Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater eThekwini Region.

By

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Dissertation submitted in partial compliance with the requirements for the Master's Degree in Technology: Chiropractic

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I, Hyla Van Der Colff, declare that this dissertation is representative of my own work in both the concept and execution of this research and that any reference to the work of others has been acknowledged accordingly.

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DEDICATION

I dedicate this to my incredible parents for their love and continued support. Thank you for always believing in me.

To my grandmother, thank you for your immeasurable love.

Aan ons Hemelse Vader waarsonder niks moontlik sou wees nie.

GOD IS LIEFDE

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To my parents – I am fortunate to have this opportunity because of all your sacrifices and hard work. Thank you for always driving me to do my best. The possibilities of how prosperous my life will be are endless. Without you both, this would not have been possible.

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"Nothing worth having comes easy."

— Theodore Roosevelt

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ABSTRACT

BACKGROUND: Temporomandibular disorders (TMDs) affect up to fifteen percent of adults. It produces craniofacial pain of musculoskeletal structures within the head and neck. One particular cause of TMDs is said to be myofascial pain syndrome (MFPS), which according to various research papers, if not considered and/or assessed, the general cause of a patient's pain could be disregarded and incorrect treatment offered.

Numerous studies conducted internationally on dental management of temporomandibular joint disorder (TMJD) concluded that there is a significant gap in dentists' education and training regarding the identification and management of MFPS. Upon reviewing the current literature available in South Africa, very little research existed on dentists' knowledge and the management strategies that they utilised regarding MFPS in TMJD patients.

OBJECTIVES: To determine the dentists' knowledge regarding MFPS of the temporomandibular joint (TMJ). What assessment and treatment/management strategies they use, and whether they make use of referral networks and if the respondents' demographics influence their knowledge, utilisation, perception and referral patterns.

METHODOLOGY: The researcher developed a research questionnaire, which was validated by both an expert and a pilot study group. This questionnaire was then used as a research tool in this cross-sectional study. General dental practitioners from the Greater eThekwini Region received an invitation to participate. The questionnaire-based survey consisted of five sections: biographical profile of respondents; topic background; perception; knowledge; utilisation and management (including referral patterns) of MFPS.

RESULTS: The majority of respondents did receive basic education in MFPS, with 76.9% reporting that they received undergraduate education and 57.7% indicating that they had attended post-graduate courses/talks on MFPS. There was a 100% response from dentists indicating their willingness to attend post-graduate courses/talks on MFPS. The results indicated that the respondents, who felt that their curriculum regarding MFPS was sufficient, were more knowledgeable and more competent in diagnosing and managing MFPS. Overall, the average score for knowledge was 65.17%. Clinical features

(78.85%) and the perpetuating and relieving factors (72.11%) scored the highest while causes (58.06%) and differential diagnoses (51.16%) scored the lowest knowledge levels. Respondents mostly made use of allopathic medical fields, and not of alternative medical fields, however a high number of respondents (73.1%) indicated that they would consider chiropractic co–management of patients with MFPS.

CONCLUSION: This study adds new information in the South African context regarding dentists' understanding of the myofascial component of TMDs. It also provides the dental profession with information about the knowledge and practices related to MFPS as well as information regarding the strengths and weaknesses on its educational component. It is recommended that dentists receive additional training on differential diagnoses and causes. It is also recommended that the chiropractic profession take this opportunity to offer courses/talks on MFPS and join forces with the dentistry profession on how they can assist in managing patients with MFPS.

Keywords: Dentistry, myofascial pain syndrome (MFPS) myofascial trigger points (MFTPs) and temporomandibular joint dysfunction (TMJD).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

DUT	Durban University of Technology
HPCSA	Health Professions Council of South Africa
IREC	Institutional Research and Ethics Committee
KZN	KwaZulu-Natal
MFPS	Myofascial pain syndrome
MFTPs	Myofascial trigger points
RDC	Research diagnostic criteria
ROM	Range of motion
SOT	Sacro Occipital Technique
SOTO	Sacro Occipital Technique Organisation
SPSS	Statistical Package for the Social Sciences
TMD	Temporomandibular disorder
TMDs	Temporomandibular disorders
TMJ	Temporomandibular joint
TMJs	Temporomandibular joints
TMJD	Temporomandibular joint dysfunction
USA	United States of America

DEFINITION OF TERMS

Alternative medical fields	These fields in medicine, uses systems, merchandises and practices are not part of standard allopathic medical care. Chiropractic, homeopathy and acupuncture are a few examples of alternative medical fields (Adrian-Vallance 2006).
Autonomic phenomena	This is when a person responds to a stimulus, which results in, vasoconstriction, paleness, coldness, sweating, goose bumps, drooping of the eyelid and/or hypersecretion (Simons, Travell and Simons 1999).
Autonomous/Autonomy	To be autonomous is having the ability to make one's own educated choices, without being influenced or controlled by others (Morrison 2009).
Beneficence	This essential ethical norm attempts to maximise the research benefits for the participants/respondents. The researcher, through such a control, attempts not to take advantage of them and by so doing prevents them coming to harm (Polit and Beck 2010).
Allopathic medicine	In contrast to alternative care, treatments in allopathic medicine include pharmaceutical drugs and surgeries. This field consists of, but is not limited to, medical doctors, doctors of osteopathy, physical therapists, psychologists, and registered nurses. (Adrian-Vallance 2006).
Craniofacial pain	Craniofacial pain has a variety of aetiologies that results in pain felt over the head, face, and related structures including the neck (Kapur, Kamel and Herlich 2003).

Justice	This is another essential ethical norm in which the researcher puts controls in place to ensure that all participants are treated equally (Parahoo 2014).
Knowledge	Knowledge comes from a process of learning and/or experiences, resulting in an increase of information, skills and understanding (Adrian-Vallance 2006).
Motor dysfunction	This term describes problems or dysfunctions with the normal functioning of the muscle, nerve or centre that allow body movement to take place (Huber and Gillaspy 2012).
Non-maleficence	This is yet another essential ethical norm that prevents the researcher from allowing their research participants to come to any harm or distress. (Polit and Beck 2010).
Perception	This term describes how a person may reason or think about something through his or her own unique and personal knowledge and understanding of the subject (Adrian-Vallance 2006).
Referred pain	This pain is felt in an area away from the site of the trigger point or the point of origin (Simons, Travell and Simons 1999).
Sacro Occipital Technique (SOT)	This is a technique carried out by chiropractors of adjusting patterns in the body. This technique received its name because of the significance of the relationship between the sacrum and occiput. This is in contrast to simple spinal adjustments and focuses on balance between the cranium, pelvis, extremities and organs (SOTO USA n.d).

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Temporomandibular joint disorders (TMDs) are a collection of articular and neuromusculoskeletal conditions relating to the temporomandibular joint (TMJ) (Gauer and Semidey 2015), for example: TMJ dislocations, osteoarthritis and myofascial pain syndrome (MFPS) (Uyanik and Murphy 2003). These disorders affect up to fifteen percent of adults (Gauer and Semidey 2015). They produce craniofacial pain of musculoskeletal structures within the head and neck (Scrivani, Keith and Kaban 2008).

This research focuses on MFPS. It is a common cause of unexplained mouth and face pain (Jaeger 2013). It is reported as one of the three distinct causes of temporomandibular joint disorder (TMD) (Uyanik and Murphy 2003), that produces head, neck and facial pain (Romero-Reyes and Uyanik 2014). Myofascial pain syndrome results from a group of active and/or latent myofascial trigger points (MFTPs). Myofascial trigger points are small groups of muscle fibres that become hyperirritable. This is because they are made up of actin and myosin filaments. When calcium is released and these filaments are continuously activated it leads to a local contracture (Chaitow and DeLany 2003). A local contracture results in both increased oxygen consumption as well as a reduction of blood supply to that area, leading to an oxygen deficiency (Simons 2004). The additional release of vasoneuroactive peptides produces localised oedema and further reduces blood flow (Mense, Simons and Russell 2001), resulting in additional irritation, a cycle of local metabolic crisis and muscle fatigue (Ingraham and Taylor 2016).

When compressing MFTPs with one's finger/s it causes a referred pain that is characteristic of that muscle and point resulting in motor dysfunction and autonomic phenomena (Chaitow and DeLany 2003). Myofascial pain syndrome commonly affects the sternocleidomastoid, pterygoids, temporalis and masseter muscles, which in turn can cause referred pain that can mimic toothache (Chaitow and DeLany 2003; Laudenbach and Stoopler 2002). Malcmacher (2013) explained that the teeth are connected to the jaws, which in turn connects to the muscles as well as the structures of the head and neck. Dentist must not ignore this in

patients. Simons (2004) has found that if MFPS and MFTPs are not considered and/or assessed, the general cause of a patient's pain could be disregarded and incorrect treatment offered. An enhanced working knowledge of MFPS may provide dentists and other clinicians, for example: orthodontists and oral surgeons with an effective method to relieve a patient's pain (Dommerholt 2006).

Numerous studies conducted internationally on the dental management of temporomandibular joint dysfunction (TMJD) concluded that there is a significant gap in the education and training of practising dentists regarding the identification and management of MFPS (Simm and Guimaraes 2013; Jamalpour *et al.* 2011; Sieber *et al*. 2003; Ayer, Machen and Getter 1977). A review of the literature available in South Africa (Berry 2006; Graff-Radford 1984) noted a paucity of information on the knowledge and management strategies utilised by dentists regarding MFPS in TMJD patients. It is important to know if dentists do treat MFPS, to understand the type of management that they provide and whether this includes referral to other practitioners, for example: general practitioners, physiotherapists and chiropractors.

This study aimed to determine the knowledge that dentists have regarding MFPS as well as the clinical practices; including diagnosis and management of MFPS of the TMJ. Currently, to the best of the researcher's knowledge, no questionnaire exists to assess the knowledge and management strategies utilised by dentists with regard to MFPS. The researcher developed a research questionnaire, which was validated by both an expert and a pilot study group, to use as a research tool in this cross-sectional study. General dental practitioners from the Greater eThekwini Region received an invitation to participate. The questionnaire-based survey consisted of five sections: demographic profile of the respondent; topic background; perception; knowledge; utilisation and management (including referral patterns) of MFPS.

1.2 AIM

The aim of this study was to determine the management strategies used by dentists in the Greater eThekwini Region with regard to MFPS of the TMJ.

1.3 OBJECTIVES

- To determine the knowledge of dentists regarding MFPS of the TMJ, its diagnosis and management.
- To determine the utilisation of MFPS assessments and treatments of the TMJ by dentists.
- To determine if management strategies of MFPS of the TMJ make use of referral networks.
- To determine the association, if any, between selected demographic profiles, knowledge, utilisation, perception and referral patterns of the respondents.

1.4 RATIONALE

Even though a high incidence and prevalence of MFPS exists, it remains as a highly misunderstood condition (Testa, Barbero and Gherlone 2003; Simons and Dommerholt 2006; Dommerholt, Bron and Franssen 2006; Cummings and Baldry 2007). Facco and Ceccherelli (2005); Simons (2004) and Marcus (2002) highlighted this as they indicated that although MFPS is considered to be one of the primary diagnosis of acute and chronic health conditions it is still unrecognised and undertreated in practices.

Simons (2004) reported that if MFPS and MFTPs are not considered and assessed, it results in the general cause of a patient's pain to be disregarded and ineffectively addressed. Furthermore, the proper diagnosis and treatment of MFPS may help to decrease the number of misdiagnosis of this in patients with TMJD (Prakash, Rath and Mukherjee 2012). Malchacher (2013) wrote that a 2011 study in The Journal of the American Dental Association estimated that about 680,000 teeth receive endodontic therapy every year when the actual tooth may not even be the pain source. This indicates that many patients are undergoing unnecessary therapies annually and are not being fully assessed for MFTPs and MFPS. The education of dentists, with particular reference to MFPS and its relationship to TMD, is therefore important. Jamalpour *et al*. (2011) concluded that a need exsists to develop and strengthen undergraduate dental courses and continuous education programmes in TMJD/orofacial pain.

This study could enhance dentists' working knowledge of MFPS. Such knowledge could then provide them with an effective method of providing pain relief (Dommerholt 2006). Evidence from the literature on MFPS management suggests that patients should be treated in a multi-

disciplinary manner, and that it could largely reward both the practitioner and the patient if proper treatment and management of MFPS occurs (Odendaal 2003). Various case studies demonstrated the importance of dental chiropractic co-treatment with regard to TMJ conditions (Rubis, Rubis and Winchester 2014; Blum and Gerardo 2011; Blum and Panahpour 2009; Blum 2004; Chinappi and Getzoff 1996).

This study could add new information in the South African context regarding dentists' understanding of the myofascial component of TMJ syndrome. It will provide much needed information regarding referral patterns and whether dentists are willing to refer patients to chiropractors in the future. Information that this study could generate may provide the dental profession with information about knowledge and practices related to MFPS. Based on the outcome, it could indicate that forming inter-professional relationship between chiropractors and dentists with regard to the co-treatment and management of MFPS would be in the best interest of the patients.

1.5 OUTLINE OF CHAPTERS

This chapter (Chapter one) introduced the research topic as well as highlighting the aims, objectives and rationale of the study. Chapter Two will provide the basic anatomy of the TMJ and reviews the literature relevant to this topic to enable a clearer understanding of the research. Chapter Three describes the methodology applied in the study, including how the data was statistically analysed. Chapter Four presents the results, including an interpretation and discussion thereof. Chapter Five concludes the research and additionally provides further recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews the basic anatomy of the TMJ, including its osseous structures; ligaments; the temporomandibular disc; blood supply; venous drainage; innervation and the muscles of mastication. It also includes literature related to MFPS of the TMJ, although more specifically related to TMJD. Furthermore, this chapter also includes how dentists treat and manage MFPS, it investigates their knowledge and education regarding MFPS and how treating TMJD may benefit from co-management between them and chiropractors.

2.2 ANATOMY OF THE TEMPOROMANDIBULAR JOINT

2.2.1 Osseous structures

The temporomandibular joint is a joint formed between the temporal bone (temple) and its articulations with three surfaces: the mandibular fossa, articular tubercle and the head of the mandible (Anon. 2014). Its classification includes a joint that moves in multiple planes and is described as complex, multiaxial, synovial and condylar (Malik 2008). The joint articular surfaces of the TMJ do not come into contact as an articular disc separates the joint into two synovial joint cavities. The upper cavity allows for gliding movements and the lower cavity provides for hinge movements (Phinney and Halstead 2003). The temporomandibular joints (TMJs) work bilaterally to allow fine movements of the jaw, including opening and closing as well as side deviation of the mandible (Bath-Balogh and Fehrenbach 2015). Unlike other synovial joints, fibrocartilage covers the TMJs articular surfaces, while a thin fibrous capsule surrounds the areas of articulation of the temporal bone and the head of the mandible (Standring 2015; Moore, Dalley and Agur 2006).

2.2.2 Ligamentous structures

There are three extra-capsular ligaments stabilising the TMJ, which include:

- One major ligament, the temporomandibular ligament or lateral ligament runs from the articular tubule to the outer and posterior surface of the mandibular neck (Fehrenbach and Herring 2015). A thickening of part of the joint capsule forms this ligament and in conjunction with the post-glenoid tubercle help to prevent the dislocation of the joint backwards (Moore, Dalley and Agur 2013).
- Two minor ligaments are the stylomandibular ligament and the sphenomandibular ligament (Patangay and Mujahid 2015). The stylomandibular ligament attaches from the styloid process to the angle of the mandible thus restricting excessive protrusion (forward movement) of the TMJ. The sphenomandibular ligament attaches from the sphenoid spine to the mandible thereby providing mechanical support to the TMJ (Stone and Haggerty 2015).

2.2.3 Temporomandibular disc

The articular disc consists of non-vascular and non-innervated dense fibrous connective tissue divided into three areas: a thickened anterior and posterior band, and a central transitional zone (Stone and Haggerty 2015). Formation of the disc is between the condyle and the fossa, which functions as a non-ossified bone that is composed of dense fibrous connective tissue. It divides the joint into superior and inferior articular surfaces (Christo *et al*. 2005) allowing for movement. The superior surface articulates with the temporal bone, more specifically at the mandibular fossa, allowing for sliding and translational movements during mouth opening (Moore, Dalley and Agur 2006). The inferior surface articulates with the head of the mandible allowing for hinge and rotatory movements (Moore, Dalley and Agur 2006).

2.2.4 Blood supply, venous drainage and innervation

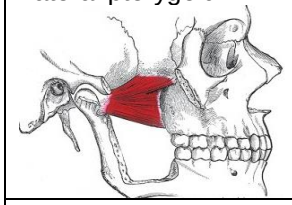
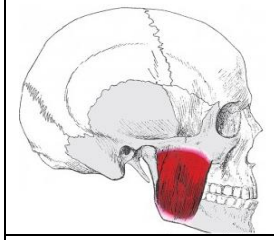
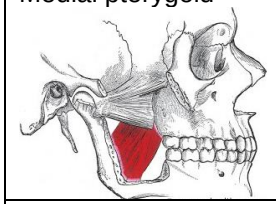
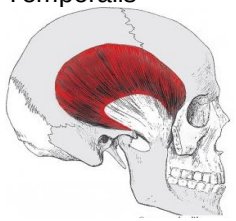
The principle blood supply to the TMJ occurs via the two branches of the external carotid arteries, the lingual arteries, and the facial arteries bilaterally. Furthermore, the external carotid artery divides into the superficial temporal artery and the internal maxillary artery to supply blood to the muscles of mastication and the TMJ itself (Greenberg, Glick and Ship 2008). The venous drainage of the TMJ occurs via the superficial temporal vein and

the maxillary veins bilaterally (Moore, Dalley and Agur 2013). Branches of the trigeminal nerves supply sensory innervations to the TMJ bilaterally. The auriculotemporal branches are the main suppliers of sensory innervation, whereas the masseteric branches are secondary suppliers (Premkumar 2011). The anterior portion of the joint receives motor innervation from the masseteric nerve and the deep temporal nerves, while the anterior-medial portion receives its motor innervation through the masseteric nerve alone. The autonomic supply occurs via the auriculotemporal nerve as well as the nerves that travel alongside the superficial temporal artery (Greenberg, Glick and Ship 2008).

2.2.5 Muscles of mastication

The muscles of mastication (chewing), namely the temporal, masseter, medial and lateral pterygoid muscles primarily generate movement and stability of the TMJ (Greenberg, Glick and Ship 2008). **Table 1.1** demonstrates the origin, insertion, action and nerve supply of these muscles. Other contributors to TMJ stability and movement includes the digastric muscles, responsible for lowering and repositioning of the mandible, the mylohyoid and geniohyoid muscles, allowing for mandible depression (when the infrahyoid muscle stabilises the hyoid bone), and lastly the buccinator muscles that control the cheek positioning during chewing movements (Greenberg, Glick and Ship 2008).

Table 1.1: Temporomandibular joint muscle anatomy, innervation, action and nerve supply (Vizniak 2008).

Muscle	Origin	Insertion	Action	Nerve
Lateral pterygoid 	Superior head: greater wing of sphenoid Inferior head: lateral surface of lateral pterygoid plate	Superior head: capsule and articular disc of TMJ Inferior head: neck of mandibular condyle	Protraction of the mandible; lateral deviation of mandible to side opposite of contraction (during chewing)	Trigeminal nerve Cranial Nerve V
Masseter 	Superficial part: zygomatic process of maxilla; inferior border of zygomatic arch Deep part: posterior aspect of inferior border of zygomatic arch	Superficial part: angle and ramus of mandible Deep part: superior ramus and coronoid process of mandible	Elevation of mandible (clenches teeth); protraction of mandible; retraction of mandible	Trigeminal nerve Cranial Nerve V
Medial pterygoid 	Medial surface of lateral pterygoid plate of sphenoid; palatine bone and pterygoid fossa	Inner surface of mandibular ramus and angle of mandible	Elevation of mandible (clenches teeth); protraction of mandible; lateral deviation of mandible	Trigeminal nerve Cranial Nerve V
Temporalis 	Temporal fossa	Coronoid process and ramus of mandible	Elevation of mandible; retraction of mandible (posterior fibres)	Trigeminal nerve Cranial Nerve V - Mandibular branch

Permission from Dr. N. Vizniak to use relevant table, pictures and content (Appendix N).

2.3 MYOFASCIAL PAIN SYNDROME

2.3.1 Introduction

Myofascial trigger points are prevalent in people who have musculoskeletal pain (Lucas 2007; Rashiq and Galer 1999). Myofascial pain syndrome is more prevalent in females, with a 2:1 ratio in favour of females (Vazquez-Delgado, Cascos-Romero and Gay-Escoda 2009; Wilks 2003; Malleson *et al*. 2001). People between the ages of 30-49 years are more likely to suffer from MFPS, with the prevalence falling with age (Vazquez-Delgado, Cascos-Romero and Gay-Escoda 2009; Freeman, Nystrom and Centeno 2009). Even though a high incidence and prevalence of MFPS exists, it remains as a highly misunderstood condition being under-recognised and not being diagnosed and treated properly (Testa, Barbero and Gherlone 2003; Simons and Dommerholt 2006; Dommerholt, Bron and Franssen 2006; Cummings and Baldry 2007).

Myofascial pain syndrome is defined as pain of muscular origin that is characterised by MFTPs (Gerwin 2001; Simons, Travell and Simons 1999). Myofascial trigger points are small patches of muscle tissue that undergo an isolated spasm, cutting off the blood supply in that area, resulting in additional irritation and a cycle of local metabolic crisis (Ingraham and Taylor 2016). Compression of these points can give rise, not only to a characteristic referred pain, but could also cause motor dysfunction, and autonomic phenomena (Chaitow and DeLany 2011). They can also cause impaired circulation and changes to tissue texture and cutaneous temperature (Ward 2003).

According to a number of researchers, approximately 85% of patient consultations are due to MFPS (Dommerholt, Bron and Franssen 2006; Cote *et al*. 2004; Han and Harrison 1997). It is also considered the leading diagnosis among pain management physicians and patients reporting with pain to general practitioners (Harden *et al*. 2000). Myofascial pain syndrome is a predominant cause of unexplained orofacial pain, yet most health-care providers poorly recognise it as a cause of chronic pain and still lack the knowledge that neck, head and facial pain commonly originates from muscles situated in those regions (Jaeger 2013).

2.3.2 Aetiology and perpetuating factors

The aetiology of MFPS is poorly understood and diversely described in the literature with little consensus on what causes it (Vazquez-Delgado, Cascos-Romero and Gay-Escoda 2009; Cummings and Baldry 2007; Huguenin 2004).

