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ASSESSMENT OF IMPACT OF COVID-19 ON TEMPOROMANDIBULAR DISORDERS AND ITS PREVALENCE IN CENTRAL INDIA POST-COVID: A SURVEY

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ABSTRACT

BACKGROUND. Temporomandibular disorders (TMD) are characterized by pain and dysfunction affecting the temporomandibular joints and surrounding muscles. TMD prevalence in the general population is estimated at 5-12%, with psychological factors like anxiety and depression contributing to its onset and progression. TMD's impact extends to various health conditions and psychological distress. The COVID-19 pandemic exacerbated musculoskeletal pain, with studies indicating a heightened prevalence of TMD among those affected.
OBJECTIVE. The objective of this study was to evaluate the prevalence and impact of temporomandibular disorders (TMD) in individuals affected by COVID-19 in Central India.
MATERIAL AND METHODS. This observational, cross-sectional study was conducted in Central India from January to April 2024 and included 400 patients attending the hospital OPD. Participants were selected via convenience sampling, with a focus on those affected by COVID-19. Data was collected through a pre-tested, self-administered structured questionnaire, validated through expert consultation and a pilot study. Statistical analysis was performed using SPSS 21.0, assessing data distribution and significance.
RESULTS. Among participants, 24.5% were aged 56 years or above, with 120 (30%) diagnosed with TMD. Of these, 46.67% were diagnosed post-COVID, with jaw pain being a prominent symptom. The pandemic worsened symptoms for 55.56% of participants, with many attributing this to increased stress. A significant number of participants sought medical help during the pandemic, but satisfaction with treatment options was low. Challenges such as increased pain and difficulty eating were reported, and most participants faced additional health issues post-COVID.
CONCLUSIONS. The study reveals that TMD diagnosis and symptoms were notably affected by COVID-19, with increased pain and functional challenges reported. Despite seeking treatment, participants expressed dissatisfaction with available options, highlighting need for enhanced management and support strategies for TMD in the context of post-COVID health challenges.

Keywords: *temporomandibular disorders, prevalence, COVID-19, jaw disorder, pain*

INTRODUCTION

Temporomandibular disorders (TMD) are characterized by dysfunction and pain affecting the temporomandibular joints (TMJ), masticatory muscles and surrounding structures. The prevalence of TMD in the general population is estimated to be around 5-12%, with women being twice as likely to develop the condition compared to men (1,2). The exact causes of TMD remain elusive, but research indicates that psychological factors, such as anxiety and depression, significantly contribute to both the onset and progression of the disorder (3). Individuals suffering from TMD often experience not only localized pain but also a range of other health issues. For example, there is a notable association between painful TMD and respiratory conditions like bronchitis and asthma, as well as widespread pain in adolescents. Furthermore, those with painful TMD report a higher incidence of systemic health conditions compared to those without TMD (4). This complex interplay between TMD and various health conditions as well as the significant impact of TMD on overall health and well-being underscores the importance of a comprehensive approach to treatment (5). The burden of TMDs extends beyond the physical symptoms, as they are also associated with psychological distress. Chronic pain and functional limitations can lead to anxiety, depression, and a reduced overall quality of life (6).

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Coronavirus Disease 2019 (COVID-19) emerged in Wuhan, China in November 2021 and swiftly spread across the globe. Infected individuals exhibited a range of symptoms, from mild headaches to severe respiratory issues, which in many cases led to death (5). The WHO's declaration of COVID-19 as a pandemic by March 2020 and the ensuing government interventions to prevent its spread such as social distancing and varying degrees of lockdowns to curb the virus's spread led to significant physical and mental health challenges. The reduction in social interactions, difficulties in accessing medical care, economic instability, and the pervasive fear of illness and death all contributed to a complex and multifaceted public health crisis (6,7).

