INSTITUTO UNIVERSITÁRIO EGAS MONIZ

MESTRADO INTEGRADO EM MEDICINA DENTÁRIA

TEMPOROMANDIBULAR DYSFUNCTION: DETECTION OF SIGNS AND SYMPTOMS IN PATIENTS OF THE EGAS MONIZ UNIVERSITY CLINIC

Trabalho submetido por
Lina Khan Domun
para a obtenção do grau de Mestre em Medicina Dentária

setembro de 2025

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To my parents, Nishaat and Ahmad,

Under the guidance and blessing of God, I am becoming a doctor

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RESUMO

Objetivo: Em doentes que ocorreram à Consulta de Triagem da Clínica Universitária Egas Moniz no ano 2023, avaliar a presença de sinais e sintomas associados às DTM. E a relação entre estes dados e os obtidos na Consulta de Oclusão.

Materiais e Métodos: Foram analisados os processos clínicos de 1425 doentes que recorreram à consulta de Triagem da Clínica Universitária Egas Moniz durante o ano 2023, com idade entre os 18 e os 45 anos. Foram recolhidos dados sobre o motivo da consulta, a presença de sinais e sintomas associados às DTM. Em seguida, recolhemos os dados da Consulta de Oclusão. Os dados recolhidos foram organizados e submetidos a tratamento estatístico.

Resultados: Foi identificada uma associação significativa entre a presença de sinais e sintomas de DTM e os fatores género, motivo da consulta e comparência na Consulta de Oclusão. No total, 32% dos doentes apresentaram pelo menos um sinal ou sintoma, sendo a maioria mulheres (68.8%). Entre os doentes sintomáticos, apenas 3% referiram dor na ATM como principal motivo da consulta. Os sinais mais frequentes foram o clique na ATM (24%), seguido da dor na ATM (10.7%), do bruxismo (5.9%) e de movimentos mandibulares limitados (5.5%). Apesar da deteção durante a Consulta de Triagem, apenas 13.5% destes doentes deram continuidade na Consulta de Oclusão para uma avaliação mais aprofundada.

Conclusão: Este estudo confirmou que a DTM é uma condição comum, particularmente entre as mulheres. No entanto, muitos doentes não recorrem a uma consulta especializada para um diagnóstico mais preciso de DTM e tratamento adequado, revelando uma lacuna entre a deteção e a gestão. Uma melhor educação dos doentes, uma comunicação mais clara e um sistema de referenciação padronizado são essenciais para garantir o tratamento atempado da DTM.

Palavras-chave: Disfunções temporomandibulares, DTM sinais, DTM sintomas, DTM deteção

ABSTRACT

Aim: In patients who attended the Triage Consultation in the Clinic of the Egas Moniz University Clinic in 2023, evaluate the presence of signs and symptoms associated with TMD. And the relationship between these data and those obtained in the Occlusion Consultation.

Materials and methods: The clinical records of 1425 patients who attended the Triage Consultation at the Egas Moniz University Clinic during 2023, aged between 18 and 45 years, were analysed. Data were collected regarding the reason for the consultation and the presence of signs and symptoms associated with TMD. Subsequently, information from the Occlusion Consultation was gathered. The collected data were organised and subjected to statistical analysis.

Results: A significant association was found between the presence of signs and symptoms and the factors gender, purpose of consultation, and attendance at the Occlusion Consultation. Almost one-third of the patients (32%) exhibited at least one sign or symptom of TMD, with women (68.8%) representing the majority of affected individuals. Among symptomatic patients, only 3% reported TMJ pain as their reason for consultation. The most frequent signs were TMJ click (24%), followed by TMJ pain (10.7%), bruxism (5.9%), and limited mandibular movements (5.5%). Despite detection during the Triage Consultation, only 13.5% of these 32% of patients proceeded to the Occlusion Consultation for further evaluation.

Conclusion: This study confirmed that TMD is a common condition, especially among women. However, many patients did not attend a specialised consultation for a more accurate TMD diagnosis and appropriate treatment, revealing a gap between detection and management. Better patient education, clearer communication, and a standardised referral system are essential to ensure the timely treatment of TMD.

Keywords: Temporomandibular disorders, TMD signs, TMD symptoms, TMD detection

RÉZIMÉ

Obzektif: Parmi banne pasians ki finne vine dan Konsiltasion Triyaz dans liniversité Egas Moniz dan 2023, noun évalié bann signs ek bann sintoms asosié avek TMD. Apré noun get relasion ant ca bann donés la avek ban donés dépi Konsiltasion Oklizion.

Materyel ek metod: Ban donés clinik anrezistrés lor 1425 pasians ant 18 ek 45 ans ki ti vin dan Konsiltasion Triage dan liniversité Egas Moniz dan 2023 fine analizé. Donés lor zot rezon pou konsilté ek lor prézans ban signs ek ban sintoms rélié ar TMD finne ramasé. Mem donés fin ramasé dan Konsiltatsion Oklizion. Tou ca bann donés la finne met en orde ek finne fer bann analiz statistik ar zot.

Rézilta: Fin trouve en asosiasion inportan ant prézans bann sign ek ban sintom ek bann fakter sex, kifer finn konsilté ek sipa fin ale dan Konsiltasion Oklizion. Preské en tier ban pasians (32%) ti ena omwin enn signs ek sintoms TMD, avek ban fam (68.8%) reprezant mazorité pasian afektés. Parmi ban pasians ki ena ban sintoms, selman 3% ti dire ki zot ena douler TMD kan zot finne vini. Bann sign pli frekan ti TMJ klik (24%) swivi par douler TMJ (10.7%), bruxism (5,9%) ek mouvman mandibiler limité (5.5%). Malgré deteksion pandan triyaz, zis 13.5% parmi sa 32% pasian-la finn al dan Konsiltasion Oklizion pou enn evaliasion pli profon.

Konklizyon: Sa letid-la finn konfirmé ki TMD se enn kondision komin, sirtou parmi bann fam. Sepandan, boukou pasian pa finn asisté enn konsiltasion spesializé pou enn diagnostik TMD pli presi ek enn tretman apropriyé, seki finn devwal enn gap ant deteksion ek zestyon. Enn meyer ledikasion pou bann pasian, enn kominikasion pli kler, ek enn sistem referans standarizé zot esansiel pou asir tretman TMD dan ler.

Mo-klés: Maladi tamporomandib, sign TMD, sintom TMD, deteksion TMD

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ABBREVIATIONS

AC – Articular capsule

AD – Articular disc

CBCT– Cone-beam computed tomography

CPOCs – Chronic overlapping pain conditions

CT– Computed tomography scan

DC/TMD – Diagnostic Criteria for Temporomandibular Disorders

EEG – Electroencephalography

IASP – International Association for the Study of Pain

IBS – Irritable bowel syndrome

MRI – Magnetic Resonance Imaging

M-TMD – Masticatory myalgia

NSAIDs – Nonsteroidal Anti-Inflammatory Drugs

NREM – Non-rapid eye movement

PTR – Pterygomandibular ligament or raphe

RDC/TMD – Research Diagnostic Criteria for Temporomandibular Disorders

REM – Rapid eye movement

SF – Synovial fluid

SM – Synovial membrane

SML – Sphenomandibular ligament

STML – Stylomandibular ligament

TENS – Transcutaneous electrical nerve stimulation

TMD – Temporomandibular dysfunctions or disorders

TMJ – Temporomandibular joint

TML – Temporomandibular ligament

I. INTRODUCTION

The stomatognathic system is a highly intricate network comprising diverse anatomic structures that play a crucial role in the neurosensory function.
According to the American Academy of Orofacial Pain, "the stomatognathic system is the functional and anatomic relationship among the teeth, jaws, TMJs, and muscles of mastication" (Tuncer, 2020).
It permits essential functions such as chewing, swallowing, speech, yawning, and breathing (Tuncer, 2020). Any restrictions on these activities can adversely affect the health, ultimately impacting an individual's quality of life (Díaz-Quevedo et al., 2021).
Among the most frequent conditions affecting this system is Temporomandibular Dysfunction (TMD), which represents a group of psychophysiological disorders (Fonseca et al., 2023). Although not life-threatening, it can affect the health and day-to-day life, with symptoms that may be chronic and difficult to manage (Yin et al., 2020).

Despite the clinical significance of temporomandibular disorders, TMDs are often under-recognised or insufficiently assessed in general dental practice, particularly at the undergraduate level. Therefore, it is important that dental students apply their theoretical knowledge of TMDs in clinical practice to accurately identify their signs and symptoms (Xiong et al., 2023).

Before determining when a condition qualifies as a clinical disorder, it is essential to establish a clear terminological foundation for key terms to ensure a common understanding of the concepts discussed.
Biomedical vocabulary standards for disease concepts vary considerably; therefore, we will use a set of definitions developed for ontology (Scheuermann et al., 2009):

- Disorder: A causally relatively isolated combination of physical components that is clinically abnormal and not readily reducible to some other entity.
- Pathological process: A bodily process that is a manifestation of a disorder.
- Disease: A disposition to undergo pathological processes that exists in an organism because of one or more disorders in that organism.
- Sign: A bodily feature of a patient that is observed in a physical examination and is deemed by the clinician to be of clinical significance.

- Symptom: a bodily feature of a patient that is observed by the patient and is hypothesised by the patient to be a realisation of a disease.

1. Temporomandibular joint

1.1 Definition

The Temporomandibular joint (TMJ) or craniomandibular articulation promotes the articulation of the upper and lower jaws (Abbass et al., 2024).

A widely accepted definition of a joint is that it is the connection of two or more bony or cartilaginous elements; even though the term is sometimes used broadly, such as the point where two or more parts join (Manfredini, 2010).

Joints are classified into three groups: fibrous joints, where the joint surfaces are connected by fibrous tissue; cartilaginous joints, where the surfaces are connected by cartilage; and synovial joints or diarthroses, which allow the greatest range of motion.

Synovial joints usually consist of two joint surfaces of bone or cartilage, a capsule, and a synovial membrane. Synovial joints can be further classified into different categories based on their degree of mobility. Those that allow uniaxial movement include the trochoid and trochlear joints. Those that allow movement in two axes are called reciprocal joints, and those that allow movement in three axes are known as condylar and spheroidal joints. Articulations between flat surfaces are referred to as flat or arthrodial joints; their movements are minimal and involve the sliding of one surface over the other (Manfredini, 2010).

This joint (TMJ) is one of the most captivating and intricate synovial structures of the body. TMJ shares common characteristics with all synovial joints: a disc, bone, a fibrous capsule, a synovial membrane, fluid, and ligament (Alomar et al., 2007; Shetty et al., 2014).

Interestingly, TMJ is the only ginglymoarthrodial joint of the human body. This term originates from ‘’ginglymus’’ which refers to a hinge joint, and ‘’arthrodia’’ which refers to a joint that allows sliding movements (Shetty et al., 2014). This indicates the presence of both rotational and translational motions (Naylor, 1962). Effectively, a hinge joint allows movement only in a single plane, specifically forward and backward, whereas an arthrodial joint enables gliding motions between articular surfaces (Helland, 1980; Joshua & Bouloux, 2018).

The TMJ presents a higher risk of dislocation compared to other joints. The diagnosis of acute temporomandibular joint dislocation is typically straightforward, as it is commonly associated with intense pain, an inability to achieve full jaw closure, and a noticeable occlusal discrepancy (Joshua & Bouloux, 2018).

TMJ operates in synergy with intra-articular discs, mandibular muscles, and occlusion, forming the articulatory system (Wilkie & Al-Ani, 2022).

As previously stated, the TMJ has diverse functions that are essential to human life, including chewing, sucking, swallowing, breathing, and phonating. It also allows for the opening and closing of the mouth, as well as the protrusion, retrusion, and lateralisation of the jaw. Therefore, it enables articulating different facial expressions through facial musculature (Bordoni & Varacallo, 2023).

1.2 Anatomy

The Temporomandibular joint (TMJ) is located in the middle section of the skull, beneath the posterior portion of the zygomatic arch, in front of the external acoustic meatus, and connects the mandible to the cranium (Helland, 1980).

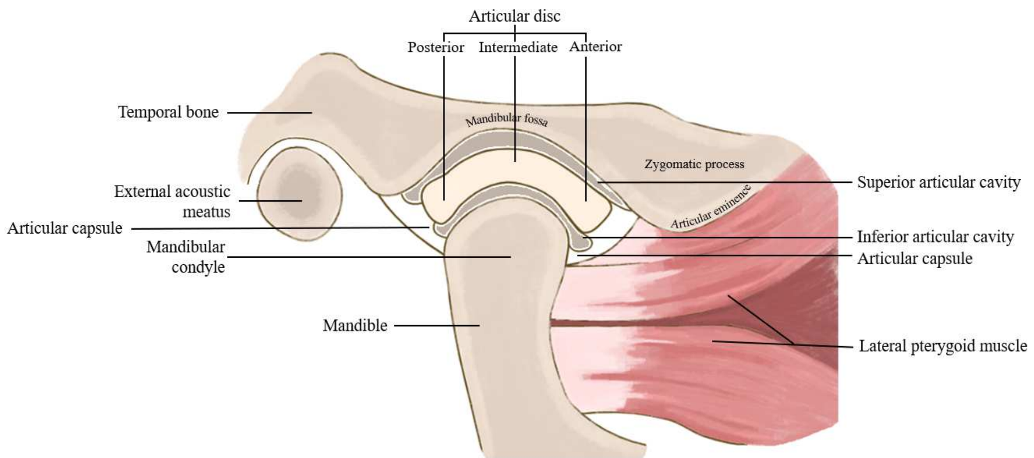

Figure 1 - Anatomical illustration of the temporomandibular joint: bones, disc, capsule and muscle

It is formed by the condylar process of the mandibular bone, which includes the mandibular condyle, the mandibular fossa, and the articular eminence, both belonging to the temporal bone, as well as the articular disc and a joint capsule, as illustrated in Figure 1 (Siéssere et al., 2008).

Two temporomandibular joints can be observed on the coronal plane. One is located on the right side and the other one on the left side of the face. Both are united thanks to the mandibular bone. As a result, the two joints operate as a unit in such a way that the movements of one joint influence the other (Iturriaga et al., 2023).

Mandibular condyle & fossa

The mandible is the largest and toughest facial bone, as illustrated in Figure 2, with two distinct protuberances: the condyloid process, also called the condylar process, which is the head of the condyle at the back, and the coronoid process at the front of the mandible (Helland, 1980).

