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Prevalence of temporomandibular joint dysfunction among the indigenous population of India

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ABSTRACT

Purpose: Primary dental care facilities and awareness about temporomandibular disorders are lacking among the indigenous population of Kerala. The aim of the study was to determine the prevalence of temporomandibular joint dysfunction (TMD) disorders among the indigenous populations of Kerala.

Methodology: This cross-sectional study included adults aged 18 years and above, visiting primary health care centre in the tribal hamlet in the town of Kalpetta, Wayanad District, Kerala, India, for reasons other than dental. Axis I and II of Research Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) was used to screen for TMD. A local language validated screening questionnaire was used. The clinical examination was carried out as per the DC/TMD by a calibrated examiner. The data was processed using SPSS and the frequencies and proportions for signs and symptoms of TMD were estimated.

Results: Among 198 adults screened, 23 (11.6 %) had TMD. Among these 60 % of the adults were aged 31–65 years and predominantly females (86.9 %). 39 % of these patients were dentulous. All affected adults experienced TMD related pain for more than 3 months with 90 % of them experiencing moderate-to-severe pain. Myofascial pain was the most prevalent type. Other findings included moderate anxiety levels in 34.8 % and abnormal oral behaviour and high physical symptoms in 40 % TMD patients.

Conclusion: TMD disorders were prevalent among the indigenous population and remained undiagnosed. The study highlights the need for screening and the availability of basic dental care for the indigenous populations.

1. Introduction

The American Academy of Orofacial Pain has defined temporomandibular disorders (TMDs) as "a collective term that embraces a number of clinical problems that involve the masticatory muscles, the temporomandibular joint (TMJ), and the associated structures". Temporomandibular disorders are the commonest reasons for orofacial pain of non-dental origin. The TMDs are characterized by clinical signs such as muscle and/or TMJ tenderness; TMJ sounds (clicking, popping, or grating) while opening or closing the mouth or while chewing; and mouth deviation, restriction, or deflection while mouth opening or closing. The sum or exacerbation of these signs and symptoms eventually limits or even disables individuals from performing their physiological activities.[1]

Due to the high variability in the presentation, TMDs are generally diagnosed based on a thorough history and physical examination.[2,3] The condition is quite prevalent with nearly one in four individuals having at least one sign of TMJ dysfunction and about 33 % of individuals reporting at least one TMD symptom.[4] These symptoms usually vary over time and correlate significantly with teeth grinding or clenching, muscle tension, and several other parafunctional oral habits. Psychosocial factors also influence the symptoms in TMD patients.[5]

However, there is a lack of adequate epidemiologic data estimating the proportion and distribution of TMDs among different populations. Evaluation of existing literature reveals controversy regarding the prevalence of TMD features in different groups of individuals. The association between dental and prosthetic status and TMDs is also controversial and lacks adequate data.

The pluralistic, multi-ethnic, multi-linguistic land of India is the home to one of the largest tribal populations in the world, constituting

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roughly one-quarter of all indigenous people.[6] The tribal population accounts for 8.2 % of the total Indian population.[7] Large inequalities and discrimination exist between the indigenous and mainland population worldwide[7] and India is no way different.[8] The indigenous population of India, classified as scheduled tribes or Adivasis, face higher mortality rates, community disorders like tuberculosis, undernutrition, and anaemia. They also experience inadequate poor hygiene, increased tobacco/alcohol use, and limited access to healthcare.[9–14] The indigenous population also experience distinctive concerns related to oral health owing to the lack of adequate access to primary dental care. As the public interest in overall oral health has been increasing, the interest and demand for the identification and treatment of TMD has been increasing as well. The tribes are a part of the Indian society and general problems of consciously changing or modernizing Indian society are applicable to them as well.

However, due to lack of awareness, accessibility, and affordability, many of them have been living with the pain and dysfunction for many years. The current study was hence planned to evaluate the prevalence of TMJ dysfunction among the indigenous population of Kerala, in order to obtain baseline data which can be used in the further evaluation and appropriate management of TMDs in this population.

