Open Access

ISSN: 2617-0817 E-ISSN: 2789-5912

Original Article

Assessment of Bony Changes of Condyle in Patient with Temporomandibular Joint Disorder Diagnosed in a Tertiary Care Hospital

DOI: dx.doi.org

Sarwer Jamal Biplob[1], Sadia Rasul Prianka[2]

Received: 14 Jun 2024
Accepted: 27 Jun 2024
Published: 28 Dec 2024

Published by:
Sher-E-Bangla Medical College, Barishal, Bangladesh

*Corresponding Author

ABSTRACT

Introduction: *Temporomandibular joint disorder (TMD) is a common condition characterized by pain, dysfunction, and degenerative changes in the temporomandibular joint (TMJ). These disorders can lead to significant alterations in the structure of the condyle, affecting its function. This study aims to assess the bony changes of the condyle in patients with TMD, diagnosed by CBCT, at the Oral and Maxillofacial Surgery Department of BSMMU.* ***Methods & materials:*** *The study was a descriptive, cross-sectional study conducted at the Department of Oral and Maxillofacial Surgery and the Department of Radiology and Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), over 12 months (July 2022 – June 2023). The study population included patients diagnosed with temporomandibular joint disorders (TMDs) who presented at the Department of Oral and Maxillofacial Surgery, BSMMU. A total of 32 patients were selected by consecutive sampling.* ***Result:*** *The results of this study reveal significant bony changes in the condyles of TMD patients, as diagnosed through CBCT. The most common findings included subcortical sclerosis (93.8%), osteophyte formation (93.8%), condylar erosion (87.5%), and condylar flattening (81.3%), indicating chronic joint degeneration. Additionally, subcondylar pseudocysts were observed in 75% of TMD patients, underscoring the severity of the condition.* ***Conclusion:*** *This study underscores the critical role of Cone Beam Computed Tomography (CBCT) in assessing bony changes of the condyle in patients with Temporomandibular Joint Disorder (TMD). The findings highlight the prevalence of significant degenerative changes, such as subcortical sclerosis, osteophyte formation, condylar erosion, and condylar flattening in TMD patients.*

Keywords: *Bony Changes, Temporomandibular Joint, Maxillofacial Surgery, CBCT*

(The Planet 2024; 8(1): 28-31)

1. *Oral & Maxillofacial Surgeon, Department of Oral & Maxillofacial Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh*
2. *Medical Officer, Department of Surgical Oncology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh*

INTRODUCTION

Temporomandibular joint disorders (TMDs) encompass a range of conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures, often leading to pain, joint sounds, and restricted mandibular movement[1]. TMDs are among the most common causes of orofacial pain, affecting approximately 5% to 12% of the general population, with a higher prevalence in females [2, 3]. The etiology of TMDs is multifactorial, involving trauma, parafunctional habits, occlusal discrepancies, psychological stress, and degenerative joint diseases, with degenerative joint changes often manifesting as condylar erosion, flattening, sclerosis, osteophyte formation, and subcondylar pseudocysts [4]. Assessing these bony changes is crucial for understanding disease progression, guiding treatment strategies, and preventing long-term joint dysfunction. Various imaging modalities have been employed for TMJ assessment, including conventional panoramic radiography (orthopantomogram, OPG), magnetic resonance imaging (MRI), and computed tomography (CT) [5]. However, these techniques have certain limitations; OPG, though widely used, cannot provide detailed three-dimensional (3D) information, while MRI is primarily useful for evaluating soft tissue changes rather than osseous alterations [6]. Computed tomography (CT) has been preferred for assessing osseous changes, but its higher radiation dose limits its routine application [7]. Cone-beam computed tomography (CBCT) has emerged as a superior imaging modality for evaluating TMJ bony changes, offering high-resolution images with lower radiation exposure compared to conventional CT [8]. CBCT provides precise visualization of the condylar morphology, allowing the detection of early degenerative changes that might not be apparent in other imaging modalities. Studies have demonstrated that CBCT is highly effective in identifying subtle bony abnormalities such as erosions, osteophytes, and sclerosis, which are indicative of joint degeneration in TMD patients [9]. A study reported that CBCT had significantly greater accuracy in detecting TMJ osseous changes compared to OPG, with a sensitivity of over