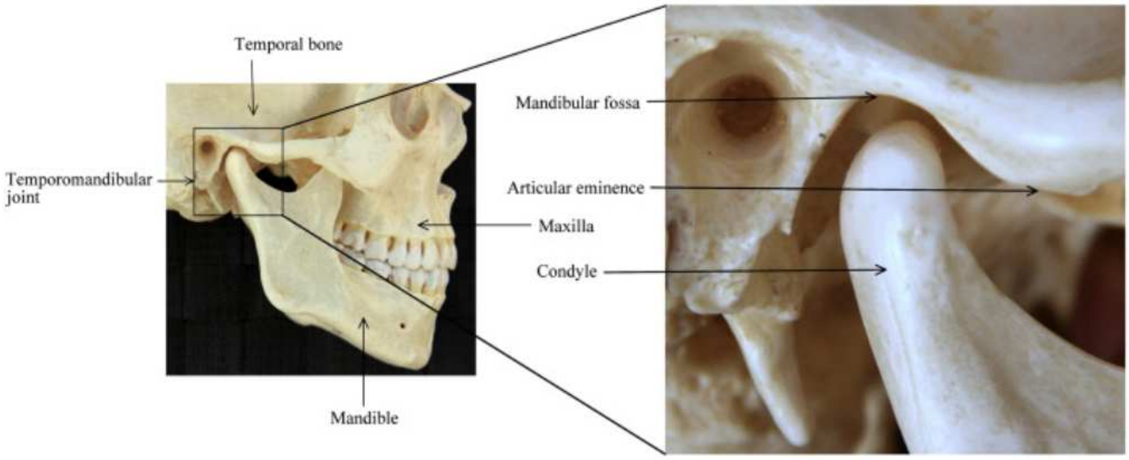

Figure 2 - Skeletal components of the temporomandibular joint. Reprinted from Pandarakalam & Khalaf, (2014)

The condyle is generally convex, possessing short projections known as medial and lateral poles, as shown in Figure 3 (Tuncer, 2020). The lateral pole is rough, with a blunt tip, and connects to the lateral collateral ligament and the lateral ligament, formerly called the temporomandibular ligament. However, the medial pole is smooth and rounded, and it is where the medial collateral ligament attaches. In adults, the condyle can measure approximately 15 to 20 mm in width and 8 to 10 mm in depth (Alomar et al., 2007; Helland, 1980).

At the junction of the condyle and the condylar neck lies the pterygoid fovea, a slight depression on the anterior surface that functions as a site of insertion for the superior head of the lateral pterygoid muscle, while the medial pterygoid muscle originates from it (Bordoni & Varacallo, 2023).

Figure 3 - Anterior view of the mandibular condyle, in which LP is the lateral pole; MP is the medial pole, PF is the pterygoid fovea. Reprinted from Mallya & Lam, (2018)

The mandibular fossa, also known as the glenoid fossa, as displayed in Figure 2, is a concavity located within the temporal bone that functions as a socket for the mandibular condyle (Tuncer, 2020). Its base is composed of a thin cortical layer, which appears transparent when illuminated (Hylander, 2006).

For context, the temporal bone comprises four parts: the largest is the squamous part, followed by the petromastoid, then the styloid process, and finally the tympanic part, which is the smallest. Different regions of the temporal bone shape the mandibular fossa. Anteriorly, it is formed by the articular eminence of the squamous temporal bone, while posteriorly, it is bounded by the tympanic plate, which also forms the anterior wall of the external acoustic meatus of the zygomatic portion of the temporal bone. Additionally, the postglenoid process helps form the upper wall of the external acoustic meatus (Bordoni & Varacallo, 2023; Hylander, 2006).

The articular eminence is a transverse bone that forms the posterior root of the zygomatic arch and the anterior wall of the mandibular fossa, providing a broad articular surface.
Lateral to it, the articular tubercle is a small, non-articular projection that serves as the attachment point for the temporomandibular ligament (TML) (Bordoni & Varacallo, 2023; Hylander, 2006).
Several fissures divide different sections of the temporal bone and extend across the mandibular fossa. Posteriorly and laterally to the fossa, the tympanosquamous fissure divides the tympanic portion from the squamous portion of the temporal bone. It also distinguishes the articular from the non-articular area of the glenoid fossa (Hylander, 2006; Iturriaga et al., 2023).
Medially, the tegmen tympani or the tegmental wall of the tympanic cavity of the petrous part of the temporal bone divides this fissure into two: the petrosquamous fissure anteriorly, and the petrotympanic fissure or Glaserian fissure posteriorly, through which the chorda tympani nerve passes (Alomar et al., 2007; Hylander, 2006).

Unlike most synovial joints, where the articular surfaces are surrounded by hyaline cartilage, the articular surface composing the TMJ: the condyle of the mandible, the mandibular fossa, and also the articular eminence, is instead covered by a dense, avascular membrane of fibrous cartilage (superficial fibrous layer) (Tanaka & Koolstra, 2008; Hylander, 2006).
These functional surfaces have thicknesses of approximately 1.5 to 2mm in the mandibular condyle and 0,5 to 1mm in the mandibular fossa and articular eminence (Iturriaga et al., 2023). Fibrocartilage contains dense collagen fibres, primarily type I and III, and is associated with cartilaginous tissue. It enhances the TMJ's ability to withstand friction during joint movements and improves its repair capacity in adaptive conditions (Iturriaga et al., 2023).

The occurrence of this type of tissue is tied to the evolutionary development of this joint, as evidenced by its early ontogeny.
A standard synovial joint is composed of bones that are initially formed in cartilage, specifically hyaline cartilage, and then calcified and replaced by bone during ontogeny.
In contrast, the bones of the TMJ are dermal or membrane bones; during their development, they are surrounded by periosteum. This lining gradually evolves into the

dense, fibrous articular tissues of the TMJ during the early phase of its development (Hylander, 2006).

Articular disc and capsule

The articular disc (AD) is a biconcave and elliptical structure composed of dense fibrous connective tissue, containing a range of fibrocartilage (Hylander, 2006; Runci Anastasi et al., 2020). Its distinctive shape enables a smooth articulation between the mandibular condyle, the articular eminence, and the mandibular fossa. Its structural configuration increases the contact interface between opposing articular surfaces, thereby promoting a more even distribution of mechanical loads across the joint (Runci Anastasi et al., 2020).

The disc consists of three parts: the anterior band, the intermediate portion, and the posterior band, as illustrated in Figure 1 (Tuncer, 2020).

The thinnest part of the disc, the intermediate portion, is attached to the anterior wall of the mandibular fossa and the anterosuperior surface of the condyle, which contributes to its flexibility, promoting efficient articulation (Iturriaga et al., 2023; Tuncer, 2020).

The anterior band connects to the front part of the mandibular fossa, the articular tubercle, and the front area of the mandible condyle, while the posterior band connects to the highest point of the mandibular fossa and the top of the mandible condyle (Iturriaga et al., 2023).

The anterior and posterior bands of the disc are vascularized and innervated, whereas the intermediate portion is both avascular and aneural. Consequently, the intermediate portion relies on the diffusion of nutrients from the synovial fluid to meet its metabolic demands.
Due to the firmness of the anterior and posterior bands, the structural integrity, the ability to withstand intended loads, and the ability to perform its function without collapsing are ensured (Iturriaga et al., 2023).

During lateral, protrusion, and opening movements, the disc shifts its position to place the intermediate portion between the mandibular fossa, articular eminence, and mandibular condyle, moving along with the condyle (Alomar et al., 2007; Iturriaga et al., 2023).

As previously stated, TMJ is classified as a synovial joint, which is characterised by the presence of an articular cavity that is divided into two cavities, superior and inferior, by the articular disc (AD) (Hylander, 2006).
Gliding or translatory movements mainly occur in the superior cavity, while hinge or rotary movements happen in the lower cavity. Therefore, the TMJ is often described as a hinge joint with a movable socket. (Alomar et al., 2007; Hylander, 2006).

The anterior and posterior articular capsules (AC) delimit this cavity. Superiorly, the capsule attaches to the squamous portion of the temporal bone along the outer limits of the articular surface of the eminence, the fossa, and the preglenoid plane. While posteriorly it arises from the postglenoid process, the posterior articular lip, and the tympanosquamosal fissure (Tuncer, 2020).

The joint capsule is a thin, fibroelastic structure composed of connective tissue that is highly vascularised and richly innervated. The AC has a delicate membrane lining its interior, known as the synovium of the synovial membrane (SM), which is responsible for secreting synovial fluid (SF). This fluid plays a vital role in the nutrition, lubrication, and overall health of the joint (Iturriaga et al., 2023).
Laterally, the capsule is reinforced by the temporomandibular ligament (TML), and together these structures function to stabilise the joint and limit the movements of the mandible (Barlattani Jr et al., 2019; Tuncer, 2020).

Ligaments

The TMJ is maintained by several anatomical structures, particularly the ligaments, as shown in Figure 4, which are connective tissues composed of fibroblasts, collagen, and elastic fibres that support joint stability and regulate its movement within physiological limits. They also play a crucial role in joint proprioception by contributing to the conscious perception of skeletal position (Cuccia et al., 2011; Runci Anastasi et al., 2020).

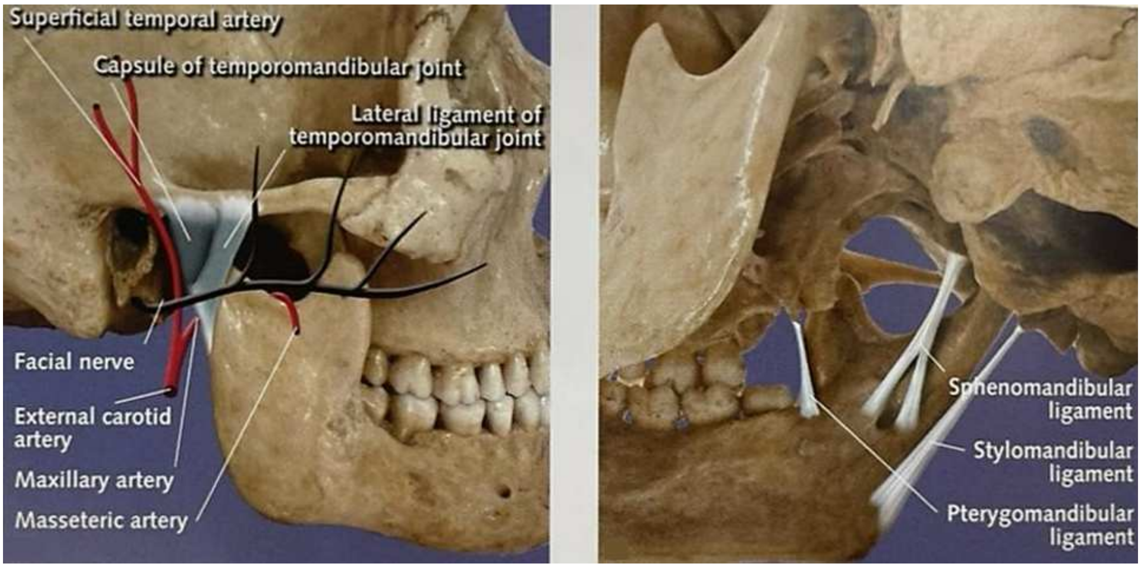

Figure 4 - Lateral ligament, extrinsic joint ligaments and their relations. Reprinted from Manfredini, (2010)

Lateral ligament (TML)

The lateral ligament, more commonly known as the temporomandibular ligament (TML), and the medial ligament are part of the intrinsic ligament of the TMJ.

They extend between the zygomatic arch of the temporal bone and the neck of the mandibular condyle, and they adhere to the medial and lateral borders of the articular disc. While the TML is thick and has an outer oblique portion and an inner horizontal portion, the medial ligament is thin (Helland, 1980; Tuncer, 2020).

Other ligaments, known as accessory or extrinsic ligaments, have no direct connection to the TMJ itself, but they play a role in restricting mandibular movements (Manfredini, 2010).

Stylomandibular Ligament (STML)

The STML is a localised concentration of deep cervical fascia, originating from the apex of the styloid process, and it is inserted medially onto the mandible's angle and posterior border at an inclination of approximately 30 degrees. It measures on average 40 mm to 45 mm in length. The STML relaxes when the jaws are closed and loosens even more during the mouth opening. This can be explained by the fact that the angle of the mandible swings up and back while the condyle slides down and forward, which reduces tension on the ligament. It becomes tense during extreme protrusive movements (Alomar et al., 2007; Cuccia et al., 2011).

The STML has an essential role, becoming taut when the SML loses control of the condyle. It is the only stabiliser during extreme, protrusive movements such as the maximum, forceful hinge of the jaw (Cuccia et al., 2011).

Sphenomandibular Ligament (SML)

The SML usually emerges from the spine of the sphenoid bone and inserts into the petrotympanic fissure and extends to the anterior process of the malleus. In only about one-third of the individuals, the ligament originates exclusively from the spine of the sphenoid bone.

Then, runs downward and outward to insert on the lingula of the mandible at an approximately 50 degree angle of inclination (Cuccia et al., 2011).

This ligament remains passive during mandibular motions, maintaining a consistent level of tension throughout both the opening and closing phases (Alomar et al., 2007; Manfredini, 2010).

Pterygomandibular Ligament (PTR)

The pterygomandibular ligament, also known as the pterygomandibular raphe (PTR), or buccopharyngeal raphe, forms part of the buccopharyngeal fascia. It extends from the apex of the hamulus of the medial pterygoid plate of the skull to the posterior boundary of the retromolar trigone of the mandible, forming an average inclination angle of 70 degrees relative to the mandible (Cuccia et al., 2011; Manfredini, 2010).

Muscles

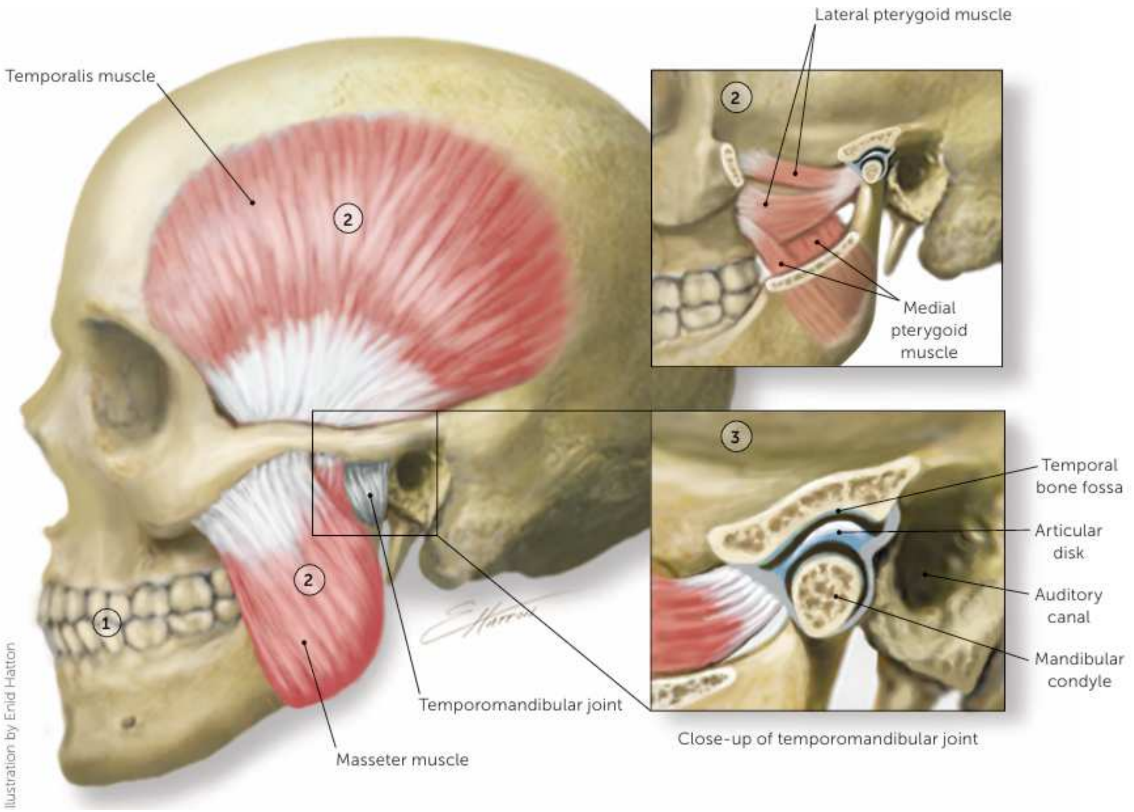

Figure 5 - Anatomical illustration of the lateral view of the temporomandibular joint and masticatory muscle. Reprinted from Matheson et al., (2023)

Like other joints, the TMJ cannot move on its own; it requires the action of surrounding muscles. These masticatory muscles, one of the principal muscle groups of the head, include the masseter, temporalis, medial pterygoid, and lateral pterygoid, as illustrated in Figure 5. They work in a precisely coordinated sequence of contraction and relaxation, enabling mandibular motions such as elevation, depression, protrusion, retrusion, lateral movements, and helping to maintain stability (Iturriaga et al., 2023).

