented with OA, even if it was a secondary focus. Most practitioners had obtained the same challenges and barriers when it came to the nutritional management of OA.

CHAPTER 6

DISCUSSION

6.1 INTRODUCTION

This chapter discusses the findings of the study which focused on the use of nutritional supplementation and education in the chiropractic management of patients with OA amongst practicing chiropractors in South Africa.

6.2 OVERVIEW OF THE RESEARCH DISCUSSION

The aim of this study to explore the use of nutritional supplementation and education in the management of OA by selected practicing chiropractors in South Africa. In total, seven main themes were identified:

Theme One: Active utilisation of nutritional supplementation.

Theme Two: Choice of supplementation prescribed for OA.

Theme Three: Importance of nutritional education and supplementation in management of OA.

Theme Four: Holistic management of OA.

Theme Five: Impact and influence of nutrition and nutritional education on patient outcomes.

Theme Six: Collaborative practice.

Theme Seven: Challenges and barriers associated with OA.

The themes and subthemes are discussed as follows:

6.3 THEME ONE: ACTIVE UTILISATION OF NUTRITIONAL SUPPLEMENTATION AND EDUCATION

The literature exploring the utilisation of nutritional supplementation by chiropractors in South Africa was limited. Villacorta *et al.* (2020) noted that a gap exists in nutritional education amongst healthcare providers, especially when it comes to chronic diseases (Villacorta *et al.* 2020). However, participants in this study expressed that they did utilise nutritional supplementation on a regular basis in the management of patients with OA. The practitioners provided a platform to discuss nutritional education with OA patients during the consult or after treatment was provided. The majority of the participants in this study discussed how they

included nutritional education and supplementation into their chiropractic treatment. The practitioners obtained a whole picture of what a patient's daily diet involved and discussed the importance of anti-inflammatory foods. Practitioners emphasised that they would first advise patients on specific dietary changes before recommending the most suitable supplementation for OA.

Berner *et al.* (2021) discussed the role of nutrition in physical therapist practice. Physiotherapists follow the recommended treatment guidelines for patients with OA and, thus, it is within their professional scope of practice to screen for and provide information on diet and nutritional issues in patients. This also includes the referral of patients to registered dieticians for an expert's opinion. However, there is limited literature exploring the use of nutrition by physiotherapists. Similarly, literature exploring the utilisation of nutrition by biokineticists is also limited, most studies done with regards to OA have investigated the use of exercise and weight reduction.

Wallis *et al.* (2021) conducted a qualitative study exploring the views of orthopaedic surgeons, rheumatologists and general practitioners. The practitioners acknowledged the importance of non-surgical management of OA but the management focused on self-management, exercise therapy, weight management and analgesia. The literature exploring nutritional education and supplementation for OA specifically is limited. Crowley *et al.* (2019) noted the importance of nutrition in the prevention of the development of health conditions such as OA, making it important to be included by all health care professionals in their management and treatment of patients with OA.

From the sample used in this study, it is evident that they do use nutritional supplementation and education in clinical practice. The results obtained in this study provide a broader understanding for healthcare providers as to how nutrition can improve the outcomes of the treatment provided to a patient with regards to OA, and how they are utilised by chiropractors in their discipline of practice.

6.4 THEME TWO: COMMONALITY IN CHOICE OF SUPPLEMENTATION PRESCRIBED FOR OA

Most participants in the study prescribed dietary supplements that contain ingredients such as chondroitin, glucosamine sulfate, curcumin and MSM, which is in accordance with the supplementation recommended by the arthritis foundation. One of the commonly prescribed supplements was OsteoEze, which contains ingredients such as chondroitin and glucosamine

sulfate, which have been shown to assist with improving bone integrity and assisting in the reduction of pain (Meng *et al.* 2023). Another common supplement prescribed by practitioners was omega 3 due to its role in decreasing inflammation (Cordingley and Cornish 2022). The chirogenix supplement was also commonly prescribed as it contained ingredients such as MSM, chondroitin and glucosamine sulfate. Vitamin D and calcium were prescribed and included into their supplementation regime. Vitamin D and calcium have properties that encourage bone support (Chin, 2020). Mathieu *et al.* (2022) found that the most common supplements prescribed by chiropractors included multivitamins, vitamin C, vitamin D, calcium, probiotics, glucosamine sulfate, and omega 3 fatty acids. The most recent study conducted on nutrition by chiropractors by Lee *et al.* (2018) showed that the most common supplements used by chiropractors are essential fatty acids, probiotics, single or multi vitamins and minerals.

The data collected from this study showed that chiropractors in South Africa prescribe similar supplements for patients with OA as other chiropractors practising in different parts of the world, thus indicating that chiropractors are up to date with the correct guidelines with regards to OA and supplementation.

6.5 THEME THREE: IMPORTANCE OF NUTRITIONAL EDUCATION AND SUPPLEMENTATION IN MANAGEMENT OF OA

6.5.1 The Role of Nutritional Education and Supplementation in OA

Rosetibaum *et al.* (2010) discussed the importance of diet, nutritional supplementation and education in the progression of musculoskeletal diseases (Rosetibaum *et al.* 2010). Similarly, Messina *et al.* (2019) also discussed how diet has been shown to reduce OA symptoms, slow down the progression of the disease and improve overall joint health (Messina *et al.* 2019). Half of the participants (50%) in this study emphasised the importance of nutritional supplementation in OA. Most practitioners mentioned using nutritional supplementation as part of their chiropractic treatment, as a long-term form of management, and to provide an extra barrier of prevention and support. A less number of the participants (25%) specified that the use of nutritional supplementation was not the first line of nutritional protocol, these practitioners specified the importance of improving diet prior to supplementation and also the importance of getting the patient moving through specifically targeted strengthening. This shows that nutritional education and supplementation play a major role in the management of patients with OA.