ISSN: 2617-0817 E-ISSN: 2789-5912

90% [10]. Similarly, Alexiou et al. (2009) found that CBCT was superior in evaluating condylar cortical erosion and joint space narrowing, making it the imaging modality of choice for assessing TMD-related bony changes [11]. Given the advantages of CBCT, its role in diagnosing and monitoring TMD progression has become increasingly important in maxillofacial practice. Despite its effectiveness, there remains a need for further research on the patterns and prevalence of condylar bony changes in TMD patients, particularly in specific populations. The identification of which bony alterations are most frequently associated with symptomatic TMD cases can help in refining diagnostic criteria and improving treatment strategies. Additionally, understanding whether certain demographic factors, such as age and gender, influence the occurrence and severity of these bony changes can contribute to a more individualized approach to TMD management. This study aims to assess the bony changes of the condyle in patients with temporomandibular joint disorder diagnosed by CBCT, visiting the Oral and Maxillofacial Surgery Department at Bangabandhu Sheikh Mujib Medical University (BSMMU).

METHODS & MATERIALS

The study was a descriptive, cross-sectional study conducted at the Department of Oral and Maxillofacial Surgery and the Department of Radiology and Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), over 12 months (July 2022 – June 2023). The study population included patients diagnosed with temporomandibular joint disorders (TMDs) who presented at the Department of Oral and Maxillofacial Surgery, BSMMU. Consecutive sampling was used, enrolling all eligible patients until the required sample size was achieved. Based on an effect size of 0.92, with $\alpha = 0.05$ and power = 0.80, the estimated sample size was 32, equally distributed between the case (TMD patients) and control (healthy individuals) groups, with 16 participants in each (10). The inclusion criteria for the case group consisted of adult patients (aged 18–65 years) clinically diagnosed with TMDs using the Research Diagnostic Criteria (RDC/TMD), possessing previous panoramic or joint radiographs, and having undergone recent cone beam computed tomography (CBCT) scans. Patients with a history of recent joint or condylar trauma or craniomandibular malignancies were excluded. The control group comprised 16 randomly selected individuals without any known TMJ disorders. During participant enrollment, all symptoms were recorded, followed by a clinical examination and radiographic investigations, including digital orthopantomogram (OPG) and CBCT scans. TMJ evaluation included (a) bony changes of the condyle (flattening, erosion, sclerosis, osteophytes, resorption), (b) joint space (normal, increased, reduced, or bony contact between the condyle and mandibular fossa), and (c) bony changes of the mandibular fossa (normal, sclerosis, erosion, resorption). All data were statistically analyzed by Statistical Package for Social Sciences (SPSS) version 26.0. Institutional Review Board (IRB) approval was obtained before the commencement of the study, and necessary permissions were taken from the respective departments at BSMMU. The study's objectives, procedures, risks, and benefits were explained to participants in an easily understandable local language, and written informed consent was obtained from all subjects, ensuring voluntary participation without exploitation.

RESULTS

Table – I: Distribution of Patients by Age and Gender (*n*=32)

Age Group	Case (TMD Patients)		Control (Healthy)		Total	
	Male (n, %)	Female (n, %)	Male (n, %)	Female (n, %)	n	%
< 20 years	1 (6.3%)	1 (6.3%)	1 (6.3%)	0 (0.0%)	3	9.4
20-40 years	3 (18.8%)	4 (25.0%)	2 (12.5%)	3 (18.8%)	12	37.5
40-60 years	4 (25.0%)	4 (25.0%)	1 (6.3%)	4 (25.0%)	13	40.6
> 60 years	1 (6.3%)	1 (6.3%)	1 (6.3%)	1 (6.3%)	4	12.5
Total	9 (28.1%)	10 (31.3%)	5 (15.6%)	8 (25.0%)	32	100

The 40-60 years age group had the highest number of patients (40.6%), followed by 20-40 years (37.5%). Fewer participants were aged >60 years (12.5%) or <20 years (9.4%). Females (56.3%) outnumbered males (43.7%), with the highest female representation in the 40-60 years group. [Table I]