Hsieh *et al*. (2000) simply classified the causes of MFPS as follows:

- **Acute or chronic repetitive trauma** including strain, sprain, contusion, poor posture and muscle overloading.
- **Lesions of various structures** including bursitis, synovitis, tendonitis, arthritis and intervertebral disc lesions.
- **Emotional stresses** including anxiety, depression and somatisation.

Baldry (2005) characterised activation of trigger points in MFPS into primary and secondary causes. The primary causes have been listed in **Table 1.2**.

Table 1.2: The primary causes of myofascial pain syndrome

A) Biological/structural factors
Mechanical abuse: - This can be due to an acutely sustained or repetitive muscle overload for example a prolonged muscle contraction (Chaitow and DeLany 2011; Lavelle, Lavelle and Smith 2007; Simons, Travell and Simons 1999).
Trauma: - This can occur as a direct injury or a sudden strain to the muscle, could be due to extreme or unusual exercise or due to repeated minor trauma to the muscle. Trauma to the muscle results in a local inflammatory response (Chaitow and DeLany 2011; Baldry 2005; Simons, Travell and Simons 1999).
- Leaving a muscle in shortened position for a prolonged period particularly if the muscle is in a contracted state (Simons, Travell and Simons 1999).
Nerve compressions: - Myofascial trigger points develop in the muscle supplied by the compressed nerve roots in cases of intervertebral disc ruptures (Simons, Travell and Simons 1999). During nerve compression, identifiable neuropathic electromyography changes can be noted, and can result in disturbed microtubule communication between the neuron and the end plate (Chaitow and DeLany 2011; McPartland and Simons 2006; Simons, Travell and Simons 1999).

Table1.2 Continued: The primary causes of myofascial pain syndrome

B) Factors in everyday life
Adverse environmental conditions: - Exposure to excessive heat, cold or dampness amongst other conditions (Chaitow and DeLany 2011; Simons, Travell and Simons 1999).
Other: - Sedentary individuals (Vazquez-Delgado, Cascos-Romero and Gay-Escoda 2009), nutritional deficiencies, lack of exercise, sleep disturbances (Pankaj *et al*. 2015), social deprivation and abuse/abusive environments (Malleson *et al.* 2001).
C) Measurable and psychological factors
Systemic biochemical imbalances: - Such as hormonal disturbances (Chaitow and DeLany 2011; Simons, Travell and Simons 1999).
Structural disharmony (Pankaj *et al*. 2015) and skeletal imbalances: - Cause muscle imbalances between the agonist and antagonist muscles, resulting in overloading of muscles (Rosen 1994).
Hypermobility or ligamentous laxity: - These are significant risk factors in the development of MFTPs (Ofluoglu *et al*. 2006; Adib *et al*. 2005; Nijs 2005; Ferrell *et al*. 2004; Malleson *et al.* 2001).

Secondary causes have been documented (Baldry 2005; Simons, Travell and Simons 1999) and include:

- Satellite trigger points are able to activate trigger points within their referral zone.
- Low oxygenation of tissue making the muscle prone to develop MFTPs.
- Compensating synergistic or antagonistic muscles:
    - Synergistic muscles may develop trigger points due to the compensation that takes place when the primary muscle contains MFTPs.
    - Antagonistic muscles may develop MFTPs during contraction of the primary muscles that also contains MFTPs.
    - The development of active and latent trigger points can also occur in variable degrees due to the above compensating mechanisms.

In addition to the primary and secondary aetiological factors, there are also perpetuating factors which can cause the persistence of MFTPs. Management of MFPS should thus include prevention or limitation of these factors and not just the symptomatic relief of the initiating factors (DeLaune 2008). These factors must be acknowledged clinically and treated when possible (Gerwin 2010) (**Table 1.3)**.

Table 1.3: The perpetuating factors of myofascial pain syndrome (Bron and Dommerholt 2012; Gerwin 2010; Tollison, Satterthwaite and Tollison 2002; Simons, Travell and Simons 1999).

Category	**Factors**
Mechanical	Poor ergonomics, stressful posture and hypomobility.
Structural	Body asymmetries, including leg length differences, scoliosis or morton's foot (a long second metatarsal bone).
Systemic	Nutritional insufficiencies: Iron, Vitamin (most commonly C, D, B1, B6 and B12) and folic acid. Several trace mineral including calcium, zinc, magnesium and potassium. Metabolic and endocrine insufficiencies: Hypothyroidism, hypoglycaemia and gout. Chronic infections and diseases: Viral (for example herpes simplex virus type one or influenza). Bacterial (for example tooth abscesses or blocked sinuses). Parasitic (for example amoebiasis, fish tapeworm or giardiasis).
Psychological	Hopelessness, anxiety, depression and emotional stress.
Other	Drugs (statins), impaired sleep, fatigue, cold damp weather, air conditioner use, latent myofascial trigger points, satellite trigger points, allergy, chronic visceral diseases and/or nerve impingements.

2.3.3 Characteristics and clinical findings of myofascial trigger points

The reliability of diagnosing MFTPs has been a point of debate for a long time within literature and still the reliability of physical examination are inconsistent. (Lucas *et al*. 2009; Bohr 1995, cited in Gerwin *et al*. 1997). Diagnosis has mainly been through clinical history and examination. Gerwin *et al*. (1997) produced the first paper to establish interrater reliability in trigger point identification, thereby opening a field of study into the clinical efficacy of manual physical examination (Simons, Travell and Simons 1999; Rickards 2006; Chaitow and DeLany 2011).

Notwithstanding this, Quintner, Bove and Cohen (2014) stated in their review article on a critical evaluation of the trigger point phenomenon that physical examination could not be relied upon in the diagnosis of MFPS. In this review, the work of Tough *et al*. (2007) was also assessed. They examined 93 papers, identifying nineteen different sets of diagnostic criteria for MFPS and/or myofascial trigger points. Even though there is still no clear criteria, in more than half of the reviewed articles it was found that spot tenderness and pain reproduction to identify MFTPs were the common and universal criteria for trigger point location. Thus, for the diagnosis of MFTPs to be clinically significant, all essential criteria have to be present (Chaitow and DeLany 2011; Simons, Travell and Simons 1999). These criteria are outlined in **Table 1.4**.

Table 1.4: Diagnostic criteria of myofascial trigger points - Essential (Chaitow and DeLany 2011; Rickards 2006; Simons, Travell and Simons 1999; Gerwin *et al*. 1997).

The essential criteria for myofascial trigger points
1) Taut band
2) Spot tenderness/tender nodule
3) Reproduction of symptoms (referred pain a distance from the stimulation) on application of tenderness to the nodule
4) Painful limit to full stretch motion
5) Possible local twitch response

Besides the essential criteria, confirmatory signs also exist, as indicated in **Table 1.5.** These signs strengthen the diagnosis of MFPS (Chaitow and DeLany 2011; Rickards 2006; Baldry 2005; Simons, Travell and Simons 1999; Gerwin *et al*. 1997).

Table 1.5: Confirmatory signs of myofascial pain syndrome

Objective signs	Subjective symptoms
Visual or tactile identification of local twitch response	Regional pain.
Pain or altered sensation on compression of tender nodule	Persistent pain.
Painful limit to full range of motion	Pain that does not follow a dermatological or nerve root distribution.
Pain on contraction of the muscle	Report of few systemic symptoms and neurological defects are usually absent.
Weakness of the muscle	Electromyographic demonstration of spontaneous electrical activity characteristic of active loci in the tender nodule of a taut band.
Jump sign	Imaging of a local twitch response induced by needle penetration of tender nodule.

2.3.4 Differential diagnoses when considering myofascial trigger points

Some of the most important conditions to consider when myofascial pain is present are highlighted in **Table 1.6**. However, they are not the only conditions to be considered (Chaitow 2003; Borg-Stein and Simons 2002; Gerwin 2001; Simons, Travell and Simons 1999).

Table 1.6: Differential diagnoses of myofascial trigger points

Possible basis	Specific examples
Fibromyalgia.	
Nutritional/metabolic deficiencies	Vitamin D, folic acid, ferritin, iron and muscle enzyme deficiency Celiac disease.
Rheumatologic disease	Polymyalgia rheumatica, rheumatoid arthritis, lupus and ankylosing spondylitis.
Joint and bone disorders	Osteoarthritis and degenerative joint disease.
Iatrogenic causes	Simvastatin and atorvastatin.
Viscerosomatic disorders	Heart disease, kidney stones, irritable bladder, irritable bowel syndrome and endometriosis.

Table 1.6 Continued: Differential diagnoses of myofascial trigger points

Mechanical dysfunction	Hypermobility, hypomobility, leg-length inequality, scoliosis, pelvic movement asymmetries and temporomandibular joint dysfunction.
Hormonal disorders	Hypothyroidism, testosterone deficiency and oestrogen deficiency.
Infectious disease	Lyme disease, herpes zoster, babesiosis and candidiasis.
Acute trauma	Fractures, soft-tissue injury, postoperative pain and chronic cervical whiplash neck pain.
Psychological diagnoses	Depression, anxiety and sleep disorders.
Vascular-occlusive disorders	Peripheral vascular disease.
Neurological defects	Spinal disc prolapse/herniation, radiculopathies, entrapment neuropathies and complex regional pain syndrome.
Regional soft tissue disturbances	Bursitis and tendonitis.

2.3.5 Myofascial trigger points as related to this study

Table 1.7: The referral patterns of muscles to the orofacial area

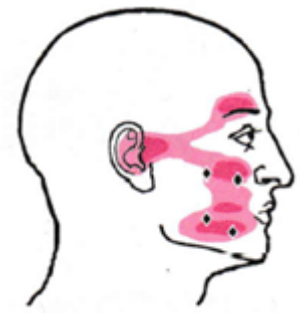
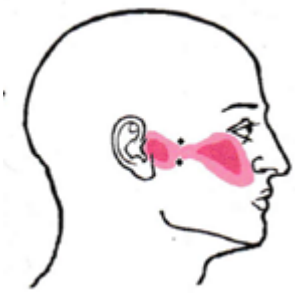
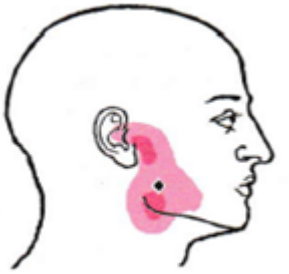
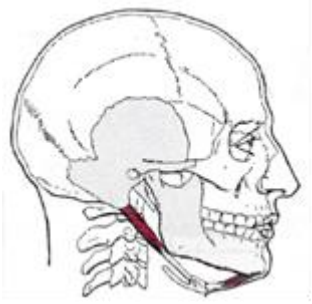
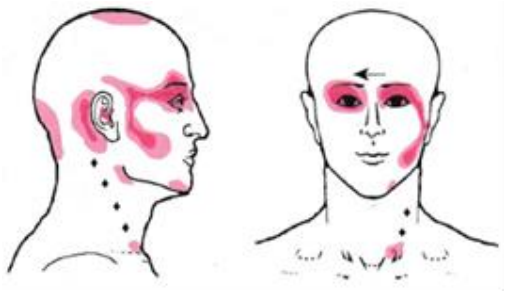
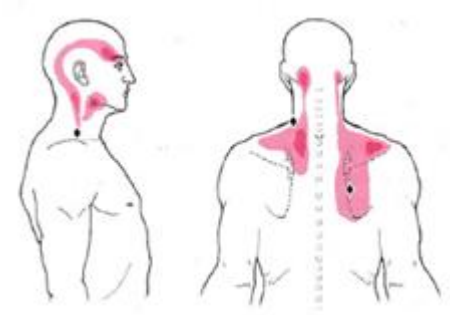
The referral patterns of muscles to the orofacial area.	
Temporalis referral pattern (Vizniak 2008). 	The temporalis muscle normally refer above and below the muscle and may refer to the upper teeth (Vizniak2008) resulting in pain, tenderness and a possible hypersensitivity to heat and/or cold. Its pain referral also includes the eyebrow and temporal area, often resulting in temporal headaches. Occasionally the referred pain will be reported around the maxilla and TMJ areas (Simons, Travell and Simons 1999).
Masseter referral pain pattern (Vizniak 2008). 	The masseter muscle refers pain over the ear, cheek and jaw, eye and molars (Vizniak 2008).This results in hypersensitivity to pressure, and temperature changes in these teeth (Simons, Travell and Simons 1999).
Lateral pterygoid muscle referral pain patterns (Vizniak 2008). 	The lateral pterygoid muscle refers pain over the TMJ and zygomatic arch (Vizniak 2008).
Medial pterygoid muscle referral pain patterns (Vizniak 2008). 	Pain referral from the medial pterygoid usually occurs over the TMJ and angles of the mandible (Vizniak 2008). Pain can also present in the back of the throat, pharynx and ear (Simons, Travell and Simons 1999).

Table 1.7 Continued: The referral patterns of muscles to the orofacial area

Anterior digastric (Vizniak 2008). 	The anterior digastric muscle refers pain to the lower four mandibular incisors (Simons, Travell and Simons 1999).
Sternocleidomastoid referral pain pattern (Vizniak 2008). 	The sternocleidomastoid muscle primarily refers pain over the mastoid process and supraorbital regions (Vizniak 2008). Mainly, the sternal division cause eye and facial pain as its referral include the cheek and throat area (Simons, Travell and Simons 1999).
Trapezius muscle referral pain pattern (Vizniak 2008). 	The upper fibres of the trapezius muscle can occasionally cause pain around the angle of the jaw. Infrequently pain may refer to the occiput and lower molar teeth (Vizniak 2008).

2.4 MYOFASCIAL PAIN SYNDROME AS RELATED TO TEMPOROMANDIBULAR DISORDERS

2.4.1 Introduction

Temporomandibular disorder is a collection of musculoskeletal and neuromuscular conditions relating to the TMJ, which affects up to fifteen percent of adults (Gauer and Semidey 2015). It is also known as temporomandibular joint dysfunctions and/or craniomandibular dysfunctions. Since most TMJD patients complain about pain within the muscles of mastication and not in the TMJ itself, the American Dental Association preferred the term temporomandibular disorder to TMJD (Okeson and de Kanter 1996). It is seen as a musculoskeletal disorder due to repetitive motion of the masticatory muscles (Wright and North 2009). They produce craniofacial pain of musculoskeletal structures within the head and neck (Scrivani, Keith and Kaban 2008).

Myofascial pain syndrome is the most common form of temporomandibular disorder (Mortazavi *et al*. 2010; Sayler 2005; Uyanik and Murphy 2003; Gremillion 2002). It produces head, neck and facial pain (Romero-Reyes and Uyanik 2014), which commonly affect the pterygoid, temporalis and masseter muscles that in turn cause referred pain that can mimic toothache, headaches and facial pain (Laudenbach and Stoopler 2002). It is a leading cause of a patient's dental consultation (Rezaei-Nejad 2004, cited in Mortazavi *et al*. 2010). According to Cardli *et al*. (2005) cited in Mortazavi *et al*. (2010) and Sherman and Turk (2001), a muscular association occurs in 90% of TMJD cases. It seems to occur more frequently in the female population, with a female to male ratio of 3:1, and commonly occurs between 15 and 35 years of age (Garg *et al*. 2013).

2.4.2 Aetiology

The aetiology of TMJD is controversial and is often multifactorial in nature (Ibsen and Phelan 2016; Mesnay 2012), with various factors such as genetics, posture, structure, physiology, and psychology that may interact to cause it (Chisnoiu *et al*. 2015). The American Society of Temporomandibular Joint Surgeons (2003) classified TMJD as either being intra-articular (mainly pathologies of the internal joint surfaces) or extra-articular (mainly muscular pathologies). Uyanik and Murphy's (2003) study classified TMJD into two groups: articular (internal derangement and inflammatory joint disorders) and muscular (myalgia, myositis and myofascial pain). Peck *et al*. (2014) expanded this classification and took into account

conditions that are less common, but still clinically important, such as masticatory muscle disorders (**Table 1.8).**

Table 1.8: Classification of temporomandibular joint disorder - Masticatory muscle disorders

Categories	**Examples**
Muscle pain	• Myalgia (Local myalgia, myofascial pain and myofascial pain with referral) • Tendonitis, myositis and spasms
Contractures	• Fibrosis of tendons, ligaments or muscle fibers
Hypertrophy	• Enlargement of one or more masticatory muscles
Neoplasm	• Myoma and rhabdomyosarcoma
Movement disorders	• Orofacial dyskinesia and oromandibular dystonia
Masticatory muscle pain attributed to systemic/central pain disorders	• Fibromyalgia

The most common cause of TMD is MFPS (Fricton 2016; Gauer and Semidey 2015). It is the main cause of up to 50% of all TMDs (Reiter *et al*. 2012). The muscular causes of TMDs are usually because of a direct result from either macro- or micro-trauma (Fricton 2016). Macro-trauma can include direct trauma and whiplash injuries (Friedman and Weisberg 2000). Micro-trauma includes repetitive activities such as nail biting, bruxism, jaw clenching and the chewing of gum (Simons, Travel and Simons 1999). Besides the muscles of mastication, the muscles of the neck and shoulders should also be assessed as the source of pain/referred pain, or as a source of the primary trigger points that may be responsible for activating the muscles of mastication (Sanches *et al*. 2014; Fernandez-de-las-Penas *et al*. 2010; Simons, Travel and Simons 1999).

2.4.3 Symptoms

Bagis *et al*. (2012) found that almost all people (80%) with TMJD complain of pain, headache, earache, pain in their temples, or difficulty opening their mouth. Signs and symptoms can be referred, isolated or combined from the TMJ, the masticatory muscles, the cervical muscles and associated structures (Aristeguieta, Ortiz and Ballesteros 2005). Usually the patient reported a feeling of ‘muscle stiffness’ and/or ‘tiredness’. In addition, the pain can be described as a dull ache, which increases throughout the day and can be heavy, tender or aching. Patients may use terms such as tiring and troublesome to describe it (Kino *et al*. 2005). Movement, such as chewing or locking of the jaw during mouth opening,

aggravates it, thus the patient's primary complaint may be pain when they move their jaw (Sharav and Benoliel 2008). Clicking, popping and snapping or grinding and crepitus within the TMJ are also common complaints (Arora *et al*. 2015; Buraa and Alazzawi 2013; Sharav and Benoliel 2008; Nykoliation and Cassidy 1984). Additionally, the patient may verbally report limited jaw opening, bite alterations (such as biting the inside lining of the mouth, showing an over or under bite), bruxism and clenching or otic symptoms (for example otalgia, tinnitus, vertigo, dizziness and/or subjective hearing loss) (Arora *et al*. 2015; Buraa and Alazzawi 2013; Sharav and Benoliel 2008; Nykoliation and Cassidy 1984).

2.4.4 Assessment and diagnosis

Often during the assessment of suspected TMJ involvement, simple screening tests are used. This usually includes four simple questions for which a 'Yes' answer to one or more of the questions could indicate the presence of TMJD (De Boever *et al*. 2007; Nilsson, List and Drangsholt 2006):

1. Do you have pain when you open your mouth wide or chew? Does this pain occur once a week or more?
2. Do you have pain in your temples, face, TMJ or jaw? Does this pain occur once a week or more?
3. Have you lately experienced that your jaw is locked or that you cannot open it widely?
4. Do you have a headache more than once a week?

The research diagnostic criteria (RDC) categorise TMJD criteria into groups according to the shared factors between conditions (Dowrkin and LeResche 1992, cited in Durham *et al*. 2009). The first group consist of muscular disorders:

- A) Myofascial pain:
  - Reported pain in masticatory muscles.
  - Pain on palpation in at least three sites, one of them should be on the same side of the reported pain.

- B) Myofascial pain with limited opening
  - Myofascial pain.
  - Pain-free unassisted opening < 40 mm and passive stretch ≥ 5 mm.

Shaffer *et al*. (2014) further listed the following as considerations in assessing if a patient is presenting with a TMJ complaint that is of muscular origin:

- Usually associated with: stress, anxiety, clenching, bruxism.
- Palpable tenderness of musculature.
- Palpable trigger points within the TMJ musculature.
- Aggravation with activity for example mastication.
- Often bilateral when it is the primary disorder.
- Confirmed through: muscular management and patient education such as identifying and reducing contributing factors (**Table 1.3**).

The use of the patient's pain history is not only important in determining the diagnosis but it is also important in monitoring progress (Shaffer *et al*. 2014). This requires the practitioner to make use of intake questionnaires given to each new patient (Shaffer *et al*. 2014; Zakrzewska 2013; De Boever *et al*. 2007) to accurately detail the locations, qualities, intensity, aggravating and relieving factors and so forth of the pain (Shaffer *et al*. 2014; Wright and North 2009). In addition, the practitioner must determine and screen for the presence of disorders that may mimic TMJD symptoms or complicate the prognosis and/or healing time of the patient (Zakrzewska 2013; Sizer, Brismée and Cook 2007). The latter may necessitate inquiries about other diseases or symptoms that may influence the patient's response to management, for instance cervical dysfunction (Wright and North 2009).

Objective measures in monitoring patients are primarily reliant on observation (Shaffer *et al*. 2014; Zakrzewska 2013). This requires the observation and subsequent reporting on any postural deficits, relative prominence of musculature, the size and shape of the mandibular, any asymmetry, the resting position of the mandibular, and on the temperature and colour of the skin. Internally this observation requires inspection for abnormalities of the oral structures (teeth, tongue, tonsils and the soft and hard palates), as well as extra-oral structures (arteries, veins, lymph nodes and glands). This is followed by a thorough physical examination that reviews the mandibular range of motion (ROM):

- Active ROM testing consist of opening the mouth, left and right lateral deviation, as well as protrusion/retraction (Shaffer *et al.* 2014). Normal minimal ranges include 40 mm opening, 7 mm lateral deviation, and a 6 mm protrusive (Wright and North 2009).
- Testing passive ROM can present some difficulty as muscle guarding is commonly found in TMJD (Shaffer *et al.* 2014).

After the ROM has been assessed, then palpation of the TMJ and masticatory muscles can intensify or reproduce the patient's pain and in so doing determining whether the primary pain source is muscle or TMJ (Shaffer *et al.* 2014). Furthermore, palpation of structures such as the thyroid and carotid arteries are necessary to ensure that the pain does not spread from these structures (Wright and North 2009). Evaluation of the neck and shoulder muscles, with particular reference to the sternocleidomastoid, posterior cervical and upper trapezius muscles are also important in TMJD (Arora *et al*. 2015; Buraa and Alazzawi 2013; Sharav and Benoliel 2008; Nykoliation and Cassidy 1984). Palpation is the most common clinical technique in the assessment (Srbely, Kumbhare and Grosman-Rimon 2016).