Wei and Dai (2021) suggested that health professionals should consider promoting nutritional education and encourage patients to improve their daily diet (Wei and Dai, 2021). The participants of this study practice methods are aligned with the literature. Crowley *et al.* (2019) discussed the importance of nutritional education in the prevention of the development of conditions such as OA, further stating that nutritional education will improve a patient's overall health and provide long term healthcare benefits.

6.5.2 Patient Education on the Benefits of Nutrition

Patient education has been encouraged throughout literature. It is important to educate patients on the condition that they have been diagnosed with and how its progression can be managed. Ardoin *et al.* (2022) discussed the effectiveness of patient-centred dietary educational interventions, stating that patient education has been proven to improve health outcomes when administered correctly. The participants in this study highlighted the importance of patient education with regards to the benefits of nutrition, emphasising the importance of the types of foods patients consume and the importance of improving diet. This shows that chiropractors educate their patients on nutrition to provide them with a better understanding of how and why it is necessary to understand what they are putting into their bodies and the long-term effects it will have on their health.

6.6 THEME FOUR: HOLISTIC MANAGEMENT OF OA

The holistic care model proposed by the Ministry of Health and Welfare (Taiwan) in 2005 emphasises the importance of managing the patient as a whole; it ensures that the underlying causes of a problem is treated and creates a general balance that results in improved health outcomes (Tsai and Yan 2021). Richard *et al.* (2023) described chiropractic care as being based on the principle that the body has the inherent ability to heal itself and that the correct alignment of the musculoskeletal system is important for the overall health and well-being of an individual. Apart from alignment, chiropractors ensure that patients are treated and managed holistically by ensuring all aspects of the patient are taken care of. Holistic care focuses on the patient as a whole — the physical, mental and spiritual needs of the patient within a cultural and social context. It includes the consideration of the patient's family background, health beliefs, values, sexual orientation and the exclusivity of the patient's needs.

Most of the participants emphasised how the incorporation of nutritional supplementation has enabled a holistic treatment approach allowing the patient to appreciate the treatment provided by the practitioner. This would make patients more willing to make the necessary life style

interventions in order to improve their health and well-being. Patients are also more likely to continue coming in for treatment on a regular basis to maintain the improvement in the progression of their OA. This indicates that managing a patient holistically shows greater improvements in patients OA symptoms. Lefebvre *et al.* (2012) stated that the holistic approach used by chiropractors and the intimate doctor-patient relationship provide a platform for nutritional supplementation, this is evident within in the data obtained from participants within this study.

6.7 THEME FIVE: IMPACT AND INFLUENCE OF NUTRITION AND NUTRITIONAL EDUCATION ON PATIENT OUTCOMES

Rosetibaum *et al.* (2010) emphasised the importance of diet, supplementation and education playing a major role in the progression of musculoskeletal diseases, concluding that it is essential to consume foods that contain the vitamins and minerals that are needed to maintain health bones and joints (Rosetibaum *et al.* 2010). Messina *et al.* (2019) revealed that diet has been shown to reduce symptoms, slow down the progression of the disease and improve overall joint health (Messina *et al.* 2019). Practitioners found that patients who followed the nutritional advice provided and incorporated the appropriate supplementation had shown positive improvements in their overall health and wellbeing. Patient outcomes were noted over a period of time and the patients presented with improved movement, less pain and improved function. Most practitioners also noted that OA patients had improved range of motion and also reported less stiffness and, thus, patients presented with an improved quality of life.

For patients with advanced OA progression, the use of nutritional education and supplementation assisted with the management of the patient's symptoms for as long as possible to avoid surgical intervention. Only one practitioner reported that some patients reported no difference in their OA symptoms. This may have been due to lack of consistency with supplementation or difficulty maintaining the appropriate diet to assist in alleviating the symptoms associated with OA. Another practitioner found that the effects of supplementation cannot be quantified which made it difficult to differentiate on whether it was the nutritional aspect improving the patient's symptoms or the chiropractic treatment provided to the patients that had a greater impact on improving the symptoms associated with OA.

Mathieu *et al.* (2022) revealed that studies exploring the impact of nutrition are limited. The results found in this study contribute to the gap in literature that exists.

6.8 THEME SIX: COLLABORATIVE PRACTICE

A multimodal approach of healthcare ensures that patients are managed in a holistic way using up-to-date scientific approaches (Maras and Surme 2022). The majority of the participants in this study had established a relationship with other healthcare professionals, such as biokineticists, dieticians and homeopaths, to manage OA patients effectively. These practitioners expressed that co-managing patients was beneficial in assisting patients with their pain. Dieticians were able to provide patients with more in-depth knowledge on diet and nutritional value. The care provided by biokineticists showed a decrease in pain and improved quality of life in patients with OA. Participants also collaborated with general practioners (GPs) to provide patients with cortisone injections to decrease pain and inflammation. Lee *et al.* (2018) suggested that different professions can collaborate to advance the welfare of the public because there is so much work to be done in the field of nutrition. This is evident in the multimodal of care that has been utilised by chiropractors to manage the symptoms associated with OA.

6.9 THEME SEVEN: CHALLENGES AND BARRIERS ASSOCIATED WITH OA

6.9.1 Cost of Supplementation

Dantas *et al.* (2021) discussed the impact of cost on individuals with OA. The study conducted showed that the cost of medication, treatment, surgical interventions and assistive devices can be substantial. The management of OA requires regular healthcare visits and diagnostic tests, thus further increasing financial burden on the patient (Dantas *et al.* 2021). Most participants in this study found that one of the challenges associated with OA was cost. Supplementation for OA can be purchased without prescription. The type of supplement, brand and where it is purchased, can further increase the cost. The better recommended supplementation can be quite costly and most patients are not able to maintain a daily consumption of these supplements on a monthly basis. With the increased cost of living maintaining an appropriate diet and purchasing supplementation for OA on a regular basis can pose a huge financial burden. Eyles *et al.* (2023) revealed that OA imposes a greater financial burden for people living in low- and middle-income countries and this includes countries such as South Africa.