Table – II: Distribution of Patients by Educational Status (*n*=32)

Educational Status	Case (n, %)	Control (n, %)	Total (n, %)
Illiterates	3 (18.8%)	2 (12.5%)	5 (15.6%)
Primary	5 (31.3%)	5 (31.3%)	10 (31.2%)
Secondary	4 (25.0%)	5 (31.3%)	9 (28.1%)
HSC and above	4 (25.0%)	4 (25.0%)	8 (25.0%)
Total	16 (50.0%)	16 (50.0%)	32 (100%)

The largest proportion of patients had primary education (31.2%), followed by secondary education (28.1%). Higher education (HSC and above) was noted in 25.0%, while illiteracy was observed in 15.6% of participants. Educational background can influence awareness and healthcare-seeking behavior regarding temporomandibular disorders (TMD). [Table II]

Table – III: Distribution of Patients by Socio-Economic Class (*n*=32)

Socio-Economic Class	Case (n, %)	Control (n, %)	Total (n, %)
Low	6 (37.5%)	5 (31.3%)	11 (34.4%)
Middle	7 (43.8%)	8 (50.0%)	15 (46.9%)
High	3 (18.8%)	3 (18.8%)	6 (18.7%)
Total	16 (50.0%)	16 (50.0%)	32 (100%)

ISSN: 2617-0817 E-ISSN: 2789-5912

The middle socio-economic class (46.9%) had the highest representation, followed by the low socio-economic class (34.4%). Only 18.7% belonged to the high socio-economic group. Socioeconomic status plays a crucial role in access to healthcare and the likelihood of developing TMD due to stress-related factors. [Table III]

Table – IV: Distribution of Patients by Side of TMJ Involvement (*n*=32)

Side of Involvement	Case (n, %)	Control (n, %)	Total (n, %)
Right	5 (31.3%)	4 (25.0%)	9 (28.1%)
Left	5 (31.3%)	6 (37.5%)	11 (34.4%)
Bilateral	6 (37.5%)	6 (37.5%)	12 (37.5%)
Total	16 (50.0%)	16 (50.0%)	32 (100%)

Bilateral involvement (37.5%) was most frequently observed, indicating widespread joint degeneration in TMD patients. Left-sided cases (34.4%) were slightly more prevalent than right-sided cases (28.1%). Bilateral involvement suggests chronic degenerative changes, which are often seen in advanced stages of TMD. [Table IV]

Table – V: Distribution of TMJ Findings in Cases vs. Controls (*n*=32)

Findings	Case (TMD Patients) (n, %)	Control (Healthy) (n, %)
Condylar Erosion	14 (87.5%)	1 (6.3%)
Condylar Flattening	13 (81.3%)	1 (6.3%)
Subcortical Sclerosis	15 (93.8%)	0 (0.0%)
Osteophyte Formation	15 (93.8%)	0 (0.0%)
Subcondylar Pseudocyst	12 (75.0%)	1 (6.3%)

In TMD patients, osteophyte formation (93.8%) and subcortical sclerosis (93.8%) were the most commonly observed degenerative findings. Condylar erosion (87.5%) and condylar flattening (81.3%) were also highly prevalent. Subcondylar pseudocysts (75.0%) were noted in three-fourths of TMD cases. [Table V]