Research indicates that the incidence of musculoskeletal dysfunction and pain increased significantly with COVID-19 infection. Studies have shown that 45.1% of patients continued to experience musculoskeletal pain even after recovering from COVID-19, with many reporting new onset pain (8). Additionally, research on orofacial pain conditions revealed a high prevalence of temporomandibular disorder (TMD) symptoms, with COVID-19 patients facing twice the risk of developing TMD events (9). Recent studies also highlighted that chronic TMD patients were more susceptible to the psychological distress caused by the pandemic, which in turn led to increased levels of orofacial pain. The pandemic exacerbated the biological, psychological, and social factors that influence TMD, making it a more complex and challenging disorder to manage (10,11).

The COVID-19 pandemic has had a notable impact on individuals with musculoskeletal and orofacial pain conditions, especially those with temporomandibular disorders (TMD). Various factors during the pandemic have exacerbated the prevalence and severity of these conditions, emphasizing the importance of additional research and holistic management approaches. However, there remains a gap in our understanding of how COVID-19 specifically affects TMDs in the central India region. Therefore, this study was conducted to investigate the prevalence and impact of COVID-19 on TMDs in this geographical area.

MATERIALS AND METHODS

Study design, study population, sample size, sampling technique. This observational, cross-sectional analytical study included 400 patients attending the hospital OPD, selected through convenience sampling. It was conducted from January to April 2024 in Central India. The participants, either new or existing cases of temporomandibular disorders at single tertiary care dental hospital in the regular OPD of Oral Medicine and Radiology who had been affected by the COVID-19 virus were included in the study. These were new as well as old patients who were diagnosed with TMD in the OPD of Oral Medicine and Radiology based on signs and symptoms shown by the patient. COVID-19 infection was confirmed by the reports presented by the patients. A written informed consent was obtained from all participants, ensuring anonymity to maintain privacy and confidentiality of the collected information.

Method for data collection. The information was gathered using pre-tested, pre-validated, self-administered structured questionnaire by reviewing relevant literature on temporomandibular disorders. Content validity, which ensures a test measures its intended construct, was established by consulting subject experts from the Department of Oral Medicine, Diagnosis and Radiology. Additional input was gathered from discussions with these experts. To further validate the questionnaire, a pilot study was conducted with 10 participants affected with TMJ disorders, not included in the main study. Based on their feedback, ambiguous or unsuitable questions were modified, resulting in the final version of the questionnaire. A pre-test was conducted to identify flaws and assess the time requirements of the questionnaire. This pre-test involved 30 participants, representing 10% of the sample size. The pre-test assumed these participants had similar characteristics to the actual study respondents. The objectives were to:

- Identify any difficult or misinterpreted parts of the instrument
- Assess the clarity of the instrument
- Evaluate the sequencing of questions
- Determine the acceptability of questions and respondents' willingness to answer
- Detect any errors in the questionnaire
- Assess the appropriateness and clarity of questions.

The principal investigator conducted the pre-test to ensure that all questions were understood by the respondents.

The questionnaire comprised of two sections. The first section was composed of questions related to socio-demographic characteristics of participants. In the second section, the data pertaining to symptoms, diagnosis, treatment taken, effects on eating habits, sources of information, awareness about post-COVID temporomandibular joint disorders and its impact on life was recorded. After data collection, the self-administered questionnaires were reviewed for internal consistency and completeness.

Statistical analysis. The data was entered into the excel sheet. The data was analyzed using SPSS (Statistical Package for Social Sciences) 21.0 version, IBM, Chicago. The data was analyzed for probability distribution using Kolmogorov-Smirnov test which

indicated that data was normally distributed. The descriptive statistics was performed. The qualitative data was represented by frequency and percentage.

RESULTS

In this study, Table 1 shows that majority of the study participants (24.5%) belonged to the age group of 56 years and above followed by 46-55 and 30% of total participants were diagnosed with TMD. Among participants, 56.25% of the respondents were males, while 43.75% were females. Majority rated their current health status as fair (49%).