The access to healthcare in South Africa is limited in rural areas, with government facilities such as clinics only providing medication for temporary pain relief. The cost of supplementation

is high, making it difficult to keep up with month-to-month purchases. For individuals with medical insurance, the purchase of supplementation is not covered by the insurer and needs to be paid for in cash. These patients may also not be able to keep up with the regular purchasing of the necessary supplementation required.

6.9.2 Patient Compliance

Figure 6.1 provides some examples of factors that may hinder patient compliance

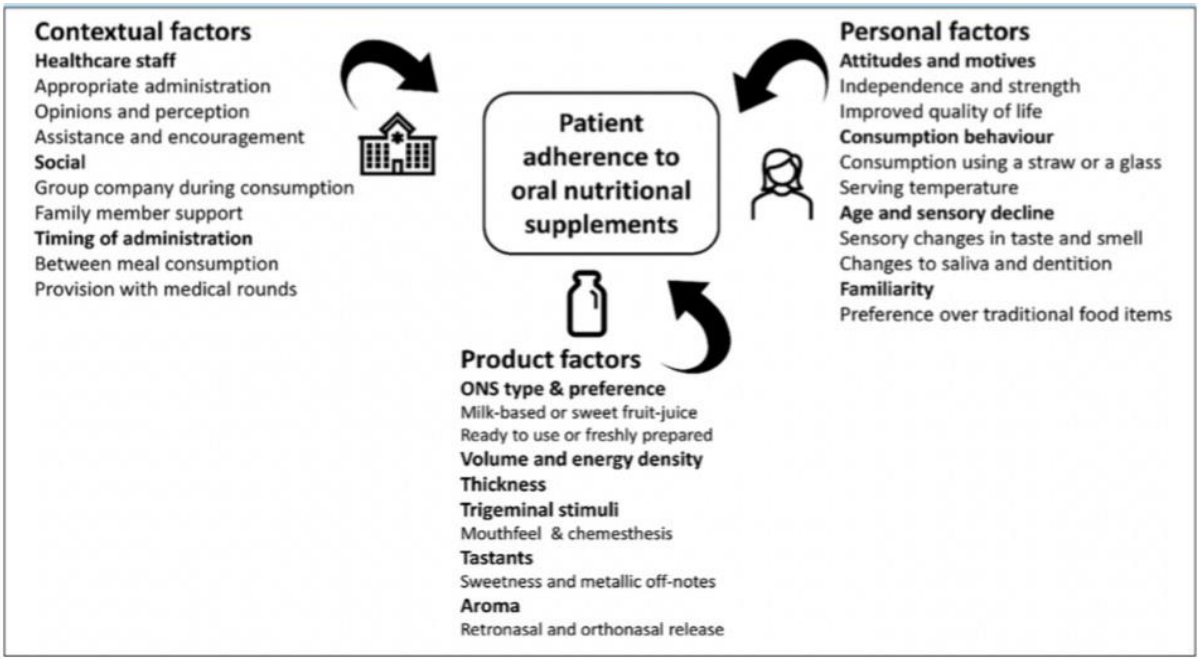

Figure 6.1: Depicts the factors that affect oral nutritional supplement adherence (Lester et al. 2022)

Lester *et al.* (2022) discussed the factors affecting patient adherence to nutritional supplementation, stating that compliance was mostly good when explained effectively by the healthcare provider. Factors influencing compliance included factors such as family attitude, age and a lack of understanding. A common challenge faced by practitioners was patient compliance. In addition to treatment provided to a patient, it is also important that patience participate actively in maintaining their own health at home to further help alleviate their OA symptoms. Even though practitioners gave patients exercises, general health advice or dietary advice, patients were less likely to implement these changes at home. Several different factors may influence a patient's compliance to the at home advice provided by a practitioner, such as forgetfulness, which is most common in elderly patient; a patient's lack of understanding of the advice given to them, may be due to a language barrier or the lack of knowledge on healthcare; the cost of improving diet; and purchasing supplementation, as well as religious/cultural beliefs.

6.9.3 Dietary Preferences/Allergies

Religion can influence an individual's consumption of supplements in numerous ways. Certain religions have dietary limitations that can influence the consumption of supplementation. For example, in the Islam religion, halal dietary restrictions many influence the selection of supplements to ensure they do not include prohibited substances. Some religions have religious traditions that may favour herbal or traditional cures over conventional supplements. The participants from this study expressed difficulty in dietary supplementation in certain patients due to their religion which required a specific diet, and patient's preferences on a specific diet i.e., vegetarian and allergies. A common allergy practitioners came across in patients was shellfish which is a common ingredient in many supplements. Another barrier was patients who followed strict plant-based diet, which made it difficult to recommend supplements that would be most suitable. With South Africa being a country with diverse religious beliefs, supplementation may or may not adhere to all religious beliefs, for example the use of bovine collagen for patients following Hinduism.

6.10 CONCLUSION

The participants in this study expressed similar approaches when it came to the use of nutritional education and supplementation in patients with OA. Most practitioners found the inclusion of nutritional supplementation and education to be beneficial to OA patients as it assisted in the alleviation of the symptoms with which the patient presented. The majority of the participants in the study expressed that nutritional education and supplementation should always be provided to patients to better improve their outcomes. Most practitioners also mentioned that they had established a multidisciplinary approach, which included dieticians, biokineticists and homeopaths, and had patients benefit greatly from such care.

CHAPTER 7

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS OF THIS STUDY

7.1 INTRODUCTION

This chapter focuses on the research questions, the strengths and limitations of the study, the conclusions from the study and the recommendations based on the findings of the study.

7.2 RESEARCHER POSITIONING

This research highlighted the utilisation of nutritional education and nutritional supplementation in the management of OA by chiropractors. As a future chiropractor, the researcher was familiar with the chiropractic treatment provided to patients with OA and had a background on the benefits of the incorporation of nutritional supplementation and education. The researcher was able to interact effectively with the participants which allowed for a comprehensive interpretation of data.

