Assessment of Range of Motion of Temporomandibular Joint among Dental Students of Dhulikhel Hospital

Luitel A,[1] Bali H,[2] Gautam P,[2] Shrestha R,[2] Singh N,[2] Gurung K[2]

[1]Department of Oral Medicine and Radiology

BP Koirala Institute of Health Sciences,

Dharan, Sunsari, Nepal.

[2]Department of Oral Medicine and Radiology,

Kathmandu University School of Medical Sciences,

Dhulikhel, Kavre, Nepal.

Corresponding Author

Abhinaya Luitel

Department of Oral Medicine and Radiology

BP Koirala Institute of Health Sciences,

Dharan, Sunsari, Nepal.

E-mail: abhinayaluitel@gmail.com

Citation

Luitel A, Bali H, Gautam P, Shrestha R, Singh N, Gurung K. Assessment of Range of Motion of Temporomandibular Joint among Dental Students of Dhulikhel Hospital. *Kathmandu Univ Med J*. 2024;88(4):404-7.

ABSTRACT

Background

Restriction in mandibular range of motion (ROM) is one of the main signs of mandibular dysfunction and an important criterion for evaluation of functional state of the masticatory system.

Objective

The objective of this study was to evaluate the normal ROM of Temporomandibular Joint (TMJ) among dental students of tertiary care hospital at central region of Nepal.

Method

After ethical clearance, cross- sectional study was conducted between August to September 2022 among all dental students who gave consent. The inter-incisal opening, bilateral lateral excursion and protrusion were measured thrice using 15 cm metallic scale and an average was considered to reduce ambiguity. The data was entered in Microsoft excel and transferred to SPSS version 20 for statistical analysis. The descriptive statistics was calculated and independent t test was applied to compare the mean between genders.

Result

Total of 145 students (25 males and 120 females) were included with the mean age of 21.32 ± 1.29 years. The overall mean inter-incisal opening was 44.82 ± 5.80 mm, right lateral excursion was 8.23 ± 2.11 mm, left lateral excursion was 8.70 ± 1.80 mm and protrusion was 5.65 ± 1.87 mm. There was statistically significant difference in right and left lateral excursion and protrusion among genders.

Conclusion

The inter-incisal opening of participants in our study appeared towards lower range of normal mouth opening while lateral excursion appeared consistent with those described in the literature. The protrusive movement of our participants was decreased, compared to those recorded in the literature.

KEY WORDS

Inter-incisal opening, Lateral excursion, Protrusion, Temporomandibular joint

INTRODUCTION

Measurement of range of motion (ROM) of temporomandibular joint (TMJ) is routine practice in dentistry. Maximum interincisal opening, lateral excursion and protrusion are a variable which we come across in our everyday dental practice.[1] In order to make a diagnosis of decreased ROM it is essential to establish what constitutes the normal for the population.[2] Research has shown that the measurement of ROM of TMJ varies significantly with age and gender. Limited ROM of TMJ is one of the early signs of many pathological and traumatic conditions.[2] Early recognition of decreased or limited ROM is necessary for a prompt and efficient approach to diagnosis and to plan out the treatment options judiciously.[2,3]

Any restriction in mandibular ROM is commonly accepted as one of the main signs of mandibular dysfunction and is an important criterion for the evaluation of functional state of the masticatory system.[4] Clinical measurement of normal ROM of TMJ is an important diagnostic tool for evaluation of stomatognathic system, especially in those who have suspected temporomandibular and neurogenic dysfunctions.[5] Numerous studies across the world have characterized the ROM of TMJ in their population. However, to the best of our knowledge and literature search its numerical value in Nepalese population is still not clear.

The present study is an attempt to evaluate the normal ROM of TMJ in young Nepalese population. This will serve as a guide for various studies and will have clinical utility in treatment and diagnosis of diseases which directly or indirectly affect mouth opening.

METHODS

A cross-sectional hospital-based study was conducted in Department of Oral Medicine and Radiology between August to September 2022. The ethical clearance was obtained from Institutional review committee (IRC), Kathmandu University School of Medical Sciences (KUSMS) (IRC number: 152/22). Among all 198 dental students (first to fourth year), those who consented for the study were included. Students with trismus, spacing/crowding of anterior teeth, attrition of or fractured anterior teeth, prosthesis on anterior teeth, endodontically treated anterior teeth, midline shift, features of temporomandibular disorders and fixed/removable orthodontic therapy were excluded.