Among the 120 participants (Table 2) diagnosed with TMD there were 57.5% males and 42.5% females with 46.67% diagnosed post-COVID with majority having jaw pain (38.33%) as the symptom of TMD. The symptoms of 55.56% participants worsened during COVID-19 pandemic and increased stress and anxiety was the major factor (40%) causing the worsening of symptoms. Moreover, 66.67% sought medical help during COVID-19 pandemic for the TMD.

Table 3 shows that there were (60.71%) patients who were currently facing challenges related to TMD post-COVID and increased pain and discomfort (55.88%) being the most prominent challenge. Also, 69.64% participants changed their eating habits post-COVID due to TMD with limited ability to open the mouth wide (43.59%) as the most common among them. There were 60.71% participants currently receiving any specific treatment or therapy for post-COVID TMD and only 21.43% of the participants were satisfied

Table 1. Demographic profile of study participants (n=400)

Question		n	%
Age group	18-25	65	16.25
	26-35	73	18.25
	36-45	78	19.5
	46-55	86	21.5
	56 and above	98	24.5
Gender	Male	225	56.25
	Female	175	43.75
Diagnosed with any jaw or jaw related disorder (TMD)	YES	120	30
	NO	280	70
Rate your overall health status currently	Excellent	50	12.5
	Good	88	22
	Fair	196	49
	Poor	66	16.5

Table 2. Responses of patients diagnosed with any jaw or jaw related disorder (n=120)

Question		n	%
When diagnosed with any jaw or jaw related disorder	Pre COVID (before 2020)	19	15.83
	During COVID (2020-2022)	45	37.50
	Post COVID (after 2022)	56	46.67
Symptoms	Jaw pain	46	38.33
	Headaches	16	13.33
	Clicking or popping sound	22	18.33
	Difficulty chewing	36	30.00
Changes in TMD symptoms during the COVID-19 pandemic	Yes, my symptoms worsened	25	55.56
	Yes, my symptoms improved	8	17.78
	No, my symptoms remained the same	12	26.67
Factors causing worsening of symptoms	Increased stress and anxiety	18	40.00
	Limited access to healthcare services	9	20.00
	Changes in daily routines and habits	6	13.33
	Lack of access to TMD-specific treatments	12	26.67
Sought medical help for your TMD during the COVID-19 pandemic	YES	30	66.67
	NO	15	33.33

Table 3. Responses of participants diagnosed with TMD post COVID-19 (n=56)

Question		n	%
Currently facing any challenges related to TMD post-COVID?	YES	34	60.71
	NO	22	39.29
Challenges experienced *(n=34)	Increased pain and discomfort	19	55.88
	Financial constraints for treatment	4	11.76
	Lack of awareness about post-COVID TMD management	11	32.35
Changes in your eating habits post-COVID due to TMD	YES	39	69.64
	NO	17	30.36
How have your eating habits changed *(n=39)	Difficulty chewing certain foods	12	30.77
	Avoidance of hard or tough foods	8	20.51
	Changes in portion sizes	2	5.13
	Limited ability to open the mouth wide	17	43.59
Currently receiving any specific treatment or therapy for your post-COVID TMD	YES	34	60.71
	NO	22	39.29
Satisfaction with the available treatment options for post-COVID TMD in Central India	Yes, completely satisfied	12	21.43
	Yes, somewhat satisfied	21	37.50
	No, not satisfied	23	41.07
Received any information or education about managing TMD post-COVID	YES	26	46.43
	NO	30	53.57
Source of information *(n=26)	Healthcare professionals	11	42.31
	Online resources and websites	7	26.92
	Support groups or communities	2	7.69
	Social media platforms	6	23.08
How well-informed do you feel about post-COVID TMD management	1 (Not informed at all)	9	16.07
	2	13	23.21
	3	14	25.00
	4	12	21.43
	5 (Very well-informed)	8	14.29
Awareness about any support groups or organizations that specifically focus on post-COVID TMD in Central India	YES	2	3.57
	NO	54	96.43
Any other health issues or changes since recovering from COVID-19 *(n=101)	YES	79	78.22
	NO	22	21.78
Biggest impact of TMD post COVID-19	Work	11	19.64
	Social life	8	14.29
	Physical health	24	42.86
	Mental health	13	23.21