7.3 REFLECTIONS OF THE STUDY

7.3.1 Research Questions

This study aimed to explore the use of nutritional supplementation and education in the management of OA by selected practicing chiropractors in South Africa. The interview guide consisted of six main questions which focused on the utilisation of nutritional education and supplementation, its importance and the impact on clinical practice. The second set of questions were probes and consisted of seven questions which delved deeper into patient outcomes after they had implemented the nutritional supplementation and nutritional education provided to them by the practitioner. There were 12 semi-structured interviews that were conducted with chiropractors registered with AHPCSA and who were practising within South Africa. A qualitative, exploratory approach was utilised in this study.

7.3.2 Research Question 1: The Role of Nutritional Supplementation in Your Management of Osteoarthritis

Research Question 1 of this study was to describe the role of nutritional supplementation in the management of OA. It asked if the practitioner did not include nutrition, what were the reasons

for that. Most of the participants in the study described the role of nutritional supplementation as important but it was not the primary focus; the main focus was the musculoskeletal system and reducing the patient's symptoms through chiropractic treatment. The practitioners included the supplements that they recommend to patients, i.e., OsteoEze. All the participants in the study included nutritional supplementation into the management of patients with OA.

7.3.3 Research Question 2: Description of the role of nutritional education in the management of osteoarthritis

Research Question 2 of this study asked participants to describe and discuss the role of nutritional education in their management of osteoarthritis. Almost all participants in this study found that nutritional education plays a major role in the management of patients with OA. The practitioners explained that it was important to educate the patients of the importance of the types of foods they eat. Most practitioners favoured explaining the benefits of consuming anti-inflammatory foods. Dietary intervention was the first line of protocol and, thereafter, the practitioner advised on nutritional supplementation.

7.3.4 Research Question 3: How practitioners include nutritional education into their chiropractic treatment

Research Question 3 of this study investigated how practitioners include nutritional education into their chiropractic treatment. Nutritional education would be discussed during the history taking of the patient; the practitioner would ask the patient in-depth questions on the types of foods they consume and nutritional would be opened for discussion throughout the consult. At the end of the consult most practitioners would advise patients on the types of diets and foods they should include into their daily diet, some practitioners provided patients with a list of foods that would be most suitable to assist in the management of the patients OA symptoms

7.3.5 Research Question 4: The different aspects of nutritional supplementation utilisation and education matter in the management of osteoarthritis

Research Question 4 of this study asked how the different aspects of nutritional supplementation utilisation and education matter in the management of osteoarthritis. The practitioners emphasised that it was difficult to say how the different aspects of nutritional education and supplementation mattered in their management of OA but patients seemed to show greater improvements when nutritional supplementation and education were combined with chiropractic care, as opposed to not including it at all.

7.3.6 Research Question 5: Nutritional advice to patients in conjunction to manual therapy

Research Question 5 of this study asked how often, if ever, does the practitioner give nutritional advice to their patients in conjunction to manual therapy and if it is of necessity or only biased to a certain patient or population. There was no bias towards a certain patients or populations nutritional advice was given to most patients, even those who presented with different health conditions, emphasising that it is important for everyone to know the types of foods that they are putting into their bodies. Some practitioners indicated that nutritional advice was given when they found it to be necessary

7.3.7 Research Question 6: Impact and influence nutritional supplementation and education on the participants clinical practice in the management of OA

Research Question 6 of this study investigated the impact and influence nutritional supplementation and education on the participants' clinical practice in the management of OA. Nutritional education and supplementation had a huge positive impact on clinical practice for the majority of the practitioners, indicating that patients appreciate the treatment more when the practitioner focuses on all aspects of their wellbeing. Patients came in with less pain and an increase in range of motion. In contrast, a few practitioners indicated that it had no impact at all and did not change the treatment outcomes of the patients.

7.4 STRENGTHS OF THE STUDY

This research study will provide a better understanding for chiropractors and other healthcare professionals on the importance of nutrition and its contribution to patient outcomes. This study also provides some benefits to the patient in that it promotes healthy living and wellness of people of all ages. Furthermore, it will enhance patient's nutrition and give the patients' health-related knowledge. The study also contributes to the scientific literature on the use of nutritional education and supplementation by chiropractors in the management of patients with OA.

7.5 LIMITATIONS OF THE STUDY

There were 12 registered chiropractors who agreed to participate in the study. The sample size was small but it was in line with the sample size required for qualitative research. The information provided by the participants proved to be sufficient in answering the research

questions and providing general information on how a chiropractor would utilise nutritional supplementation and education in the management of a patient with OA.

Additionally, the number of OA patients seen by most chiropractors was limited and, thus, this might not give a true reflection of the impact of nutritional supplementation and education in conjunction with chiropractic treatment in patients with OA. Also the number of years the participants had in practice was limited. In order to get more accurate information, participants with more years in practice would have been required.

7.6 RECOMMENDATIONS

Upon researching the literature, it has been noted that there seems to be a paucity of information regarding the specifics in the chiropractic treatment of OA. Further studies should explore the treatment protocol of OA by chiropractors. A study in which the use of nutritional supplementation and the use of chiropractic treatment for OA are compared will provide greater insight on the benefits associated with chiropractic treatment for patients with OA.

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APPENDICES

Appendix A: Letter of Information

LETTER OF INFORMATION

Title of the Research Study: Exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa

Principal Investigator/s/researcher: Tiffany Grimett, registered student completing MHSc: Chiropractic

Co-Investigator/s/supervisor/s: Dr A. Abdul-Rasheed, M. Tech: Chiropractic, PhD: Health Science
Dr K. Padayachy, M. Tech: Chiropractic, PhD: Anatomy

Brief Introduction and Purpose of the Study: Osteoarthritis is the most common form of arthritis affecting the world's population, the aim of this study is to explore the use of nutritional supplementation and education in the management of osteoarthritis by selected practicing chiropractors in SA.

Greeting Good day, I wish to welcome you to my research study

Introduce yourself to the participants I am a 6th year student at DUT doing research for my Master's Degree in Chiropractic.

Outline of the Procedures: You will be required to participate in an interview that is estimated no longer than one hour in duration. A request is made for the interview to be voice recorded for record purposes. The interviews will be conducted on MS Teams.