DISCUSSION

The 40-60 years age group accounted for the largest proportion of both TMD patients and controls, with 40.6% of patients falling within this range. This finding aligns with previous studies that suggest TMD is more prevalent in middle-aged individuals, potentially due to the cumulative effects of wear and tear on the temporomandibular joint (TMJ) over time [12, 13]. The underrepresentation of younger and older individuals in the study supports the notion that TMD primarily affects individuals in their mid-adulthood years. In terms of gender, females (56.3%) outnumbered males (43.7%), consistent with the well-documented higher incidence of TMD in women, likely due to hormonal differences, stress levels, and other psychosocial factors [14]. Regarding educational background, the largest group of participants had primary education (31.2%), followed by secondary education (28.1%), with 25.0% having completed higher education. The relatively high proportion of individuals with only primary or secondary education suggests that lower levels of formal education may be linked to the prevalence of TMD. It is plausible that individuals with lower education levels might have limited awareness about the condition, potentially leading to delays in seeking care. Additionally, education could influence the understanding of pain management and the adoption of healthier coping mechanisms, which may reduce the risk of developing TMD [15]. The majority of patients were from middle-class socio-economic backgrounds (46.9%), with the next largest group coming from low socio-economic status (34.4%). The findings indicate that socio-economic status plays an important role in the risk factors associated with TMD. Those from middle and low socio-economic backgrounds may experience higher stress levels due to financial and social pressures, which could contribute to the onset and progression of TMD [16]. Furthermore, lower socioeconomic status may hinder access to timely healthcare and preventive measures, exacerbating the condition. Conversely, those in the higher socio-economic group might have better access to healthcare resources, including early diagnosis and management, potentially leading to fewer cases of advanced TMD. Bilateral TMJ involvement was the most common finding (37.5%), followed by left-sided (34.4%) and right-sided involvement (28.1%). The predominance of bilateral involvement suggests chronic degenerative changes, which are typically observed in the advanced stages of TMD. This finding emphasizes the importance of early diagnosis and intervention to prevent the progression of joint degeneration and avoid complications such as limited jaw mobility or pain [17]. TMD patients exhibited significantly more degenerative changes in the TMJ compared to healthy controls. The most commonly observed findings in TMD patients included subcortical sclerosis and osteophyte formation (93.8%), both of which are indicative of chronic joint degeneration. Other findings, such as condylar erosion (87.5%) and condylar flattening (81.3%), were also highly prevalent. These degenerative changes are characteristic of TMD and reflect the pathological remodeling of the TMJ that occurs due to chronic stress or dysfunction. The presence of subcondylar pseudocysts (75.0%) in a significant proportion of TMD patients further highlights the severity and complexity of the condition. These findings contrast starkly with the near absence of such features in the control group, underscoring the pathological nature of TMD [18-20].

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, this study underscores the critical role of Cone Beam Computed Tomography (CBCT) in assessing bony changes of the condyle in patients with Temporomandibular Joint Disorder (TMD). The findings highlight the prevalence of significant degenerative changes, such as subcortical sclerosis,

osteophyte formation, condylar erosion, and condylar flattening in TMD patients.

RECOMMENDATION

Based on the findings, CBCT should be routinely utilized for early and accurate detection of bony changes in the condyle among TMD patients, facilitating timely intervention and preventing disease progression. Further longitudinal studies with larger sample sizes are recommended to establish a clearer correlation between CBCT findings and clinical severity. Additionally, comparative studies between CBCT and other imaging modalities, such as MRI and ultrasound, could further validate CBCT's diagnostic superiority.