with the available treatment options for post-COVID TMD in Central India. Only 46.43% had received any information or education about managing TMD post-COVID with healthcare professional (42.31%) being the major source of information. The biggest impact of TMD post COVID-19 was on physical health as answered by 42.86% participants. Overall, majority (78.22%) of the participants were facing other health issues or changes since recovering from COVID-19.

DISCUSSION

This study was conducted to investigate the prevalence and assess impact of COVID-19 on temporomandibular disorders in Central India post-COVID. By analyzing the demographic data and health status of the respondents, the study aimed to understand the relationship between the pandemic and the occurrence of TMDs. In this study, the majority of participants were aged 56 years or above, accounting

for 24.5% of the sample. The impact of COVID-19 may differ between countries, affecting various age groups differently. This study also relied on self-reported data, which may have influenced the demographic profile of our participants, leading to a higher representation of older individuals. This difference in population distribution highlights the importance of considering regional and methodological factors when comparing study outcomes across different populations (12).

This study found that 56 out of 120 participants diagnosed with temporomandibular disorders (TMD) (46.67%) were diagnosed post-COVID-19, with 46 of these cases (38.33%) reporting jaw pain as their primary symptom. This suggests a link between COVID-19 and the development of TMD. This aligns with the study by Shalev-Antsel T (2023), which reported a 3.3-fold increase in TMD diagnosis in the post-COVID era (13). The consistency between our study and the research by Shalev-Antsel T highlights growing evidence that COVID-19 may be a contributing factor to the onset of TMD. This underscores the necessity for further research into the long-term effects of COVID-19 on musculoskeletal and orofacial health (13).

In the current study, the symptoms of 22 participants (55.56%) worsened during the COVID-19 pandemic, with many attributing this exacerbation to increased stress and related factors. Specifically, 18 participants (40%) identified heightened stress levels as a significant contributor to the worsening of their TMD symptoms. Additionally, 30 participants (66.67%) sought medical help for TMD during the pandemic. These results are in line with findings from another research. Shalev-Antsel (2023) and Scelza G (2023) also reported similar trends, noting that the pandemic period was associated with a worsening of TMD symptoms and an increase in patients seeking medical assistance for these issues (13,14). This alignment across studies underscores the significant impact of the COVID-19 pandemic on individuals with TMD, highlighting the role of stress as a key factor in symptom exacerbation and the increased demand for medical care during this period.

In this study, 34 participants (60.71%) reported ongoing challenges related to TMD post-COVID, with increased pain and discomfort being the most prominent issue for 19 individuals (55.88%). Additionally, 39 participants (69.64%) altered their eating habits due to TMD, primarily because of the limited ability to open their mouths wide, which affected 17 individuals (43.59%). The pandemic's impact on mental health is well-documented, with increased levels of stress, depression, and anxiety reported globally (15-18). Santomauro highlighted a significant rise in the prevalence of depression and anxiety across all ages and both sexes in 204 countries (19). These emotional and psychosocial factors have been identified as potential risk factors for the development and exacerbation of TMD. Consistent with these findings, our study supports the notion that the pandemic intensified bruxism and TMD symptoms, a trend observed in other researches as well (19). For instance, Weng S (2022) found a decrease in oral health-related quality of life due to these conditions. Studies have shown that the stress and anxiety induced by the pandemic contributed to an increase in TMD cases and symptom severity, underlining the profound effect of psychological stressors on physical health during this period (20,21). Furthermore, this trend has continued into the post-COVID era, indicating the long-term impact of pandemic-related stress on TMD, necessitating ongoing attention and management strategies for those affected (12,22).