The students who gave consent were informed about the procedure. They laid down comfortably in dental chair in semi-supine position and intraoral examination was performed. The different ROM of TMJ (maximum interincisal opening, right and left lateral excursion and protrusion) were measured in millimeter by principal investigator using sterilized 15 cm long metallic scale. Each measurement was performed three times and the average value was considered to reduce ambiguity. Pre-designed pro-forma in word document was used for data collection. The data was entered in Microsoft excel sheet and transferred to Statistical Package for Social Sciences (SPSS) version 20 for statistical analysis. Descriptive statistics was calculated, unpaired t test was used for comparison between genders. p-value less than 0.05 was considered as statistically significant. Students with limited ROM were further evaluated for presence of any TMJ disorders or any other pathology. The diagnosis was made and management was done accordingly when necessary.

RESULTS

There were total of 198 dental students, 47 of them were excluded and six did not consent. Of 145 who met the inclusion criteria, there were 120 (82.75%) females and 25 males (17.25%). The mean age of the sample population was 21.32 ± 1.29 years. The mean of different ROM of TMJ is presented in table 1 and its comparison between male and female is presented in table 2.

Table 1. Mean ROM of TMJ

Range of motion	Mean (mm)	Std. Deviation
Interincisal opening	44.82	5.80
Right lateral excursion	8.23	2.11
Left lateral excursion	8.70	1.80
Protrusion	5.65	1.871

Table 2. Comparison of mean of different ROM of TMJ among male and female.

	Gender	N (%)	Mean (mm)	Std. Deviation	P value
Interincisal opening	Male	25 (17.25%)	46.30	5.48	0.162
	Female	120 (82.75%)	44.50	5.84	
Right lateral excursion	Male	25 (17.25%)	9.08	2.71	*0.027
	Female	120 (82.75%)	8.05	1.94	
Left Lateral excursion	Male	25 (17.25%)	9.42	1.94	*0.029
	Female	120 (82.75%)	8.55	1.74	
Protrusion	Male	25 (17.25%)	6.82	2.41	*<0.001
	Female	120 (82.75%)	5.41	1.64	

*Independent t-test; p< 0.05 is statistically significant

DISCUSSION

The range of mandibular movement plays an important role in the physiological functioning of the mouth, and in the diagnosis of TMJ disorders. Assessing mandibular movement is considered an important clinical tool for evaluating the state of TMJs and their associated structures, where a decrease or increase in the values of these ranges can be associated with an alteration. Limited range of motion is the sign of various TMJ disorders like fracture, internal derangements, ankylosis, degenerative joint diseases etc., including masticatory muscle disorders. Age, gender, race, ethnicity and individual anatomy can slightly influence the normal range of mandibular motion.

Our sample population had female preponderance (82.75%). This was similar to study by Yao 20095 and Loster 2016.6 This is directly correlated to higher admission rate of female students compared to males in dental field. However, in a study by Li et al., Patel et al., Al-Dlagian et al., Gbolahan et al. and Iturriaga et al. number of male participants were more.[2-4,7,8] This study was conducted among young adult Nepalese population with mean age of 21 years. All of them were young students pursuing their bachelor's degree at the university college. This age group was similar in the studies performed by Li et al., Loster et al. and Gbolahan et al.[2,6,7] Iturriaga et al. and Patel et al. had age ranging from 9-10 years, while Yao et al. had mean age of 46 years.[3,5,8]

In our study the mean interincisal opening in male was 46.30 mm and female was 44.50 mm with overall mean of 44.82 mm. The difference between the gender was statistically non-significant. Similar pattern was observed in study by Patel et al. and Dlagian et al.[3,4] Contrary to our findings, the overall mean mouth opening was higher in the studies by Gbolahan et al., Yan et al., Iturriaga et al., Loster et al. and Yao et al.[2,5-8] The difference in mean interincisal opening between genders was statistically not significant as portrayed by Iturriaga et al., Patel et al. and Loster et al. while it was statistically significant in study by Yan et al., Dlagian et al. and Yao et al.[2-4,6,8] While some studies show a slight difference in maximum mouth opening between genders males generally have larger opening due to overall large facial structures. However, in terms of practical functionality the difference may be considered negligible and clinically non-signifuicant.[6-9] It may also vary according to population studied and measurements used. Variations in mouth opening primarily depend on individual facial anatomy as well rather than gender alone.[7,8]