2.4.5 Treatment and management

After assessing the patient, a decision needs to be made with regard to their treatment and management. These include the option of referral, particularly when the dentist cannot come to a diagnosis, or the pain is chronic and possibly of a neuropathic origin. At this point, patients should be referred to a specialist in TMJD/orofacial pain. Conversely, if a working diagnosis is made then management will generally not be based on the aetiology of the condition as this is not well defined (Greene 2001), but is more so directed to the symptomatology and factors influencing each individual. Clinically, management could either be approached passively, where the practitioner is the main person playing a role in the health of the patient, or actively, where the patient plays a main role in their return to full health (De Boever *et al*. 2007).

Mrzezo (2015) briefly outlined the definitive treatment for masticatory muscle disorders, directing treatment and management toward the elimination/reduction of causative factors. Clinicians can use the following treatment protocol:

1. Remove any cause of constant deep pain input in for instance the aetiology.
2. Ease the local and systemic causes contributing to myofascial pain (for example emotional stress, where stress management techniques are indicated).
3. If a sleep disorder is suspected, this needs to be evaluated and referred. A low dosage of a tricyclic antidepressant may be helpful.
4. One of the chief components in managing myofascial pain is by eliminating trigger points. The following techniques of elimination are listed: spray and stretch, pressure and massage, ultrasound and electrogalvanic stimulation, injection and stretch and supportive therapy (physical therapy modalities and

manual techniques and pharmacologic therapy) (Travel and Simmons 1983; Chaitow and DeLany 2011).

In addition, Arora *et al*. (2015) stated that MFPS requires an intensive multi-disciplinary treatment module as part of the management strategy. It must, however, be considered that it may be difficult to completely cure MFPS or TMJD. As a result, they divide the management of MFPS into two groups, non-surgical management and surgical management (Arora *et al*. 2015). This viewpoint is more clearly outlined in **Table 1.9**.

Table 1.9: Management of myofascial pain syndrome (Arora *et al*. 2015; Garg *et al*. 2013; Liu and Steinkeler 2013; De Boever *et al*. 2007; Odendaal 2003).

<table>
<tr><td colspan="2">A) <u>Surgical management</u></td></tr>
<tr><td colspan="2">Arthroscopy, botulinum toxin A(BtA) injections, condylotomy, high condylectomy, menisectomy and myotomy.</td></tr>
<tr><td colspan="2">B) <u>Non-surgical management</u></td></tr>
<tr><td colspan="2"><u>B1) Initial therapy</u>: Reassurance, diet, rest and thermotherapy.
<u>B2) Supportive therapy</u>:
<u>B2.1) Relief of dysfunction</u>: Restrictive use exercises (active, passive and isometric).
<u>B2.2) Alternative Treatment Therapy:</u> Spray and stretch techniques, ischemic compression, trigger point pressure release, relaxation therapy and occlusal appliances.
<u>B2.3) Relief of pain:</u>
<u>Pharmacological therapy</u>: Analgesics, anti-inflammatory agents, anxiolytics agents, muscle relaxants and herbal medicines.
<u>Physical therapy:</u></td></tr>
<tr><td><u>Cutaneous Stimulation Therapy:</u>
Superficial massage, stripping massage, ice massage, periosteal therapy, muscle and trigger points injections, dry needling and hydrotherapy.</td><td><u>Electrical Stimulation Therapy:</u>
Electro galvanic stimulation, trans cutaneous stimulation, acupuncture, ultrasound, iontophoresis and cold or soft laser.</td></tr>
</table>

2.5 THE DIAGNOSIS, TREATMENT AND MANAGEMENT OF THE TEMPOROMANDIBULAR JOINT IN THE DENTAL OFFICE

Numerous studies conducted internationally on dental management of TMJD concluded that there is a significant gap in the education and training of practising dentists regarding the identification and management of MFPS (Simm and Guimaraes 2013; Jamalpour *et al*. 2011; Sieber *et al*. 2003; Ayer, Machen and Getter 1977). Jamalpour *et al*. (2011) aimed to evaluate the knowledge and beliefs of general dental practitioners regarding TMD in Sanandaj, Iran. A questionnaire regarding the diagnosis and classification, treatment and prognosis, chronic pain and pain behaviour was given to 80 general dental practitioners. The following areas showed a significant difference between the diagnosis of TMJD by general dental practitioners and TMJ experts (Jamalpour *et al*. 2011):

- Tenderness of masticatory muscles is the most common symptom of TMJD.
    - Ninety percent of TMJ experts agreed in comparison to 38% of general dentists.
- Temporomandibular joint radiography is very useful in the diagnosis of soft tissue, bone and joint disorders.
    - Seventy percent of TMJ experts agreed in comparison to 36% of general dentists.
- Measurement of the mouth opening is a reliable method for the diagnosis of TMJD.
    - Seventy percent of TMJ experts disagreed in comparison to 39% of general dentists.

One significant difference in the management of TMJD by general dentists and the TMJ experts was that only 48% of general dentists believed that anti-inflammatory drugs were useful for joint pain, compared with 90% of TMJ experts. Other treatment methods typically used included physical therapy, relaxation therapies and occlusal splints, as reported by the TMJ experts (Jamalpour *et al*. 2011). Due to the results, the authors concluded that there is a need to develop and strengthen undergraduate dental courses and continuous education programmes in TMJD/orofacial pain (Jamalpour *et al*. 2011). Ommerborn *et al*. (2010) compared the use of different therapies between general dentists and specialists. A significant difference was found in the usage of occlusal splints (75%) by general dentists, as compared with 56.97% of specialists; and physiotherapy as a choice by almost sixteen percent of general dentists as compared with 25.30% of specialists. Other therapies used included relaxation techniques, thermal packs and medications. There were no significant

difference in the percentage of use of these methods by general dentist and specialists (Ommerborn *et al*. 2010).

This difference between professions is also evident in the results obtained from 2 544 members of the American Dental Association who completed a questionnaire on the management of MFPS (Glass, Glaros and McGlynn 1993). This study showed that there was a considerable variation in the way common treatments were performed between members of the dental profession. The most common treatment type utilised by the general dentist included splints (68%), occlusion equilibration, and thermal packs (27%). In a study carried out by Candirli *et al*. (2016), from a total of 288 Turkish dentists, only 1.4% used occlusal splint therapy for TMJ pain and 5.9% in cases with myofascial pain, indicating that there is a difference in the manner that dentists approach different diagnoses. Therefore, appropriate management strategies are contingent on accurate diagnoses. This was also shown by Reissmann *et al*. (2015), who indicated that only 40% of the respondents indicated the use of relaxation techniques in the management of TMJD. In a study by Glass, Glaros and McGlynn (1993), a total of 53.34% patients with MFPS were referred out by general dentists as opposed to being treated and managed in-house. The majority of referrals (94.46%) were referred to other dental professions, while only 5.54% were referred to practitioners outside of the dental community. Mainly referring to other dental professions does not necessarily mean that the cause is treated and consequently patient recovery will not be optimal if the original MFTPs are not treated (Manolopoulos *et al*. 2008).

2.6 THE KNOWLEDGE AND EDUCATION OF MYOFASCIAL PAIN SYNDROME

Baharvand *et al*. (2010) investigated the level of knowledge, attitudes and practices of dental practitioners regarding TMJD in Tehran, Iran. They found that the level of knowledge and attitude of general dental practitioners regarding TMJD was poor and that most were not treating TMJD patients. The average score of knowledge was given out of 23. There was almost a fifteen percent difference in TMJD knowledge between general dental practitioners and TMJD experts. The practitioners disagreed about aetiology, diagnosis, and signs and symptoms, although they seemed to agree on management (Baharvand *et al*. 2010). If there are differences between the diagnoses, then the likelihood that the practitioners will be treating similar numbers of a particular condition of the jaw will be decreased. As a result, they may consider treating patients in the same manner, but have limited opportunity to implement these strategies in practice. Baharvand *et al*. (2010) indicated that dentists' attitudes and knowledge were both lower (particularly with an increase of age or years of practising).

According to Jamalpour *et al*. (2011), TMJD should form part of the curriculum of general dentistry, as most patients with disorders of the TMJ are first seen by or referred to by dentists. Consequently, a general dentist's knowledge in this field is very important (Jamalpour *et al*. 2011). This significance is highlighted by Fricton *et al*. (1985) who reported on the diagnosis of 296 patients referred to a dental clinic for chronic head and neck pain of at least six months duration. In more than half of the cases, the main diagnosis was MFPS; and in 21%, the pain was due to conditions of the TMJ. Simons (2004) reported that if myofascial pain and trigger points are not considered, assessed and addressed, the general cause of a patient's pain would be disregarded. More recently, Kim (2005) stressed that even though the understanding of orofacial pain sources had improved, it is still evident that diagnosing this correctly is still challenging for the dental profession.

Jaeger (2013) further stated that examination of each head and neck muscle must be routinely included in patients with persistent pain complaint. Cervical MFTP's are often the 'key' trigger points, perpetuating 'satellite' trigger points in the masticatory muscles (Jaeger 2013). These often fall outside of the curriculum of dental practitioners. Malcmacher (2013) outlines this in writing that many dental professionals do not know, and were not educated about the existence of trigger point pathways between the head/neck muscles and the jaws/teeth. Dommerholt (2006) noted that education in MFPS mainly occurs through post-

graduate and continued professional development opportunities. In his work, he concluded that an enhanced knowledge of MFPS would allow dentists and other clinicians with an effective method to relieve the pain. A number of studies conducted internationally on dental management of TMJD concluded that there is a significant gap in dentists' knowledge and education regarding diagnosis, symptoms, treatment and prevention (Simm and Guimaraes 2013; Jamalpour *et al*. 2011; Schonwetter, Walton and Whirney 2011; Tegelberg, Wenneberg and List 2007). Simm and Guimaraes (2013) conducted a survey at a dental school in Brazil. They wanted to assess the education provided with regard to orofacial pain and TMJD. The topic of pain mechanism was found to cover less than ten percent of the course time. In only 35.5% of responding schools, an orofacial pain/TMJD specialist taught this concept. The authors thus concluded that the teaching in relation to orofacial pain and TMJD was insufficient and segmented.

Jamalpour *et al*. (2011) expressed that it is commonly the practice to send patients with TMJD to a dentist as the first line of treatment. By use of a questionnaire, they assessed the level of knowledge and beliefs of general dental practitioners compared with TMJD experts. The study documented that the general dentists and TMJD experts agreed on treatment protocols, but not on the diagnosis and chronic pain domain regarding TMJD. The Authors concluded that there is a need to develop and strengthen undergraduate dental courses and continuous education programmes in TMJD/orofacial pain. Schonwetter, Walton and Whirney (2011) assessed graduates from the Manitoba Dental School in Canada. Students reported a lack of confidence in various areas, including orofacial pain. This showed that there were problematic areas that still needed to be addressed in the dental curriculum. Tegelberg, Wenneberg and List (2007) assessed general dental practitioners' knowledge regarding TMJD in children and adolescents. A questionnaire was given to 286 Swedish dentists and seventeen TMJD international experts. Although there was conformity concerning knowledge of TMJD, disagreement occurred about the treatment and prognosis of TMJD. The authors suggested that this difference could be due to undergraduate curricula that is different throughout different countries.

In a study carried out by Steenks (2007), it appeared that the incapability in managing TMJD and orofacial pain was related to a poor level of knowledge about the disorder. There was an agreement in their study that a lack of education regarding TMJD an orofacial pain existed in undergraduate dental education. The authors concluded that professional organisations should sanction an enhanced education and training programme to teach undergraduates. Klasser and Gremillion (2013) wrote that advances in knowledge greatly influences dental curricula. They stated that there is still ambiguity with regard to the field of orofacial pain and,

more specifically, TMDs. In addition, they stated that advancement in this area would not be an easy task because it will require input from educational organisations to the professional organisations. However, they all agreed that such teaching is needed to promote orofacial pain/TMD education. Porto *et al*. (2016) reported that despite discussion and recommendations to advance the knowledge about orofacial pain and TMJD, only a few changes were made. The authors found that no significant changes occurred in the past 20 years with respect to knowledge and beliefs even though there was an increase in research and more updated publications about TMJD became available.

2.7 DENTAL AND CHIROPRACTIC CO-TREATMENT

According to Chinappi and Getzoff (1996), temporomandibular/craniomandibular dysfunction should be assessed and treated between chiropractors and dentists. They highlighted that this co-treatment would increase the possibility that the patient's symptoms would improve. Various authors (Rubis, Rubis and Winchester 2014; Blum and Gerardo 2011; Blum and Panahpour 2009; Dal Bello and Borilli 2009a; Dal Bello and Borilli 2009b; DeVocht, Schaeffer and Lawrence 2005; Chinappi and Getzoff 1995) have demonstrated the importance of chiropractic and dental co-treatment with regard to TMJ conditions.

Rubis, Rubis and Winchester (2014) produced a case study on chiropractic and dental co-treatment of TMJD. A 38-year-old female presented to a chiropractor complaining of jaw pain, tinnitus, headaches and neck and shoulder soreness. In addition to chiropractic treatment, dental management included the use of an anterior repositioning splint. The authors concluded that co-treatment allowed for a quick resolution of the condition and symptoms. Blum and Gerardo (2011) presented a case where a dentist referred his 66-year-old female patient for chiropractic care. The patient presented with neck pain and stiffness with associated jaw crepitus. The use of cervical traction and sacro occipital technique (SOT) treatment provided immediate relieve. In another study, in which two papers were presented at the 2009 chiropractic research conference, stated how patients with TMJD can benefit from dental and chiropractic co-treatment. In the first study, (Dal Bello and Borilli 2009a), six individuals with diagnosed malocclusion and TMJ pain were divided into two groups. One group received cervical adjustment and the other was treated using SOT. Overall, 83.33% of participants had a decrease in TMJ pain. This result highlighted that chiropractic treatment is effective in decreasing TMJD symptoms. The second paper by Dal Bello and Borilli (2009b) assessed the orthodontic professional's attitude about the effects of chiropractic treatment in patients with malocclusion and TMJ pain. The results showed that in 83.33% of the cases, the orthodontists was largely positive about chiropractic treatment.

Blum and Panahpour (2009) presented on two patients with TMD that received SOT treatment. They found a decrease in pain and an absence of crepitus during TMJ functioning. It was also noted that relaxation of the cervicocranial and craniomandibular musculature occurred. At the end of their study, they stated that one of the leading problems for chiropractic and dental co-treatment is that neither profession seemed not to be aware of each other's professions which caused problems and confusion with diagnosing and treatment options. DeVocht, Schaeffer and Lawrence (2005) reported on a case where a 30-

year-old female suffered for seven years with unsettled jaw pain because of eight root canals treatments done on one tooth. Medical and dental care was not successful. A long process (20 months) of chiropractic care and two months of massage therapy resulted in resolving all the patient's symptoms, except for the feeling of fullness of the right cheek. Blum (2004) highlighted that more recently a professional co-relationship had been developing between chiropractors and dentists, especially in TMJD. Blum (2007) stated that there is a need for co-treatment with respect to TMJD, as chiropractic alone cannot affect dental occlusion or condylar position for prolonged periods, dentistry alone can also not take into account postural influences on occlusion, and vice versa, thus both professions should work together. He reported that an essential part of the continued development of this relationship would depend largely on educating both professions about the other, including information on what each profession can contribute to patient care. The main part of the article discussed the field of chiropractic that makes use of SOT. This field consists of chiropractors who engage in dental and chiropractic co-treatment. They practice SOT as they have received training from the Sacro Occipital Technique Organisation (SOTO) – United States of America (USA). This group is the only chiropractic-based affiliate of the American Alliance of TMJD Organisations, an association principally consisting of dentists who treat TMJD (Blum 2009). The SOTO – USA focuses on developing dental and chiropractic co-treatment models, and in so doing promotes the professions' integration (Blum 2004).

Chinappi and Getzoff (1995) reported on a case where a 33-year-old female presented for treatment to an orthodontist. Her symptoms included an overbite, severe crowding of the lower teeth, a history of bilateral headaches and jaw popping. Dental care alone did not resolve the problem, as her head and neck were unable to adapt to the changes made to the maxillary and mandibular structures. Chiropractic adjustments to her spine, neck and cranial structures enabled her body to respond positively to the dental changes. The authors concluded that this case supports integrated care and that if these professions became more aware of one another, continued development in this area can take place. Malcmacher (2013) writes:

"Stop ignoring these patients, learn how to do a thorough head and neck examination to identify trigger points, learn some frontline TMJ and myofascial pain techniques, and you will be amazed at how much better your treatment outcomes will be and how fast your practice will grow (Malcmacher 2013)".

2.8 DEMOGRAPHICS

From previous studies conducted on the dental profession in South Africa, the following demographic profiles were noted:

- In the studies on the dental profession male respondents were notably higher in number than female respondents (Snyman, van der Berg-Cloete and White 2016; Naidoo 2015). Lalloo *et al*. (2005) showed that the percentage of females graduating had more than doubled since 1994.
- The majority of respondents were between the age of 30 and 39 years (Naidoo 2015).
- The majority of respondents were Indian, followed by White respondents **(**Naidoo (2015). In the post-apartheid period, the number of White graduating students decreased from 78% to 46% (Lalloo *et al.* 2005).
- Majority of respondents graduated from the University of Pretoria, the University of Witwatersrand or the University of Western Cape (Snyman, van der Berg-Cloete and White 2016). Lalloo *et al*. (2005) showed that between 1985 and 2004 the University of Pretoria had the most graduates, followed by the University of Witwatersrand.

2.9 CONCLUSION

This literature highlights that one of the most common forms of TMJD is MFPS. Patients with TMJD conditions are most often seen first by a general dentist who if they had the knowledge, would refer them on to a chiropractor. The general dentists' education still presents with a significant gap, especially with regard to the identification and management of MFPS. This restricts dentists and chiropractors from being able to treat the patient fully. Inability to identify the presence of MFPS leads to misdiagnosis, incorrect treatment, mismanagement and incorrect referrals. The literature also points to the importance of chiropractic and dental co-treatment of TMJ conditions. This allows the patient to be treated more effectively as they are receiving professional input from two different professions.

CHAPTER THREE

METHODOLOGY

3.1 STUDY DESIGN

This cross-sectional and descriptive study, set in a quantitative paradigm, utilised a questionnaire to provide data regarding the management strategies dentists in the Greater eThekwini Region used with regard to MFPS of the TMJ. The use of a questionnaire allowed the researcher to be detached and impartial, which provided a greater focus on measuring objective facts (Parahoo 2014). The Research Questionnaire (Appendix A) comprised of the following sections: demographic profile of the respondent; topic background; perception; knowledge; utilisation and management (including referral patterns) of MFPS.

3.2 SAMPLE SIZE

As at 02 February 2015, communication with Ms Daffue, a statistics and data analyst at the Health Professions Council of South Africa (HPCSA) indicated that there were 76 actively registered general dental practitioners in the eThekwini Municipality of KwaZulu-Natal (KZN) (excluding all Dental Specialists). An updated list reflecting changes to the HPCSA database was attained before the commencement of data collection. All practitioners identified as practising in the selected wards (outlined in **Section 3.4**) in the Greater eThekwini Region received a Research Questionnaire (Appendix A) following a Letter of Information (Appendix B) and an Informed Consent Form (Appendix C). As per approval of the statistician, Mr Singh, for the data to be generalised statistically, a 70% minimum questionnaire return rate is required, and this was obtained.

3.3 INCLUSION AND EXCLUSION CRITERIA

To participate in this research, the respondents had to have met the following inclusion/exclusion criteria.

3.3.1 Inclusion criteria

- General dental practitioners registered with the HPCSA.
- Only general dental practitioners who had completed and signed the Informed Consent Form (Appendix C).
- General dental practitioners who were practising in the Greater eThekwini Region (defined as Wards 25 – 33).

3.3.2 Exclusion criteria

- General dental practitioners who failed to return the questionnaire within the data collection period.
- General dental practitioners who participated in the expert group or pilot study.
- Respondents not meeting any of the aforementioned inclusion criteria.

3.4 SAMPLE AREA

For the purposes of this research, the Greater eThekwini Region included wards from Durban North Central and Durban South Central:

Ward 25 – Sydenham.
Ward 26 – South Beach, North Beach, Durban Beach, Old Fort and Point.
Ward 27 – Morningside, Greyville, Berea, Essenwood, Windermere and Stamford Hill.
Ward 28 – Durban Central Business District and Warwick Triangle.
Ward 31 – Musgrave and Overport.
Ward 32 – Esplanade and Congella.
Ward 33 – Bulwer and Glenwood.

3.5 ADMINISTRATION OF QUESTIONNAIRE

Based on the HPCSA database, each prospective respondent was contacted telephonically with an invitation to participate in the study. If they agreed to participate, their e-mail and telephonic contact details and their practice address(es) were requested. All respondents who agreed to participate received a Letter of Information (Appendix B) and Informed Consent Form (Appendix C) via e-mail to explain the research. The questionnaires were then personally delivered to the respondents. To enhance the probability of an adequate response rate, the research included two methods of delivery and return of the questionnaire as highlighted in Sections 3.5.1 below.

3.5.1 Data collection

3.5.1.1 Hand delivery/return of questionnaires

The researcher hand-delivered the questionnaire and briefly outlined the purpose of the study. The researcher also made a follow-up telephone call during week one to determine if the questionnaire could be collected or whether the respondent required additional time to complete the questionnaire. A follow-up visit was made at the end of week one, week two and week three, depending on whether a response was received. When the Letter of Information (Appendix B), Informed Consent Form (Appendix C) and Research Questionnaire (Appendix A) were collected by the researcher, the respondent was requested to place the Letter of Information (Appendix B) and the Informed Consent Form (Appendix C) into a labelled and sealed ballot box. Additionally, the Research Questionnaire (Appendix A) was placed in a separate ballot box labelled accordingly. Both these boxes had a tick list attached to them, so that the researcher could keep track of the sequential documents that were inserted into the respective boxes. These boxes were only opened on completion of data collection (once all or the majority (70%) of questionnaires were received). The latter allowed for confidentiality of responses. Thereafter, they were opened and the documents were then kept in a locked cabinet for the duration of data capturing, analysis and reporting.