In this study, 34 participants (60.71%) were currently receiving specific treatment or therapy for post-COVID TMD in terms of medicines and physiotherapy. However, only 12 participants (21.43%) expressed satisfaction with the available treatment options for post-COVID TMD in Central India. Additionally, just 26 participants (46.43%) had received any information or education about managing TMD post-COVID, with healthcare professionals being the primary source of information for 11 participants (42.31%). It is evident that when treatment outcomes fail to meet patients' expectations, dissatisfaction increases. Surgeons and other healthcare professionals should explain, prior to treatment, what a reasonable outcome would be, the estimated timeline to achieve it, its potential duration, and any possible risks and complications. Fulfilling these criteria can help manage patients' expectations and reduce the likelihood of disappointment with their treatment outcomes (23).

The significant impact of TMD on physical health post-COVID-19, as reported by 24 participants (42.86%), can be attributed to several factors. The COVID-19 pandemic has had far-reaching effects on overall health, both directly and indirectly caused by factors such as increased stress and anxiety, post-viral fatigue and muscle pain, inflammation, changes in lifestyle, and health system strain. Furthermore, the finding that a majority of participants (78.22%) were facing other health issues or changes since recovering from COVID-19 highlights the broader impact of the virus on overall health. This can be attributed to several reasons. Many individuals experience long-term symptoms post-COVID, known as "long COVID", which can include fatigue, brain fog, muscle pain, and respiratory issues (24). These ongoing health challenges can compound the physical strain of TMD. COVID-19 can alter the immune system, potentially making individuals more susceptible to

other infections and health issues. The mental health toll of the pandemic can manifest physically, with conditions such as depression and anxiety leading to somatic symptoms, including pain and discomfort (15,16). Lockdowns and social distancing measures have led to reduced physical activity for many people, contributing to overall physical deconditioning, weight gain, and other health problems (16). Delayed or missed medical appointments during the pandemic can result in unmanaged or worsening health conditions, leading to a broader range of health issues post-COVID.

Limitations. This cross-sectional study could not establish causality between COVID-19 and TMD due to its single-point data capture and limited scope. Being unicentric and geographically narrow, it is susceptible to sampling bias, affecting generalizability. Future research should involve a broader, more diverse sample and utilize longitudinal designs to better understand trends and causal relationships between COVID-19 and temporomandibular disorders. Research can be conducted in various regions globally to gain deeper insights into the connection between COVID-19 and TMJ-related issues.

CONCLUSION

The present study highlights a significant increase in the incidence of temporomandibular disorders (TMD) among older adults during the COVID-19 pandemic. One of the most striking observations was the heightened prevalence of jaw pain, which became the dominant symptom for many participants. This surge in TMD symptoms can largely be attributed to the elevated stress and anxiety levels experienced during the pandemic. Stress has long been known to exacerbate TMD symptoms, often leading to muscle tension, bruxism, and jaw clenching, all of which can contribute to pain and dysfunction. During the pandemic, many individuals reported worsening pain and increased difficulty in performing basic functions like eating, which significantly impacted their quality of life. This increase in severity may reflect both the psychological strain and changes in lifestyle (such as altered routines, less physical activity, or dietary habits) that accompanied the crisis. Although a substantial portion of participants sought treatment, the level of satisfaction with available options was notably low, suggesting that the treatment modalities currently accessible may not be fully addressing the needs or concerns of those affected by TMD. Moreover, the majority of participants expressed dissatisfaction with the amount of information provided to help them manage their condition. This points to a gap in patient education and a need for more comprehensive, accessible resources on TMD prevention and management. Taken together, these findings underscore the urgent need for enhanced support systems, more effective treatment options, and improved patient education to better manage TMD in the post-pandemic era.

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