Risks or Discomforts to the Participant: There are no foreseeable risks for participating in the study.

Explain to the participant the reasons he/she may be withdraw from the Study: You are free to withdraw from study at any stage of the study. There will be no adverse consequences should you choose to withdraw.

Benefits: The research will add new literature on the use of nutritional education and supplementation in the chiropractic management of OA within a South African context. It will provide a broader outlook of the benefits of nutrition in the progression and treatment outcomes of OA.

Remuneration: There is no remuneration or incentives for participating in the study.

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

Confidentiality: All personal details will be kept confidential and allocated a code. The raw data will only be accessible to the researcher, research supervisor and co-supervisor

Results: The results of the study will be distributed to the participants of this study and the full dissertation will be available on the DUT library website. The results of this study will also be published in a peer-reviewed journal article.

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

Storage of all electronic and hard copies including tape recordings: The consent forms and downloaded interview recordings will be stored electronically in a password protected device which data is being analysed. The data will be kept for a period of five years after which it will be appropriately destroyed.

Persons to contact in the Event of Any Problems or Queries: Please contact the researcher Tiffany Grimett on 0749687956, my supervisor Dr A. Abdul-Rasheed on 076 11 44203, my co-supervisor Dr K. Padayachy on 0843716438\031 464 4057 or the DUT-Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Acting Director: Research and Postgraduate Support on researchdirector@dut.ac.za

Appendix B: Consent

CONSENT

Full Title of the Study: Exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa

Names of Researcher/s: Tiffany Grimett, registered student completing MHSc Chiropractic
Dr A. Abdul-Rasheed, M. Tech; Chiropractic, PhD Health Science (main supervisor)
Dr K. Padayachy: M. Tech: Chiropractic, PhD: Anatomy (co-supervisor)

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _____ (Tiffany Grimett), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 029/23.
- 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, _____(Tiffany Grimett) 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 C: Letter of Request for Permission to Conduct Study

01 May 2022

Tiffany Grimett
Student Number:21811406
Email: tiffanygrimett@gmail.com

Request for Permission to Conduct Research

Dear Allied Health Professional Council of South Africa

My name is Tiffany Grimett, an MHSc Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa.

I am hereby seeking your consent to conduct research on willing participants, the participants are selected practicing chiropractors within South Africa. A minimum of twelve interviews will be conducted over a period of time across the MS Teams platform.

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 on 0749687956 (tiffanygrimett@gmail.com). Thank you for your time and consideration in this matter.

Yours sincerely,

Tiffany Grimett
Durban University of Technology

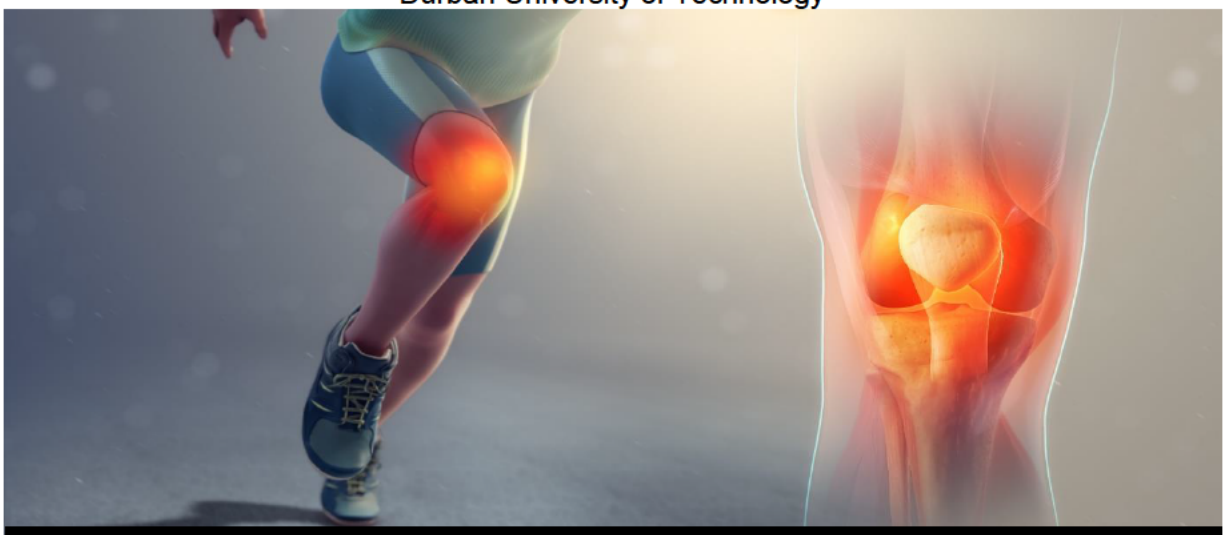
Appendix D: Advertisement

WELCOME TO MY RESEARCH STUDY

Researcher: Tiffany Grimett

MHSc Chiropractic

Durban University of Technology



The research I wish to conduct is on the Chiropractic management of patients with osteoarthritis

ARE YOU CURRENTLY PRACTICING AS A CHIROPRACTOR?

Are you actively involved in the nutritional education and nutritional supplementation in your management of patients with OA?