3.5.1.2 E-mail delivery/return of questionnaires

Those respondents who requested delivery via e-mail received the Research Questionnaire (Appendix A) with the Letter of Information (Appendix B) and the Informed Consent Form (Appendix C) attached to an e-mail sent to them by the researcher. The Letter of Information

(Appendix B), the Informed Consent Form (Appendix C) and the Research Questionnaire (Appendix A) were then printed, completed and signed by the respondent, before being scanned and e-mailed back to the researcher (vandercolffhyla@gmail.com). Those that had the facilities to complete and sign electronically did so, saved and e-mailed the documents to the researcher. On receipt of the e-mail, the researcher printed the returned documents and placed the Letter of Information (Appendix B) and the Informed Consent Form (Appendix C) into a sealed ballot box. The questionnaire was also printed and placed in a separate sealed box labelled as confidential. For confidentiality of the respondents all e-mail communications were then deleted, leaving only the printed copies of documents available for further use.

3.5.1.3 Data storage and disposal

During data capture and analysis, the questionnaires were kept in a locked cabinet. After completion of the study all data obtained in this study (in the printed format, whether the respondent e-mailed or returned the questionnaire by hand) was safely stored in a locked cabinet in the Department of Chiropractic and Somatology together with the compact disc containing statistical data and reference articles. The expert group recording was also stored on a digital video disc (DVD) and kept with the questionnaires. The data will be kept for a period of fifteen years before shredding and disposal.

3.5.2 Questionnaire background and design

English was the language chosen for compiling of the questionnaire, as the target group was educated in English, and at minimum, would have required English as a second language for entry into dental training. Development of the questionnaire involved the utilisation of several sources (Snow 2013; Jamalpour *et al*. 2011; Lamula 2010; Ralekwa 2010). These sources assisted in the format and style of the questionnaire. Although the sources (Snow 2013; Lamula 2010; Ralekwa 2010) did not specifically address the MFPS component of TMJD, their questionnaires were on perception, knowledge and utilisation, assisting with regard to the type of questions generally used to obtain information on knowledge, perception and utilisation. However, Jamalpour *et al*. (2011) conducted research on knowledge and beliefs regarding TMDs. Their research aided as a guideline to assess more specifically the myofascial component of the TMJ. The researcher, with these guidelines, developed a questionnaire that consisted of five main sections: demographic profile of respondent; topic background; perception (Simm and Guimaraes 2013); knowledge (Gerwin 2001); utilisation and management (including referral patterns) (Romero-Reyes and Uyanik 2014) of MFPS.

- The demographic section obtained information about the respondent's age, gender, ethnicity, qualifications obtained, and institutes where they obtained their qualifications and years of clinical experience.
- Topic background mainly provided information about the respondent's educational background with regard to MFPS.
- The knowledge section consisted of basic questions regarding the topic such as definitions; causes; perpetuating and relieving factors; and differential diagnoses. It mainly comprised of yes/no and true/false questions.
- The utilisation and management section included feedback on the referral patterns used by clinicians. It also included questions relating to how MFPS was assessed. These included the types of management strategies utilised by dentists and whether this included referrals to other practitioners, such as chiropractors.
- The perception section consisted of the practitioner's perception of their knowledge and ability to detect and manage MFP. The types of questions included Likert scale questions (a sliding scale measuring the respondent's attitude in terms of level of agreement/disagreement to a set of questions/statements) (Uebersax 2006) as well as yes/no type questions. The section also assessed the perception of the practitioner regarding education about MFPS of the temporomandibular area.

The Pre-expert Group Questionnaire (Appendix D) was then evaluated by an expert group. The use of the expert group allowed the researcher to develop the questionnaire's face (logical), content and construct validity, which are defined as:

- Face validity denotes whether the questionnaire is applicable to the study and easy to interpret and whether the data represented the constructs, they were assumed to capture (Vahed 2014; Bernard 2012).
- Content validity denotes whether the questionnaire is adequately designed to assist the researcher in answering/addressing the aims and objectives of the study. It ensures that the survey focused on concepts that emerged from the literature review (Vahed 2014).
- Construct validity is defined as the questionnaire's ability to have internal validity. Internal validity means that the questionnaire has multiple questions that allow the researcher to triangulate information around particular topics within the questionnaire (Singh 2008; Langworthy and Smink 2000).

3.5.3 Expert group

The defined validities were attained by having an expert group assess the questionnaire. The group comprised of individuals who were representative of the specific areas of expertise related to the research content, as well as the procedure in which the research was conducted (Bernard 2012; Terre Blanche, Durrheim and Painter 2006; Morgan 1998).

The expert group comprised of the following individuals:

- The researcher.
- The researcher's co-supervisor, who is also a Durban University of Technology (DUT) Chiropractic Department senior lecturer (lecturing in myofascial pain).
- A DUT Dental Sciences Department lecturer who is also a dentist, who assisted in the initial stages of the topic.
- One chiropractic student currently engaged in their own research in developing and utilising a questionnaire as a basis for their study.
- One DUT Chiropractic Department lecturer.

All members of the expert group signed a Confidentiality Statement and Code of Conduct form (Appendix E); they were given a Letter of Information (Appendix F), an Informed Consent Form (Appendix G) and a Pre-expert Group Questionnaire (Appendix D) (Morgan 1998). The researcher conducted the meeting, explained the purpose of the expert group and answered questions (Snow 2013; Morgan 1996). During the meeting, a discussion of the questionnaire occurred question-by-question. Where required, adjustments were made to the questionnaire in order to compile a Post-expert Group Questionnaire (Appendix H). The meeting was also voice recorded by the researcher so that the researcher could reflect on all comments and recommendations made (Sentsomedi 2015; Allison 2014). The recording, stored on a DVD, is only accessible to the researcher and is used for examination purposes only.

3.5.3.1 Post-expert group questionnaire

The Post-expert Group Questionnaire is attached as Appendix H. The following changes occurred as per the expert group meeting:

Section A - The following instruction was added: Please tick (√) the appropriate box and specify where necessary.

Question 1	Listing of all options should be alphabetically.
Question 2	Supplemented that ethnicity is for statistical purposes only.
Question 5	Year of completion changed to year of graduation.
Question 6	This question was divided to form two questions: • Question 6: Name of institute you graduated from? • Question 7: Was this qualification gained in South Africa?

Section B - The following instruction was added: In your opinion are the following statements true or false. Please tick (√) the appropriate box.
'Section B' is now 'Section D' in the post-expert group questionnaire.
Twenty-nine 'True or False' questions were formed from the original questions from 'Section B'. This allowed for easier answering and for similar questions/themes to be spread throughout the section.

Section C - The following instruction was added: Utilisation and management strategies including referral patterns: Please tick (√) the appropriate box and where specified, you can tick (√) more than one box.

Where necessary, it was indicated that the respondent could choose more than one option. An additional question was added after question one, to indicate if the respondent answered (No) to question one, they may proceed to 'Section D'.

Question 3	Now question 4, the word 'management' was replaced with the word 'treatment'.
Question 4	Now question 5, the word 'management' was replaced with the words 'treatment options'.

Question 5	This question was divided to form two questions: • Question 6: Do you give self-care advice with regard to MFPS to your patients? Question 7: If yes to the above question, what does this self-care advice include? Additionally heat and ice therapy were divided into two separate options.
Question 6	Was labelled question 8 and re-worded to read as follow: Do you refer patients with MFPS to other practitioners for treatment and management?
Question 7	Was labelled question 9 and re-worded to read as follows: If yes – To whom do you refer with regard to MFPS?
Question 9	This question was replaced by the following question: If you answered 'occasionally', under which circumstances do you refer out to other practitioners regarding MFPS?

Section D - The following instruction was added: Please select only one option per question by ticking (√) the appropriate box.

'Section D' - Now 'Section E' in the post-expert group questionnaire.
This section's question format was changed from a scale of one to ten to a Likert scale utilising five options: Strongly Agree; Agree; Neutral; Disagree and Strongly Disagree.
The open-ended question following Section D was removed.

Questions 6 – 8 of 'Section D' of the pre-expert group questionnaire were moved to 'Section B'.

The following replaced the content of Section B that was moved to Section D.
The following instruction was added: Please tick (√) the appropriate box.
Two introductory questions/statements were added:

Question 1	MFPS is a component of TMJ disorders (also known as Craniomandibular Dysfunction and Craniofacial Pain).
Question 2	Have you received education/training with regard to MFPS at an undergraduate level?

3.5.4 Pilot study

After obtaining ethical clearance (Appendix M), the pilot group composed of three registered general dental practitioners in the eThekwini Municipality, tested the viability of the Post-expert Group Questionnaire (Appendix H). These three members, who fulfilled the inclusion criteria, all received a Post-expert Group Questionnaire (Appendix H); a Letter of Information (Appendix I); an Informed Consent Form (Appendix J); a Confidentiality Statement and Code of Conduct (Appendix K); a Letter of Information (Appendix B); an Informed Consent Form (Appendix C); a Post-expert Group Questionnaire (Appendix H) and a Pilot Study Evaluation Form (Appendix L).

The pilot study was needed to evaluate the viability of the methodology of the proposed study and to identify any flaws or shortcomings of the method of data collection (Fink 2012; Hicks 2009). After receiving all completed pilot questionnaires, the researcher amended the questionnaire to include all considered suggestions (**Section 3.5.4.1**) from the pilot group to compile the final Research Questionnaire (Appendix A).

3.5.4.1 Final questionnaire

After adjustments as suggested on completion of the pilot study, finalisation of the questionnaire occurred.

General changes:

All options were listed alphabetically.
In ‘Section B’, Question One - Myofascial pain syndrome and Temporomandibular joint was written in full, but acronyms was used in the rest of the questionnaire.
The following was added at the end of the questionnaire: ‘End: Thank you’.

Section A

Question 4	‘Please specify’ was added.
Question 5	Spelling of ‘graduation’ was corrected.

Section B

Question 2	'In' was replaced by 'at' and a question mark added at the end of the sentence.
Question 4	'If yes' was replaced with: If you answered (Yes) to question 3.
Question 5	'If no to above' was replaced with: If you answered (No) to question 3.

Section C

Instructions – A comma was added after the word 'specified'.

Question 3	Spelling of 'assess' was corrected and 'If yes to question 1' was replaced with: If you answered (Yes) to question 1.
Question 4	A comma was added after the word 'pain'.
Question 5	'If yes to above' was replaced with: If you answered (Yes) to question 4.
Question 7	'If yes to the above question' was replaced with: If you answered (Yes) to question 6.
Question 9	'If yes' was replaced with: If you answered (Yes) to question 8.
Question 10	'If you answered occasionally' was replaced with: If you answered (Occasionally) to question 8, and the word 'circumstanced' was replaced with 'circumstances'.

Section D

The full stops were removed after question: 2, 6, 7, 17 and 26.

Instructions and question 4	The word 'is' was replaced by 'are'.
Question 7 and 17	The word 'defines' was replaced with 'defined'.
Question 22	Spelling of 'throat' was corrected.
Question 23	Spelling of 'rheumatica' was corrected.
Question 24	An 'a' was added before the word 'characteristic'.
Question 27	Spelling of 'syndromes' was corrected.

Section E

Question 1 – The word ‘on’ was replaced by ‘of’.

3.5.5 Outcome measures

In outcome measurements, numbers are allocated to a variable of interest, providing the raw material for statistical analysis (Crano and Brewer 2002). Measurements used included:

- Nominal: Where numbers are used merely as a label. For example, coding respondents’ gender as 1 = Male or 2 = female.
- Ordinal: These variables show relationship between the size of the numbers and the magnitude of the quality represented by the numbers.
- Interval: It is where the numbers represent the magnitude of the differences.
- Ratio: Has a true zero point and the ratio of the numbers reflect the ratio of the attribute measured for example age.

Contingency tables are tables showing the distribution of one variable in rows and another in columns. These are used to determine whether there was an association between the variables (Beh and Lombardo 2012). Correlations determined the strength of the relationships between variables (Gravetter and Wallnau 2008).

3.6 STATISTICAL ANALYSIS

Following a statistical consult with Mr Singh, A *p* value of less than 0.05 was considered as statistically significant. Data was captured on an Excel spreadsheet and imported into the SPSS Statistics 23.0 (SPSS 2014). Data was analysed to demonstrate knowledge, perception, utilisation and management strategy and referral patterns. Descriptive statistics describe how quantitative data is organised and summarised (Baran and Jones 2016). All categorical variables were presented by using frequency tables and bar charts. Inferential statistics were planned with the purpose of generalising the outcomes from a sample of the entire population of interest. It assisted in determining whether differences between groups (for instance, South African trained dentists and overseas trained dentists) are unique to his or her sample or are a result of real differences between the population represented (Allua and Thompson 2009).

3.6.1 Reliability statistics

Reliability and validity are vital characteristics of precision. Reliability is calculated by taking many measurements on the same topic. A reliability coefficient of (0.60) or lower is alarming (Dornyei, 2010).

3.6.2 Factor analysis

Data reduction is the main outcome from utilising factor analysis. Factor analysis is characteristically used in survey research. It assists the researcher in signifying a number of questions with a small number of hypothetical factors (Lotz 2009). With this method the matrix tables are preceded by a summarised table that reflects the results of KMO and Bartlett's Test. The requirement is that Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be greater than 0.5 and Bartlett's Test of Sphericity less than 0.05 (Simamane 2016).

3.6.3 Section analysis

This section analysis the scoring patterns of the respondents per variable. Firstly, the results will be given as summarised percentages for the variables of every section. Thereafter, depending on the importance of each statement, the results will be analysed further (Govender 2014).

3.7 ETHICAL CONSIDERATIONS

The Durban University of Technology Institutional Research and Ethics Committee (IREC) approved this proposal (REC 23/16) in May 2016, providing the following Ethical Clearance number: IREC 019/16 (Appendix M).

Autonomy, justice, beneficence and non-maleficence were addressed as follows:

- All questionnaires were identical in structure and context.
- The questionnaire was only used after it was validated and tested by an expert group and a pilot study.

- The respondents remained anonymous and at no stage were any of the respondents' personal details such as their name or address or other personal details recorded on the questionnaires or for any purposes of analysis or reporting.
- All respondents signed the Letter of Information (Appendix B) and an Informed Consent Form (Appendix C) before completing the questionnaire. The Letter of Information (Appendix B) and an Informed Consent Form (Appendix C) were not inserted into the ballot box along with the questionnaire to maintain anonymity.
- A coding system was used to track all returned and outstanding questionnaires by the researcher. The researcher only knew the code. There was no reference to results obtained from specific respondents.
- Exclusion occurred where dentists were unwilling to take part in the study. Withdrawal from the study could only take place before inserting the questionnaire into the sealed box, to prevent tampering with the questionnaires and other respondents' completed forms.
- The respondents were given two months to complete the questionnaire. Upon completion of the research, results will be made available to the respondents via the Durban University of Technology's Institutional Repository.

CHAPTER FOUR

RESULTS

This study made use of a list of 76 actively registered general dental practitioners in KZN as per the database of the HPCSA. Of this, three dentists moved away from the sample area and three took part in the pilot study and were thus excluded from the main study. Seventy questionnaires were despatched; of the 70 respondents, eight indicated that they did not wish to participate in the study, while ten respondents did not complete the questionnaire within the data collection period and were therefore excluded. Fifty-two questionnaires were returned, which gave a 74.28% response rate on despatched questionnaires, and an 83.87% response rate on valid respondents. This was above the minimum requirement of 70%, as statically determined.

The questionnaire was divided into five sections that measured various themes as illustrated below:

Section A - Biographical data.
Section B - Topic background.
Section C - Utilisation and management strategies including referral patterns.
Section D - Knowledge.
Section E - Perception.

4.1 STATISTICAL ANALYSIS

- The reliability scores for Sections D and E exceeded the suggested Cronbach's alpha value. This indicates that the scoring of these sections were consistent and acceptable.
- All of the conditions were satisfied for factor analysis as the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value was 0.629 which is greater than 0.500. The Bartlett's Test of Sphericity significant value was 0.000, which is less than 0.05. The Rotated Component Matrix for Section E noted that the variables that constituted Section E loaded along three components (sub-themes). The respondents identified different trends within the section.

Section analyses was performed for Sections D and E. Here, the scoring patterns of the respondents were analysed as per variable and, per section. After the results were given in summarised percentages, important statements were further analysed (Govender 2014).

4.1.1 Section A: Biographical Data

This section summarises the biographical characteristics of the respondents.

4.1.1.1 Age and gender distribution

Table 1.10: Gender distribution by age

Age (Years)			Gender		Total
			Female	Male	
	20 - 29	Amount of respondents	3	4	7
		% within Age coded	42.9	57.1	100.0
		% within Gender	23.1	10.3	13.5
		% of Total	5.8	7.7	13.5
	30 - 39	Amount of respondents	7	9	16
		% within Age coded	43.8	56.3	100.0
		% within Gender	53.8	23.1	30.8
		% of Total	13.5	17.3	30.8
	40 - 49	Amount of respondents	3	4	7
		% within Age coded	42.9	57.1	100.0
		% within Gender	23.1	10.3	13.5
		% of Total	5.8	7.7	13.5
	50 - 59	Amount of respondents	0	14	14
		% within Age coded	0.0	100.0	100.0
		% within Gender	0.0	35.9	26.9
		% of Total	0.0	26.9	26.9
	60 - 69	Amount of respondents	0	7	7
		% within Age coded	0.0	100.0	100.0
		% within Gender	0.0	17.9	13.5
		% of Total	0.0	13.5	13.5

Table 1.10 Continued: Gender distribution by age

70 - 79	Amount of respondents	0	1	1
	% within Age coded	0.0	100.0	100.0
	% within Gender	0.0	2.6	1.9
	% of Total	0.0	1.9	1.9
Total	Amount of respondents	13	39	52
	% within Age coded	25.0	75.0	100.0
	% within Gender	100.0	100.0	100.0
	% of Total	25.0	75.0	100.0

In **Table 1.10**, the ratio of females to males was approximately 1:3. There were no females representing the age categories of 50 – 79 years, whereas 56.4% of the male respondents fell within this age categories. The youngest respondent was 24 years of age and the oldest respondent was 70 years of age, with a mean age of 45.44 years and a standard deviation of 13.189. The age category of 30-39 years was the highest represented category with 30.8% of respondents falling within this category. Of the sixteen respondents in this age group, 56.3% were male and 43.85% were female. This category comprised of 23.1% of the total male sample and 53.8% of the total female sample between the ages of 30 to 39 years. This category of males between the ages of 30 to 39 years formed 17.3% of the total sample, while females formed 13.5% of the total sample.

4.1.1.2 Ethnic distribution

The ethnic distribution of this study sample is shown in **Figure 1.1**. The majority of respondents were Indian (73.1%), followed by White (19.2%), with the smallest ethnic grouping being African and Coloured (3.8% each).

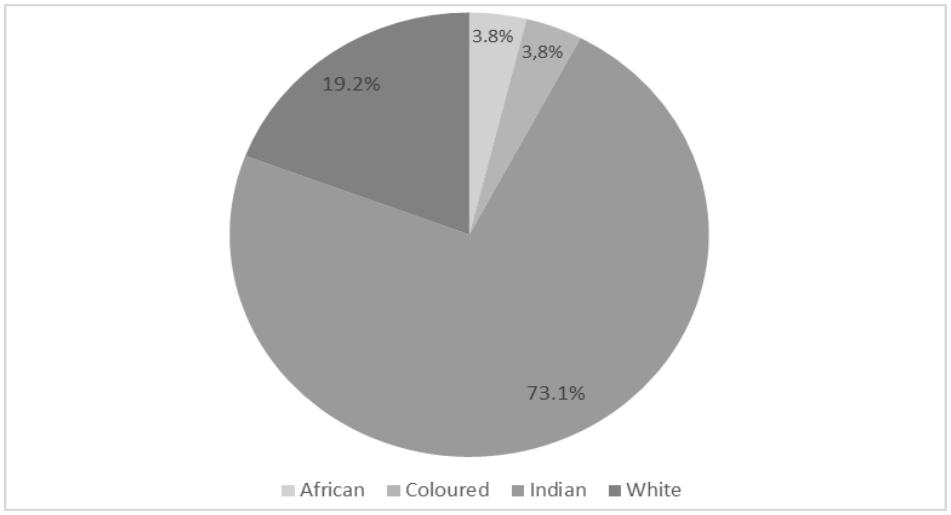


Figure 1.1: Ethnic distribution

4.1.1.3 Educational background

The majority of respondents (90.0%) had either a Bachelor of Dentistry or a Bachelor of Dental Science/Surgery.

Four of the respondents (7.69%) had additional specialisations that included:

Degree in Community Health
Diploma in Aesthetic Dentistry
Diploma in Orthodontics
Diploma in Orthodontics and Periodontics

4.1.1.4 Year of graduation

Table 1.11: Year of graduation

Year	Frequency	Percent
1962	1	1.9
1973	2	3.8
1975	1	1.9
1978	2	3.8
1980	2	3.8
1981	2	3.8
1983	2	3.8
1985	1	1.9
1986	2	3.8
1987	1	1.9
1988	1	1.9
1989	4	7.7
1990	2	3.8
1992	1	1.9
1993	1	1.9
1996	3	5.8
2000	2	3.8
2001	1	1.9
2002	1	1.9
2003	4	7.7
2004	1	1.9
2005	5	9.6
2006	1	1.9
2007	1	1.9
2008	1	1.9
2010	2	3.8
2013	3	5.8
2014	2	3.8
Total	52	100

Table 1.11 describes the year of graduation of respondents. Respondents graduated between 1962 to 2014. Just over half (53.8%) of the respondents graduated before the year 2000. The highest number of graduates per year was five respondents (9.6%) who graduated in 2005.

4.1.1.5 Institutions from which respondents graduated

The names of the institutions from which respondents graduated are shown in **Table 1.12.**

Table 1.12: Institutions from which respondents graduated

Name of institute	Frequency	Percent
Medical University of South Africa.	3	5.8
University of the Western Cape.	18	34.6
University of the Witwatersrand.	12	23.1
Manipal College of Dental Sciences (India).	6	11.5
University of Pretoria.	5	9.6
Kasturba Medical College (India).	3	5.8
Birmingham University Dental School (UK).	2	3.8
Stellenbosch University.	2	3.8
University of Bombay (India).	1	1.9
Total	52	100

Just over three-quarters (76.9%) of the respondents graduated from South African universities. The highest number graduated from the University of the Western Cape (34.6%), followed by respondents from the University of the Witwatersrand (23.1%) and the University of Pretoria (9.6%). Most of the remaining respondents graduated from different universities in India (19.2%), while (3.8%) graduated from a British university in the UK.

4.1.1.6 Years in practice

Table 1.13: Descriptive statistics of years in practice

	Number	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Number of years practicing	52	1	53	20.615	12.8187
Valid N (list wise)	52				

A large standard deviation (12.8187) was observed **(Table 1.13)**. This deviation is due to the large range in the number of years practising, with one year being the minimum and 53 years the maximum. The mean number of years practising was 20.615, with 51.92% of the respondents having had 20 plus years experience.