Originating on the cranium and inserting onto the mandible, and in some cases the articular disc of the TMJ, these muscles are functionally divided into adductors, which close the jaw, and abductors, which open the jaw (Alomar et al., 2007).

The temporalis, masseter, and medial pterygoid muscles function as primary adductors, generating the force needed for mandibular elevation during occlusion, while the lateral pterygoid muscles act as the primary abductors, initiating mandibular depression and aiding in opening (Alomar et al., 2007).

The **masseter** muscle is the most superficial and easily palpable of the masticatory muscles. Rectangular, it consists of two parts: a superficial fascicle, with fibres descending in a slightly oblique direction toward the back, and a deep fascicle, made up of vertical fibres. It originates from the zygomatic arch, with several layers, and inserts on the lateral surface of the mandible as well as the lateral surface of the coronoid process. Its innervation comes from the masseteric branch of the trigeminal nerve. When contracted, the masseter exerts a strong upward force on the mandible, closing the teeth together. Because of the way its fibres are arranged, the superficial fascicle also helps in moving the mandible forward during protrusion (Alomar et al., 2007; Iturriaga et al., 2023).

The **temporalis** is a flat, fan-shaped muscle with anterior fibres oriented vertically, middle fibres obliquely, and posterior fibres horizontally. It originates from the temporal fossa and the deep surface of the temporal fascia and converges inferiorly to form a tendon that passes beneath the zygomatic arch. This tendon inserts into the coronoid process, the anterior border of the mandibular ramus, and the medial and lateral borders of the retromolar fossa. Functionally, the anterior and middle fibres elevate the mandible, while the posterior fibres produce retrusion. During mandibular closure, the temporalis acts as an essential stabiliser. It is innervated by the third branch of the trigeminal nerve, specifically the deep temporal nerves (Alomar et al., 2007; Iturriaga et al., 2023).

The **lateral**, or **external pterygoid**, lies within the infratemporal fossa and has two heads. The upper head originates from the extracranial surface of the greater wing of the sphenoid bone and inserts on the anteromedial aspect of the temporomandibular joint capsule, the articular disc, and the neck of the mandibular condyle (Alomar et al., 2007; Bordoni & Varacallo, 2023).

The inferior head originates on the outer face of the external wing of the pterygoid process of the sphenoid bone and inserts into the pterygoid fovea (Bordoni & Varacallo, 2023).

Bilateral contraction of the inferior head moves the mandibular condyles forward and downward over the articular eminences, producing mandibular protrusion. When assisted by the mandibular depressor muscles, this action initiates mouth opening. Unilateral contraction shifts the mandible laterally toward the opposite side. The superior head remains mostly inactive during opening and becomes engaged during closure in coordination with the elevator muscles (Iturriaga et al., 2023).

The **medial**, or **internal pterygoid**, is a thick, rectangular muscle parallel to the masseter muscle but located on the inner surface of the mandible. It originates from the pterygoid fossa of the sphenoid bone. It runs obliquely downwards, posteriorly, and laterally, inserting into the inner side of the medial face of the angle and of the mandibular branch. Like the external pterygoid, the internal pterygoid is innervated by the mandibular branch of the trigeminal nerve. It works with the masseter muscle for elevation and protrusion of the mandible, and during lateral movements, unilateral contraction produces mediotrusion movement, drawing the mandibular condyle towards the midline of the face during jaw movement (Bordoni & Varacallo, 2023; Iturriaga et al., 2023).

The vascular supply comes from branches of the external carotid artery, including the superficial temporal, deep auricular, anterior tympanic, ascending pharyngeal, and maxillary arteries. Innervation arises from the mandibular branch of the trigeminal nerve through the auriculotemporal, deep temporal, and masseteric nerves (Zagalo et al., 2010).

2. Temporomandibular dysfunctions (TMDs)

2.1 Definition

Temporomandibular dysfunctions (TMDs) are among the most common orofacial pain conditions of non-dental origin and are frequently observed within the general population (Yang et al., 2017; Zieliński et al., 2024). They are defined as a group of clinical conditions that affect the TMJ and associated myofascial muscles, with symptoms that may extend to adjacent structures, including the teeth, ears, neck, head, and back muscles (Yang et al., 2017).

TMD is typically characterised by clinical signs such as TMJ and/or muscle pain, joint noises, and restriction, deviation, or deflection of the mouth opening path. These disorders affect both the hard and soft tissues of the orofacial region and can vary widely in severity. Chronic pain is the primary reason patients with TMD seek clinical treatment (List & Jensen, 2017). Moreover, TMD can be associated with impaired general health, depression, and other psychological conditions, and can significantly impact the patient's quality of life (List & Jensen, 2017).

2.2 Epidemiology

Recent epidemiological studies have shown considerable variability in the reported prevalence of TMD signs and symptoms in the general population.
According to Dimitroulis (2017), an estimated 60-70% of individuals present at least one clinical indicator of TMD. The guidelines of the American Academy of Orofacial Pain estimate 40% to 75% of the population displays at least one sign of the disease (Cuccia et al., 2011).

However, despite the high prevalence of clinical signs, only about 25% of individuals perceive or report related symptoms, and just 5% of those exhibiting one or more signs seek treatment (Dimitroulis, 2018). Other studies estimate that approximately 30% of the population will experience both signs and symptoms of TMD at some point in their lives, although only about 1/3 of these individuals will require clinical treatment (Fonseca et al., 2023; Garstka et al., 2023).

Gender differences are consistently reported in the literature. TMDs are 1.5 to 2 times more prevalent in women than in men (Cuccia et al., 2011), and among patients who seek care, women outnumber men by at least 4 to 1 (Dimitroulis, 2018).
This female predominance is thought to reflect the influence of hormonal changes, along with greater susceptibility to psychosocial factors (Garstka et al., 2023).

Unlike other joint disorders that also show female predilection but tend to appear postmenopausally, TMD is most common among women between 18 and 45 years old.

Its onset usually occurs after puberty and peaks during their reproductive years, particularly between the ages of 20 and 40 years (Qin et al., 2024).
It is less common among children, adolescents, and the elderly, with symptom intensity generally decreasing with age (Qin et al., 2024).

2.3 Aetiology

TMD represents a modern societal issue that may worsen due to the fast-paced lifestyle, constant stress, and improper use of the masticatory system (Garstka et al., 2023).

TMD aetiology is complex and multifactorial. Because this structure involves overlapping symptoms, diagnosis and treatment often require input from neurologists, otolaryngologists, surgeons, and dentists to help differentiate the disorders affecting this area (Garstka et al., 2023).

Numerous factors can contribute to TMDs. Although most of these factors are not proven to be causal, they are associated with TMDs. These factors are classified as follows:
Factors that may cause the onset of TMDs are referred to as initiating or precipitating factors. For example, participation in some sports or traumatic incidents.
Factors that increase the risk of TMDs are referred to as predisposing factors.
Factors that interfere with healing or enhance the progression of TMDs are called perpetuating or maintaining factors (Ângelo et al., 2023).

Throughout a patient's lifetime, certain factors can disrupt normal function, leading to dysfunction of the masticatory structures. These factors are called etiologic factors. The successful management of TMD relies on identifying and controlling them (Chisnoiu et al., 2015).

There are five major etiologic factors associated with TMD: occlusal factors, trauma, emotional stress, deep pain input, and parafunctional activities (Okeson, 2019).

A. Occlusal factors

When considering the dynamic functional relationship between the mandible and the cranium, it appears that the occlusal condition can influence TMDs through two main mechanisms. The first one involves acute changes in the occlusal condition, which may trigger a protective muscle co-contraction response leading to muscle pain. In most cases, however, patients adapt through new muscle patterns with little consequence. The second one occurs when significant orthopaedic instability is present, particularly under heavy loading forces. In general, problems in bringing the teeth into occlusion are managed by the muscles, whereas problems that arise once the teeth are in contact place stress on the joints. When either of these two conditions is present, dental therapy may be indicated; in their absence, treatment is usually not required (Okeson, 2019).

B. Trauma

Trauma to the facial structures can lead to functional disturbances in the masticatory system. Trauma is divided into (Chisnoiu et al., 2015; Okeson, 2019):

- Microtrauma: a low-level force that is repeatedly applied over a long period, commonly due to habits like clenching or bruxism, that can lead to cumulative tissue damage.
- Macrotrauma: a sudden, forceful impact such as a blow to the face, which can result in structural alterations.

C. Emotional stress

Elevated stress levels can significantly affect masticatory function. Often, these patients exhibit increased tonicity of head and neck muscles, along with greater levels of nonfunctional muscle activity such as bruxism and tooth clenching (Chisnoiu et al., 2015).

D. Deep pain input

Deep pain can alter normal muscle function by centrally exciting the brainstem, leading to a protective muscle response known as co-contraction. This is a natural defence mechanism where the body limits movement to respond to injury or threat. As a result, a patient who is experiencing pain, such as a toothache, may exhibit restricted mouth opening (Okeson, 2019).

This protective response can also be triggered by sinus pain, as well as ear pain, and even by pain originating outside the facial region, such as the cervical spine. Unfortunately, this mechanism is often overlooked. Dentists may misinterpret these phenomena as TMD and begin treating the patient. only after unsuccessful treatment is the true source recognised. A clear understanding of this response is essential to effective treatment and emphasises the importance of making the correct diagnosis (Okeson, 2019).

E. Parafunctional Activities

Masticatory muscle activity can be classified as either functional, including chewing, speaking, and swallowing or parafunctional, which refers to nonfunctional behaviours such as clenching, grinding, and other oral habits (Okeson, 2019).

An important concept related to parafunctional activity is muscle hyperactivity, which refers to any muscular activity that exceeds what is necessary for normal function (Okeson, 2019).

Some muscle hyperactivity may not even involve tooth contact or jaw movement but merely represents an increase in static tonic contraction of the muscle. Some of these activities may be associated with TMD symptoms (Chisnoiu et al., 2015).

Parafunctional activities are classified based on the time of occurrence: diurnal, which occurs throughout the day, and nocturnal, which occurs at nighttime (Abe et al., 2022).

Diurnal activity

Daytime parafunctional activities include clenching and grinding, as well as many unconscious oral habits, such as cheek and tongue biting, finger and thumb sucking, and unusual postural habits. Additionally, these activities may involve occupation-related behaviours, including biting on pencils, nails, or holding objects under the chin.

During daily activities, it is common for individuals to place their teeth together and apply force. The masseter muscle contracts periodically in ways that are unrelated to the actual task being performed. This irrelevant activity often occurs during routine activities such as reading, driving or even lifting heavy objects (Abe et al., 2022).

Nocturnal Activity

During sleep, activity is typically present as isolated episodes of clenching or rhythmic contractions known as bruxing.
It’s unclear whether these activities result from different etiologic factors or are the same phenomenon in different forms.
Since they often occur together and are hard to distinguish, both are commonly referred to as bruxing events (Giovanni & Giorgia, 2021).

Understanding nocturnal bruxism involves some knowledge of the sleep cycle, which is studied through polysomnography, by monitoring the brain activity through electroencephalography (EEG) during sleep (Giovanni & Giorgia, 2021).
Sleep consists of two main phases (Okeson, 2019):

- Non-rapid eye movement (NREM) sleep, which includes four stages ranging from light to deep sleep.
- Rapid eye movement (REM) sleep, characterised by muscle twitches, changes in heart and breathing rates, and rapid eye movement. This is the stage when dreaming and bruxism events usually occur.

Clinically, it’s important to recognise that most parafunctional activities occur at a subconscious level. As a result, self-reporting is often unreliable. For example, sleep studies consistently show a weak correlation between what patients believe they do at night and what is observed in a sleep lab. Diurnal activities may also go unnoticed by the patient; however, once made aware by the clinician, many can begin to identify and reduce these habits (Okeson, 2019).

It is important to understand that not every factor affects every patient in the same way, and sometimes, it is difficult to identify which specific factor is responsible for a patient’s symptoms. Many of them may have some of these factors without ever developing TMD.

This highlights the role of another key variable: the patient's adaptability. Indeed, all patients aren't biologically the same. Every individual has a unique system for tolerating irregular conditions. The human musculoskeletal system is remarkably adaptable and often compensates for these variations without exhibiting any signs of dysfunction or pathology (Okeson, 2019).

While many etiological factors are environmental or behavioural, there is a speculation that only certain biologically vulnerable individuals develop pain and dysfunction after an exacerbating event, such as psychological trauma or malocclusion. This suggests that maybe there is an underlying genetic predisposition that we haven't uncovered yet (Dimitroulis, 2018).

2.4 Signs and symptoms

Temporomandibular disorders (TMDs) are associated with a wide range of clinical signs and symptoms that can vary significantly between individuals.

The most common ones are summarised in Figure 6 (Fonseca et al.,2023):

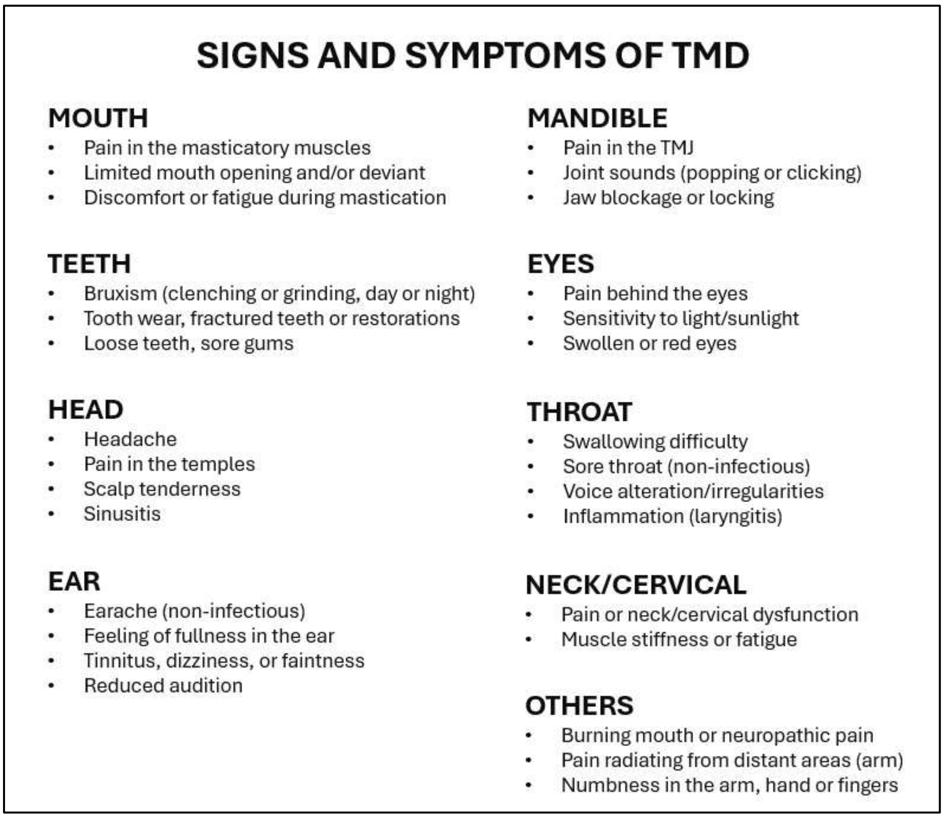

Figure 6 - Signs and symptoms of TMD. Adapted from Fonseca et al., (2023)

Although pain is the most reported symptom, TMD is not always painful. When present, the pain is typically described as persistent, nagging, or intermittent and often localised in the masticatory muscles, the TMJ, or surrounding areas (Fonseca et al., 2023).