2. Methods

2.1. Study setting

This was a cross-sectional study conducted in a primary health centre at Kalpetta, Wayanad district of Kerala, India. The study was approved by the Institutional Review board. Patients were free either to participate or not participate in the study. All the participants of the study were required to sign the approved consent form.

2.2. Study population

This study included adults, attending primary health care for other than dental reasons in the tribal hamlet in the town of Kalpetta, Wayanad District, Kerala, India. All adults above 18 years of age who were ready to participate in the study and sign the consent form were included. Individuals with any previous history of trauma to the facial region, or any muscle disorders, or under psychiatric treatment or undergoing treatment for TMDs were excluded from the study.

2.3. Assessment of TMD

Screening for TMD was carried out using the Axes I and II of DC/TMD protocol, which is useful for initial screening and identification of patients with TMD.[9] The Axis I protocol helps in categorizing the disorder while Axis II protocol involves the use of different screening instruments for evaluating aspects such as chronicity of pain, disability and pain associated with TMD through the pain grade scale. The screening instruments that are part of the Axis II protocol include the following.

a) Graded chronic pain scale (GCPS) version 2.0, for evaluating pain intensity, interference, and disability.[10]
b) Patient health questionnaire – 9 (PHQ-9) for depression.[11,12]
c) Generalized anxiety disorder scale-7 (GAD-7) for assessing the influence of TMD on anxiety and mood of the affected individuals.[13]
d) -15 for evaluating the physical symptoms.[14,15]
e) Oral behaviors checklist (OBC)[16–19] for assessing the presence of parafunctional behaviors
f) Jaw functional limitation scale (JFLS)[20,21] for evaluating the functional limitation of the masticatory system.

2.4. Clinical examination of TMD

The clinical examination was carried out by a single clinical examiner trained according to the DC/TMD consortium guidelines, including the DC/TMD video. The evaluation of the physiological features included physical examination where the patient was in Fowler (90°) position, free from objects that may hinder the evaluation (such as glasses, headbands, barrettes, scarves, etc.). Gloves were used throughout the inspection. The following aspects were evaluated: presence and location of pain (joint and/or muscle) referred by the patient and confirmed in clinical examination, the pattern of jaw opening (straight, deviation with reduction and deviation without reduction), measurement (path) of the jaw opening (free pain opening, high maximum unassisted and maximum assisted, registered with millimetric ruler), palpation of joint sounds and present of joint pain in opening and close jaw: clicks (short precise sound commonly called click) and crepitus (continuous sound, like the rubbing of two solid structures), palpation of joint sounds and presence of joint pain during lateral jaw movements, presence of muscle pain (right and left) to major palpation at 16 extra-oral muscular sites; (two pounds of pressure) and at 4 intraoral muscles (one pound of pressure), and presence of joint pain (right and left; one pound of pressure) in the posterior insertion and lateral pole of TMJ.

The masseter and temporalis muscles were palpated one side at a time. The intent was to palpate the whole muscle, including the tendonous attachments. To maximise systematic coverage, three vertical bands of the temporalis and three horizontal bands of the masseter were palpated. All the muscles were palpated at a static state. To palpate the lateral pterygoid, the patient was asked to move his or her mandible toward the same side. The finger was placed on buccal side of alveolar ridge above the maxillary molars and move finger posteriorly, medially, and upward as far as possible.

The submandibular and posterior mandibular region are the supplemental palpation sites. The posterior mandibular region is defined as that area between the insertion of the SCM and posterior border of the mandible. The submandibular region is defined as the area 2 cm anterior to the angle of the mandible, and medial to the mandible. The patient was asked to relax the jaw during the palpation of the submandibular and posterior mandibular region.