4.2 INTERPRETATION OF RESULTS

4.2.1 The knowledge of dentists regarding myofascial pain syndrome of the temporomandibular joint, its diagnosis and management

To assist with this objective, Sections B and D of the questionnaire are given consideration.

Section B - This section deals with the basic introductory questions regarding MFPS.

The following patterns were observed:

- Every statement demonstrates a significant higher level of agreement (Yes), although further levels of agreement are lower it was still greater than levels of disagreement (No).
- The significance of the differences is tested and shown in the **Table 1.14**.

Table 1.14: Introductory questions regarding myofascial pain syndrome

Statements/Questions	Yes	No	Chi Square *p*-value
1. Myofascial pain syndrome (MFPS) is a component of temporomandibular joint (TMJ) disorders (also known as Craniomandibular Dysfunction and Craniofacial Pain).	92.0	8.0	0.000
2. Have you received education/training with regards to MFPS at an undergraduate level?	76.9	23.1	0.000
3. Have you attended any post-graduate courses/talks on myofascial pain?	57.7	42.3	0.267
4. If you answered (Yes) to question 3, did you find it beneficial?	90.0	10.0	0.000
5. If you answered (No) to question 3, would you attend such a course/talk?	100.0	0.0	-

The highlighted *p*-values seen in **Table 1.14** are less than 0.05. This suggests that the distributions were not alike, that is, the differences between how respondents scored (Yes) or (No) were significant. The majority (92%) of respondents indicated that MFPS is a component of TMJD. Just over three-quarters (76.9%) of respondents indicated that they received education/training with regard to MFPS at an undergraduate level. Whether dentists

attended any post-graduate courses/talks on myofascial pain was of no significance as the *p*-value was more than 0.05. Of the respondents that attended such courses/talks, 90% found it beneficial. All respondents that had not attended such courses/talks previously, indicated that they would attend future courses.

Section D - This section looked at testing the knowledge (definitions; clinic features; myofascial components; causes; perpetuating and relieving factors and differential diagnoses of MFPS) of respondents by using mixed true and false questions.

Appendix O: Section D – Scoring patterns

All of the *p*-values are significant ($p < 0.05$), that is, the difference between True and false is significant.

The percentage of correct responses for each sub-theme of knowledge is listed in descending order in **Table 1.15**:

Table 1.15: Knowledge scores per sub-themes

Sub-themes	**Percentages**
Clinical features.	78.85
Perpetuating and relieving factors.	72.11
Intro definitions.	67.80
Myofascial component.	63.08
Causes.	58.06
Differential diagnoses.	51.16
Total for section	**65.17**

Overall, the level of knowledge was neutral. Clinical features (78.85%) as well as perpetuating and relieving factors (72.11%) resulted the highest scores. The lowest scores were the causes (58.06%) and differential diagnoses (51.16%) sub-sections.

4.2.2 Assessment and treatment of myofascial pain syndrome of the temporomandibular joint including the use of referral networks

Section C - This section dealt with questions regarding the utilisation and management strategies used with regard to MFPS. This section also inquired about referral patterns.

Question One of this section asked if dentists assess/diagnose MFTP's. Approximately two-thirds of the respondents (69.2%) indicated that they do assess for trigger points. The respondents that answered 'No' (30.8%), were required to skip the remainder of Section C and continue to Section D.

Dentists preferred three methods of assessment/diagnosis of MFTP's. As shown in **Figure 1.2** the main method was flat/pincher palpation (51.95%), followed by use of signs and symptoms (38.5%) and x-ray imaging (25%). The method of assessment/diagnosis least used was ultrasound imaging (1.9%).

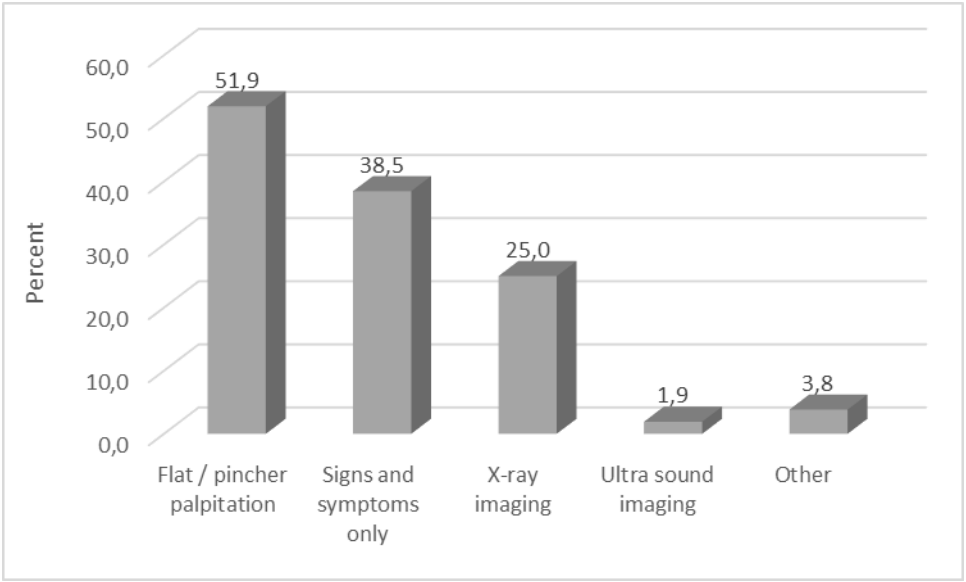


Figure 1.2: The methods of assessment/diagnosis

Just over three-quarters of the respondents (77.8%) conducted treatment of MFPS on their own. This question (Do you treat patients with myofascial pain, on your own?) was found to be ambiguous after completion of the results as it indicated that the majority of respondents treated MFPS without the help of other practitioners. This did not correspond to later questions with regard to referrals. Therefore, it must be kept in mind that each respondent could have interpreted this question differently.

Figure 1.3 shows that three methods of treatment were preferred. Pharmaceutical drugs were most prominent (51.9%), followed by usage of a mouth guard (42.3%) and night splints (38.5%). The least preferred methods of treatment were myofascial release and trigger point injection (11.5%) each and transcutaneous nerve stimulation (1.9%).

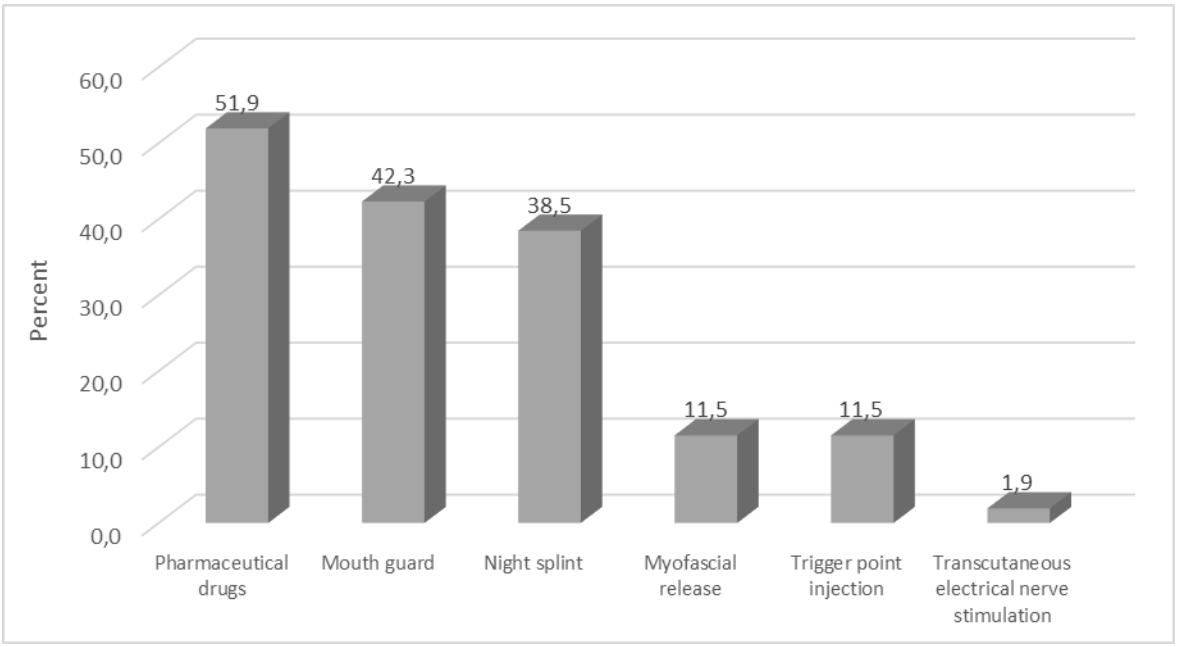


Figure 1.3: The treatment options utilised

A very high percentage (94.4%) of respondents indicated that they gave self-care advice concerning MFPS. **Figure 1.4** shows what types of self-care advice dentists encourage. Relaxation techniques (61.5%), heat therapy (50%) and stretching (40.4%) were the top three methods dentists encouraged whereas ice therapy (19.2%) and ischaemic compression (11.5%) were least recommended.

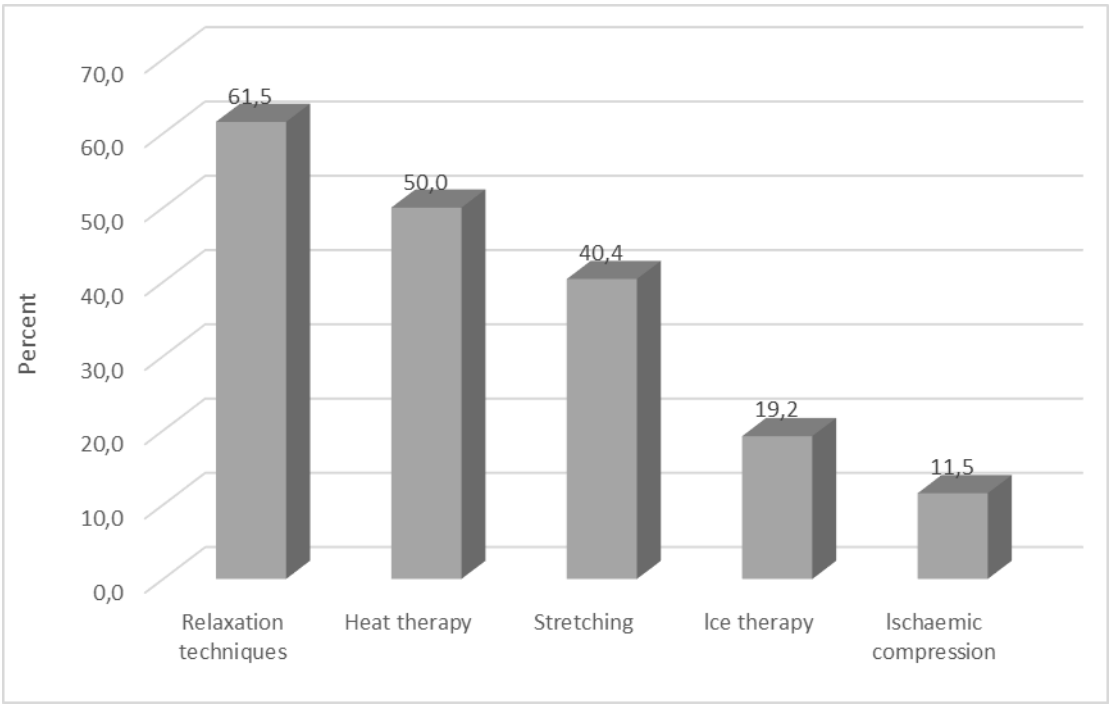


Figure 1.4: The types of self-care advice encouraged

To gain information about referral patterns, dentists were asked if they referred patients with MFPS to other practitioners. The results indicated that only a small number of respondents (8.3%) had not referred patients with MFPS to other practitioners. Of the remaining respondents, 61.1% referred out to other practitioners while 30.6% reported that they only refer out occasionally. Again, this supports the notion that a previous question, Question Four, enquiring if dentists conducted treatment of MFPS on their own, was ambiguous. Just over three-quarters indicated that they treat patients with MFPS on their own, although majority of the respondent indicated that they refer/occasionally refer patients with MFPS out to other practitioners. The circumstances under which dentists occasionally referred patients with MFPS out to other practitioners was also asked (Question Ten). The answers indicated that dental practitioners referred patients out when they found it difficult to make a diagnosis, or in severe cases and where their management had not been sufficient or was unsuccessful.

Figure 1.5 shows that referrals were mainly made to other practitioners within the dental profession (57.7%), followed by 17.3% being referred to physiotherapists. Chiropractors (9.6%), general practitioners (7.7%) and psychologists (5.8%) were least likely to receive referrals from dentist.

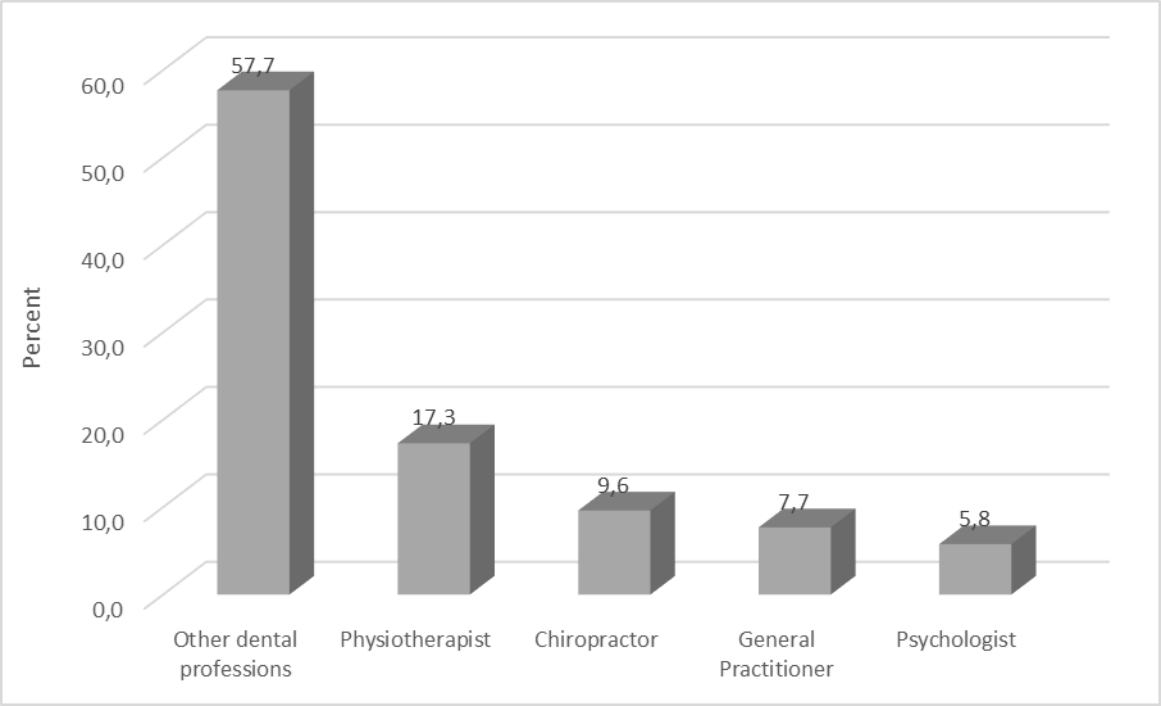


Figure 1.5: Practitioners to whom dentists referred

Section E

This section focuses on dentists' perception with regard to various components of MFPS.

The chi-square test (**Table 1.16**) indicates that four of the scoring patterns are significantly different, that means that there was a large difference in respondents that agreed versus disagreed.

- Do your feel it is important to assess for MFPS in your office?
- Do you feel competent in managing myofascial pain?
- Do you feel that your curriculum was sufficient with regard to myofascial pain?
- Would you consider chiropractic co-management of a patient with MFPS?

Table 1.16: Dentists' perception with regard to myofascial pain syndrome

		Agree		Neutral		Disagree		Chi Square
	Question	**Count**	**Row N %**	**Count**	**Row N %**	**Count**	**Row N %**	***p*-value**
Do you feel that your knowledge of myofascial pain is sufficient?	E1	11	21.2	17	32.7	24	46.2	0.087
Do your feel it is important to assess for MFPS in your office?	E2	43	82.7	7	13.5	2	3.8	0.000
Do you feel competent in diagnosing myofascial pain?	E3	21	41.2	17	33.3	13	25.5	0.390
Do you feel competent in managing myofascial pain?	E4	14	26.9	28	53.8	10	19.2	0.006
Do you feel that your curriculum was sufficient with regards to myofascial pain?	E5	12	23.1	11	21.2	29	55.8	0.003
Would you consider chiropractic co-management of a patient with MFPS?	E6	38	73.1	9	17.3	5	9.6	0.000

As shown in **Table 1.16** above and in **Figure 1.6** below, 82.7% of respondents felt that it is important to assess for MFPS in their office, however only 26.9% indicated that, they felt competent in managing myofascial pain. When asked if they would consider chiropractic co-management of a patient with MFPS, just under three-quarters (73.1%) answered that they would, while only 9.6% stated that they would not consider this.

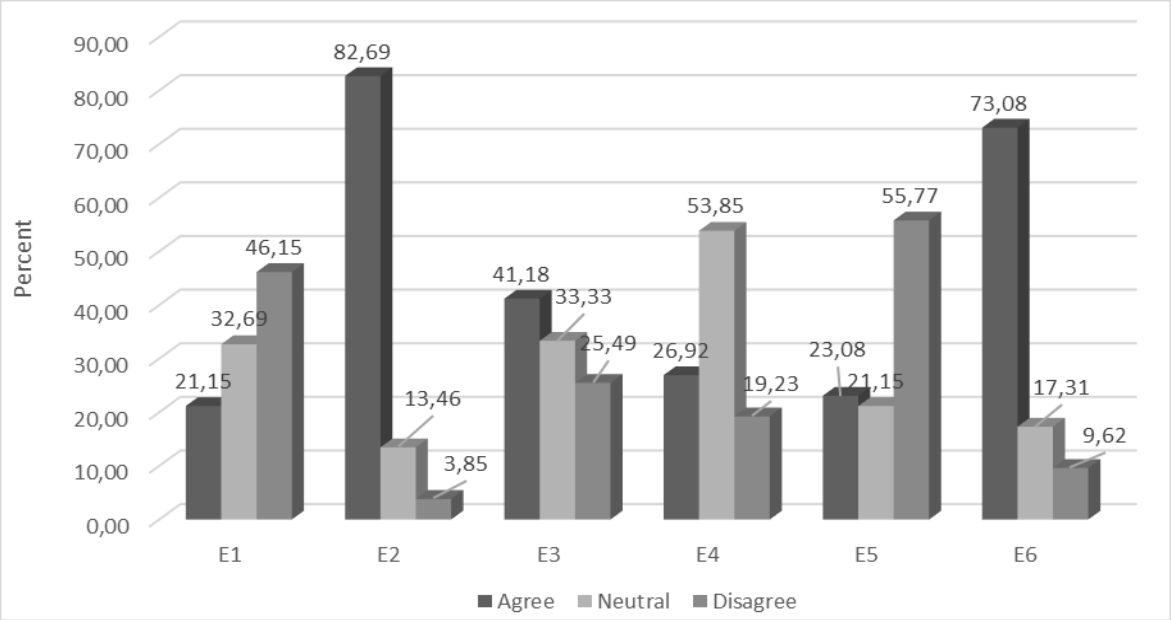


Figure 1.6: Dentists' perception with regard to myofascial pain syndrome

4.2.3 The association between selected demographic profiles, knowledge, utilisation, perception and referral patterns

To ascertain if there were any associations, hypothetical testing was done followed by a second Chi square test. This determined if the relationship between variables were statistically significant.

Table 1.17: Statistical significant ($p < 0.05$) Statements/Questions from Section B (Topic background).

Statement/Question	Gender	Age	Qualification	Year of graduation	Country of qualification
1. Myofascial pain syndrome (MFPS) is a component of temporomandibular joint (TMJ) disorders (also known as Craniomandibular Dysfunction and Craniofacial Pain).	0.204	0.011	0.988	0.031	0.268
3. Have you attended any post graduate courses/talks on myofascial pain?	0.023	0.018	0.471	0.194	0.040
4. If you answered (Yes) to question 3, did you find it beneficial?	0.474	0.373	0.047	0.873	0.197

As seen in **Table 1.17,** the age of the respondents, and the year they graduated had an impact on the way Statement/Question One was answered. Attending post-graduate courses/talks on myofascial pain was influenced by their age and gender and whether they gained their qualification in South Africa or not. The type of qualification also determined if they found such post-graduate courses/talks on myofascial pain beneficial.

Table 1.18: Statistical significant ($p < 0.05$) Statement/Question from Section C (Utilisation and management strategies including referral patterns).

Statement/Question	Ethnicity	Qualification	Year of graduation	Name of institute
Do you refer patients with MFPS to other practitioners for treatment and management?	0.010	0.355	0.023	0.215

Table 1.18 above shows the respondents' ethnicity and the year they graduated influenced if they referred patients with MFPS to other practitioners.

Table 1.19: Statistical significant ($p < 0.05$) Statements/Questions from Section E (Perception).

Statement/Question	Age	Qualification
Do you feel that your knowledge of myofascial pain is sufficient?	0.603	0.000
Do you feel it is important to assess for MFPS in your office?	0.001	0.910
Would you consider chiropractic co- management of a patient with MFPS	0.151	0.031

Table 1.19 shows that the respondents' age had an influenced on whether they felt that it was important to assess for MFPS in their offices. The type of qualification influenced the respondent's perception of whether their knowledge of myofascial pain was sufficient and it influenced wherever they would consider chiropractic co-management of a patients with MFPS or not.

4.3 SUMMARY

In this study, there were approximately a 1:3 ratio of female to male respondents. There were no female respondents above the age of 50 years, while more than half (56.4%) of the male respondents were above the age of 50 years. The majority of the respondents were Indian (73.1%) followed by White (19.2%). Of all of the respondents, only four respondents had additional specialisations. Respondents graduated between 1962 to 2014. Just over half of the respondents graduated before the year 2000. About three-quarters of respondents graduated from South African universities. On average, the statistics from this study reported a mean of 20.615 years in practice and 51.92% of the respondents had 20 plus years of in practice, which indicates that responses came from experienced individuals.