Many patients may misinterpret TMD-related pain as a headache, dental pain, or ear-related conditions, such as otitis (Fonseca et al., 2023; Garstka et al., 2023).
In addition to pain, other common clinical signs include joint sounds during mandibular movements, restricted mandibular mobility, difficulty in mouth opening, and parafunctional habits, both occlusal and non-occlusal. A diagnosis of masticatory dysfunction may be considered when a patient presents with at least three of these features (Garstka et al., 2023).

A frequently reported issue among TMD patients is bruxism. Nocturnal bruxism affects approximately 8% of the population, while awake bruxism has a higher estimated prevalence of 20%. Currently, bruxism is classified as a disorder, but rather as a physiological stress-coping mechanism (Ângelo et al., 2023; Garstka et al., 2023).

2.5 Diagnosis

To manage masticatory disorders effectively, it’s essential to understand the numerous types of problems that can exist and their various causes.
Diagnosis involves grouping these disorders based on common symptoms and aetiologies. Each diagnosis requires its specific treatment, as there is no universal or unique appropriate treatment for all TMDs (Okeson, 2019).

Therefore, making an accurate diagnosis is essential. In many instances, the success of the therapy depends not on how well the treatment is performed but rather on how appropriate the therapy is. In other words, proper diagnosis is the key to successful treatment (Gale, 2022; Okeson, 2019).

The main temporomandibular disorders are listed in Figure 7 below (Dimitroulis, 2018):

TYPES OF TEMPOROMANDIBULAR DISORDERS

1. MYOFASCIAL PAIN AND DYSFUNCTION

a. Myositis
b. Fibromyalgia
c. Neuropathic pain
d. Chronic pain syndrome

2. TMJ FUNCTIONAL DERANGEMENT

a. Internal derangement – disc displacement
b. Hypermobility disorders – dislocation
c. Hypomobility disorders – ankylosis, posttraumatic

3. TMJ DEGENERATIVE / INFLAMMATORY JOINT DISEASE

a. Osteoarthrosis/ arthritis
b. Rheumatoid arthritis
c. Psoriatic arthritis
d. Juvenile arthritis

Figure 7 - Types of temporomandibular disorders. Adapted from Dimitroulis, (2018)

Among these categories, myofascial pain and dysfunction is by far the most prevalent. This muscle disorder is caused by oral parafunctional habits such as clenching or bruxism. It is sometimes associated with psychogenic disorders such as headaches, fibromyalgia, chronic back pain, and irritable bowel syndrome. Stress, anxiety, and depression are often key contributing factors (Abouelhuda et al., 2017; Dimitroulis, 2018).

Internal derangement, as shown in Figure 7, refers to an abnormal positioning of the articular disc, leading to mechanical interference such as clicking and limitation of the mandibular activity, including restricted mouth opening or, in some cases, hypermobility resulting in jaw dislocation (Dimitroulis, 2018; Mehndiratta et al., 2019a).

Osteoarthrosis is a localised degenerative joint condition that mainly targets the articular cartilage of the mandibular condyle in the temporomandibular joint. It most commonly affects older individuals, but can sometimes occur in younger individuals (Dimitroulis, 2018).

Accurate diagnosis requires a thorough clinical evaluation, and an experienced dentist is key in distinguishing TMD from other orofacial conditions. During the clinical

evaluation, the clinician should take a detailed medical and dental history, focusing on the pain's location, onset, characteristics, aggravating and relieving factors, previous treatments, and any history of other pain disorders (Maini & Dua, 2023)
Modern diagnostic protocols, such as the DC/TMD, support this process by combining physical exams with standardised self-report questionnaires (Garstka et al., 2023).

The RDC/TMD employed a dual-axis diagnostic system: Axis I, to yield clinical diagnoses focused on clinical history and physical examination, and Axis II, focused on pain parameters, mandibular jaw function, psychological status, and the level of psychosocial function (Dworkin, 2010).

In disorders where pain is a primary symptom, identifying its source is critical.
As previously noted, differential diagnosis is crucial, as other disorders such as dental pain, disorders of the ears, nose, and sinuses, neuralgias, headaches, and diseases of the major salivary glands all may mimic symptoms of TMD pain (Dimitroulis, 2018; Maini & Dua, 2023).

In cases where the pain perceived is primary, the site and source of pain coincide, making diagnosis simpler and more straightforward. Indeed, the patient will be pointing directly to the source of pain. In contrast, for a heterotopic pain, also known as referred pain, the patient will be pointing towards the site of the pain, a site distant from the source, making accurate identification more challenging (Okeson, 2019).
Pain localised explicitly to the pre-auricular area is a strong indicator of TMD (Dimitroulis, 2018). It is important to remember that the treatment is effective only if it is directed at the source, not at the site of pain. One key in locating the source of the pain is that local provocation, such as palpation, should accentuate it (Okeson, 2019).

Certain signs can help guide the diagnosis. Pain triggered by mandibular movements, headaches, and referred pain often indicates a muscular origin. Tenderness on palpation of the TMJ and the presence of joint sounds are more suggestive of intra-articular involvement. A thorough examination should include inspection of the cavity, otoscopic assessment of the inner ear, and evaluation of the neck musculature (Maini & Dua, 2023).
Additional diagnostic tools can enhance the evaluation of TMJ. For instance, a stethoscope may help in the detection of joint sounds. Several imaging techniques are

available but should only be utilised when clinically indicated. Cone-beam computed tomography (CBCT) offers detailed visualisation of joint structures and bone abnormalities (Garstka et al., 2023).
Magnetic resonance imaging (MRI) is considered the standard technique for evaluating the articular disc and surrounding soft tissues. Computed tomography (CT), on the other hand, is particularly valuable for identifying osseous changes and diagnosing joint pathology (Mehndiratta et al., 2019b; Prabhakar et al., 2024). Both MRI and CT are especially indicated in severe, chronic, or suspected structural abnormalities of the TMJ. Ultrasonography can help visualise the position of the disc, although it is less reliable for detecting osteoarthritis. Panoramic radiography, while less detailed, remains widely used as an initial imaging investigation to provide an overview of both the dentition and TMJ joint (Maini & Dua, 2023).

2.6 Historical background

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) introduced by Dworkin & LeResche in 1992, has gained international recognition and is a standardised system for diagnosing and classifying TMDs widely used across the globe (List & Jensen, 2017; Yang et al., 2017). This set of diagnostic criteria revolves around a common case definition for a given type of disorder, standardised examination methods, and standardised methods of gathering self-report information. (List & Jensen, 2017; Yang et al., 2017)

In 2001, a major multi-site study of the RDC/TMD, funded by the National Institute of Dental and Craniofacial Research, led to a series of publications, a public symposium in 2008, and an international consensus workshop in 2009. This workshop, led by the International RDC/TMD Consortium Network and IASP's Orofacial Pain Special Interest Group, brought together experts across disciplines to refine the taxonomy of TMDs. Their work led to the publication of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) in 2014, which upheld and improved upon the foundational principles of the RDC/TMD (Committee on Temporomandibular Disorders (TMDs): From Research Discoveries to Clinical Treatment et al., 2020). The current diagnosis of TMD should be based on the DC/TMD examination protocol, because only with the correct diagnosis is the correct treatment possible (Garstka et al., 2023).

2.7 Treatment

The primary goals while treating TMDs are to reduce or eliminate pain and/or joint noises, as well as restore the normal mandibular function (Stelea et al., 2021).

Nevertheless, some symptoms may resolve spontaneously without requiring additional treatment (Maini & Dua, 2023).

Effective management often involves a multidisciplinary team approach, allowing treatment to be specifically tailored to the individual needs of each patient (Dimitroulis, 2018).

Table of indications of the management strategies of TMD (Dimitroulis, 2018):

TMD MANAGEMENT STRATEGIES

1. EXPLANATION AND REASSURANCE
- a. TMD is not life-threatening
- b. TMD is not a Cancer
- c. TMD can become a chronic condition
- d. TMD can be managed

2. EDUCATION AND SELF-CARE
- a. Soft diet
- b. Jaw rest (especially during long dental appointments)
- c. Avoid extreme jaw movements (i.e. yawning)
- d. Topical heat (e.g. wheat packs)
- e. Protect face and jaws from cold weather
- f. Avoid stress and anxiety

3. MEDICATIONS
- a. Anti-inflammatories
- b. Anxiolytics
- c. Muscle relaxants
- d. Antidepressants

4. JAW PHYSIOTHERAPY
- a. Massage and stretching
- b. Dry needling
- c. TENS – transcutaneous electrical nerve stimulation
- d. Pulsed ultrasound therapy

5. OCCLUSAL APPLIANCE THERAPY

6. BEHAVIOURAL THERAPY
- a. Lifestyle counselling
- b. Relaxation therapy
- c. Hypnosis
- d. Biofeedback

7. PSYCHOTHERAPY

8. OTHER
- a. Acupuncture
- b. Botox injections
- c. Chiropractic manipulation

9. TMJ SURGERY
- a. Closed procedures
  - TMJ arthrocentesis
  - TMJ arthroscopy
- b. Open procedures
  - TMJ arthrotomy/arthroplasty
  - TMJ joint replacements

Figure 8 - TMD management strategies. Adapted from Dimitroulis, (2018)

Treatment options can be both conservative and surgical, depending on the severity and nature of the disorder (Dimitroulis, 2018).

Approximately 90-95% of cases are initially managed with non-surgical treatment such as physiotherapy, occlusal splint therapy, and pharmacological treatment (Zieliński et al., 2024).

Physiotherapy, as illustrated in Figure 8, is an integral part of the conservative management of TMD, aiming to restore function, alleviate pain, and enhance joint mobility. Treatment modalities include kinesiotherapy, where patients are trained in proper mandibular movements, and manual therapy, such as the joint mobilisation technique. Additional techniques for relieving muscular pain include therapeutic massage, ultrasound therapy, and electrotherapy such as electrical nerve stimulation (TENS) (Crăciun et al., 2022; Garstka et al., 2023).

Occlusal splint therapy is a widely used method for various TMDs. The splint modifies the occlusal relationship between the teeth, influencing the positioning of the condylar process. They are typically used to stabilise occlusion, reduce joint loading, and protect teeth from parafunctional wear. Different types of splints are selected based on the underlying pathology: repositioning splints are used in cases of disc displacement to guide the mandible into centric relation, while relaxation splints are indicated for muscular disorders to alleviate strain and reduce parafunctional habits (Garstka et al., 2023).

Pharmacological management of TMD includes several medications that aim to lessen inflammation, muscle tension, and pain. Nonsteroidal anti-inflammatory drugs (NSAIDS), especially ibuprofen, are frequently used in treating acute TMJ arthritis following a sudden disc displacement (Garstka et al., 2023; Wu et al., 2021).
Oral opioids, such as codeine or oxycodone, may occasionally be considered but are discouraged due to their potential for dependence and significant side effects. Other medications, such as corticosteroids, are effective in treating moderate to severe TMD (Minervini et al., 2024).

Additionally, myorelaxants like cyclobenzaprine may be useful for managing TMD of muscular origin and chronic orofacial pain. Anticonvulsants, such as gabapentin, can help alleviate temporal and masseter muscle pain and are generally well-tolerated.
In contrast, benzodiazepines, while providing anxiolytic and muscle-relaxing effects, are not recommended due to the risk of dependence and cognitive impairment.
In addition to systemic medications, iontophoresis may be used to enhance the transdermal delivery of drugs, thereby improving local pain control and joint mobility (Garstka et al., 2023; Minervini et al., 2024).

While most patients, 90% recover with simple measures such as jaw rest and a soft diet, others require professional care. However, a small percentage, less than 10% of TMD patients, may be suitable for surgical intervention, as shown in Figure 9 (Dimitroulis, 2018; Ellis et al., 2021).

INDICATIONS FOR TMJ SURGERY

1. ABSOLUTE INDICATIONS

a. Ankylosis (e.g. Fibrous or osseous joint fusion)
b. Neoplasia (e.g. Osteochondroma of the condyle)
c. Dislocation (i.e. Recurrent or chronic)
d. Developmental disorders (e.g. Condyloma hyperplasia)

2. RELATIVE INDICATIONS

a. Internal derangement
b. Osteoarthrosis
c. Trauma
I. General indications
Disorder not responding to non-surgical therapy
TMJ is the source of pain and dysfunction
- Pain localised to the TMJ
- Pain on functional loading and movement of the TMJ
- Mechanical interference with TMJ function

II. Specific indications
Chronic severe limited mouth opening
Advanced degenerative joint disease with intolerable symptoms of pain and joint dysfunction
Confirmation of severe joint disease on CT scan or MRI

Figure 9 - Indications for TMJ surgery. Adapted from Dimitroulis, (2018)

Surgery is reserved for cases where conservative treatment has failed or when there is a significant structural pathology. Careful patient selection is critical to minimise risks and maximise benefits. Before surgery, the surgeon must assess whether the procedure is truly necessary. The patient will have to comply with the treatment regimes, have a good understanding of the nature of their disorder, and not have unrealistic expectations. If these criteria are not met, the risks of surgery may outweigh the potential benefits (Dimitroulis, 2018; Yoda et al., 2020).

3. Pain

3.1 Definition

The current International Association for the Study of Pain (IASP) adopted in 2020 a revised definition of pain: ‘‘An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage’’(Hammer, 2024).

Pain is always a personal experience, shaped by biological, psychological, and social factors. It is known as the biopsychosocial model of pain (Klasser & Romero Reyes, 2023). Whereas nociception refers to the neural process of encoding noxious stimuli (St. John Smith, 2018).

3.2 Classifications of pain

Pain may be viewed through different classifications, as illustrated in Figure 10, including anatomical, physiological, and mechanistic frameworks.

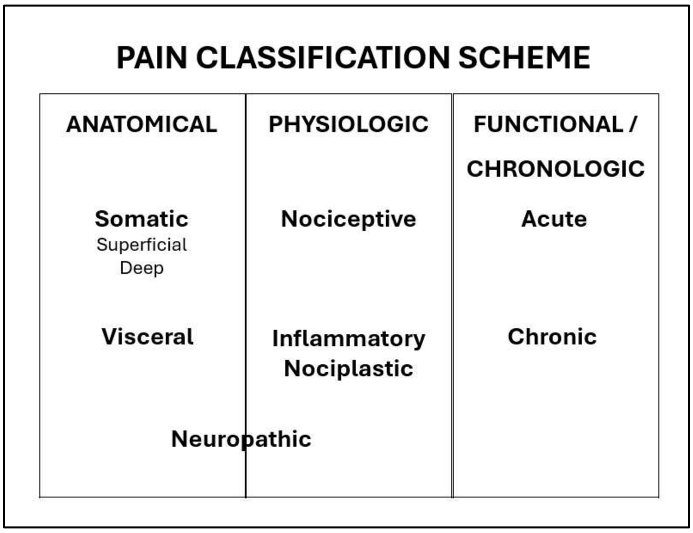

Figure 10 - Pain classification scheme. Adapted from Klasser & Romero Reyes, (2023)

Probably one of the common classifications is acute and chronic pain. Although often defined by duration, this classification is better understood as functional rather than just merely chronological:

Acute pain is a short-term, usually lasting less than three months, that serves as a protective mechanism. It often results from a specific injury or disease and is self-limiting, resolving naturally on its own with healing and resting (Grichnik, 1991; Klasser & Romero Reyes, 2023).