To measure the maximum unassisted opening the patient is asked to open as wide as possible, even if it is painful. The interincisal distance between the maxillary and mandibular reference teeth are measured. To measure the maximum assisted opening, permission is obtained from the patient to “stretch” his or her mouth further. The patient is informed to raise his or her hand if the examination has to be stopped. After the patient opens the mouth, the thumb is placed on the maxillary central incisors, and cross index finger over the mandibular central incisors. Using moderate pressure, the mouth is pushed open further. The interincisal distance between the maxillary and mandibular reference teeth are measured. It is critical that this measurement is at least the same as was measured for maximum unassisted opening.

For the evaluation of opening pattern, the patient is asked to place the back teeth completely together, ad slowly open the mouth as wide as possible, even if it is painful and close and put back the teeth completely together again. The opening movement could be straight (no observed deviation:$<$ 2 mm to either side of the midline), corrected (i.e., S-or C-curve deviation, $>$2 mm) or uncorrected (i.e., lateral deviation $>$2 mm).

To record the TMJ noises during opening & closing movements, The patient is asked to slowly open as wide as possible regardless of pain, and then slowly close until his or her back teeth are completely together again. This is repeated 2 or more times. The noise if present is recorded as a “click” or “crepitus” if it is present on at least 1 of the 3 movements. Multiple types of noises can be present in a single joint.

For recording TMJ noises during lateral and protrusive movements, the patient is asked to place his or her back teeth completely together (where they fit together the best), then to open slightly and move his or her jaw to the right as far as he can regardless of pain, and then move it back to its normal position and place his or her back teeth completely together. Repeat 2 more times. Repeat same procedure with left lateral

and protrusive movements.

2.5. Data collection process and data items

The data obtained from each individual including demographic details, dentition status, evaluation of the existing denture, TMD screener, symptom questionnaire, examination form, and others (including GCPS, PHQ 9, GAD 7, PHQ 15, OBC and JFLS) were entered in Microsoft Excel sheet.

3. Results

3.1. Patient demographics

A total of 198 patients were screened for TMD. Among these, 23 (11.61 %) of them were diagnosed with TMD based on the screening and clinical examination. Majority (86.96 %, n = 20) of these patients with TMD were women and were between the age group of 31–65 years (Table 1). The dentition status of these patients has been enumerated in Table 1. Majority (43.48 %, n = 10) of the patients were partially edentulous.

3.2. Axis II assessment protocol findings

According to the chronic pain grade evaluation of DC/TMD Axis II protocol, 52.17 % (n = 12) patients had high intensity pain without disability (CPG II) while 47.83 % (n = 11) of the patients had low-intensity pain without disability (CPG I). The estimated interference score was 47.83 % (n = 11) (Interference score III) with 'moderately limiting' and 39.13 % (n = 9) (Interference score III) with 'severely limiting' TMD.

The patient health questionnaire (PHQ 9) revealed that all 23 patients had mild, moderate, or severe depression. Majority (56.52 %, n = 13) of these patients had mild depression while moderate and severe depression was noted in 21.74 % (n = 5) of the patients (Table 2). According to the evaluation based on the GAD-7 questionnaire, 65.22 % of the patients had mild anxiety while moderate anxiety was noted in 34.78 % (n = 8) patients (Table 2).

According to the PHQ-15 questionnaire, majority (56.52 %, n = 13) of the patients had low physical symptoms, while medium and high physical symptoms were noted in 34.78 % (n = 8) and 8.70 % (n = 2) patients, respectively.

According to the OBC, 47.83 % (n = 11) of the affected patients had normal behaviors, while 13.04 % (n = 3) patients had twice higher frequency of oral behaviors (compared to those with TMD). The frequency of oral behaviors was 17 times more than that noted in TMD in 39.13 % (n = 9) patients.

Outcomes of the JFLS have been enumerated in Table 3. The mean estimated mastication score was 4.34, mean mobility score was 5.03, and the verbal and non-verbal communication score was 2.75. The mean determined global scale was 4.35.