The results indicated that 76.9% of respondents received education/training with regard to MFPS at undergraduate level. Slightly more than half of the respondents attended post–graduate courses/talks on MFPS, with 90% indicating that they found this beneficial. All of the respondents that had not attended such courses/talks indicated that they would attend such a course/talk. Respondents had a good level of knowledge regarding MFPS. Clinical features and perpetuating and relieving factors were the top scoring sections. However, their knowledge regarding the causes and differential diagnoses of MFPS was poor.

Results showed that approximately two-thirds of the respondents do assess for trigger points. The main method of assessment was by flat/pincher palpation followed by the use of signs and symptoms. Ambiguity was noted when more than three-quarters of respondents

indicated that they treated MFPS on their own. This did not correlate with the later question on referral where less than 10% of respondents indicated that they do not refer patients with MFPS to other practitioners. Pharmaceutical drugs and the use of mouthpieces were the main methods of treatments used. The majority of respondents gave self-care advice mainly regarding relaxation techniques, heat therapy and stretching. Referrals were mainly made to other dental professions followed by physiotherapists.

Last of all, the results were provided regarding associations between the respondent's demographics and their knowledge, utilisation, management and perception concerning MFPS.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

5.1.1 Age and gender distribution

This study indicated a ratio of females to males of approximately 1:3 (**Table 1.10**). The results from Snyman, van der Berg-Cloete and White's (2016) study closely represents the result of this study. They did an online questionnaire survey of dentists belonging to the South African Dental Association distributing 3 367 questionnaires. Of the returned questionnaires, 234 (67.09%) were from male respondents. The difference could be due to two factors. Snyman, van der Berg-Cloete and White's (2016) study had over four times the respondents compared to this current study (52 respondents). It is unknown what percentage of dentists were from the eThekwini Region or KZN as their study did not include this. Naidoo's (2015) results highlighted that from a 103 private dentist in KZN, 62% of responses were from males in contrast to 38% females. This percentage of male respondents are lower than that of this current study. This could be because this current study was limited to the Greater eThekwini Region, while the study by Naidoo (2015) had respondents from the entire KZN, with 40.8% of respondents being from areas outside of the eThekwini Region.

Naidoo (2015) found that the female respondents were significantly younger than the male respondents were. This is again seen in this study as the majority of females (53.8%) fell within the age category of 20-39 years. In contrast to this, the majority of males (35.9%) fell within the age category of 50-59 years (**Table 1.10**). This can be expected, as work by Lalloo *et al*. (2005) showed the change in gender profile of dental graduates in South Africa. Pre 1995, 79% of graduates were males compared with 21% females. This drastically changed post 1995, as graduates constituted of only 54% male and 46% female graduates. This indicates that the more recent graduates consists of more female dentists.

In this current study, there were no female respondents in the age category of 50-79 years (**Table 1.10**). This finding is expected as Lalloo *et al*. (2005) indicated that majority of the older graduating dentist were mainly males (64%). The mean age of this current study was 45.44 years, with the youngest respondent being 24 years of age and the oldest respondent 70 years of age (**Section 4.1.1.1**). This also corresponds to the age ranges of other studies on dentists in South Africa (Snyman, van der Berg-Cloete and White 2016; Naidoo 2015). Candirli *et al*. (2016) did a study on 370 dentists working in Turkey. Their studies mean age was 33.12 (± 9.24) years, with the youngest respondent being 23 years of age and the oldest 69 years. This shows that this current studies age range was also in line with that of overseas studies.

5.1.2 Ethnic distribution

There was a significantly larger percentage of Indians (73.1%) in this study compared to Whites (19.2%), Africans (3.8%) and Coloureds (3.8%) (**Figure 1.1**). This is in contrast to the ethnic distribution in the KZN province as Africans (73%) makes up the majority followed by Indians (16.7%), Whites (6.65) and Coulourds (2.5%) (Anon. 2011). In contrast to this, the high number of respondents being Indians may be subjective as the city of Durban has the highest population and concentration of Indians in South Africa (Anon. 2011). The study by Naidoo (2015) showed similar ethnic trends with the majority of respondents being Indian/Asia (62.1 %) followed by White respondents (21.4%). Naidoo's (2015) study had a lower percentage of Indian/Asian respondents as compared to this current study. This could be because Naidoo's (2015) study included areas of KZN that is less densely populated with Indians. Lalloo *et al*. (2005) showed that Indian graduates increased from 9% to 22%, while White graduates decreased from 78% to 46% post 1995. There is a possibility that this increase of Indian graduates has increased even more since 2005.

5.1.3 Educational background

A Bachelor of Dentistry or a Bachelor of Dental Science/Surgery were the main qualifications held by the respondents. Four of the respondents (7.69%) had additional specialisations (**Section 4.1.1.3**). This is only slightly higher than a study by Snyman, van der Berg-Cloete and White (2016), where 5.56% of their respondents were dental specialists including Orthodontists, Maxillo- Facial and Oral surgeons, Periodontists and Prosthodontists. It must

be noted that they had a large sample of 234 questionnaires and surveyed dentists from around South Africa.

In this current study, one respondent had a diploma in Orthodontics and Periodontics. In a study in Iran most of the TMD experts who saw the majority of the TMJD cases were prosthodontists (Baharvand *et al*. 2010). A study on Brazilian dental schools showed that the Prosthodontics department is the main department that teaches orofacial pain/TMD (Simm and Guimaraes 2013).

5.1.4 Year of graduation

The year of graduation ranged from 1962 to 2014. Just over half (53.8%) of the respondents graduated before the year 2000. The highest number of graduates per year was five respondents (9.6%) graduating in 2005 (**Table 1.11**). Snyman, van der Berg-Cloete and White's (2016) respondents graduated between 1960's and 2010 although more than half of their respondents (61.97%) graduated before the year 2000. The year of graduation is important as this determines the type of educational syllabus followed.

5.1.5 Institute from which respondents graduated

An interesting result was noted with regard to the main South African universities from which dentists qualified. The highest number graduated from the University of the Western Cape followed the University of the Witwatersrand and the University of Pretoria (**Table 1.12**). This result, however, conflicts with both Snyman, van der Berg-Cloete and White (2016) and Lalloo *et al*. (2005). Snyman, van der Berg-Cloete and White (2016) found a graduation pattern with 44.44% of their respondents graduating from the University of Pretoria, followed by the University of Witwatersrand (17.52%) and the University of Western Cape (15.38%). The slight difference noted could again be because their respondents were from across South Africa, whereas this current study was limited to Greater eThekwini Region.

Lalloo *et al*. (2005) showed that between 1985 and 2004 the University of Pretoria had the most graduates (28.46%) followed by the University of Witwatersrand (22.6%). The University of the Western Cape ranked fourth with the number of Dental student graduates, with 15.22% graduating there between 1985 and 2004. As previously mentioned, more than ten years have passed since the study by Lalloo *et al*. (2005) and changes over these years should be expected.

It could possibly be concluded that since all universities offering dental studies are outside the KZN province, the majority of dentists who practice in Greater eThekwini Region and graduated from the University of the Western Cape, could have grown up in KZN. Their decision to choose the University of the Western Cape could have been influenced by the university's position as the highest-ranking university in Africa (Anon. 2016). Another reason for the respondents choosing UWC could be that they could resume similar lifestyles. For instance, they are perhaps more likely to choose the University of the Western Cape as it is also a coastal province.

Nearly a quarter of respondents did not graduate from South African universities. These respondents graduated from universities in India (19.2%), while 3.84% graduated from the Birmingham University Dental School in the United Kingdom (**Section 4.1.1.5**). Snyman, van der Berg-Cloete and White (2016) did not specify overseas universities, however only 5.56% of their respondents graduated from overseas universities. It must be noted that although they had a larger sample, this study was focused on an area densely populated by the Indian population (Anon. 2011) and as such, this may be the reason that this study attracted more respondents that are Indian. It could also possibly be assumed that in contrast to Snyman, van der Berg-Cloete and White's (2016) respondents, more of the Indian respondents from this study graduated in India.

5.1.6 Years in practice

A large standard deviation was observed (**Table 1.13**)**.** This deviation is due to the large range in the number of years practising, with one year being the minimum and 53 years the maximum. The mean number of years practising was 20.615, with 51.92% having had 20 plus years' experience. This is similar to the results from Snyman, van der Berg-Cloete and White's (2016) study, where 45.49% had 20 plus years' of experience. Similarly, Reissmann *et al*. (2015) also found that mean years since graduation was 21.2 years. On average, the statistics from this study showed that respondents had been practicing for a long period indicating that experienced individuals provided the data.

5.2 THE KNOWLEDGE OF DENTISTS REGARDING MYOFASCIAL PAIN SYNDROME OF THE TEMPOROMANDIBULAR JOINT, ITS DIAGNOSIS AND MANAGEMENT

Section B and Section D of the questionnaire assisted in addressing objective one.

Section B

This section deals with the basic introductory questions regarding MFPS

From the results, it was noted that the majority of the respondents (92%) were familiar with MFPS as a component of TMJD (**Table 1.14**). This indicated that they had some knowledge of MFPS and as a result would have been able to complete the remainder of the questionnaire sufficiently.

Just over three-quarters of respondents (76.9%) indicated that they have received education/training with regard to MFPS at undergraduate level (**Table 1.14**.) This is also seen in a study done on 53 dental schools in the Brazilian area (Simm and Guimaraes 2013). All respondents from their study indicated that education in orofacial pain/TMDs took place at undergraduate level. In this current study 23.1% of the respondents indicated that they had not received education/training with regard to MFPS at undergraduate level (**Table 1.14**). The reasons for this is unknown, however, it could perhaps be because these respondents studied at the same University, or perhaps the level of education and time spent on this topic, was so little that they did not recall it, or they felt the level of education/training was not sufficient enough to say that they had received MFPS education.

To further asses the respondents' background with regard to MFPS, they were asked if they had previously attended any post-graduate courses/talks on myofascial pain. Just over half of the respondents (57.7%), had attended such courses (**Table 1.14**). This is significantly lower than the results reported by Reissman (2015) who indicated that 87.8% of general dentists from Northern Germany had attended post-graduate courses/talks on MFPS. This could be because Northern Germany is a first world country that offers more post-graduate courses/talks. Their people might also have a greater financial stability and can thus afford the cost related to post-graduate courses. As a third world country, South Africa might not have enough people to present such courses, or perhaps the need is not as vast. The

financial instability of South Africans could also influence their decisions to not attend or attend such courses.

Of the 30 respondents that attended these post-graduate courses/talks, 90% found them beneficial. This may have indicated that the presenter provided information about MFPS that was not covered within the undergraduate level. It is unknown why the small group of respondents did not find the post-graduate courses/talks beneficial; however, these respondents perhaps had adequate undergraduate education in MFPS. It could be that they were already working in this field and therefore well versed on MFPS. These respondents could also have qualified overseas, where the curriculum could possibly include education on MFPS and/or community service may have provided for learning experiences on MFPS.

All the respondents who indicated that they had not attended any post-graduate courses/talks on myofascial pain indicated that they, if given the opportunity, would attend such a course/talk. This indicates dentists' willingness to broaden their knowledge on MFPS. This could also present an opportunity for other professions, such as chiropractic, to present talks/courses on MFPS that caters specifically to dentists. Such co-operation also allows for initiating communication and education of each other's professions, and in so doing building on an inter-professional relationship.

Section D

This section interprets the following factors on the respondents' knowledge (definitions; clinic features; myofascial components; causes; perpetuating and relieving factors and differential diagnoses of MFPS). In contrast to the respondents' results that indicated, they had a good level of knowledge (67.17%) (**Table 1.15**) Baharvand's *et al*. (2010) results indicated that their respondents had a mean knowledge score of 10.85 ± 2.54 out of 23. In their study, 23.72% of the respondents were graded as having a fairly low level of TMD knowledge, and only 25% were graded as having a fair level of knowledge. In their study the lowest level of knowledge among the respondents were shown to be in the aetiology domain, this low level of knowledge regarding the causes of MFPS was also seen in this current study.

The following conclusions can be drawn from the respondents who had attended post-graduate courses/talks on MFPS. Overall, they had increased their knowledge. However for these respondents, differential diagnoses and causes were also the two sub-sections that scored lower in comparison to the other sections. On average, respondents who had attended post-graduate courses/talks on MFPS scored about 20% more on the clinical

features, perpetuating and relieving factors as well as on the myofascial sub-sections. Therefore, it could possibly indicate that post-graduate courses/talks cover these three sub-sections in more detail than that of differential diagnoses and causes.

A pattern was noted concerning knowledge and age. It was shown that the eldest respondent (70 years) did not have a high knowledge of MFPS. This could be because MFPS was not part of the syllabus when he/she studied dentistry or it could also be due to the practice preference of the particular practitioner. The majority of the respondents that had a good level of knowledge was between the ages of 30 and 39 years, followed by respondents between the ages of 50 and 59 years. It is unknown why there was a decrease in knowledge noted in the respondents aged 40-49 years. Perhaps this could be due to curricular changes that took place during their time of studying.

In conclusion, 76.9% of the respondents reported having received undergraduate education in MFPS and 57.7% had attended post-graduate courses/talks. Those who had attended these courses had a higher level of knowledge in all sub-themes. Respondents' knowledge scores could indicate that undergraduate courses and post-graduate courses/talks focus on the clinical features and the perpetuating and relieving factors, but not on differential diagnoses and causes. This reflects that even though dentists may have a high level of knowledge regarding aspects such as relieving factors, this will not be useful if the diagnosis cannot be made, or the diagnosis is incorrect.

5.3 ASSESSMENT AND TREATMENT OF MYOFASCIAL PAIN SYNDROME OF THE TEMPOROMANDIBULAR JOINT INCLUDING THE USE OF REFERRAL NETWORKS

Section C of the questionnaire assisted in addressing objective two.

This section discusses how the respondents managed and refer patients with MFPS

Approximately two-thirds of the respondents (69.2%) indicated that they do assess for trigger points (**Section 4.1.3**). However, 30.8% of the respondents stated that they did not even consider MFPS in their patients. This result could be expected as 23.1% of respondents indicated that they did not receive undergraduate education in MFPS and 42.3% had not attended any post-graduate courses/talks. This indicates that these respondents do not have the necessary skills to assess, diagnose and manage patients with MFPS.

The results of this study suggests that approximately 50% of the time, dentists use palpation as their main tool of assessment, followed by evaluating the signs and symptoms of patients in order to determine if MFPS is present. Palpations, signs and symptoms and x-ray imaging are three methods of assessing for MFTP's that dentists will commonly use for assessing the TMJ (De Boever *et al*. 2007). This concurs with the results from this current study on the most commonly used methods to assess/diagnose MFPS. According to Srbely, Kumbhare and Grosman-Rimon (2016), palpation is the most common clinical technique in the assessment of MFTPs. They note that ultrasound, however, is not currently used routinely to diagnose MFPS and this was supported by the results of this study as only 1.9% of the respondents used ultrasound imaging. This question had some ambiguity as selecting the second option of 'signs and symptoms only' should indicate that they do not use other diagnostic tool except for signs and symptoms, however, respondents at times selected both 'flat/pincher palpation' and 'signs and symptoms only'.

Ambiguity was also noted when the majority of respondents indicated that they treat MFPS without the help of other practitioners. This, however, does not correspond to later questions with regard to referrals as a high number indicated that they do refer out. The results of this study was notably lower than that of Ommerborn's *et al*. (2010) study in which it was reported that 91.6% of general dental practitioners stated that they predominantly treat craniomandibular disorders on their own.

Ayer, Machen and Getter (1977) found an interesting result when assessing myofascial pain-dysfunction syndrome and pathologic bruxing habits among dentists. A vast majority of the dentists did not seek treatment for the relief of MFPS, as they did not believe that the treatment would be successful. This shows that as time progressed from 1977 to 2016, dentists' beliefs have changed and they now encourage and perform treatments of MFP.

Results regarding the methods of treatment were unexpected (**Figure 1.3**). Jamalpour *et al*. (2011) compared the knowledge between general dental practitioners and TMJ specialists with regard to TMD. Sixty percent of TMJ specialists did not agree with general dentists that the first treatment option for TMD was using an occlusal splint. They also found a significant difference (48%) between the two groups when asked if anti-inflammatory drugs are useful for joint pain. While the TMJ experts agreed, less than 50% of the general dentist agreed that anti-inflammatory drugs are useful. Ommerborn *et al*. (2010) also found pharmaceutical drugs were part of only 4.7% preferred treatment method. In contrast to the results from Jamalpour *et al*. (2011) and Ommerborn *et al*. (2010), this current study showed that pharmaceutical drugs were the preferred type of intervention. In contrast to these allopathic treatment options, alternative treatment options such as myofascial release, trigger point injection and transcutaneous nerve stimulation were the least prefer methods. This could signifying a lack of knowledge of different professions and alternative options in managing patients with MFPS.

A very high percentage (94.4%) of respondents indicated that they give self-care advice concerning MFPS. This was expected and relates to their higher level of knowledge about perpetuating and relieving factors of MFPS. They, thus, can use this knowledge to suggest therapies, or inform the patient of perpetuating factors that can be avoided. For example: relaxation techniques (61.5%), heat therapy (50%) and stretching (40.4%) were the top three methods dentists encouraged whereas ice therapy (19.2%) and ischaemic compression (11.5%) were least recommended (**Figure 1.4**). These results are similar to Jamalpour's *et al*. (2011) study as he found that 73% of general dentists agreed that relaxation therapies are helpful in the treatment of TMD. In contrast, Ommerborn *et al*. (2010) found that only a small group of dentists treated patients with craniomandibular disorders by use of relaxation techniques (10.22%) and heat (7.78%). Ischaemic compression (11.5%) was the least recommended by dentists when giving self-care advice. This could be due to dentists not knowing about this treatment mechanism, or perhaps they feel that it is more of an in-room treatment option.

The results of this study showed only a small number of respondents (8.3%) do not refer patients with MFPS to other practitioners (**Section 4.1.3**). Again, this supports the notion that a previous question enquiring if dentists conducted treatment of MFPS on their own, was ambiguous. Of the respondents, 77.8% indicated that they treat on their own; however only 8.3% stated that they do not refer out. This positive result (8.3%) indicates that the majority of the dental profession is open to referrals. Either this could be be due to interest in patient co-management or because they do not feel that, they can adequately manage these patients and thus refer out. The results of this study further indicated that of the dentist that do refer, they mainly refer to other dental professions and physiotherapist (**Figure 1.5**). This outcome is similar to Ommerborn's *et al*. (2010) results wherein they reported that their respondents did not treat craniomandibular disorders on their own, but instead referred to other practices within the dental profession and secondly to physiotherapists. Jamalpour *et al*. (2011) reported that both general dental practitioners (80%) and TMJ experts (100%) agreed that physical therapy is useful for treatment of TMD.

In this study, there are a large difference between the amount of referrals to other dental professions (57.7%) as compared to other professions such as physiotherapists (17.3%) and chiropractors (9.6%). The reason such a low percentage of respondents referring their patients to chiropractors could be that they are not aware of what chiropractors do. It was found that the respondents referred patients out when they found it difficult to make a diagnosis, in severe cases or their management technique was unsuccessful.

Section E

This section discusses the respondents' perception of the various components of MFPS.

It was noted that a high number of respondents (82.7%) indicated that it is important to assess for MFPS in their office (**Table 1.16**). The fact that the majority of respondents felt that it is important to assess for MFPS could indicate their willingness to undergo additional education with regard to MFPS and particularly its management. In a study by Simm and Guimaraes (2013), it was reported that in the majority of dental schools the subject of pain mechanism, which includes orofacial pain, made up less than ten percent of total course hours. Data from Ommerborn *et al*. (2010) supports the need for extending education in craniomandibular disorders and orofacial pain in undergraduate dental curriculum as well as in post-graduate courses.

Although majority (53.8%) of respondent's responses were neutral, a low number of respondents (26.9%) indicated that they felt competent in managing MFPS. A low number of respondents (23.1%) felt that their curriculum was sufficient with regard to myofascial pain. This may indicate that the respondents' perception with regard to the curriculum affects their perception on their ability to manage MFPS.

A rather positive feedback was noted when almost three-quarters (73.1%) of respondents indicated that they would consider chiropractic co-management of patients. This was expected as results from this study showed that respondents do not feel competent in management of MFPS, and therefore prefer to refer patients, than treat the condition themselves. The 9.6% that indicated that they would not refer to chiropractors (**Figure 1.5**) could relate to the previous finding of 8.3% of respondents that do not refer patients with MFPS. This could be due to their ability to sufficiently manage these patients because they feel competent through the knowledge they have gained in either undergraduate studies or post-graduate courses/talks.

The results show the following patterns:

- Respondents indicated that the more comprehensive the curriculum, the higher the knowledge regarding MFPS and vice versa.
- Respondents with better knowledge regarding MFPS felt more competent in diagnosing and managing MFPS.
- When respondents felt it was important to assess for and diagnose MFPS, they were also more likely to feel competent in managing it.

5.4 THE ASSOCIATION BETWEEN SELECTED DEMOGRAPHIC PROFILES, KNOWLEDGE, UTILISATION, PERCEPTION AND REFERRAL PATTERNS

The following interpretations were made regarding the statements/questions from Section B (Topic background) that showed statistical significance ($p < 0.05$) (**Table 1.17**):

- The age of the respondents, and the year they graduated had an impact on the way Statement/Question One was answered.

  The four respondents that answered that Statement/Question incorrectly fell within the ages of 20-39 years and 70-79 years. All respondents between the ages of 40 and 69 years answered this statement correctly. It could be argued that with an increase in age, the older respondents had an increase of basic introductory knowledge as only the younger respondents answered incorrectly. However, the majority of respondents aged 20-29 years (85.7%) and 30-39 years (86.7%) answered this correctly. This indicates a relatively equal level of introductory knowledge over a large range of age groups.

  Statistically, the year of graduation also had an impact on the way Statement/Question One was answered. Yet, this could not be generalised due to the random occurrences of years. The four respondents who answered incorrectly, graduated in the following years: 1962; 2001; 2004 and 2013. Each of the four respondents should be looked at individually (for example, they just had not attended enough lectures, or they had not practised for a while).

- Attending post-graduate courses/talks on myofascial pain was influenced by the age and gender of the respondents and whether they gained their qualification in South Africa.

  Fewer than three-quarters of the respondents (71.4%) from the age group 50-59 years and all respondents (100%) between the ages of 60 and 69 years attended post-graduate courses/talks on MFPS. In contrast, the majority of respondents (85.7%) between the ages of 20 and 29 years had not attended such courses/talks. This could possibly be because the older respondents had more time and finances to attend courses as compared to younger respondents.