Chronic pain, in contrast, is a widespread and complex condition characterised by persistent or recurrent pain lasting longer than three months, often continuing beyond the normal healing period, and lacks a clear biological purpose. It may arise from injury, disease, or unknown causes, and is increasingly recognised as a disease itself rather than just a symptom (Chen et al., 2023; Fonseca et al., 2023).

Chronic pain is frequently accompanied by psychiatric comorbidities such as depression, anxiety, sleep disturbances, and somatisation; psychological distress that manifests as physical symptoms, which reduce the quality of life and increase the risk of suicide (Barjandi et al., 2024).

It is a significant public health problem, affecting about one in five people in Europe and the United States. It is more common in women compared to men, suggesting gender-related factors influence its development and persistence (Barjandi et al., 2024).

Chronic pain can further be classified according to its underlying mechanism. It is commonly categorised as either nociceptive or neuropathic, depending on whether the underlying disease compromises the integrity of the somatosensory nervous system (Scholz, 2014).

Nociceptive pain arises from actual or potential damage to non-neural tissue and is produced by the activation of nociceptors. It is typically momentary, nonpersistent, and proportional to the stimulus, and serves as a defence mechanism by triggering behavioural and physiological responses to prevent or limit tissue damage (Hammer, 2024; Klasser & Romero Reyes, 2023).

Neuropathic pain is a direct consequence of a lesion or disease affecting the somatosensory nervous system, which processes information about the body, including visceral organs, rather than external sensory modalities such as vision, hearing, or smell (Amstrong & Herr, 2023).

The condition often manifests as ongoing or intermittent spontaneous pain, commonly described as burning, pricking, or squeezing, and may include evoked pain in response to normally non-painful stimuli, such as light touch or cold (Finnerup et al., 2021).

The presence of symptoms or signs alone does not justify the use of the term ‘‘neuropathic’’.
Diagnosis of a lesion requires evidence of an abnormality established through recognised neurological criteria and supported by investigations, such as imaging, neurophysiology, biopsies, or laboratory tests, or when there was obvious trauma. While the term disease is commonly used when the underlying cause of the lesion is known, for example, stroke, diabetes mellitus, or a genetic abnormality (Finnerup et al., 2021).

Physiological or mechanistic classification included nociceptive, neuropathic pain and further includes categories such as inflammatory and nociplastic pain, broadening the understanding of pain (Klasser & Romero Reyes, 2023).

Inflammatory pain occurs when tissue damage from mechanical trauma, heat, or infection triggers the release of inflammatory mediators. These mediators then interact with sensory neurons, increasing the intensity and duration of nociceptive signalling. Unlike nociceptive pain, inflammatory pain often persists longer than the initial stimulus, resulting in persistent pain. It promotes protective behaviours, such as resting the affected area (Hammer, 2024).

Nociplastic pain is a new third mechanistic descriptor adopted by the IASP in 2016. It is defined as a type of pain that results from altered nociception without clear evidence of actual or threatened tissue damage, causing the activation of peripheral nociceptors, and without evidence for disease or lesion in the somatosensory system.

Unlike neuropathic pain, there is no identifiable structural damage to the somatosensory pathways. Clinically, it often presents with comorbidities like sleep disturbances and sensory changes in the affected area, such as mechanical or cold allodynia. This type of pain is typical of a group of disorders called chronic overlapping pain conditions (COPCs), which includes, for example, fibromyalgia and irritable bowel syndrome (IBS) (Hammer, 2024).

Another important classification exists; the anatomical classification distinguishes somatic and visceral pain.

Somatic pain arises from nociceptors located in the body's superficial or deep tissues (Klasser & Romero Reyes, 2023).

Superficial somatic pain originates from the cutaneous and mucosal tissues and is typically described as easy and well localised, due to the high density of free nerve endings in the dermal tissue. This ability to localise pain acts as an early warning system to protect the body's protective layers.

Deep somatic pain originates from musculoskeletal structures. It is less well localised, spreading beyond the locus of noxious stimulation.

Visceral pain arises from the viscera, the internal organs. It is often diffuse and difficult to localise and prone to refer to areas distant from the source, frequently to superficial somatic areas. A classic example is the pain of a myocardial infarction, which can be perceived in the chest wall (Amstrong & Herr, 2023; Klasser & Romero Reyes, 2023).

3.3 Pain in the Orofacial Region

Orofacial pain refers to any pain disorders of the face, mouth, jaw, head, and neck.

The origin of pain associated with these structures may derive from local factors or involve systemic, autoimmune, infectious, traumatic, or neoplastic pathologies. Common examples of these conditions include odontogenic and periodontal pains, musculoskeletal disorders such as temporomandibular disorders (TMDs), headache, and neurovascular pains, vascular disorders, and other neuropathic pains (Klasser & Romero Reyes, 2023).

Due to the complex anatomical and neurological connections in this area, orofacial pain conditions may fall into more than one pain category at the same time.
For instance, TMJ pain that lasts several months, is triggered by chewing, and persists for several hours after stopping the stimulus, is classified as a deep somatic pain that is both chronic and inflammatory (Klasser & Romero Reyes, 2023).

In this context, it's important to note that TMDs are the most common non-odontogenic chronic pain conditions in the orofacial region.
Among TMDs, pain from the masticatory muscles, known as masticatory myalgia (M-TMD), is more frequently encountered compared to other TMJ disorders (Barjandi et al., 2024). Lifetime prevalence ranges from 3% to 15% in the general population but can be higher in groups with conditions like fibromyalgia, chronic fatigue syndrome, or whiplash-associated disorders. M-TMD is characterised by local or regional muscle pain, greater tenderness, difficult chewing, and limited mouth opening (Barjandi et al., 2024).

Headaches are another significant source of pain in the orofacial region.
Recurrent headaches are more common among patients with TMD, with as many as 80 % affected, compared to a 20% to 23% occurrence rate in the general population. It has been estimated that one in three people experiences severe headaches at some point in their life. Although earlier studies have linked TMD with headache, causal relationships have not been established (Abouelhuda et al., 2017; Klasser & Romero Reyes, 2023).

In 2020, a study by Yin et al. revealed new insights into TMD pain. MRI have provided a deeper understanding of what happens to brain structure and function in TMD patients with chronic pain. This study has shown structural and functional brain alterations in those TMD-related pain patients (Yin et al., 2020).

II. MATERIALS AND METHODS

1. Characterisation and relevance of the study

This study aims to evaluate the identification of signs and symptoms of temporomandibular dysfunctions based on a cross-sectional, observational, and descriptive-analytical study.

2. Objectives of the study

The following hypotheses were formulated:

Null hypothesis (H_0): There is no association between the presence of temporomandibular dysfunction (TMD) signs and symptoms (orofacial pain, TMJ pain, headache, mandibular movement limitation, TMJ click, TMJ lock, bruxism) and the factors age, gender, reason for consultation, or attendance at the Occlusion Consultation.

Alternative hypothesis (H_1): There is an association between the presence of temporomandibular dysfunction (TMD) signs and symptoms (orofacial pain, TMJ pain, headache, mandibular movement limitation, TMJ click, TMJ lock, bruxism) and at least one of the factors age, gender, reason for consultation, or attendance at the Occlusion Consultation.

3. Sample

The study population consisted of patients who attended the Triage Consultation at the Egas Moniz University Clinic between January and December 2023. All patients in the sample had a Triage record, and some of these patients subsequently attended the Occlusion Consultation within the same year. The data were obtained from patients' clinical histories, either from paper records or from electronic records stored on a computer.

A sample of 1425 patients (N=1425), including both males and females, was obtained.

These patients met the following established inclusion and exclusion criteria:

Inclusion criteria:

- Clinical records from the Triage Consultation of the Egas Moniz University Clinic, collected during 2023
- Clinical records from both the Triage and Occlusion Consultation of the Egas Moniz University Clinic, collected during 2023
- Patients aged between 18 and 45 years old
- Assessment of the presence of signs and symptoms associated with temporomandibular disorders (TMDs)

Exclusion criteria:

- Clinical records from the Triage and Occlusion Consultations that did not take place during the year 2023
- Clinical records that were incorrectly filled out
- Patients below 18 or above 45 years old

4. Ethical Consideration

Data collection was performed anonymously, extracting only the variables necessary to characterise the study population. These included: the purpose of consultation, reported pain, attendance at the Occlusion Consultation, and the identification of signs and symptoms of temporomandibular dysfunction (TMD).

All procedures complied with the regulations governing data protection and the international ethical standards established and approved by the Comissão Científica do Mestrado Integrado em Medicina Dentária do Instituto Superior de Ciências da Saude Egas Moniz, and by the Comissão de Ética da Egas Moniz (Approval reference: 1551, document attached in annexe).

5. Data Collection & Statistical Analysis

The data were compiled into a Microsoft Office Excel 2010 database.

For the statistical analysis, the collected data were processed using IBM SPSS Statistics software, version 30.0. Descriptive statistics were applied to present the frequencies and percentages of the variables studied, and inferential statistical analysis was conducted using the bivariate Chi-square test (independence/association), with a significance level of 5% ($p \leq 0.05$).

III. RESULTS

1. Descriptive Statistics - Characteristics of this study

The initial investigation was based on 3375 patient records.

We had only 1425 patient records, which were in the age category of 18-45.

For this study, some patient records within this age group lacked certain information, resulting in 1382 or 1378 valid cases, depending on the factors investigated, which included gender, age group, TMJ pain, mandibular movement limitation, TMJ clicking, purpose of consultation, and attendance at the Occlusion Consultation.

Table 1 - Distribution of the study population (Triage patients) by age group and gender

	18-20	21-25	26-30	31-35	36-40	41-45	**TOTAL**
MALE	78	158	85	80	66	68	535
FEMALE	189	233	101	96	139	132	890

Table 2 - Distribution of the patients attending the Occlusion Consultation by age group and gender

	18-20	21-25	26-30	31-35	36-40	41-45	**TOTAL**
MALE	1	5	1	3	1	3	14
FEMALE	8	16	7	4	8	5	48

Table 3 - Demographic characteristics of the study population

Sex (in %):	1425
Female	890 (62.4%)
Male	535 (37.6%)
Age average	29
Age groups (in %):	N=1425
- 18-20	267 (18.7%)
- 21-25	391 (27.4%)
- 26-30	186 (13.1%)
- 31-35	176 (12.4%)
- 36-40	205 (14.4%)
- 41-45	200 (14.0%)

The study population was predominantly composed of young adults aged 18 to 25, with a female predominance (Tables 1, 2, 3).

Table 4 - Distribution of patients by Purpose of consultation at the Triage Consultation

Purpose of consultation in Triage Consultation (in %):	N=1425
Came because of TMJ pain	13 (0.9%)
Came for another reason than TMJ pain	1402 (98.4%)
Unspecified	10 (0.7%)

Although TMJ pain was present in a small proportion of patients, it was not the main reason for consultation (Table 4).

Table 5 - Proportion of patients attending Occlusion Consultation

Patients Attending Occlusion Consultation (in %)	62 (4.4%)

Table 6 - Characteristics of TMJ pain: intensity, location, and symptom distribution

Orofacial Pain Level (in %):	N=62
Slight Pain 1-2	11 (17.7%)
Medium Pain 3-7	18 (29.0%)
High Pain 8-10	5 (8.1%)
Unspecified	28 (45.2%)
TMJ Pain Detection (in %)	N=1425
Presence of TMJ pain	152 (10.7%)
Absence of TMJ pain	1268 (89.3%)
TMJ Pain Location (in %)	N=62
Right TMJ	28 (41.8%)
Left TMJ	32 (47.7%)
Both sides	7 (10.5%)

Distribution of Symptoms (in %)	N=62
Unilateral symptoms – right side	15 (32.6%)
Unilateral symptoms – left side	14 (30.4%)
Bilateral symptoms	17 (37.0 %)

Orofacial pain is mainly moderate in intensity, often localised to the right TMJ, and the symptoms frequently manifest bilaterally (Table 6).

Table 7 - Frequency of headache in the study population

Headache (in %)	N=62
No headache	32 (56.1%)
Headache	25 (43.9%)
Occasional headache	23 (40.3%)
Daily headache	2 (3.5%)

Headache was not a common finding in this population, and when present, it was generally occasional rather than persistent, with daily headaches being rare (Table 7).

Table 8 - Frequency of mandibular movement limitations in the study population

Mandibular Movement Limitations (in %)	N=1425
No limitation	1301 (94.5%)
Limitation	75 (5.5%)
Opening Limitation	19 (1.4%)
Closing Limitation	11 (0.8%)

Mandibular movement limitations were relatively uncommon in this population, and when present, they were more frequently associated with opening movements than with closing (Table 8).

Table 9 - Frequency of TMJ functional symptoms in the study population

TMJ Functional Symptoms (in %)	N=1425
No TMJ clicking	1041 (75.5%)
TMJ clicking	330 (24.0%)
TMJ locking	7 (0.5%)

TMJ clicking was the most predominant functional manifestation, while locking was rarely observed (Table 9).

Table 10 - Frequency of bruxism in the study population

Bruxism Presence and Type (in %)	N=1425
No bruxism	1341 (94.1%)
Bruxism	84 (5.9%)
Daytime bruxism	19 (1,3%)
Nighttime bruxism	40 (2.8%)

Bruxism was present in a proportion of patients, with nighttime bruxism being more commonly reported than daytime bruxism (Table 10).

Table 11 - Frequency of TMD signs and symptoms in relation to TMJ pain

Presence of TMD signs and symptoms	N=1425
Yes	443 (31.1%)
No	939 (65.9%)
Not specified	43 (3.0%)
Have more than one TMD sign and symptom	
Yes	160 (11.2%)
No	1246 (87.4%)
Not specified	19 (1.3%)
Have one or more signs other than TMJ pain	
Yes	404 (28.4%)

No	1002 (70.3%)
Not specified	19 (1.3%)
Have more than one sign other than TMJ pain	
Yes	157 (98.1%)
No	3 (1.9%)
Have one sign other than TMJ pain	
Yes	247 (19.8%)
No	999 (80.2%)

443 patients presented with at least one TMD sign and symptom. Of the 443 patients, 160 patients had more than one TMD sign and symptom (Table 11).

After excluding TMJ pain, 404 patients still demonstrated one or more signs and symptoms. There are 157 with multiple signs and symptoms and 247 with a single sign and symptom (Table 11).

Therefore, even without TMJ pain, a significant proportion of patients exhibited other clinical signs, and many displayed multiple symptoms (Table 11).

2. Inferential Statistics - Analysing the Relationship Between Variables

Relationship between Presence of signs and symptoms and Gender

Table 12 - Crosstabulation between presence of signs and symptoms and gender

			Gender		Total
			Male	Female	
Presence of signs and symptoms	Yes	Count	134	309	443
		% within Presence of signs and symptoms	30.2%	69.8%	100.0%
	No	Count	382	557	939
		% within Presence of signs and symptoms	40.7%	59.3%	100.0%
Total		Count	516	866	1382
		% of Total	37.3%	62.7%	100.0%

Table 13 - Chi-Square Tests Results for presence of signs and symptoms and gender

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	14.004[a]	1	.000	
Likelihood Ratio	14.245	1	.000	
Linear-by-Linear Association	13.994	1	.000	
N of Valid Cases	1382			

The Chi-Square test indicated a statistically significant association, ($\chi^2(1) = 14.004$, $p < .001$), confirming that symptom prevalence differed significantly between males and females (Table 13). Crosstabulation analysis revealed that 35.7% of females reported symptoms compared to only 26.0% of males. Conversely, 74.0% of males reported no symptoms, compared to 64.3% of females (Table 12). This shows that females were more likely to experience or report signs and symptoms than males in the sample.