3.3. Clinical examination

The average duration of edentulism was 3.79 years (Table 4) while the average duration of TMD pain was 3.05 years. Nine patients had pain in the lateral pterygoid and temporalis tendon. Majority (62.26 %, n = 14) of the patients experienced pain while mouth opening as pain free opening was noted in 37.74 % (n = 9) of the patients. Corrected deviation was noted in 34.78 % (n = 8) patients.

4. Discussion

Globally, it is estimated that there are about 476 million indigenous people residing in 90 countries across the world.[22] Disparities, especially in terms of access to oral health have been reported in several countries.[23] It has also been reported that oral diseases affect up to 80 % of the indigenous population, globally.[24] Screening for oral health disorders is hence an important step in ensuring early identification and appropriate management of these disorders in this population.

The current study noted that 11.6 % of the screened population had TMJ disorders, with tenderness being the most common feature (47.83 %), followed by clicking (43.48 %). Further, most of these patients (43.48 %) had bilateral clicking, corrected deviation (34.78 %), and

Table 1
Demographic characteristics Dentition evaluation of the study population diagnosed with TMD.

Total prevalence: 23/198 (11.61 %)			
		n	%
Age group (yr)	18–30	6/23	26.09
	31–65	14/23	60.86
	65	3/23	13.04
Gender	Males	3	13.04
	Females	20	86.96
Dentition status	Dentulous	9/23 (39.13)	
	Partial edentulism	10/23 (43.48)	
	Partial edentulism 0–3 teeth missing	7/10 (70)	
	Partial edentulism 4–6 teeth missing	2/10 (20)	
	Partial edentulism 7–9 teeth missing	1/10 (10)	
	Complete edentulism	4/23 (17.39)	
Number of teeth missing	Anterior	76/156 (48.71)	
	Posterior	80/156 (51.28)	
Kennedy's Class – maxilla	Class I	0/23	
	Class II	1/7 (14.29)	
	Class III	5/7 (71.43)	
	Class IV	1/7 (14.29)	
	NA (dentulous or complete edentulism)	16/23 (69.57)	
Kennedy's Class – mandible	Class I	0/23	
	Class II	1/6 (16.67)	
	Class III	5/6 (83.33)	
	Class IV	0/23	
	NA (dentulous or complete edentulism)	17/23 (73.91)	

Table 2
GCPS, PHQ-9-depression, GAD-7: Anxiety, PHQ-15: Physical symptoms and OBC: Oral behaviors checklist.

Total Number of screened individuals = 198			
Total number of individuals screened positive = 23			
SCALE	VARIABLE	n	%
GCPS – **Chronic Pain Grade**	I – Low intensity pain, without disability	11	47.83
	II – High intensity pain, without disability	12	52.17
GCPS – **Interference score**	0 – None	3	13.04
	III – Moderately limiting	11	47.83
	IV – Severely limiting	9	39.13
PHQ-9-Depression	mild	13	56.52
	moderate	5	21.74
	severe depression	5	21.74
GAD-7: Anxiety	mild	15	65.22
	moderate	8	34.78
PHQ-15: Physical Symptoms	low physical symptoms	13	56.52
	medium physical symptoms	8	34.78
	high physical symptoms	2	8.70
OBC: Oral Behaviors Checklist	0-16 – represent normal behaviors	11	47.83
	17-24 – occurs twice as often in those with TMD	3	13.04
	25-62 – occurs 17 times more often	9	39.13

Table 3
Characteristics of study participants determined through JFLS: Jaw Functional Limitation Scale.

JFLS: Jaw Functional Limitation Scale					
Age/ Gender		Mastication score (mean of 1–6 ques)	Mobility score (mean of 7–10 ques)	Verbal and non-verbal communication: (mean of items 13–20)	Global scale (1,3,6,10,11,12,13 average)
Mean		4.34	5.03	2.75	4.35
Score	Males	4.28	4.92	3.25	4.5
	Females	4.35	5.05	2.68	4.32

Table 4
Clinical examination outcomes.