You will be required to participate in an interview estimated to be 45-60 minutes

- You may withdraw at any point of the study
- All information provided will be kept confidential and used for research purposes only
- No fee required for your participation in the study
- No risks are associated with the study

Persons to contact for any queries:
Principle Investigator:
Tiffany Grimett
Cell: 0749687956
Email: tiffanygrimett@gmail.com
Supervisors: Dr Ashura Abdul-Rasheed
Email: ashuraar@gmail.com
Dr Keseri Padayachy
Email: keserip@dut.ac.za

Appendix E: Interview Guide

Interview Guide Date _____ Participant no: _____

Demographic Data

Age _____ Gender _____

Number of years participant has been in practice _____

Approximate number of patients with osteoarthritis treated _____

Interview Questions

1. Describe the role of nutritional supplementation in your management of Osteoarthritis? (if practitioner does not include nutrition- reasons?)
2. Can you describe and discuss the role of nutritional education in your management of Osteoarthritis?
3. Describe how you include nutritional education into your Chiropractic treatment
4. Describe how the different aspects of nutritional supplementation utilization and education matter in your management of Osteoarthritis?
5. Describe how often if ever do you give nutritional advice to your patients in conjunction to manual therapy and is it of necessity or only biased to a certain patient or population?
6. Describe the impact and influence nutritional supplementation and education has had on your clinical practice in the management of OA

If practitioner gives nutritional advice (Probes):

1. Discuss any challenges and barriers you have experienced with nutritional supplementation and education pertaining to Osteoarthritis in practice
2. Being in a South African setting, we have the food based dietary guidelines that have been stipulated according to the populations general state, can you elaborate and describe if you advise in accordance to the latest guidelines or do you become versatile in relation to your expertise and the individual patient?
3. Can you explore your relationship with other healthcare provides for example dieticians and what benefits do you get from such a relationship?
4. What are some of the outcomes you have noted in patients after they have implemented your nutritional advice?
5. What role do you think nutritional education and supplementation play a role in a patient's pain improvement?
6. What would you say are some of the challenges that you have faced with regards to nutritional education and supplementation in patients with OA?
7. What benefits do you think adding nutritional advice as part of chiropractic treatment will have to the patient and their healing?
8. Should the inclusion of nutritional advice be considered as part of the treatment protocol by most chiropractors if not all? if so why?

Appendix F: Pilot Study

LETTER OF INFORMATION

Title of the Research Study: Exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa

Principal Investigator/s/researcher: Tiffany Grimett, registered student completing MHSc: Chiropractic

Co-Investigator/s/supervisor/s: Dr A. Abdul-Rasheed, M. Tech: Chiropractic, PhD: Health Science
Dr K. Padayachy , M. Tech: Chiropractic, PhD: Anatomy

Brief Introduction and Purpose of the Study: Osteoarthritis is the most common form of arthritis affecting the world's population, the aim of this study is to explore the use of nutritional supplementation and education in the management of osteoarthritis by selected practicing chiropractors in SA.

Greeting Good day, I wish to welcome you to my research study

Introduce yourself to the participants I am a 6th year student at DUT doing research for my Master's Degree in Chiropractic.

Outline of the Procedures: You will be required to participate in an interview that is estimated no longer than one hour in duration. A request is made for the interview to be voice recorded for record purposes. The interviews will be conducted on MS Teams.

Risks or Discomforts to the Participant: There are no foreseeable risks for participating in the study.

Explain to the participant the reasons he/she may be withdraw from the Study: You are free to withdraw from study at any stage of the study. There will be no adverse consequences should you choose to withdraw.

Benefits: The research will add new literature on the use of nutritional education and supplementation in the chiropractic management of OA within a South African context. It will provide a broader outlook of the benefits of nutrition in the progression and treatment outcomes of OA.

Remuneration: There is no remuneration or incentives for participating in the study.

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

Confidentiality: All personal details will be kept confidential and allocated a code. The raw data will only be accessible to the researcher, research supervisor and co-supervisor

Results: The results of the study will be distributed to the participants of this study and the full dissertation will be available on the DUT library website. The results of this study will also be published in a peer-reviewed journal article.

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

Storage of all electronic and hard copies including tape recordings: The consent forms and downloaded interview recordings will be stored electronically in a password protected device which data is being analysed. The data will be kept for a period of five years after which it will be appropriately destroyed.

Persons to contact in the Event of Any Problems or Queries: Please contact the researcher Tiffany Grimett on 0749687956, my supervisor Dr A. Abdul-Rasheed on 076 11 44203, my co-supervisor Dr K. Padayachy on 0843716438\031 464 4057 or the DUT-Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Acting Director: Research and Postgraduate Support on researchdirector@dut.ac.za

CONSENT

Full Title of the Study: Exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa

Names of Researcher/s: Tiffany Grimett, registered student completing MHSc Chiropractic
Dr A. Abdul-Rasheed, M. Tech; Chiropractic, PhD Health Science (main supervisor)
Dr K. Padayachy, M. Tech: Chiropractic, PhD: Anatomy (co-supervisor)

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher (Tiffany Grimett), 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, _____ (Tiffany Grimett), 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**

Post Pilot Study Data Tool

Interview Guide

Interview Guide Date _____ Participant no:

Demographic Data

Age _____

Gender _____

Number of years' participant has been in practice _____

Average number of OA patients seen in a week/month _____

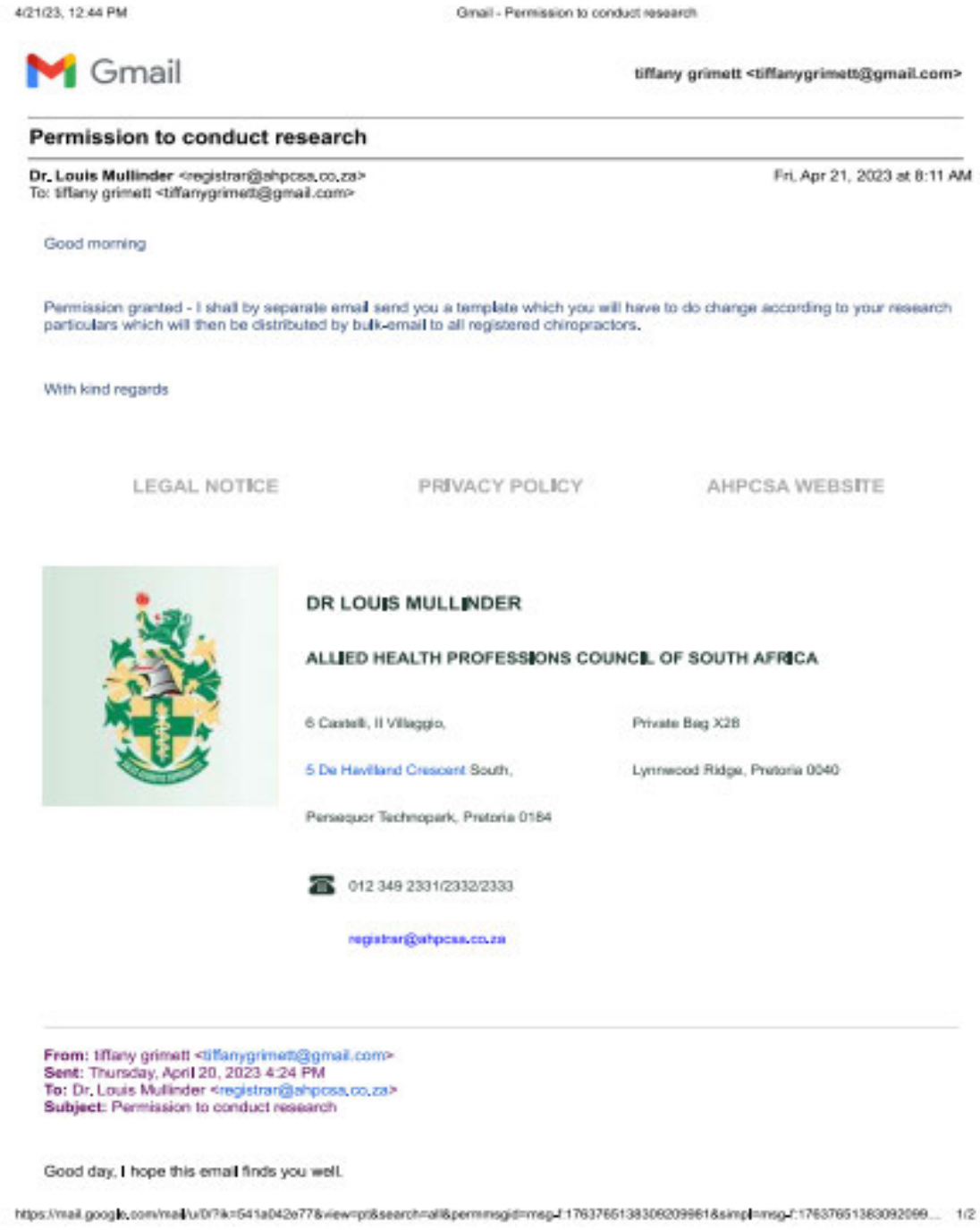
Interview Questions

1. Describe the role of nutritional supplementation in your management of Osteoarthritis? (if practitioner does not include nutrition- reasons?)
2. Can you describe and discuss the role of nutritional education in your management of Osteoarthritis?
3. Describe how you include nutritional education into your Chiropractic treatment
4. Describe how the different aspects of nutritional supplementation utilization and education matter in your management of Osteoarthritis?
5. Describe how often if ever do you give nutritional advice to your patients in conjunction to manual therapy and is it of necessity or only biased to a certain patient or population?
6. Describe the impact and influence nutritional supplementation and education has had on your clinical practice in the management of OA

If practitioner gives nutritional advice (Probes):

1. Discuss any challenges and barriers you have experienced with nutritional supplementation and education pertaining to Osteoarthritis in practice
2. Being in a South African setting, we have the food based dietary guidelines that have been stipulated according to the populations general state, can you elaborate and describe if you advise in accordance to the latest guidelines or do you become versatile in relation to your expertise and the individual patient?
3. Can you explore your relationship with other healthcare provides for example dieticians and what benefits do you get from such a relationship? Do you send for any blood work to rule out underlying conditions that could be contributing to the progression of a patients OA?
4. What are some of the outcomes you have noted in patients after they have implemented your nutritional advice?
5. What role do you think nutritional education and supplementation play a role in a patient's pain improvement?
6. What would you say are some of the challenges that you have faced with regards to nutritional education and supplementation in patients with OA?
7. What benefits do you think adding nutritional advice as part of chiropractic treatment will have to the patient and their healing?
8. Should the inclusion of nutritional advice be considered as part of the treatment protocol by most chiropractors if not all? if so why?

Appendix G: Permission to Conduct Research



4/21/23, 12:44 PM Gmail - Permission to conduct research

Gmail

tiffany grimett <tiffanygrimett@gmail.com>

Permission to conduct research

Dr. Louis Mullinder <registrar@ahpcsa.co.za> Fri, Apr 21, 2023 at 8:11 AM
To: tiffany grimett <tiffanygrimett@gmail.com>

Good morning

Permission granted - I shall by separate email send you a template which you will have to do change according to your research particulars which will then be distributed by bulk-email to all registered chiropractors.

With kind regards

LEGAL NOTICE PRIVACY POLICY AHPCSA WEBSITE

DR LOUIS MULLINDER

ALLIED HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA

6 Castelli, Il Villaggio, Private Bag X28

5 De Havilland Crescent South, Lynnwood Ridge, Pretoria 0040

Persequor Technopark, Pretoria 0184

012 349 2331/2332/2333

registrar@ahpcsa.co.za

From: tiffany grimett <tiffanygrimett@gmail.com>
Sent: Thursday, April 20, 2023 4:24 PM
To: Dr. Louis Mullinder <registrar@ahpcsa.co.za>
Subject: Permission to conduct research

Good day, I hope this email finds you well.

https://mail.google.com/mail/u/0?ik=641a042e77&view=pt&search=all&permmsgid=msg-f:1763765138306209961&simpl=msg-f:1763765138309209... 1/2

Appendix H: Ethical Clearance Certificate

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

P O Box 1334, Durban, South Africa, 4000

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

26 April 2023

Ms T Grimett
P O Box 495

Dear Ms Grimett

Exploring the use of nutritional supplementation and nutritional education in the chiropractic management of osteoarthritis amongst practicing chiropractors in South Africa
Ethical Clearance number IREC 029/23

The DUT-Institutional Research Ethics Committee 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 DUT-IREC according to the DUT-IREC Standard Operating Procedures (SOP's).