Funding: No funding sources
Conflict of interest: None declared

REFERENCES

1. *Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. American family physician. 2015;91(6):378–86.*
2. *De Leeuw R, Klasser GD. Orofacial pain: guidelines for assessment, diagnosis, and management [Internet]. Quintessence Publishing Company, Incorporated Hanover Park, IL, USA; 2018 [cited 2025 Feb 20]. Available from: https://scholar.archive.org/work/m47ij6u33jbwvfxnot2hiwxbwi/access/wayback/http://www.stomaeduj.com/wp-content/uploads/2019/07/15-BR-2-2015-Orofacial-Pain.pdf*
3. *Al-Moraissi EA, Wolford LM, Ellis III E, Neff A. The hierarchy of different treatments for arthrogenous temporomandibular disorders: A network meta-analysis of randomized clinical trials. Journal of Cranio-Maxillofacial Surgery. 2020;48(1):9–23.*
4. *Manfredini D, Piccotti F, Ferronato G, Guarda-Nardini L. Age peaks of different RDC/TMD diagnoses in a patient population. Journal of dentistry. 2010;38(5):392–9.*
5. *Kalladka M, Quek S, Heir G, Eliav E, Mupparapu M, Viswanath A. Temporomandibular Joint Osteoarthritis: Diagnosis and Long-Term Conservative Management: A Topic Review. J Indian Prosthodont Soc. 2014 Mar;14(1):6–15.*
6. *Kandasamy S, Boeddinghaus R, Kruger E. Condylar position assessed by magnetic resonance imaging after various bite position registrations. American Journal of Orthodontics and Dentofacial Orthopedics. 2013;144(4):512–7.*
7. *Scarfe WC, Farman AG, Sukovic P. Clinical applications of cone-beam computed tomography in dental practice. Journal-Canadian Dental Association. 2006;72(1):75.*
8. *Wiese M, Hintze H, Svensson P, Wenzel A. Comparison of diagnostic accuracy of film and digital tomograms for assessment of morphological changes in the TMJ. Dentomaxillofacial Radiology. 2007;36(1):12–7.*
9. *Larheim TA, Abrahamsson AK, Kristensen M, Arvidsson LZ. Temporomandibular joint diagnostics using CBCT. Dentomaxillofacial Radiology. 2015;44(1):20140235.*
10. *Patil A. Assessment of Condylar Bony Changes in Patients with Temperomandibular Joint Pain Amongst Males and Females-A Comparative Study Betweeen Digital OPG and CBCT [Internet] [Master's Thesis]. Rajiv Gandhi University of Health Sciences (India); 2018 [cited 2025 Feb 20]. Available from: https://search.proquest.com/openview/5e63c6d3bce1eec037da7d3c24b77976/1?pq-origsite=gscholar&cbl=2026366&diss=y*
11. *Alexiou KE, Stamatakis HC, Tsiklakis K. Evaluation of the severity of temporomandibular joint osteoarthritic changes related to age using cone beam computed tomography. Dentomaxillofacial radiology. 2009;38(3):141–7.*
12. *Vasegh Z, Safi Y, Azar MS, Ahsaie MG, Arianezhad SM. Assessment of bony changes in temporomandibular joint in patients using cone beam computed tomography – a cross sectional study. Head Face Med. 2023 Oct 28;19(1):47.*
13. *Okeson J. Management of Temporomandibular Disorders and Occlusion. New York State Dental Journal. 2003;69(7):61.*
14. *Ryan J, Akhter R, Hassan N, Hilton G, Wickham J, Ibaragi S. Epidemiology of temporomandibular disorder in the general population: a systematic review. Advances in Dentistry & Oral Health. 2019;10(3):1–13.*
15. *Kim TY, Shin JS, Lee J, Lee YJ, Kim M riong, Ahn Y jun, et al. Gender difference in associations between chronic temporomandibular disorders and general quality of life in Koreans: a cross-sectional study. PloS one. 2015;10(12):e0145002.*
16. *Baldiotti ALP, Amaral-Freitas G, Scariot R, Dias MLL de S, Martins R de C, Paiva SM, et al. Temporomandibular disorders are associated with sociodemographic factors, health-related and oral conditions in adolescents: A cross-sectional study. Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2022;22:e210150.*
17. *Poveda Roda R, Bagán JV, Díaz Fernández JM, Hernández Bazán S, Jiménez Soriano Y. Review of temporomandibular joint pathology: Part I: Classification, epidemiology and risk factors. Medicina Oral, Patología Oral y Cirugía Bucal (Internet). 2007;12(4):292–8.*
18. *Dias GM, Grossmann E, Carvalho ACP, Devito KL, Dos Santos MF, Ferreira LA. MRI changes and clinical characteristics in temporomandibular joints with displacement of the articular disk without reduction – a cross-sectional observational study. CRANIO®. 2023 Apr 25;1–10.*
19. *Tanaka E, Detamore MS, Mercuri LG. Degenerative Disorders of the Temporomandibular Joint: Etiology, Diagnosis, and Treatment. J Dent Res. 2008 Apr;87(4):296–307.*
20. *dos Anjos Pontual ML, Freire JSL, Barbosa JMN, Frazão MAG, dos Anjos Pontual A, Fonseca da Silveira MM. Evaluation of bone changes in the temporomandibular joint using cone beam CT. Dentomaxillofacial Radiology. 2012;41(1):24–9.*