Average duration of edentulism	3.79 years		
Average duration of TMD pain	3.05 years		
Number of positive supplemental muscle pain with palpation		Right	Left
	Posterior mandibular region	7	5
	Submandibular region	3	3
	Lateral pterygoid area	9	9
	Temporalis tendon	9	9
Average opening movements	Pain Free Opening	37.74	
	Maximum Unassisted Opening	38.7	
	Maximum Assisted Opening	38.7	
Opening pattern	Straight	15	
	Corrected deviation	8	

	click		crepitus	
	Right	Left	Right	Left
Number of positive TMJ Noises During Open & Close Movements	10	10	6	6
Number of positive TMJ Noises During Lateral & Protrusive Movements	9	9	6	6

crepitation (26.08 %), as noted in other related studies (14,32,33). According to a study from Northern India which evaluated the incidence of TMD, clicking was the most common clinical feature (42.5 %) among the patients with TMD while deviation during mouth opening was noted in 40.8 % of the patients.[25] Another study from Haryana, India reported a TMD prevalence of 51 % with a significant relation of TMD with overbite and bruxism.[26]

Psychological issues such as stress and anxiety are also believed to have a role in TMJ disorders [34, 35]. These may lead to bruxism which in turn affects the masticatory system eventually resulting in TMJ dysfunction.[27] On the contrary, the presence of TMD may also negatively influence the psychological state of the affected individuals. This is evident by the presence of varying degrees of depression among all patients with TMD in the current study. Mild to moderate anxiety was also reported among the patients with TMD. Identification and management of TMD is hence essential to break this vicious cycle.

Awareness of TMD among dentists and patients is crucial for diagnosing and treating TMD. A few of the patients in the current study had reported their visit to dental clinic and physicians for the TMJ pain they experienced. However, those patients were only prescribed basic pain-relieving medications by the medical as well as the dental practitioners. This highlights the lack of awareness about TMD management among medical and dental practitioners. According to a study from Italy, about 47 % of the dentists who participated in a survey about TMD had insufficient knowledge about TMD.[28] A study from central India which assessed the knowledge and awareness among general dental practitioners (GDPs) about TMD management, revealed that considerable percentage of GDPs lacked knowledge about the standard management protocol for TMDs and felt insecure while diagnosing and managing TMDs in their dental practice.[29] An ideal approach for managing such patients would be to identify the cause of the problem and then refer the patient to the concerned dental or medical practitioners if one is not a specialist or experienced in the management of TMD.

Knowledge about TMD among patients is also limited and there is a need to increase the awareness among patients as well as caregivers about the symptoms and consequences of TMD. Awareness should also be created about the self-care remedies and available treatment options. Failure to do this would lead to patients continuing to suffer from this disorder in silence, which would impact the physical and psychological functioning of the affected individuals.[30]

In conclusion, a considerable amount of prevalence of TMD was noted in the indigenous population of Kerala. The lack of awareness about the disorder among these individuals is also a concern. Steps should be taken to conduct screening camps on a larger scale to identify individuals suffering from TMDs and initiate appropriate management to help reduce the suffering and improve the quality of life.

Dental rehabilitation plays a crucial role in the management of temporomandibular joint disorder (TMD) in patients who are edentulous or partially edentulous. The restoration of missing teeth not only helps to improve the function of the jaw but can also aid in reducing pain and discomfort associated with TMD. In conjunction with dental rehabilitation, addressing anxiety and depression through medications or counseling can also be beneficial in the treatment of TMD. Studies have shown that stress and emotional factors can exacerbate TMD symptoms, so managing these conditions can have a positive impact on the overall well-being of the patient. By taking a comprehensive approach that includes both dental rehabilitation and mental health support, healthcare providers can help patients find relief from the challenges of TMD and improve their quality of life.

4.1. Limitations of the study

This study was conducted in a primary health care centre and included adults attending the centre for their health care needs. Hence, this population may not be a representative of the indigenous group.

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Declaration of competing interest

All authors declare that they have no conflict of interests.

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