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

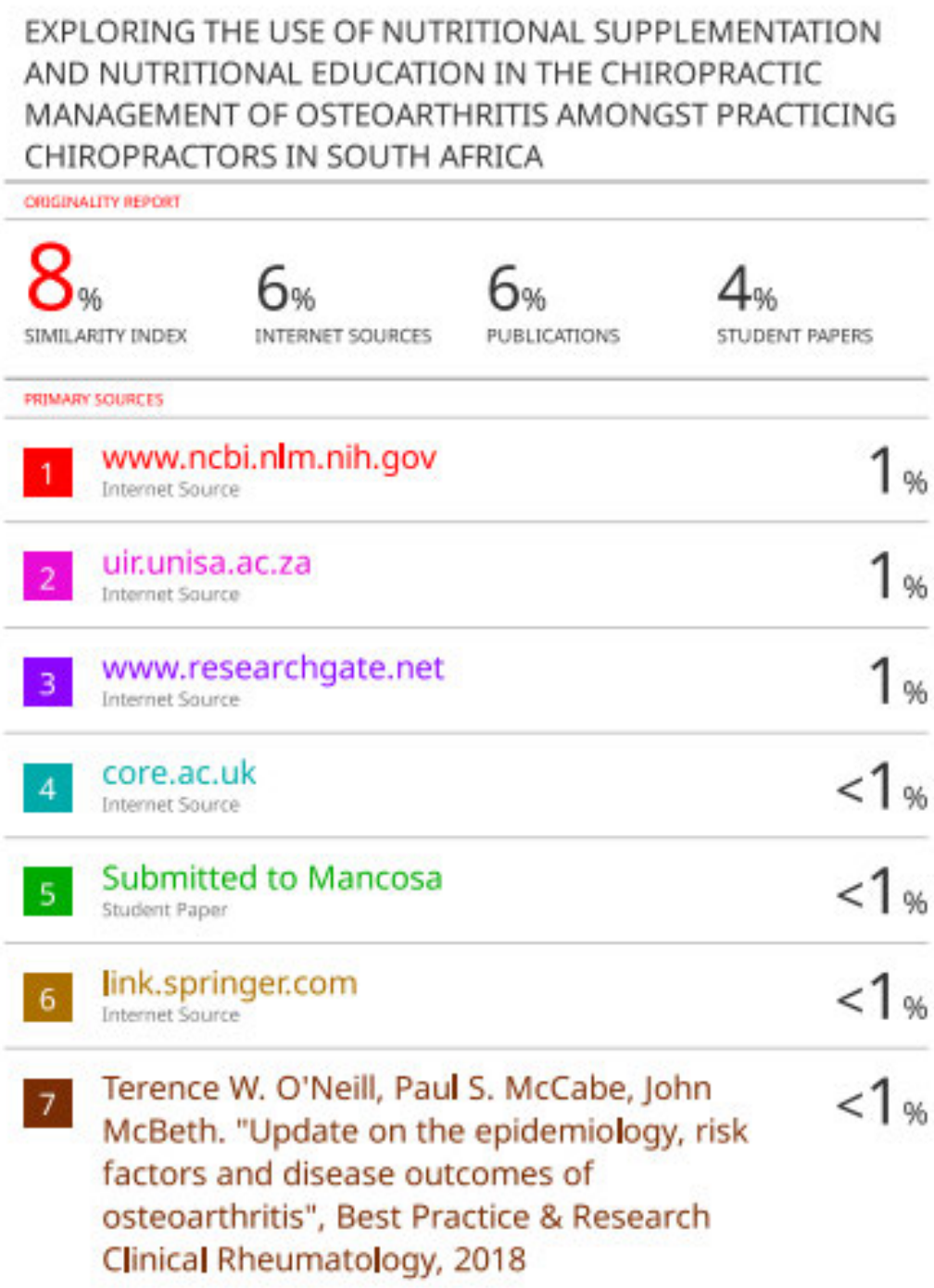
It is compulsory for a student or researcher to apply for recertification on an annual basis. The failure to do so will result in withdrawal of ethics clearance. It is the responsibility of the researcher and the supervisor to apply for recertification.

Please note that you are required to submit a Notification of Completion of Study form together with an abstract to the DUT-IREC office on completion of your study.

Yours Sincerely

Prof J K Adam
Chairperson: DUT-IREC

Appendix I: Plagiarism Report



EXPLORING THE USE OF NUTRITIONAL SUPPLEMENTATION AND NUTRITIONAL EDUCATION IN THE CHIROPRACTIC MANAGEMENT OF OSTEOARTHRITIS AMONGST PRACTICING CHIROPRACTORS IN SOUTH AFRICA

ORIGINALITY REPORT

8%	6%	6%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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2	uir.unisa.ac.za Internet Source	1%
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5	Submitted to Mancosa Student Paper	<1%
6	link.springer.com Internet Source	<1%
7	Terence W. O'Neill, Paul S. McCabe, John McBeth. "Update on the epidemiology, risk factors and disease outcomes of osteoarthritis", Best Practice & Research Clinical Rheumatology, 2018	<1%

Appendix J: Editor's Certificate

Helen Bond
IMPELA EDITING SERVICES
impelaediting@gmail.com
079 395 5873

4 November 2023

CERTIFICATE

Tiffany Grimett

Dear Tiffany

Thank you for using Impela Editing Services to edit your Master's dissertation entitled *"EXPLORING THE USE OF NUTRITIONAL SUPPLEMENTATION AND NUTRITIONAL EDUCATION IN THE CHIROPRACTIC MANAGEMENT OF OSTEOARTHRITIS AMONGST PRACTICING CHIROPRACTORS IN SOUTH AFRICA"*.

I have proofread for errors of grammar, punctuation, spelling, syntax and typing mistakes. I have formatted and checked the references according the institution's requirement.

Please note that Impela Editing accepts no responsibility for changes made by the author after emailing the final draft.

I wish you the very best in your submission.

Kind regards

Helen Bond (Bachelor of Arts, HDE)