About two-thirds of the male respondents (66.7%) had attended post-graduate courses/talks on MFPS. In contrast, only about one-third of the female respondents (30.8%) had attended post-graduate courses/talks. This could be influenced by factors such as men being the primary provider and therefore they focused more on their professions than compared with females, as females tend to have a greater focus on family (Chan and Willett 2004).

A contrast arose when comparing South African and internationally qualified dentists. There was a 50/50 split in South African respondents that had and had not attended post-graduate courses/talks on MFPS. Of the internationally qualified dentists, 83.33% had attended such courses. This could indicate that internationally qualified dentists attend more post-graduate course/talks. They could be attending these courses because they believed they needed to improve on their education or they felt they needed to keep up to date with current education.

In addition to the above, Reissmann *et al*. (2015) noted that an increase in years since graduation correlated with attendance at continued education courses on TMD.

- The type of qualification of the respondents determined if they found such post-graduate courses/talks on myofascial pain beneficial.

  According to the information, 94.4% of the respondents who qualified with a Bachelor of Dental Science/Surgery and 88.9% who qualified with a Bachelor of Dentistry found the post-graduate courses/talks on MFPS beneficial. Of the 7.69% of dentists with additional qualifications, only one found that the courses/talks was not beneficial. This could possibly indicate that their orthodontic diploma course had covered what the post-graduate courses/talks covered.

The following interpretations were made regarding the statements/questions from Section C (Utilisation and management strategies including referral patterns) that showed statistical significance ($p < 0.05$) (**Table 1.18**):

- Statistically, the respondents' ethnicity and the year they graduated influenced if they referred patent with MFPS to other practitioners. Yet, the results could not be generalised.

The three respondents, who indicated that they did not refer patients out, graduated in the following years: 1987, 2000 and 2004. One respondent was Coloured and two were Indian. Indian respondents (70.4%) would refer out while 22.2% occasionally refer out. Over half of the White respondents (57.1%) indicated that they occasionally referred out. Although both Indian and White respondents referred out, the results indicated that Indian dentists referred out more often.

- The type of qualification as well as the year and institute from which they graduated influenced the circumstances under which they would refer patients with MFPS out.

The following interpretations were made regarding the statements from Section E (Perception) that showed to be of statistical significance ($p < 0.05$) (**Table 1.19**):

- The respondents' perception of whether their knowledge of myofascial pain is sufficient was influenced by the type of qualification they had.

  Of the respondents with a Bachelor of Dental Science/Surgery, and a Bachelor of Dentistry, 44.8% and 55.5% indicated that their knowledge of MFPS was not sufficient. This may indicate that these respondents perceived that their qualification did not include sufficient information on MFPS. Only 19.2% of all the respondents agreed that their knowledge of MFPS was sufficient. Of the respondents with other qualifications, one respondent strongly agreed (Bachelor of Dental Science/Surgery and a Diploma in orthodontics) while one respondent strongly disagreed (Bachelor of Dental Science/Surgery and a post-graduate diploma in Aesthetic dentistry).

Additionally, Reissmann *et al*. (2015) found that the more resent qualifying dentists had the perception that their qualification was not sufficient.

- Respondents' age influenced whether they felt that is was important to assess for MFPS in their offices.

  Of the two respondents who disagreed, one respondent's age fell between 40 and 49 years and the other respondent was between 70 and 79 years. All respondents (100%) between the ages of 60 and 69 years, thirteen respondents (92.9%) aged 50-59 years, six respondents (85.8%) aged 40-49 years, eleven respondents (68.8%) aged 30-39 years and six respondents (85.7%) aged 20-29 years indicated that it is

important to assess for MFPS. It is shown that the importance of assessing for MFPS increase with age. This could be because they have more experience and possibly had more patients with MFPS than newly qualified dentists had.

- Respondents' qualification influenced whether or not they would consider chiropractic co-management of a patient with MFPS

  Just over three-quarters of the respondents with a Bachelor of Dental Science/Surgery (79.3%) and a Bachelor of Dentistry (66.66%) indicated that they would consider chiropractic co-management. Of the four respondents with additional specialities, only one strongly disagreed to considering chiropractic co-management. This respondent had a Bachelor of Dental Science/Surgery and a post-graduate diploma in Aesthetic dentistry. The reasoning for this is unknown; however, this could be because this qualification allows for a greater understanding and the tool to manage patients by himself/herself.

In summary, basic introductory knowledge with regard to MFPS seems to increase with an increase of age. Age, gender and country of qualification had an impact on attendance at post-graduate course/talks. Older respondents, male respondents and those respondents with international qualifications attended more post-graduate course/talks. Dentists with a Bachelor of Dental Science/Surgery were more likely to find post-graduate course/talk on MFPS beneficial. They also acknowledged that their knowledge on MFPS is insufficient. They were likely to occasionally refer patients out and would consider chiropractic co-management of their patients. The results showed that these respondents occasionally referred out before the year 2000. Results showed that respondents that qualified before the year 2000 were more likely to occasionally refer out. More Indian respondents referred out than other ethnic groups. Lastly, the older the respondent, the more they believed that assessing for MFPS was important.

5.5 KEY FINDINGS

- With regard to the background and knowledge of MFPS, it was noted that the majority of respondents received basic education in MFPS. Just over three-quarters of these respondents (76.9%) reported having received undergraduate education and 57.7% had attended post-graduate courses/talks.
- The respondents who had attended generally had a higher level of knowledge in all sub-themes. Overall, the score for knowledge was 65.17%, with education commonly focusing on the clinical features (78.85%) and the perpetuating and relieving factors (72.11%). However, the differential diagnoses (51.16%) and causes (58.06%) scored the lowest knowledge levels.
- There was a 100% response from the respondents indicating a willingness to attend post-graduate courses/talks on MFPS.
- About two-thirds of respondents do assess for MFPS in their offices. Responses indicate that they mostly make use of the correct assessment tools and give adequate self-care advice.
- When it came to treatment and referrals, they tended to stay within the allopathic medical fields such as other dental professions (57.7%), and not make use of alternative medicine fields, for example: chiropractic (9.6%).
- In contrast to the above point 73.1% of respondents indicated that they would consider chiropractic co–management.

5.6 STRENGTHS

- This study adds new information in the South African context regarding dentists' understanding of the myofascial component of TMJ syndromes.
- It provides much needed information regarding referral patterns and whether dentists are willing to refer patients to chiropractors.
- It also provides the dental profession with information about knowledge and practices related to MFPS and provides information with regard to the strengths and weaknesses within education and courses/talks on MFPS.
- This research presents an opportunity for the chiropractic profession to offer such courses/talks and in that way also inform the dental community about alternative professions and how they can assist in the management of their patients.

- This study points to dentists' willingness to form inter-professional relationships with chiropractors, co-treat, and co-manage patients with MFPS. In so doing, this study reflects on the recognition of chiropractic as a credible and valued support to dentists.

5.7 LIMITATIONS

- The population size used was restricted to those registered with the HPCSA in selected wards in the Greater eThekwini Region and to the number of general dental practitioners who complied with the inclusion criteria of this study. The small sample size may misrepresent the study population and ethnic groups.
- The data collection period fell within the period of Ramadan, numerous Indian dentists therefore indicated that they would not take part in this study. Therefore, the data collection period was delayed by a month to ensure a minimal return rate of 70%.
- It is acknowledged that respondents may have made errors during the completion of the questionnaire. As it is not possible for the researcher to determine errors on behalf of the respondents, these have been included in the results and could affect the accuracy of the results overall.
- As previously discussed ambiguity of questions can affect the results of the study.

5.8 CONCLUSION AND RECOMMENDATIONS

The results from this study show that dentists receive a basic education in MFPS. Education and courses/talks should, however, be revised to include more time on topics such as differential diagnoses and causes. A void exists as the majority of dentist felt the need for additional training and they indicated a willingness to refer patients to chiropractors if needed. The chiropractic profession should thus take the opportunity and offer courses/talks on MFPS, and inform on how they may assist the dental profession in the management of patients.

The following recommendations are suggested for future studies:

- A greater sample size should be used to achieve results that are more generalisable to the greater dental population. A method should be put into place to ensure a fair representation of gender and ethnicity.
- Factors such as holiday and religious periods should be taken into consideration.

- If this questionnaire is used for further studies, it should be modified to ensure the questions are specific and will be clearly understood by the respondents.
- Questions that may be added to gain additional information for this questionnaire could include:

    - Was there a period after graduation that you did not practice (first travelled, maternity leave, or other)?
    - How long was this period/s in total?
    - Why did you attend post-graduate courses/talk on MFPS?
    - What was the results/feedback with regard to referring patients with MFPS?

- Future studies could discuss:

    - Factors that affect dentists' reasoning for attending post-graduate courses/talks.
    - General dentists' knowledge about chiropractic.

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APPENDICES

Appendix A: Research Questionnaire

Research Questionnaire

Principle investigator: Hyla Van Der Colff

Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)

Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Research title:

Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Instructions:

Please complete the consent letter before answering the questionnaire.
Refer to the consent letter for Instructions and confidentiality statements.
Please answer as indicated and specify answers where necessary.

SECTION A					
Demographics: Please tick (√) the appropriate box and specify where necessary.					
1. Gender	Female			Male	
2. Ethnicity (For statistical purposes only)	African	Coloured	Indian	White	Other
3. Age at last birthday (years)					
4. Qualification(s)	Bachelor of Dental Science/ Surgery				
	Bachelor of Dentistry				
	Bachelor of Oral Health/ Sciences/ Hygiene				
	Masters in, if any (Please specify):				
	Other (Please specify):				
5. Year of graduation					
6. Name of institute you graduated from					
7. Was this qualification gained in South Africa	Yes			No	
8. Number of years practising					

SECTION B		
Please tick (√) the appropriate box		
1. Myofascial pain syndrome (MFPS) is a component of temporomandibular joint (TMJ) disorders (also known as Craniomandibular Dysfunction and Craniofacial Pain).	Yes	No
2. Have you received education /training with regards to MFPS at an undergraduate level?	Yes	No
3. Have you attended any post graduate courses/talks on myofascial pain?	Yes	No
4. If you answered (Yes) to question 3, did you find it beneficial?	Yes	No
5. If you answered (No) to question 3, would you attend such a course/talk?	Yes	No

SECTION C					
Utilization and management strategies including referral patterns: Please tick (√) the appropriate box and where specified, you can tick (√) more than one box					
1. Do you assess/diagnose myofascial trigger points				Yes	No
2. If you answered (No) to question 1, please continue to Section D					
3. If you answered (Yes) to question 1, how do you assess/diagnose myofascial trigger points? You may select more than one option.					
Flat/pincher palpation	Signs and symptoms only (i.e. no palpation)	Ultrasound imaging		X-ray Imaging	Other (Specify)
4. Do you treat patients with myofascial pain, on your own?				Yes	No
5. If you answered (Yes) to question 4, what treatment options do you utilize? You may select more than one option.					
Mouth guard	Myofascial release	Night splint	Pharmaceutical drugs	Transcutaneous electrical nerve stimulation (TENS)	Trigger point injection

6. Do you give self-care advice with regards to MFPS to your patients?				Yes	No
7. If you answered (Yes) to question 6, what does this self-care advice include? You may select more than one option.					
Heat therapy	Ice therapy	Ischaemic compression	Relaxation techniques	Stretching	None
8. Do you refer patients with MPFS to other practitioners for treatment and management?			Yes	No	Occasionally
9. If you answered (Yes) to question 8, to whom do you refer with regards to MFPS? You may select more than one option.					
Chiropractor	General Practitioner		Physiotherapist		
Psychologist	Other dental professions – E.g. Maxillofacial surgeon/Orthodontist		Other (Specify)		
10. If you answered (Occasionally) to question 8, under which circumstances do you refer out to other practitioners regarding MFPS?					

SECTION D		
In your opinion are the following statements true or false. Please tick (√) the appropriate box		
1. Fibromyalgia is a differential diagnosis for MFPS	True	False
2. MFPS is defined as - Pain of muscular origin that originates in a painful site in muscle. This site is characterized by the myofascial trigger points.	True	False
3. There is no pain referral beyond the myofascial trigger point area	True	False
4. Nutritional problems are a perpetuating factor of myofascial trigger points	True	False
5. TMJ articular disc displacement is a non-dental cause of toothache	True	False
6. The upper fibres of the trapezius muscle can occasionally refer to the lower molar teeth.	True	False
7. Myofascial trigger points are defined as - A hypersensitive point in skeletal muscle that is associated with a hypersensitive palpable nodule.	True	False
8. Hypermobility syndrome is a differential diagnosis for MPFS	True	False
9. Spinal mal-alignment is a perpetuating factor of myofascial trigger points	True	False
10. Glaucoma is a non-dental cause of toothache	True	False
11. The masseter muscle refers pain to the upper and lower molar teeth, resulting in hypersensitivity	True	False
12. Reproducible, exquisite spot tenderness occurs in a muscle at the trigger point location	True	False
13. Heat is a relieving factor of myofascial trigger points	True	False
14. Sinusitis is a dental cause of toothache	True	False
15. The sternocleidomastoid (SCM) muscle does not refer pain to oral structures	True	False

16. Emotional instability is a perpetuating factor of myofascial trigger points	True	False
17. Myofascial trigger points are not defined as - A faint soft tissue calcification within muscles.	True	False
18. Myofascial trigger points are a non-dental cause of toothache	True	False
19. The temporalis muscle refers pain to the maxillary teeth, mostly the upper teeth	True	False
20. Osteomalacia (Vitamin D deficiency) is not a differential diagnosis for MFPS	True	False
21. Bell's palsy and trigeminal neuralgia are a non-dental cause of toothache	True	False
22. Pain referral from the medial pterygoid occurs in the back of the throat	True	False
23. Polymyalgia rheumatica is not a differential diagnosis for MFPS	True	False
24. Pain at rest is not a characteristic feature of active myofascial trigger points	True	False
25. Stretching is not a relieving factor of myofascial trigger points	True	False
26. MFPS is defined as - A syndrome that produces chronic body-wide pain, which migrates and can be felt from head to toe.	True	False
27. Viscero-somatic pain syndromes should not be excluded as an differential diagnosis of MFPS	True	False
28. Active myofascial trigger points can activate latent myofascial trigger points	True	False
29. Heat is a perpetuating factor of myofascial trigger points	True	False

SECTION E

Perception: Please select only one option per question by ticking (√) the appropriate box

	Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
1. Do you feel that your knowledge of myofascial pain is sufficient?	SA	A	N	D	SD
2. Do your feel it is important to assess for MFPS in your office?	SA	A	N	D	SD
3. Do you feel competent in diagnosing myofascial pain?	SA	A	N	D	SD
4. Do you feel competent in managing myofascial pain?	SA	A	N	D	SD
5. Do you feel that your curriculum was sufficient with regards to myofascial pain?	SA	A	N	D	SD
6. Would you consider chiropractic co-management of a patient with MFPS?	SA	A	N	D	SD

End: Thank you

Appendix B: Letter of Information

Questionnaire letter of Information

Thank you for your interest in this research study.

Title of the Research Study:
Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Principle Investigator/s: Hyla Van Der Colff
Co-Investigator/s: Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)
Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Brief Introduction and Purpose of the Study:

Simons (2004) reports that if myofascial pain and trigger points are not considered, assessed and addressed, the general cause of a patient's pain will be disregarded.

A literature review on the management of myofascial pain syndrome concluded that patients should be treated in a multi-disciplinary manner and that if the treatment of myofascial pain syndrome is handled correctly, it can be largely rewarding for both the practitioner and the patient (Odendaal 2003).

In the South African context there is a paucity of literature on whether South African dentists routinely assess and treat MFPS. The information generated by this study can assist the Dental profession by providing information about dentist's practices related to MFPS. Similarly, this information will benefit the chiropractic profession as if it is found that there is a lack of referral to chiropractors, it signifies an opportunity for the chiropractic profession to stimulate inter-professional relationships with Dentist.

Outline of the Procedures:
Please complete the questionnaire according to the instructions given.
All answers are confidential thus you are requested to be honest and answer all questions.
Mark the appropriate box with a tick (√) and specify answers where it is required.

Hand delivery/return
Once you have completed the questionnaire in full, place the questionnaire into the envelope provided and seal the envelope. The researcher will collect the letter of information and consent as well as the questionnaire from you and place it into two separate sealed boxes.

Email delivery/return
After the relevant document have been e-mailed to you. The letter of information, consent and questionnaire should be printed. The Consent should be signed and the questionnaire completed in black pen (in order to make sure that the scanned copy is clear). The documents must then be scanned and e-mailed to vandercolffhyla@gmail.com Alternatively for those who have the facilities to electronically sign documentation are welcome to do so and email the completed letter of information and consent to vandercolffhyla@gmail.com .

If you have scanned and e-mailed the documents, please only delete the questionnaire from your computer after you have confirmation from the researcher that it has been received.

All of the data will be analysed by a qualified statistician and the results will be represented in aggregate, thus no personal details will appear in the results and no single practitioner's results will be displayed in the results. Once the research has been completed the results will be available at the Durban University of Technology library.

Risks/Discomforts to the Subject:
All of the results will be used for research purposes and all personal data will remain **confidential**.

Benefits:
Benefits to the subject: The information generated by this study can assist the Dental profession by providing information about dentists practices related to MFPS.
Benefits to the researcher: The accolade of a Master's degree in Chiropractic.

Reason/s why the Subject May Withdraw from the Study:
At any time during the research process you may withdraw from the study, however once your questionnaire is posted into the sealed container it may not be removed to protect the confidentiality of the other respondents.

Remuneration:
Participation is voluntary and there is no direct remuneration for your participation in this study.

Costs of the Study:
There are no costs involved for your participation in this study.

Confidentiality:
All information will be confidential and the results will be used for research purposes only.

Research-related Injury:
This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:
Principle investigator: Hyla Van Der Colff Cell: 082 897 5338
Supervisor: Dr. J.D. Pillay Telephone (office): 031 373 2398

Or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

Appendix C – Informed consent

Questionnaire: Consent

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Hyla Van Der Colff, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: IREC 019/16.
- I have also received, read and understood the above written information (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, and other demographics 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 the respondent	Date	Time	Signature

I Hyla Van Der Colff, herewith confirm that the above respondent has been fully informed about the nature, conduct and risks of the above study.

Full name of the Researcher	Date	Signature
Full name of the Witness	Date	Signature
Full name of the Legal Guardian (If applicable)	Date	Signature

Appendix D: Pre-expert Group Questionnaire

Pre-expert Group Research Questionnaire

Principle investigator: Hyla Van Der Colff

Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)

Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Research title:

Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Instructions:

Please complete the consent letter before answering the questionnaire.

Refer to the consent letter for Instructions and confidentiality statements.

Please tick the appropriate box and specify answers where necessary.

SECTION A					
Demographics					
1. Gender	Male			Female	
1. Ethnicity	White	African	Indian	Coloured	Other
2. Age at last birthday (years)					
3. Qualification(s)	Bachelor of Dental Science/ Surgery				
	Bachelor of Dentistry				
	Bachelor of Oral Health/ Sciences/ Hygiene				
	Masters in (if any):				
	Other:				
4. Year of completion					
5. Institute Name If your Qualification was obtained in SA or aboard)					
6. Number of years practising					

SECTION B			
Knowledge			
1. Do you know what myofascial pain syndrome is?		Yes	No
2. Myofascial pain syndrome is defined as:			
A	A syndrome that produces chronic body-wide pain, which migrates and can be felt from head to toe.		
B	Pain of muscular origin that originates in a painful site in muscle. This site is characterized by the myofascial trigger points.		
C	A highly sensitive areas within the muscle that are painful to touch and cause pain that can be felt in another area of the body.		
3. The following are differential for myofascial pain syndrome:			
Dysfunction of the limbic system		True	False
Fibromyalgia		True	False
Hypothalamus-Pituitary-Adrenal (HPA) axis		True	False
Polymyalgia rheumatic		True	False
Viscero-somatic pain syndromes		True	False
4. Myofascial trigger point is defined as:			
A	A hypersensitive point in skeletal muscle that is associated with a hypersensitive palpable nodule.		
B	A faint soft tissue calcification within muscles.		
C	A closed capsule or sac-like structure, typically filled with liquid, semisolid or gaseous material.		
5. The following are characteristics of trigger points:			
Reproducible, exquisite spot tenderness occurs in the muscle at the trigger point		True	False
Pain is only referred locally on mechanical stimulation of the trigger point		True	False

The history of the initial onset of pain and of its recurrences is poorly related	True	False
There is palpable hardening of a taut band of muscle fibers passing through the tender spot in a shortened muscle	True	False
A local twitch response of the taut band of muscle occurs when the trigger point is stimulated by snapping palpation or needle penetration	True	False

6. The following are perpetuating factors of trigger points:

Nutritional Problems	True	False
Spinal mal-alignment	True	False
Heat	True	False
Emotional Factors	True	False
Stretching	True	False

7. The following are non-dental causes of toothaches:

Displaced disc	True	False
Periodontal ligament: Occlusal trauma	True	False
Sinus	True	False
Myofascial trigger points	True	False
Trigeminal neuralgia	True	False

8. The following muscles can refer pain to the oral/teeth area:

Trapezius	True	False
Masseter	True	False
Temporalis	True	False
Sternocleidomastoid	True	False
Medial pterygoid	True	False

SECTION C

Utilization and management strategies including referral patterns

1. Do you assess/diagnose myofascial trigger points			Yes	No
2. If yes to question 1, how do you asses/diagnose myofascial trigger points?				
Signs and symptoms only (i.e. no palpation)	Flat/pincher palpation	Ultrasound therapy	Pin point laser	Other (Specify)
3. Do you manage patients with myofascial pain on your own?			Yes	No
4. If yes to above, what management do you utilize?				
Trigger point injection	Transcutaneous electrical nerve stimulation (TENS)	Myofascial release	Botox therapy	Mouth guard/splint at night
5. What self-care advice, if any, do you give regarding myofascial pain?				
Stretching	Ischaemic compression	Ice / Heat therapy	Relaxation techniques	None

6. Do you refer out to other practitioners regarding myofascial pain?	Yes	No	Sometimes

7. To whom do you refer?				
Physiotherapist	Chiropractor	General Practitioner	Psychologist	Other

8. Have you referred to a chiropractor for the following?				
Myofascial pain	TMJ problems	Neck pain	If treatment fails	None

9. What was the outcome?				
Excellent	Satisfactory	Poor	No feedback	None

SECTION D									
Perception									
1. Do you feel that your knowledge on myofascial pain is sufficient:									
1 None	2	3	4	5	6	7	8	9	10 Excellent
2. Do you feel competent in diagnosing myofascial pain?									
1 None	2	3	4	5	6	7	8	9	10 Excellent
3. Do you feel competent in managing myofascial pain?									
1 None	2	3	4	5	6	7	8	9	10 Excellent
4. Do your feel it is important to assess for myofascial pain syndrome in your office?									
1 None	2	3	4	5	6	7	8	9	10 Excellent
5. Do you feel that your curriculum was sufficient with regards to myofascial pain?									
1 None	2	3	4	5	6	7	8	9	10 Excellent

6. Have you attended any post graduate courses/talks on myofascial pain?	Yes	No
7. If yes, did you find it beneficial?	Yes	No
8. If no to above, would you attend such a course/talk?	Yes	No
9. Would you consider chiropractic co-management of a patient with MFPS?	Yes	No

Do you have any further recommendations or suggestions that can be made to improve the knowledge and practices of myofascial pain syndrome of the temporomandibular joint?