In conclusion, gender was identified as a significant factor influencing the presence of signs and symptoms, with females reporting a higher prevalence compared to males. These findings suggest that health interventions and awareness strategies should consider gender-specific differences in the experience and reporting of signs and symptoms.

Relationship between Orofacial Pain level and Gender

Table 14 - Crosstabulation between orofacial pain level and gender

			Gender		Total
			Male	Female	
Orofacial Pain Level	Slight Pain	Count	3	9	12
		% within Orofacial Pain Level	25.0%	75.0%	100.0%
	Medium Pain	Count	3	16	19
		% within Orofacial Pain Level	15.8%	84.2%	100.0%
	High Pain	Count	1	4	5
		% within Orofacial Pain Level	20.0%	80.0%	100.0%
Total		Count	7	29	36
		% of Total	19.4%	80.6%	100.0%

Table 15 - Chi-Square Tests Results for orofacial pain level and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.199[a]	2	.905	1.000		
Likelihood Ratio	.198	2	.906	1.000		
Fisher's Exact Test	.486			.857		
Linear-by-Linear Association	.076[b]	1	.783	1.000	.519	.235
N of Valid Cases	36					

The Pearson Chi-Square test indicated no significant association ($\chi^2(2) = 0.20$, $p = 0.905$). The Likelihood Ratio test ($\chi^2(2) = 0.20$, $p = 0.906$), Fisher's Exact test ($p = 0.857$) confirmed this result. The Linear-by-Linear Association test further indicated the absence of a significant linear trend across pain levels ($\chi^2(1) = 0.08$, $p = 0.783$) (Table 15). These results suggest that orofacial pain level is independent of gender in this sample. Across the sample, medium pain was the most frequent intensity in both genders (Table 14).

Relationship between TMJ pain and Gender

Table 16 - Crosstabulation between TMJ pain and gender

			Gender		Total
			Male	Female	
TMJ pain	Yes	Count	44	108	152
		% within TMJ pain	28.9%	71.1%	100.0%
	No	Count	472	751	1223
		% within TMJ pain	38.6%	61.4%	100.0%
Total		Count	516	859	1375
		% of Total	37.5%	62.5%	100.0%

Table 17 - Chi-Square Tests Results for TMJ pain and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.366[a]	1	.021	.021	.012	
Continuity Correction[b]	4.962	1	.026			
Likelihood Ratio	5.544	1	.019	.021	.012	
Fisher's Exact Test				.021	.012	
Linear-by-Linear Association	5.362[c]	1	.021	.021	.012	.005
N of Valid Cases	1375					

The Pearson Chi-Square test indicated a statistically significant association ($\chi^2(2) = 5.366$, $p = 0.021$) between the TMJ pain and the gender. This result was further supported by the Continuity Correction ($\chi^2 = 4.962$, $p = 0.026$), Likelihood Ratio test ($\chi^2 = 5.544$, $p = 0.019$), and Fisher's Exact Test (two-sided $p = 0.021$; one-sided $p = 0.012$), all of which confirmed the significance of the association. The Linear-by-Linear Association test also yielded a significant result ($\chi^2 = 5.362$, $p = 0.021$), reinforcing the finding (Table 17).

The strength of the relationship was evaluated with Cramer's V = 0.06, indicating a weak association. Overall, the analysis demonstrates that the prevalence of ATM pain differs significantly between genders, although the magnitude of the association is relatively small (Table 16).

Among those experiencing TMJ pain, the majority were female compared to males.

Relationship between Headache and Gender

Table 18 - Crosstabulation between headache and gender

			Gender		Total
			Male	Female	
Headache	Sometimes	Count	4	19	23
		% within Headache	17.4%	82.6%	100.0%
	Everyday	Count	1	1	2
		% within Headache	50.0%	50.0%	100.0%
	No Headache	Count	8	24	32
		% within Headache	25.0%	75.0%	100.0%
Total		Count	13	44	57
		% of Total	22.8%	77.2%	100.0%

Table 19 - Chi-Square Tests Results for headache and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.311[a]	2	.519	.549		
Likelihood Ratio	1.195	2	.550	.549		
Fisher's Exact Test	1.699			.432		
Linear-by-Linear Association	.395[b]	1	.530	.600	.307	.076
N of Valid Cases	57					

Pearson Chi-Square test showed no significant association ($\chi^2(2) = 1.31$, p = 0.519). The Likelihood Ratio test ($\chi^2(2) = 1.20$, p = 0.550), the Fisher's Exact Test (p = 0.432), the Linear-by-Linear Association test ($\chi^2(1) = 0.40$, p = 0.530) confirmed this result (Table 19). These findings suggest that headache occurrence is independent of gender in this sample. However, occasional headaches were relatively common, whereas daily headaches were not common in both genders (Table 18).

Relationship between Mandibular movement limitation and Gender

Table 20 - Crosstabulation between mandibular movement limitation and gender

			Gender		Total
			Male	Female	
Mandibular movement limitation	Yes	Count	16	59	75
		% within Mandibular movement limitation	21.3%	78.7%	100.0%
	No	Count	499	802	1301
		% within Mandibular movement limitation	38.4%	61.6%	100.0%
Total		Count	515	861	1376
		% of Total	37.4%	62.6%	100.0%

Table 21 - Chi-Square Tests Results for mandibular movement limitation and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.773[a]	1	.003	.003	.002	
Continuity Correction[b]	8.061	1	.005			
Likelihood Ratio	9.498	1	.002	.003	.002	
Fisher's Exact Test				.003	.002	
Linear-by-Linear Association	8.767[c]	1	.003	.003	.002	.001
N of Valid Cases	1376					

The Pearson Chi-Square test indicated a statistically significant association ($\chi^2(1) = 8.77$, $p = 0.003$), which was confirmed by the Likelihood Ratio test ($\chi^2(1) = 9.50$, $p = 0.002$) and Fisher's Exact Test ($p = 0.003$). The Linear-by-Linear Association test also indicated a significant trend ($\chi^2(1) = 8.77$, $p = 0.00$) (Table 21).

These results suggest that limitation of mandibular movement is significantly associated with gender in this sample.

Although relatively uncommon, this symptom was reported nearly twice as often in females compared to males (Table 20).

Relationship between TMJ click and Gender

Table 22 - Crosstabulation between TMJ click and gender

			Gender		Total
			Male	Female	
TMJ click	Yes	Count	96	234	330
		% within TMJ click	29.1%	70.9%	100.0%
	No	Count	417	624	1041
		% within TMJ click	40.1%	59.9%	100.0%
Total		Count	513	858	1371
		% of Total	37.4%	62.6%	100.0%

Table 23 - Chi-Square Tests Results for TMJ click and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	12.869[a]	1	.000	.000	.000	
Continuity Correction[b]	12.405	1	.000			
Likelihood Ratio	13.202	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	12.860[c]	1	.000	.000	.000	.000
N of Valid Cases	1371					

The Pearson Chi-Square test indicated a statistically significant association ($\chi^2(1) = 12.87$, $p < 0.001$), which was confirmed by the Likelihood Ratio test ($\chi^2(1) = 13.20$, $p < 0.001$) and Fisher's Exact Test ($p < 0.001$). The Linear-by-Linear Association test also indicated a significant trend ($\chi^2(1) = 12.86$, $p < 0.001$) (Table 23).

These results suggest that TMJ click is significantly associated with gender in this sample. They are mainly observed in female patients (Table 22).

Relationship between TMJ lock and Gender

Table 24 - Crosstabulation between TMJ lock and gender

			Gender		Total
			Male	Female	
TMJ lock	Yes	Count	1	6	7
		% within TMJ lock	14.3%	85.7%	100.0%
	No	Count	13	43	56
		% within TMJ lock	14.3%	85.7%	100.0%
Total		Count	14	49	63
		% of Total	22.2%	77.8%	100.0%

Table 25 - Chi-Square Tests Results for TMJ lock and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.287[a]	1	.592	.686	.509	
Continuity Correction[b]	.003	1	.957			
Likelihood Ratio	.314	1	.575	.686	.509	
Fisher's Exact Test				1.000	.509	
Linear-by-Linear Association	.282[c]	1	.595	.686	.509	.354
N of Valid Cases	63					

The Pearson Chi-Square test indicated no significant association ($\chi^2(1) = 0.29$, $p = 0.592$), which was confirmed by the Likelihood Ratio test ($\chi^2(1) = 0.31$, $p = 0.575$) and Fisher's Exact Test ($p = 1.000$). The Linear-by-Linear Association test also showed no significant trend ($\chi^2(1) = 0.28$, $p = 0.595$) (Table 25).

These results suggest that TMJ lock is statistically not significant for gender in this sample (Table 24).

Relationship between Bruxism and Gender

Table 26 - Crosstabulation between bruxism and gender

			Gender		Total
			Male	Female	
Bruxism	Yes	Count	26	58	84
		% within Bruxism	31.0%	69.0%	100.0%
	No	Count	509	832	1341
		% within Bruxism	38.0%	62.0%	100.0%
Total		Count	535	890	1425
		% of Total	37.5%	62.5%	100.0%

Table 27 - Chi-Square Tests Results for bruxism and gender

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.008[a]	1	.930	1.000	.677	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.008	1	.931	1.000	.677	
Fisher's Exact Test				1.000	.677	
Linear-by-Linear Association	.008[c]	1	.931	1.000	.677	.451
N of Valid Cases	87					

The Pearson Chi-Square test indicated no significant association ($\chi^2(1) = 1.654$, $p = 0.198$), which was confirmed by the Continuity Correction ($p = 0.242$), the Likelihood Ratio test ($p = 0.193$) and Fisher's Exact Test ($p = 0.245$). The Linear-by-Linear Association test also showed no significant trend ($p = 0.199$) (Table 27).

These results suggest that bruxism is statistically not associated with gender in this sample (Table 26).

Relationship between Presence of signs and symptoms and Age group

Table 28 - Crosstabulation of presence of signs and symptoms and age group

			Age group						Total
			18 - 20	21- 25	26 - 30	31- 35	36 - 40	41- 45	
Presence of signs and symptoms	Yes	Count	74	115	55	56	70	73	443
		% within Presence of signs and symptoms	16.7%	26.0%	12.4%	12.6%	15.8%	16.5%	100.0%
	No	Count	180	260	129	117	132	121	939
		% within Presence of signs and symptoms	19.2%	27.7%	13.7%	12.5%	14.1%	12.9%	100.0%
Total		Count	254	375	184	173	202	194	1382
		% of Total	18.4%	27.1%	13.3%	12.5%	14.6%	14.0%	100.0%

Table 29 - Chi-Square Tests Results for presence of signs and symptoms and age group

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.124[a]	5	.401
Likelihood Ratio	5.065	5	.408
Linear-by-Linear Association	4.558	1	.033
N of Valid Cases	1382		

The Chi-Square test revealed no significant association between age group and presence of signs and symptoms ($\chi^2(5) = 5.124$, p = 0.401). However, the linear-by-linear association test indicated a significant trend across age group ($\chi^2(1) = 4.558$, p = 0.033), suggesting that the likelihood of experiencing signs and symptoms may vary systematically with increasing age (Table 29).

Overall, although no significant association was identified, the observed linear trend suggests a possible relationship between increasing age and the presence of signs and symptoms. Even if individual analyses were conducted for each TMD sign and symptom with age, none of these associations reached statistical significance. For this reason, unlike the gender analysis, details tables and test results are not presented here (Table 28).

Relationship between Presence of signs and symptoms and Purpose of consultation

Table 30 - Crosstabulation between presence of signs and symptoms and purpose of consultation

			Purpose of consultation		Total
			TMJ Pain	No TMJ Pain	
Presence of signs and symptoms	Yes	Count	13	426	439
		% within Presence of signs and symptoms	3.0%	97.0%	100.0%
	No	Count	0	939	939
		% within Presence of signs and symptoms	.0%	100.0%	100.0%
Total		Count	13	1365	1378
		% of Total	.9%	99.1%	100.0%

Table 31 - Chi-Square Tests Results for presence of signs and symptoms and purpose of consultation

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	28.071[a]	1	.000		
Continuity Correction[b]	24.992	1	.000		
Likelihood Ratio	30.007	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	28.051	1	.000		
N of Valid Cases	1378				

The Pearson Chi-Square statistic was 28.071 ($p < 0.001$), indicating a statistically significant association. This was confirmed by the Continuity Correction ($\chi^2 = 24.992$, $p < 0.001$), the Likelihood Ratio ($\chi^2 = 30.007$, $p < 0.001$), and Fisher's Exact Test ($p < 0.001$). The Linear-by-Linear Association statistic ($\chi^2 = 28.051$, $p < 0.001$) also suggested a strong linear link between the variables (Tables 30, 31).

To measure the strength of this association, Cramer's V was calculated, V = 0.14, which signifies a small to moderate effect size based on Cohen's guidelines. Therefore, not only is the association statistically significant, but it also carries a meaningful, though modest, strength.

Relationship between Presence of signs and symptoms and Attendance at the Occlusion Consultation

Table 32 - Crosstabulation between presence of signs and symptoms and attendance at the Occlusion Consultation

			Attendance at the Occlusion Consultation		Total
			Yes	No	
Presence of signs and symptoms	Yes	Count	60	383	443
		% within Presence of signs and symptoms	13.5%	86.5%	100.0%
	No	Count	2	937	939
		% within Presence of signs and symptoms	.2%	99.8%	100.0%
Total		Count	62	1320	1382
		% of Total	4.5%	95.5%	100.0%

Table 33 - Chi-Square Tests Results for presence of signs and symptoms and attendance at the Occlusion Consultation

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	124.836[a]	1	.000		
Continuity Correction[b]	121.744	1	.000		
Likelihood Ratio	126.102	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	124.745	1	.000		
N of Valid Cases	1382				

The Pearson Chi-Square statistic was 124.836 (df = 1, $p < 0.001$), indicating a highly significant association. This finding was supported by the Continuity Correction (χ^2 = 121.744, $p < 0.001$), the Likelihood Ratio (χ^2 = 126.102, $p < 0.001$), and Fisher's Exact Test ($p < 0.001$), confirming the robustness and reliability of the result.

The Linear-by-Linear Association statistic (χ^2 = 124.745, $p < 0.001$) further indicated a strong linear relationship between the variables (Tables 32, 33).

The strength of association was V = 0.30, which indicates a moderate effect size. The analysis demonstrates a statistically significant and moderately strong association between Presence of signs and symptoms and Attendance at the Occlusion Consultation.

Relationship between Purpose of consultation and Attendance at the Occlusion Consultation

Table 34 - Crosstabulation between purpose of consultation and attendance at the Occlusion Consultation

			Attendance at the Occlusion Consultation		Total
			Yes	No	
Purpose of consultation	TMJ pain	Count	7	5	12
		% Purpose of consultation	58.3%	41.6%	100.0%
	Primary complaint not TMJ-related, but TMJ pain detected	Count	33	96	129
		% Purpose of consultation	25.6%	74.4%	100.0%
Total		Count	40	101	141
		% of Total	28.4%	71.6%	100.0%

Table 35 - Chi-Square Tests Results for purpose of consultation and attendance at the Occlusion Consultation

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.795[a]	1	.016		
Continuity Correction[b]	4.296	1	.038		
Likelihood Ratio	5.178	1	.023		
Fisher's Exact Test				.038	.023
Linear-by-Linear Association	5.754	1	.016		
N of Valid Cases	141				

The Pearson Chi-Square value was 5.795 and a significance level of $p = 0.016$, indicating a statistically significant relationship. The Continuity Correction ($\chi^2 = 4.296$, $p = 0.038$), Likelihood Ratio ($\chi^2 = 5.178$, $p = 0.023$), and Fisher's Exact Test (two-sided $p = 0.038$; one-sided $p = 0.023$) all confirmed this result. The strength of the relationship was assessed using Cramer's V = 0.20 (Tables 34, 35).

Overall, the analysis reveals that the purpose of consultation is significantly associated with whether the patient underwent occlusion consultation, with a small to moderate strength of association ($\varphi \approx 0.20$) between these two variables. Most patients attending the Occlusion Consultation are there because they were identified with TMD in the Triage Consultation. Initially, they did not seek treatment specifically for TMJ pain.

IV. DISCUSSION

Knowing how to identify signs and symptoms and diagnose Temporomandibular disorders is very important, as many signs and symptoms are linked to these conditions.

The primary objective of this study was to detect signs and symptoms of Temporomandibular Disorders (TMDs) and to identify potential associations with demographic and clinical factors.

This study was conducted using patient records collected by dental students during 2023 at the Egas Moniz University Clinic in Portugal.

A total of 3,375 records were generated from patients attending the Triage Consultation and the Occlusion Consultation.
Of these, 1,425 patients aged 18 to 45 years met the inclusion criteria. After excluding incomplete files, a total of 1,382 clinical records were retained for final analysis.
Missing information may indicate that the dental student either did not work properly or lacked sufficient knowledge for an accurate diagnosis.

1. Summary of main results

At least one sign or symptom of temporomandibular disorders was exhibited in one-third of the patients, 443 (32%).
This number is consistent with previous publications, which report a prevalence of 34% among the world population (Zieliński et al., 2024). Similar prevalence rates were found in various studies and countries. In Finland, 35% of the adult population showed at least one sign of TMD (Qvintus et al., 2020). In Saudi Arabia, the prevalence ranged from 30% to 50% (Alrizqi & Aleissa, 2023).
These findings show that TMD is a widespread condition that affects people all over the world.

The present study also identified gender differences in the occurrence of TMD-related signs and symptoms. Signs and symptoms were more frequently detected in females: 309

(69.8%) compared to males: 134 (30.2%), with a statistically significant differenc e ($p < 0.05$), indicating an important association between gender and the presence of TMD signs and symptoms.
This indicates that gender has a significant role in the manifestation of TMD.
More specifically, women exhibited higher rates of mandibular movement limitation (6.9% versus 3.1%), TMJ click (27.3% versus 18.7%) and TMJ pain (71.1% versus 28.9%), all of which were significantly associated with gender in this population.

Other signs, while not statistically associated with the gender, were also more prevalent among women. For example, orofacial pain was reported by 80.6% of women compared to 19.4% of men. Similarly, headaches were more frequently observed in women (77.2% versus 22.8%), as were TMJ lock (77.8% versus 22.2%) and bruxism (62.5% versus 37.5%). We can see that even if not all symptoms have a statistical significance, women still experience more symptoms than men.

Similarly, literatures report this gender disparity with women having a higher TMD prevalence than men.
Numerous studies indicate that women are approximately twice as likely to experience TMD compared to men (Committee on Temporomandibular Disorders (TMDs): From Research Discoveries to Clinical Treatment et al., 2020). Warren and Fried (2001) further emphasised this difference, reporting that TMD is 1.5 to 2 times more prevalent in women, with nearly 80% of all patients seeking treatment being female (Warren & Fried, 2001). Evidence from a large-scale population study supports this trend as well: 180.000 individuals in Sweden found that women were more than twice as likely as men to report orofacial pain and were at a higher risk of developing persistent pain (Häggman-Henrikson et al., 2020).

In the present study, chi-square analysis showed no statistically significant association between age group and the presence of TMD signs and symptoms ($p = 0.401$).
This result may be explained by the fact that most of my population fell into age groups where TMD is already common, leading to similar prevalence rates and insufficient variability to yield statistically significant differences.

Furthermore, although my sample size was large (n = 1382), some age groups, particularly those between 31 and 35 and 41 and 45 years, had smaller numbers, which reduced the power to detect subtle associations.
Moreover, the chi-square test is less sensitive to gradual linear trends compared to specific trend tests.
Interestingly, although the overall association was not significant, the linear-by-linear test revealed a significant trend ($p = 0.033$), suggesting that a systematic age-related gradient may still exist, with younger individuals being more affected: 16.7% in 18-20 years, 26.0% in 21-25 years, 12.4% in 26-30 years.

These numbers are consistent with previous studies that report that TMD prevalence tends to peak in young and middle adulthood before declining in older populations (Manfredini et al., 2010; Qin et al., 2024)

In addition to gender and age, the current study also evaluated the relationship between the presence of TMD signs and symptoms and the purpose of consultation.

Among the 439 patients who had at least one sign or symptom of TMD, only 13 (3%) reported TMJ pain as their main reason for consultation, while the remaining 97% consulted for other reasons.
In contrast, none of the patients without TMD signs and symptoms reported TMJ pain as their consultation motive.

The results demonstrated a statistically significant association between the purpose of consultation and the presence of signs and symptoms ($p < 0.001$). However, the magnitude of this association was small to moderate, Cramer's V = 0.14. Taken together, these results suggest that although TMJ pain is linked to the presence of clinical signs and symptoms, most affected patients did not report TMJ pain as their main complaint.

These findings highlight an important clinical implication: many patients with TMD-related signs or symptoms may not actively seek treatment for TMJ pain, and their condition may be detected incidentally during routine dental care or when they present for other concerns.

Previous studies have similarly reported that TMD is often underreported by patients and underdiagnosed in clinical practice, as many individuals do not recognise their symptoms as related to the temporomandibular joint (List & Jensen, 2017). For example, Kmeid et al. (2020) found that in their clinical study, 19.7% of patients with TMD remained undiagnosed, despite exhibiting typical signs and symptoms (Kmeid et al., 2020).
This highlights the importance of dentists being attentive to the most common manifestations of TMD.
In the present study, the most frequently observed clinical signs and symptoms were TMJ clicking (24.0%), followed by TMJ pain (10.7%), bruxism (5.9%), and limitation of mandibular movement (5.5%).

In this study, a statistically significant and moderately strong association was found between the presence of TMD signs and symptoms and attendance at Occlusion Consultation ($p < 0.001$, Cramer's $V = 0.30$).
Among symptomatic patients, 13.5% attended the department, compared to only 0.2% of those without symptoms who also came to the Occlusion Consultation. Nevertheless, the majority of affected patients, 86.5%, did not attend. This suggests that many affected individuals may not see their complaints as requiring specialised assessment.

In many cases, early signs and symptoms of TMD are not recognised as needing professional evaluation, and care is delayed until discomfort significantly disrupts daily life. Ilgunas et al. (2023), reported that patients often hold on and wait out the symptoms to pass until their condition becomes untenable, while at the same time attempting to maintain normal routines such as eating usual foods, continuing work, or engaging socially. These coping strategies may explain why many patients do not seek specialised evaluation, contributing to the fact that many cases remain undetected at an earlier stage.

The study also highlighted that psychological health and attitudes toward symptoms are important factors influencing both treatment-seeking behaviour and clinical outcomes (Ilgunas et al., 2023).
Taken together, these findings underscore the need for greater awareness and patient education, along with routine screening, to ensure the timely identification and management of TMD.

In this study, there is a statistically significant association between the purpose of consultation and the attendance at the Occlusion Consultation ($p = 0.016$), the effect size was small to moderate (Cramer's V = 0.20).
When examining the distribution, 58.3% of patients who consulted specifically for TMJ pain attended the Occlusion Consultation, compared with only 25.6% of those who presented for other reasons but were later identified as having TMJ pain.
This indicates that patients who report TMJ pain as their main complaint will more likely go to the Occlusal Consultation.
These findings align with previous reports by Ye et al. (2022) and Kapos et al. (2020), both highlight that TMD pain is a leading reason for patients to seek professional consultation and treatment.

Considering these findings, although no statistically significant association was observed with age, statistically significant associations were found between signs and symptoms of temporomandibular disorder and factors such as gender, the reason for consultation, and attendance at the Occlusion Consultation.

2. Limitations and potential sources of bias

The present results should be viewed in consideration of several limitations.
First, some of the clinical files were only available in paper format, and they were missing. This reduced the completeness of the study database. In addition, several records lacked information, which may have compromised the data quality.
It is also important to acknowledge that data were collected by dental students who are neither specialists in TMD nor trained experts in data collection.
Given the complexity of this condition, diagnostic accuracy may therefore have been variable.
The restricted age distribution of the sample also limited the accuracy of age-related analyses and reduced the ability to detect differences across groups.
Furthermore, certain signs and symptoms, including orofacial pain level, headache, TMJ lock, and bruxism, were mainly detected in the Occlusion Consultation. Hence, the figures refer to a small group of patients. While other signs and symptoms, such as TMJ pain, TMJ click, and limitation of mandibular movement, were first identified during the Triage consultation. Therefore, the figures are based on a larger patient population.

Regarding the prevalence of signs and symptoms, this disparity in the patient population has been taken into account.

Finally, as the study was confined to a single year (2023), it does not capture temporal variations that might arise from an analysis over several years.

These factors could have influenced the findings and should be considered when interpreting the results.

3. Studies perspectives and future directions

Future studies should aim to include a larger and more representative sample, with a balanced distribution of gender and age groups, and extend data collection over several years to capture long-term trends.

The use of standardised diagnostic protocols and specialist examiners would also strengthen diagnostic accuracy.

While the present study examined age and gender differences in TMD signs and symptoms, subsequent research should expand this perspective to include other socio-demographic factors, such as ethnicity, income, marital status, and education level, which remain underexplored. Investigating these variables could provide a more comprehensive understanding of disparities in TMD prevalence and their impact on both individuals and society.

V. CONCLUSION

This study confirmed that temporomandibular dysfunction (TMD) is a prevalent condition among patients attending the Egas Moniz University Clinic, with nearly one-third presenting at least one sign or symptom.
Significant associations were found between the presence of TMD signs and symptoms and factors such as gender, purpose for consultation, and attendance at the Occlusion Consultation. The majority of affected patients were female, and the most common manifestations included TMJ click, TMJ pain, bruxism, and limitations of mandibular movement.

Although signs and symptoms of TMDs were detected during Triage Consultation, many patients did not proceed to the Occlusion Consultation for further diagnosis or treatment. This reveals a critical gap: while detection happens, patients often fail to understand the importance of the findings or underestimate the potential risks of untreated TMD.
Without proper follow-up, conditions that could be treated conservatively may develop into chronic or more complex issues, raising the burden on both the individual and the healthcare system.

This challenge also presents an opportunity for improvement. Better communication strategies, patient education initiatives, and structured referral protocols could help bridge the gap between detection and treatment.
Dental professionals should not only recognise TMD signs but also take responsibility for ensuring that patients are informed, motivated, and guided to seek timely care.
Empowering patients with knowledge is just as important as clinical expertise in preventing disease progression.

Finally, the education of dental students must emphasise not only detection but also the management of TMDs, as they represent the next generation of practitioners responsible for early diagnosis of these conditions and appropriate treatment strategies.
Strengthening both professional training and patient awareness is crucial to prevent the progression of TMD and reduce its overall impact, ultimately improving quality of life.

VI. REFERENCES

Abbass, M. M. S., Rady, D., El Moshy, S., Ahmed Radwan, I., Wadan, A.-H. S., Dörfer, C. E., & El-Sayed, K. M. F. (2024). The Temporomandibular Joint and the Human Body: A New Perspective on Cross Talk. *Dentistry Journal*, *12*(11), 357. https://doi.org/10.3390/dj12110357

Abe, S., Kawano, F., Matsuka, Y., Masuda, T., Okawa, T., & Tanaka, E. (2022). Relationship between Oral Parafunctional and Postural Habits and the Symptoms of Temporomandibular Disorders: A Survey-Based Cross-Sectional Cohort Study Using Propensity Score Matching Analysis. *Journal of Clinical Medicine*, *11*(21), 6396. https://doi.org/10.3390/jcm11216396

Abouelhuda, A. M., Kim, H.-S., Kim, S.-Y., & Kim, Y.-K. (2017). Association between headache and temporomandibular disorder. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, *43*(6), 363. https://doi.org/10.5125/jkaoms.2017.43.6.363

Alomar, X., Medrano, J., Cabratosa, J., Clavero, J. A., Lorente, M., Serra, I., Monill, J. M., & Salvador, A. (2007). Anatomy of the Temporomandibular Joint. *Seminars in Ultrasound, CT and MRI*, *28*(3), 170–183. https://doi.org/10.1053/j.sult.2007.02.002

Alrizqi, A. H., & Aleissa, B. M. (2023). Prevalence of Temporomandibular Disorders Between 2015-2021: A Literature Review. *Cureus*. https://doi.org/10.7759/cureus.37028

Amstrong, S. A., & Herr, M. J. (2023). Physiology, Nociception. *NCBI Bookshelf*. https://www.ncbi.nlm.nih.gov/books/NBK551562/

Ângelo, D. F., Mota, B., João, R. S., Sanz, D., & Cardoso, H. J. (2023). Prevalence of Clinical Signs and Symptoms of Temporomandibular Joint Disorders Registered in the EUROTMJ Database: A Prospective Study in a Portuguese Center. *Journal of Clinical Medicine*, *12*(10), 3553. https://doi.org/10.3390/jcm12103553

Barjandi, G., Svedenlöf, J., Jasim, H., Collin, M., Hedenberg-Magnusson, B., Christidis, N., & Ernberg, M. (2024). Clinical aspects of mastication myalgia—An overview. *Frontiers in Pain Research*, *4*, 1306475. https://doi.org/10.3389/fpain.2023.1306475

Barlattani Jr, A., Martelli, M., Gargari, M., & Ottria, L. (2019). *Articular disc of temporomandibular joint: An anatomical and historical study. Functional considerations*. *33*, 199–208. PubMed. https://pubmed.ncbi.nlm.nih.gov/32338474/

Bordoni, B., & Varacallo, M. (2023). Anatomy, Head and Neck, Temporomandibular Joint. *Head and Neck*. PubMed. https://pubmed.ncbi.nlm.nih.gov/30860721/

Chen, J., Kandle, P. F., & Murray, I. V. (2023). Physiology, Pain. *NCBI Bookshelf*. https://www.ncbi.nlm.nih.gov/books/NBK539789/

Chisnoiu, A. M., Picos, A. M., Popa, S., Chisnoiu, P. D., Lascu, L., Picos, A., & Chisnoiu, R. (2015). Factors involved in the etiology of temporomandibular disorders—A literature review. *Medicine and Pharmacy Reports*, *88*(4), 473–478. https://doi.org/10.15386/cjmed-485

Committee on Temporomandibular Disorders (TMDs): From Research Discoveries to Clinical Treatment, Board on Health Sciences Policy, Board on Health Care Services, Health and Medicine Division, & National Academies of Sciences, Engineering, and Medicine. (2020). *Temporomandibular Disorders: Priorities for Research and Care* (E. C. Bond, S. Mackey, R. English, C. T. Liverman, & O. Yost, Eds.). National Academies Press. https://doi.org/10.17226/25652

Crăciun, M. D., Geman, O., Leuciuc, F. V., Holubiac, I. Ş., Gheorghiţă, D., & Filip, F. (2022). Effectiveness of Physiotherapy in the Treatment of Temporomandibular Joint Dysfunction and the Relationship with Cervical Spine. *Biomedicines*, *10*(11). https://doi.org/10.3390/biomedicines10112962

Cuccia, A. M., Caradonna, C., & Caradonna, D. (2011). *Manual Therapy of the Mandibular Accessory Ligaments for the Management of Temporomandibular Joint Disorders*. PubMed. https://pubmed.ncbi.nlm.nih.gov/21357496/

Díaz-Quevedo, A. A., Castillo-Quispe, H. M. L., Atoche-Socola, K. J., & Arriola-Guillén, L. E. (2021). Evaluation of the craniofacial and oral characteristics of individuals with Down syndrome: A review of the literature. *Journal of Stomatology, Oral and Maxillofacial Surgery*, *122*(6), 583–587. https://doi.org/10.1016/j.jormas.2021.01.007

Dimitroulis, G. (2018). Management of temporomandibular joint disorders: A surgeon's perspective. *Australian Dental Journal*, *63*(S1). https://doi.org/10.1111/adj.12593

Dworkin, S. F. (2010). Research Diagnostic Criteria for Temporomandibular Disorders: Current status & future relevance1. *Journal of Oral Rehabilitation*, *37*(10), 734–743. https://doi.org/10.1111/j.1365-2842.2010.02090.x

Ellis, O. G., Tocaciu, S., & McKenzie, D. P. (2021). Risk factors associated with poor outcomes following temporomandibular joint discectomy and fat graft. *Elsevier*, *79*(12), 2448–2454. https://doi.org/10.1016/j.joms.2021.05.018

Finnerup, N. B., Kuner, R., & Jensen, T. S. (2021). Neuropathic Pain: From Mechanisms to Treatment. *Physiological Reviews*, *101*(1), 259–301. https://doi.org/10.1152/physrev.00045.2019

Fonseca, J., Almeida, A. M., Pereira, J., & Oliveira, T. (2023). *Disfunções temporomandibulares Guia Prático para o Paciente* (1st ed.). SPDOF-Sociedade Portuguesa de Disfunção Temporomandibular, Dor Orofacial e Sono.