Appendix E – Expert Group Confidentiality Statement and Code of Conduct

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: EXPERT GROUP

Please read and complete this form prior to the commencement of the expert group.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the expert group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the respondents in the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific expert group as to the decisions of this expert group.
3. The information gathered from this expert group by the researcher will be made public in terms of a dissertation and journal publication. The researcher will ensure that any respondents in the expert group and research remain anonymous and confidential.
4. The expert group may be voice recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.
5. All data generated from this expert group (including the recording) will be kept for 15 years in a secure location at Durban University of Technology and thereafter will be destroyed.

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

_____ _____

Full name of the respondent **Signature**

_____ _____

Full name of the Witness **Signature**

_____	_____
Full name of the Researcher	**Signature**
_____	_____
Full name of Supervisor	**Signature**
_____	_____
Full name of Co-Supervisor	**Signature**

Appendix F: Expert Group Letter of Information

Expert Group Letter of Information

Thank you for participating in this expert group, your contribution is much appreciated.

Title of the Research Study:

Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Principle Investigator/s: Hyla Van Der Colff

Co-Investigator/s: Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)

Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Brief Introduction and Purpose of the Study:

Simons (2004: 105) reports that if myofascial pain and trigger points are not considered, assessed and addressed, the general cause of a patient's pain will be disregarded.

A literature review on the management of myofascial pain syndrome concluded that patients should be treated in a multi-disciplinary manner and that if the treatment of myofascial pain syndrome is handled correctly, it can be largely rewarding for both the practitioner and the patient (Odendaal 2003: 24).

In the South African context there is a paucity of literature on whether South African dentists routinely assess and treat MFPS. The information generated by this study can assist the Dental profession by providing information about dentists practices related to MFPS. Similarly, this information will benefit the chiropractic profession as if it is found that there is a lack of referral to chiropractors, there presents an opportunity for the chiropractic profession to stimulate inter-professional relationships with Dentists.

Study objectives:

1. To determine the knowledge of dentists regarding MFPS of the TMJ, its diagnosis and management.
2. To determine the utilisation of MFPS assessments and treatments of the TMJ by dentists.
3. To determine if management strategies of MFPS of the TMJ make use of referral networks.

To determine the association, if any, between selected demographic profiles, knowledge, utilisation, perception and referral patterns of the respondents.

Outline of the Procedures:

Please read and complete the informed consent letter and the code of conduct and confidentiality statement prior to commencement of the expert group meeting. Each member of the expert group will receive a copy of the questionnaire before the discussion begins. During the expert group meeting each question will be discussed sequentially. As a member of the expert group please feel free to make your opinion or suggestions known to the researcher. All comments made can contribute to the questionnaire validity. The expert group meeting will be recorded in order for the researcher to reflect on the comments made.

Risks/Discomforts to the respondent:

There are no risks involved in this study. The expert group discussion will remain confidential; all information will be used for research purposes only.

Benefits:

The expert group is very important to ensure validity of the questionnaire.

Reason/s why the Subject May Withdraw from the Study:

You may withdraw from the study at any time during the research process.

Remuneration:

Participation is voluntary and there is no direct remuneration for your participation in this study other.

Costs of the Study:

There are no costs involved for your participation in this study.

Confidentiality:

All information will be confidential and the results will be used for research purposes only. *Please do not divulge any information about the research study and the questionnaire discussed during the expert group meeting.*

Research-related Injury:

This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:

Principle investigator: Hyla Van Der Colff Cell: 082 897 5338

Supervisor: Dr. J.D. Pillay Telephone (office): 031 373 2398

Appendix G: Expert Group Informed Consent

Expert group: Consent

Statement of Agreement to Participate in the Research Study:

I……., ID number……., have read this document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by…… to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore voluntarily agree to participate in this study.

_____	_____	_____	_____
Full name of the respondent	**Date**	**Time**	**Signature**

I Hyla Van Der Colff, herewith confirm that the above respondent has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full name of the Researcher	**Date**	**Signature**

_____	_____	_____
Full name of the Witness	**Date**	**Signature**

_____	_____	_____
Full name of the Legal Guardian (If applicable)	**Date**	**Signature**

Appendix H: Post-expert Group Questionnaire

Post-expert Group Research Questionnaire

Principle investigator: Hyla Van Der Colff
Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)
Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Research title:
Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Instructions:

Please complete the consent letter before answering the questionnaire.
Refer to the consent letter for Instructions and confidentiality statements.
Please answer as indicated and specify answers where necessary.

Abbreviations: MFPS – Myofascial pain syndrome & TMJ – Temporomandibular joint

SECTION A					
Demographics: Please tick (√) the appropriate box and specify where necessary.					
1. Gender	Female			Male	
2. Ethnicity (For statistical purposes only)	African	Coloured	Indian	White	Other
3. Age at last birthday (years)					
4. Qualification(s)	Bachelor of Dental Science/ Surgery				
	Bachelor of Dentistry				
	Bachelor of Oral Health/ Sciences/ Hygiene				
	Masters in (if any):				
	Other:				
5. Year of gradation					
6. Name of institute you graduated from					
7. Was this qualification gained in South Africa?	Yes		No		
8. Number of years practising					

SECTION B		
Please tick (√) the appropriate box		
1. MFPS is a component of TMJ disorders (also known as Craniomandibular Dysfunction and Craniofacial Pain)	Yes	No
2. Have you received education /training with regards to MFPS in an undergraduate level	Yes	No
3. Have you attended any post graduate courses/talks on myofascial pain?	Yes	No
4. If (Yes), did you find it beneficial?	Yes	No
5. If (No) to above, would you attend such a course/talk?	Yes	No

SECTION C					
Utilization and management strategies including referral patterns: Please tick (√) the appropriate box and where specifies you can tick (√) more than one box					
1. Do you assess/diagnose myofascial trigger points				Yes	No
2. If you answered (No) to question 1 please continue to Section D					
3. If (Yes) to question 1, how do you asses/diagnose myofascial trigger points? You may select more than one option.					
Signs and symptoms only (i.e. no palpation)	Flat/pincher palpation	Ultrasound imaging	X-ray Imaging	Other (Specify)	
4. Do you treat patients with myofascial pain on your own?				Yes	No
5. If (Yes) to above, what treatment options do you utilize? You may select more than one option.					
Trigger point injection	Transcutaneous electrical nerve stimulation (TENS)	Myofascial release	Night splint	Mouth guard	Pharmaceutical drugs

6. Do you give self-care advice with regards to MFPS to your patients?				Yes	No
7. If (Yes) to the above question, what does this self-care advice include? You may select more than one option.					
Stretching	Ischaemic compression	Ice therapy	Relaxation techniques	Heat therapy	None
8. Do you refer patients with MPFS to other practitioners for treatment and management?			Yes	No	Occasionally
9. If (Yes) - To whom do you refer with regards to MFPS? You may select more than one option.					
Physiotherapist	Chiropractor			General Practitioner	
Psychologist	Other dental professions – E.g. Maxillofacial surgeon/Orthodontist			Other (Specify)	
10. If you answered occasionally, under which circumstanced do you refer out to other practitioners regarding MFPS?					

SECTION D		
In your opinion is the following statements true or false. Please tick (√) the appropriate box		
1. Fibromyalgia is a differential diagnosis for MFPS	True	False
2. MFPS is defined as - Pain of muscular origin that originates in a painful site in muscle. This site is characterized by the myofascial trigger points.	True	False
3. There is no pain referral beyond the myofascial trigger point area	True	False
4. Nutritional problems is a perpetuating factor of myofascial trigger points	True	False
5. TMJ articular disc displacement is a non-dental cause of toothache	True	False
6. The upper fibres of the trapezius muscle can occasionally refer to the lower molar teeth.	True	False
7. Myofascial trigger points are defines as - A hypersensitive point in skeletal muscle that is associated with a hypersensitive palpable nodule.	True	False
8. Hypermobility syndrome is a differential diagnosis for MPFS	True	False
9. Spinal mal-alignment is a perpetuating factor of myofascial trigger points	True	False
10. Glaucoma is a non-dental cause of toothache	True	False
11. The masseter muscle refers pain to the upper and lower molar teeth, resulting in hypersensitivity	True	False
12. Reproducible, exquisite spot tenderness occurs in a muscle at the trigger point location	True	False
13. Heat is a relieving factor of myofascial trigger points	True	False
14. Sinusitis is a dental cause of toothache	True	False
15. The sternocleidomastoid (SCM) muscle does not refer pain to oral structures	True	False
16. Emotional instability is a perpetuating factor of myofascial trigger points	True	False

17. Myofascial trigger points are not defines as - A faint soft tissue calcification within muscles.	True	False
18. Myofascial trigger points are a non-dental cause of toothache	True	False
19. The temporalis muscle refers pain to the maxillary teeth, mostly the upper teeth	True	False
20. Osteomalacia (Vitamin D deficiency) is not a differential diagnosis for MFPS	True	False
21. Bell's palsy and trigeminal neuralgia are a non-dental cause of toothache	True	False
22. Pain referral from the medial pterygoid occurs in the back of the trough	True	False
23. Polymyalgia rheumatic is not a differential diagnosis for MFPS	True	False
24. Pain at rest is not characteristic feature of active myofascial trigger points	True	False
25. Stretching is not a relieving factor of myofascial trigger points	True	False
26. MFPS is defined as - A syndrome that produces chronic body-wide pain, which migrates and can be felt from head to toe.	True	False
27. Viscero-somatic pain syndrome should not be excluded as an differential diagnosis of MFPS	True	False
28. Active myofascial trigger points can activate latent myofascial trigger points	True	False
29. Heat is a perpetuating factor of myofascial trigger points	True	False

SECTION D					
Perception: Please select only one option per question by ticking (√) the appropriate box					
	Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
1. Do you feel that your knowledge on myofascial pain is sufficient:	SA	A	N	D	SD
2. Do your feel it is important to assess for myofascial pain syndrome in your office?	SA	A	N	D	SD
3. Do you feel competent in diagnosing myofascial pain?	SA	A	N	D	SD
1. Do you feel competent in managing myofascial pain?	SA	A	N	D	SD
4. Do you feel that your curriculum was sufficient with regards to myofascial pain?	SA	A	N	D	SD
5. Would you consider chiropractic co-management of a patient with MFPS?	SA	A	N	D	SD

Appendix I: Pilot Study Letter of Information

Pilot study Letter of Information

Thank you for your participation in this pilot study, your contribution is much appreciated.

Title of the Research Study:

Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini Region.

Principle Investigator/s: Hyla Van Der Colff

Co-Investigator/s: Supervisor: Dr. J.D. Pillay (PhD Physiology: Exercise Science)

Co-Supervisor: Dr. A. Docrat (M.Tech: Chiro, P.G.Dip.U.T.Med. M.Med.Sci.)

Brief Introduction and Purpose of the Study:

Simons (2004: 105) reports that if myofascial pain and trigger points are not considered, assessed and addressed, the general cause of a patient's pain will be disregarded.

A literature review on the management of myofascial pain syndrome concluded that patients should be treated in a multi-disciplinary manner and that if the treatment of myofascial pain syndrome is handled correctly, it can be largely rewarding for both the practitioner and the patient (Odendaal 2003: 24).

In the South African context there is a paucity of literature on whether South African dentists routinely assess and treat MFPS. The information generated by this study can assist the Dental profession by providing information about dentists practices related to MFPS. Similarly, this information will benefit the chiropractic profession as if it is found that there is a lack of referral to chiropractors, there presents an opportunity for the chiropractic profession to stimulate inter-professional relationships with Dentist.

Study objectives:

1. To determine the knowledge of dentists regarding MFPS of the TMJ, its diagnosis and management.
2. To determine the utilisation of MFPS assessments and treatments of the TMJ by dentists.
3. To determine if management strategies of MFPS of the TMJ make use of referral networks.
4. To determine the association, if any, between selected demographic profiles, knowledge, utilisation, perception and referral patterns of the respondents.

Outline of the Procedures:

Please read and complete the informed consent letter and the code of conduct and confidentiality statement prior to evaluation of the questionnaire. Please evaluate the letter of information and consent for the questionnaire as well as the questionnaire itself. As a member of the pilot study please feel free to make your opinion or suggestions known to the researcher by completing the evaluation form and/or adding any comments on the evaluation form. All comments made can contribute to the questionnaire validity.

Risks/Discomforts to the respondent:

There are no risks involved in this study. The information sourced from the pilot study will remain confidential; all information will be used for research purposes only.

Benefits:

The pilot study is very important to ensure the questionnaire is user friendly.

Reason/s why the Subject May Withdraw from the Study:

You may withdraw from the study at any time during the research process.

Remuneration:

Participation is voluntary and there is no direct remuneration for your participation in this study other.

Costs of the Study:

There are no costs involved for your participation in this study.

Confidentiality:

All information will be confidential and the results will be used for research purposes only. *Please do not divulge any information about the research study and the questionnaire discussed during the expert group meeting.*

Research-related Injury:

This is not applicable to this study, as there will be no physical interventions.

In case of any queries regarding the questionnaire please contact the following personnel:

Principle investigator: Hyla Van Der Colff Cell: 082 897 5338

Supervisor: Dr. J.D. Pillay Telephone (office): 031 373 2398

Appendix J: Pilot Study Informed Consent

Pilot study: Consent

Statement of Agreement to Participate in the Research Study:

I……., ID number……., have read this Document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by…… to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore voluntarily agree to participate in this study.

_____	_____	_____	_____
Full name of the respondent	Date	Time	Signature

I Hyla Van Der Colff, herewith confirm that the above respondent has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full name of the Researcher	Date	Signature

_____	_____	_____
Full name of the Witness	Date	Signature

_____	_____	_____
Full name of the Legal Guardian (If applicable)	Date	Signature

Appendix K: Pilot Study Confidentiality Statement and Code of Conduct

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Pilot Study

Please read and complete this form prior to the commencement of the expert group.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the expert group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the respondents in the research process.

2. None of the information shall be communicated to any other individual or organisation outside of this specific expert group as to the decisions of this expert group.

3. The information gathered from this expert group by the researcher will be made public in terms of a dissertation and journal publication. The researcher will ensure that any respondents in the expert group and research remain anonymous and confidential.

4. The expert group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.

5. All data generated from this expert group (including the recording) will be kept for 15 years in a secure location at Durban University of Technology and thereafter will be destroyed.

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

_____	_____
Full name of the respondent	**Signature**
_____	_____
Full name of the Witness	**Signature**
_____	_____
Full name of the Researcher	**Signature**
_____	_____
Full name of Supervisor	**Signature**
_____	_____
Full name of Supervisor	**Signature**

Appendix L: Pilot Study Evaluation Form

Pilot study evaluation sheet

1) What is your opinion of the subject presented in this questionnaire?	Extremely interesting	Interesting	Average	Boring	Very boring
2) Do you think the topics raised in this questionnaire were adequately covered?	Yes	No (if no, please explain why in the space provided at the end of the form)			
3) What is your opinion about the cover letter?	Very clear	Clear	Adequate	Unclear	Needs revising
4) How would you describe the instructions accompanying each of the questions?	Very clear	Clear	Adequate	Unclear	Needs revising
5) Do you think the questionnaire is too s?	Yes	No (if no, please explain why in the space provided at the end of the form).			
6) What is your opinion of the wording of the questionnaire?	The meaning of **all questions** is absolutely clear.				
	The meaning of **most** questions is clear.				
	There is too much chiropractic/ medical jargon.				
	The questions will not be understood by chiropractors.				
	The questionnaire needs to be revised because it is unclear.				

Please tick the appropriate box

If you have any questions in the questionnaire with which you have complaints and/or suggestions to improve the questionnaire please list the number of the question and provide your comments:

If you have any other comments please feel free to write them in the space provided below:

Appendix M: Institutional Research and Ethics Committee Ethical Clearance Letter

DUT DURBAN UNIVERSITY OF TECHNOLOGY

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

27 May 2016

IREC Reference Number: **REC 23/16**

Ms H Van Der Colff
P O Box 401
Warner Beach
4140

Dear Ms Van Der Colff

Knowledge and practices of myofascial pain syndrome of the temporomandibular joint by dentists in the Greater Ethekwini region

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

We are pleased to inform you that the questionnaire has been APPROVED; you may now proceed with data collection on the proposed project.

Kindly ensure that participants used for the pilot study are not part of the main study.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2016 -05- 27
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

Appendix N: Permission form Dr. N. Vizniak for the use of his work and figures

Gmail

Hyla Van Der Colff <vandercolffhyla@gmail.com>

Requesting permission

NIKITA VIZNIAK <nik@prohealthsys.com> Tue, Apr 26, 2016 at 3:02 PM
To: Hyla Van Der Colff <vandercolffhyla@gmail.com>, contact@prohealthsys.com, nikatasha@telus.net

Hi Hyla,

No problem as long as you send me a copy of the finished work

Cheers

Dr. Nikita Vizniak | Director

Professional Health Systems – www.prohealthsys.com

6436 Thorne Ave - Burnaby, BC, Canada - V3N 2V1

T. 604.521.5520 | F. 604.521.5526 | E. nik@prohealthsys.com

Visit our youtube channel prohealthsys

prohealth®
www.prohealthsys.com

From: Hyla Van Der Colff [mailto:vandercolffhyla@gmail.com]
Sent: April 26, 2016 2:52 AM
To: contact@prohealthsys.com; nikatasha@telus.net
Subject: Requesting permission

[Quoted text hidden]

Appendix O: Section D – Scoring patterns

		True		False		Do not know		Chi Square
		Count	Row N %	Count	Row N %	Count	Row N %	*p*-value
Fibromyalgia is a differential diagnosis for MFPS	D1	38	73.1 %	7	13.5 %	7	13.5 %	0.000
MFPS is defined as - Pain of muscular origin that originates in a painful site in muscle This site is characterized by the myofascial trigger points	D2	47	90.4 %	4	7.7%	1	1.9%	0.000
There is no pain referral beyond the myofascial trigger point area	D3	4	7.7%	48	92.3 %	0	0.0%	0.000
Nutritional problems are a perpetuating factor of myofascial trigger points	D4	23	44.2 %	27	51.9 %	2	3.8%	0.000
TMJ articular disc displacement is a non-dental cause of toothache	D5	39	75.0 %	12	23.1 %	1	1.9%	0.000
The upper fibres of the trapezius muscle can occasionally refer to the lower molar teeth	D6	27	51.9 %	22	42.3 %	3	5.8%	0.000
Myofascial trigger points are defined as - A hypersensitive point in skeletal muscle that is associated with a hypersensitive palpable nodule	D7	42	80.8 %	9	17.3 %	1	1.9%	0.000
Hypermobility syndrome is a differential diagnosis for MPFS	D8	19	36.5 %	26	50.0 %	7	13.5 %	0.005
Spinal mal-alignment is a perpetuating factor of myofascial trigger points	D9	30	57.7 %	13	25.0 %	9	17.3 %	0.001
Glaucoma is a non-dental cause of toothache	D10	17	32.7 %	31	59.6 %	4	7.7%	0.000
The masseter muscle refers pain to the upper and lower molar teeth, resulting in hypersensitivity	D11	33	63.5 %	18	34.6 %	1	1.9%	0.000
Reproducible, exquisite spot tenderness occurs in a muscle at the trigger point location	D12	42	80.8 %	6	11.5 %	4	7.7%	0.000
Heat is a relieving factor of myofascial trigger points	D13	46	88.5 %	3	5.8%	3	5.8%	0.000
Sinusitis is a dental cause of toothache	D14	43	82.7 %	9	17.3 %	0	0.0%	0.000
The sternocleidomastoid (SCM) muscle does not refer pain to oral structures	D15	14	26.9 %	34	65.4 %	4	7.7%	0.000
Emotional instability is a perpetuating factor of myofascial trigger points	D16	45	86.5 %	6	11.5 %	1	1.9%	0.000
Myofascial trigger points are not defined as - A faint soft	D17	29	55.8 %	18	34.6 %	5	9.6%	0.000

tissue calcification within muscles								
Myofascial trigger points are a non-dental cause of toothache	D18	41	78.8 %	3	5.8%	8	15.4 %	0.000
The temporalis muscle refers pain to the maxillary teeth, mostly the upper teeth	D19	39	75.0 %	10	19.2 %	3	5.8%	0.000
Osteomalacia (Vitamin D deficiency) is not a differential diagnosis for MFPS	D20	31	59.6 %	14	26.9 %	7	13.5 %	0.000
Bell's palsy and trigeminal neuralgia are a non-dental cause of toothache	D21	45	86.5 %	6	11.5 %	1	1.9%	0.000
Pain referral from the medial pterygoid occurs in the back of the throat	D22	31	59.6 %	16	30.8 %	5	9.6%	0.000
Polymyalgia rheumatica is not a differential diagnosis for MFPS	D23	21	40.4 %	24	46.2 %	7	13.5 %	0.009
Pain at rest is not a characteristic feature of active myofascial trigger points	D24	19	36.5 %	28	53.8 %	5	9.6%	0.000
Stretching is not a relieving factor of myofascial trigger points	D25	11	21.2 %	38	73.1 %	3	5.8%	0.000
MFPS is defined as - A syndrome that produces chronic body- wide pain, which migrates and can be felt from head to toe	D26	14	26.9 %	34	65.4 %	4	7.7%	0.000
Viscera-somatic pain syndromes should not be excluded as an differential diagnosis of MFPS	D27	38	73.1 %	7	13.5 %	7	13.5 %	0.000
Active myofascial trigger points can activate latent myofascial trigger points	D28	46	88.5 %	4	7.7%	2	3.8%	0.000
Heat is a perpetuating factor of myofascial trigger points	D29	6	11.5 %	43	82.7 %	3	5.8%	0.000