Gale, M. S. (2022). Diagnosis: Fundamental Principles and Methods. *Cureus*. https://doi.org/10.7759/cureus.28730

Garstka, A. A., Kozowska, L., Kijak, K., Brzózka, M., Gronwald, H., Skomro, P., & Lietz-Kijak, D. (2023). Accurate Diagnosis and Treatment of Painful Temporomandibular Disorders: A Literature Review Supplemented by Own Clinical Experience. *Pain Research and Management*, *2023*, 1–12. https://doi.org/10.1155/2023/1002235

Giovanni, A., & Giorgia, A. (2021). The neurophysiological basis of bruxism. *Heliyon*, *7*(7). https://doi.org/10.1016/j.heliyon.2021.e07477

Grichnik, K. (1991). The difference between acute and chronic pain. *The Mount Sinai Journal of Medicine*. PubMed. https://pubmed.ncbi.nlm.nih.gov/1875958/

Häggman-Henrikson, B., Liv, P., Ilgunas, A., Visscher, C. M., Lobbezoo, F., Durham, J., & Lövgren, A. (2020). Increasing gender differences in the prevalence and chronification of orofacial pain in the population. *Pain*, *161*(8), 1768–1775. https://doi.org/10.1097/j.pain.0000000000001872

Hammer, H. B. (2024). Pain in Inflammatory and Degenerative Joint Diseases. *Journal of Clinical Rheumatology and Immunology*, *24*, 10–10. https://doi.org/10.1142/S2661341724740109

Helland, M. M. (1980). Anatomy and Function of the Temporomandibular Joint. *Journal of Orthopaedic & Sports Physical Therapy*, *1*(3), 145–152. https://doi.org/10.2519/jospt.1980.1.3.145

Hylander, W. L. (2006). *Functional Anatomy and Biomechanics of the Masticatory Apparatus*. https://www.researchgate.net/publication/287632897_Functional_anatomy_and_biomechanics_of_the_masticatory_apparatus

Ilgunas, A., Fjellman-Wiklund, A., Häggman-Henrikson, B., Lobbezoo, F., Visscher, C. M., Durham, J., & Lövgren, A. (2023). Patients' experiences of temporomandibular disorders and related treatment. *BMC Oral Health*, *23*(1), 653. https://doi.org/10.1186/s12903-023-03230-5

Iturriaga, V., Bornhardt, T., & Velasquez, N. (2023). Temporomandibular Joint. *Dental Clinics of North America*, *67*(2), 199–209. https://doi.org/10.1016/j.cden.2022.11.003

Joshua, L., & Bouloux, G. F. (2018). Chronic Temporomandibular Joint Dislocation. In *Dislocation of the Temporomandibular Joint*. (pp. 53–62) Springer. https://www.researchgate.net/publication/322679322_Chronic_Temporomandibular_Joint_Dislocation

Kapos, F. P., Exposto, F. G., Oyarzo, J. F., & Durham, J. (2020). Temporomandibular disorders: A review of current concepts in aetiology, diagnosis and management. *Oral Surgery*, *13*(4), 321–334. https://doi.org/10.1111/ors.12473

Klasser, G. D., & Romero Reyes, M. (2023). *Orofacial Pain: Guidelines for Assessment, Diagnosis, and Management* (7th ed.). Quintessence Publishing.

Kmeid, E., Nacouzi, M., Hallit, S., & Rohayem, Z. (2020). Prevalence of temporomandibular joint disorder in the Lebanese population, and its association with depression, anxiety, and stress. *Head & Face Medicine*, *16*(1), 19. https://doi.org/10.1186/s13005-020-00234-2

List, T., & Jensen, R. H. (2017). Temporomandibular disorders: Old ideas and new concepts. *Cephalalgia*, *37*(7), 692–704. https://doi.org/10.1177/0333102416686302

Maini, K., & Dua, A. (2023). Temporomandibular Syndrome. In *Temporomandibular Syndrome*. StatPearls Publishing. https://pubmed.ncbi.nlm.nih.gov/31869076/#full-view-affiliation-1

Mallya, S., & Lam, E. (2018). *White and Pharoah's Oral Radiology: Principles and Interpretation* (8th ed.). Elsevier. https://shop.elsevier.com/books/white-and-pharoahs-oral-radiology/mallya/978-0-323-54383-5

Manfredini, D. (2010). *Current concepts on temporomandibular disorders* (1st ed.). Quintessence Publishing.

Manfredini, D., Piccotti, F., & Ferronato, G. (2010). *Age peaks of different RDC/TMD diagnoses in a patient population*. *38*(5), 392–299. https://doi.org/10.1016/j.jdent.2010.01.006

Matheson, E. M., Fermo, J. D., & Blackwelder, R. S. (2023). *Temporomandibular Disorders: Rapid Evidence Review*. AAFP. https://www.aafp.org/pubs/afp/issues/2023/0100/temporomandibular-disorders.html

Mehndiratta, A., Kumar, J., Manchanda, A., Singh, I., Mohanty, S., Seth, N., & Gautam, R. (2019a). Painful clicking jaw: A pictorial review of internal derangement of the temporomandibular joint. *Polish Journal of Radiology*, *84*, 598–615. https://doi.org/10.5114/pjr.2019.92287

Mehndiratta, A., Kumar, J., Manchanda, A., Singh, I., Mohanty, S., Seth, N., & Gautam, R. (2019b). Painful clicking jaw: A pictorial review of internal derangement of the temporomandibular joint. *Polish Journal of Radiology*, *84*, 598–615. https://doi.org/10.5114/pjr.2019.92287

Minervini, G., Franco, R., Crimi, S., Di Blasio, M., D'Amico, C., Ronsivalle, V., Cervino, G., Bianchi, A., & Cicciù, M. (2024). Pharmacological therapy in the management of temporomandibular disorders and orofacial pain: A systematic review and meta-analysis. *BMC Oral Health*, *24*(1), 78. https://doi.org/10.1186/s12903-023-03524-8

Naylor, J. G. (1962). A scientific concept of temporomandibular articulation. *The Journal Od Prosthetic Dentistry*, *12*(3), 476–485. https://doi.org/10.1016/0022-3913(62)90131-2

Okeson, J. P. (2019). *Management of Temporomandibular Disorders and Occlusion* (8th ed.). Elsevier.

Pandarakalam, C., & Khalaf, M. W. (2014). Temporomandibular Disorders. In *Reference Module in Biomedical Sciences*. Elsevier. https://doi.org/10.1016/B978-0-12-801238-3.00002-7

Prabhakar, V., Rajvikram, N., Ramachandran, U., Saravanan, R., Ponsekar, A. A., & Thomas, D. C. (2024). Knowledge and awareness about temporomandibular disorder among dentists in India: Questionnaire study and review. *The Journal of Indian Prosthodontic Society*, *24*(3), 284–291. https://doi.org/10.4103/jips.jips_573_23

Qin, H., Guo, S., Chen, X., Liu, Y., Lu, L., Zhang, M., Zhang, H., Zhang, J., & Yu, S. (2024). Clinical profile in relation to age and gender of patients with temporomandibular disorders: A retrospective study. *BMC Oral Health*, *24*(1), 955. https://doi.org/10.1186/s12903-024-04736-2

Qvintus, V., Sipila, K., & Le Bell, Y. (2020). *Prevalence of clinical signs and pain symptoms of temporomandibular disorders and associated factors in adult Finns*. 515–521. https://doi.org/10.1080/00016357.2020.1746395

Runci Anastasi, M., Centofanti, A., Arco, A., Vermiglio, G., Nicita, F., Santoro, G., Cascone, P., Anastasi, G. P., Rizzo, G., & Cutroneo, G. (2020). Histological and Immunofluorescence Study of Discal Ligaments in Human Temporomandibular Joint. *Journal of Functional Morphology and Kinesiology*, *5*(4), 90. https://doi.org/10.3390/jfmk5040090

Scheuermann, R. H., Ceusters, W., & Smith, B. (2009). *Toward an Ontological Treatment of Disease and Diagnosis*. PubMed. https://pubmed.ncbi.nlm.nih.gov/21347182/'

Scholz, J. (2014). Mechanisms of chronic pain. *Molecular Pain*, *10*(Suppl 1), O15. https://doi.org/10.1186/1744-8069-10-S1-O15

Shetty, U. S., Burde, K. N., Naikmasur, V. G., & Sattur, A. P. (2014). Assessment of Condylar Changes in Patients with Temporomandibular Joint Pain Using Digital Volumetric Tomography. *Radiology Research and Practice*, *2014*, 1–8. https://doi.org/10.1155/2014/106059

Siéssere, S., Vitti, M., Semprini, M., Regalo, S. C. H., Iyomasa, M. M., Dias, F. J., Issa, J. P. M., & Sousa, L. G. D. (2008). Macroscopic and microscopic aspects of the temporomandibular joint related to its clinical implication. *Micron*, *39*(7), 852–858. https://doi.org/10.1016/j.micron.2007.12.006

St. John Smith, E. (2018). Advances in understanding nociception and neuropathic pain. *Journal of Neurology*, *265*(2), 231–238. https://doi.org/10.1007/s00415-017-8641-6

Stelea, C. G., Agop-Forna, D., Dragomir, R., Ancuţa, C., Török, R., Forna, N. C., & Iordache, C. (2021). Recovery of Post-Traumatic Temporomandibular Joint after Mandibular Fracture Immobilization: A Literature Review. *Applied Sciences*, *11*(21), 10239. https://doi.org/10.3390/app112110239

Tanaka, E., & Koolstra, J. H. (2008). *Biomechanics of the Temporomandibular Joint*. https://doi.org/10.1177/154405910808701101

Tuncer, A. (2020). Kinesiology of the temporomandibular joint. In *Comparative Kinesiology of the Human Body* (pp. 285–302). Elsevier. https://doi.org/10.1016/B978-0-12-812162-7.00014-X

Warren, M. P., & Fried, J. L. (2001). *Temporomandibular disorders and hormones in women*. https://doi.org/10.1159/000047881

Wilkie, G., & Al-Ani, Z. (2022). *Temporomandibular joint anatomy, function and clincal relevance*. https://doi.org/10.1038/s41415-022-5082-0

Wu, M., Cai, J., Yu, Y., Hu, S., Wang, Y., & Wu, M. (2021). Therapeutic Agents for the Treatment of Temporomandibular Joint Disorders: Progress and Perspective. *Frontiers in Pharmacology*, *11*. https://doi.org/10.3389/fphar.2020.596099

Xiong, X., Xiao, C., Zhou, X., Li, X., Wang, J., & Yi, Y. (2023). Knowledge and Attitudes regarding Temporomandibular Disorders among Postgraduate Dental Students and Practicing Dentists in Western China: A Questionnaire-Based Observational Investigation. *Pain Research and Management*, *2023*, 1–10. https://doi.org/10.1155/2023/7886248

Yang, P.-Y., Su, N.-Y., Lu, M.-Y., Wei, C.-Y., Yu, H.-C., & Chang, Y.-C. (2017). Trends in the prevalence of diagnosed temporomandibular disorder from 2004 to 2013 using a Nationwide health insurance database in Taiwan. *Journal of Dental Sciences*, *12*(3), 249–252. https://doi.org/10.1016/j.jds.2017.01.001

Ye, C., Xiong, X., Zhang, Y., Pu, D., Zhang, J., Du, S., & Wang, J. (2022). Psychological Profiles and Their Relevance with Temporomandibular Disorder Symptoms in Preorthodontic Patients. *Pain Research and Management*, *2022*, 1–8. https://doi.org/10.1155/2022/1039393

Yin, Y., He, S., Xu, J., You, W., Li, Q., Long, J., Luo, L., Kemp, G. J., Sweeney, J. A., Li, F., Chen, S., & Gong, Q. (2020). The neuro-pathophysiology of temporomandibular disorders-related pain: A systematic review of structural and functional MRI studies. *The Journal of Headache and Pain*, *21*(1). https://doi.org/10.1186/s10194-020-01131-4

Yoda, T., Ogi, N., Yoshitake, H., Kawakami, T., Takagi, R., Murakami, K., Yuasa, H., Kondoh, T., Tei, K., & Kurita, K. (2020). Clinical guidelines for total temporomandibular joint replacement. *Japanese Dental Science Review*, *56*(1), 77–83. https://doi.org/10.1016/j.jdsr.2020.03.001

Zagalo, C., Dos Santos, J. M., Cavacas, Silva, A. J. S., Evangelista, J. G., Oliveira, P., & Tavares, V.(2010). *Anatomia da Cabeça e Pescoço e Anatomia Dentária* (1st ed.). Egas Moniz.

Zieliński, G., Pająk-Zielińska, B., & Ginszt, M. (2024). A Meta-Analysis of the Global Prevalence of Temporomandibular Disorders. *Journal of Clinical Medicine*, *13*(5), 1365. https://doi.org/10.3390/jcm13051365

APPENDIX

EGAS MONIZ SCHOOL of HEALTH & SCIENCE

Comissão de Ética EGAS MONIZ

Processo Interno: 1551
PT-465/24

Ex.ma Senhora
Lina Khan Domun

Monte de Caparica, 5 de fevereiro de 2025.

Ex.ma Senhora,

Em resposta ao Pedido de Parecer que submeteu à apreciação da Comissão de Ética da Egas Moniz, com o tema denominado: "Disfunção Temporomandibular; despiste de sinais e sintomas em doentes da Clínica Universitária Egas Moniz ", foi aprovado.

A Vice-Presidente da Comissão de Ética da Egas Moniz

Profª Doutora Ângela Pereira

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