In present study the overall mean right and left lateral excursion was 8.23 mm and 8.70 mm respectively. The right and left lateral excursion in males were 9.08 mm and 9.42 mm and in females were 8.05 mm and 8.55 mm respectively. This significant difference between the genders may again be attributed to individual variability in facial anatomy.[6-8] This difference between the gender was statistically significant. Iturriaga et al. and Loster et al. presented values for lateral excursion however, the difference was not statistically significant among genders.[6,8]

The overall mean protrusive movement in our study was 5.65 mm. It was 6.82 mm in males and 5.41 mm in females and the difference was statistically significant. Compared to our study, the mean protrusive movement was higher in the studies by Iturriaga 2017 and Loster 2016.[6,8] Also, the difference between the genders was not statistically significant. This is because of the sexual dimorphism, the racial and ethnic variation that exists in maxillofacial structures.[8-9]

Race and ethnicity have been reported to be significant factors that influence the range of motion of temporomandibular joint. Variation in anthropometric characteristics, (including craniofacial morphology, mandibular length, body height and weight) socio-cultural differences and difference in functionality of masticatory system among different ethnic groups is a possible explanation for this observed difference.[9,10] Another possible reason for the noted variations in ROM of TMJ in different studies by different authors could be difference in method (use of metallic or plastic scale, digital or non-digital vernier caliper, disposable paper bite gauze) of measuring.[11,12]

The limitations of this study include limited sample size as we had included a pool of young dental students from a medical college which is not a representative sample. Use of digital vernier caliper over metallic scale would have made the measurement more precise and accurate. Assessing for ethnicity of the subjects would have added to the strength of the study.

CONCLUSION

The inter-incisal opening of participants in our study appeared towards lower range of normal mouth opening while lateral excursion appeared consistent with those described in the literature. The protrusive movement of our participants was decreased, compared to those recorded in the literature.

REFERENCES

1. Park Y, Lee T, Seog M, Kim SO, Kim J, Kwon JS, et al. An Analysis of the Temporomandibular Joint Range of Motion and Related Factors in Children and Adolescents. *Children (Basel)*. 2021 Jun 17;8(6):515. doi: 10.3390/children8060515. PMID: 34204551; PMCID: PMC8235157.
2. Li XY, Jia C, Zhang ZC. The normal range of maximum mouth opening and its correlation with height or weight in the young adult Chinese population. *J Dent Sci*. 2017 Mar;12(1):56-59. doi: 10.1016/j.jds.2016.09.002. Epub 2016 Nov 5. PMID: 30895024; PMCID: PMC6395256.
3. Patel SM, Patel NH, Khaitan GG, Thanvi RS, Patel P, Joshi RN. Evaluation of maximal mouth opening for healthy Indian children: Percentiles and impact of age, gender, and height. *Natl J Maxillofac Surg*. 2016 Jan-Jun;7(1):33-8. doi: 10.4103/0975-5950.196140. PMID: 28163476; PMCID: PMC5242072.
4. Al-Dlaigan YH, Asiry MA. Maximum mouth opening in saudi adolescents. *J Int Oral Health*. 2014 Nov-Dec;6(6):45-9. PMID: 25628483; PMCID: PMC4295454.
5. Yao KT, Lin CC, Hung CH. Maximum mouth opening of ethnic Chinese in Taiwan. *J Dent Sci*. 2009; 4(1): 40-4.
6. Loster JE, Groch M, Ryniewicz W, Osiewicz M, Wieczorek A. Assessment of range of mandibular movements as related to gender in Polish young adult non-patients. *J Stoma*. 2016; 69(2): 146-52.
7. Gbolahan OO, Osinaike BB, Udoye CI, Olawole OW. Range of mouth opening among three major ethnic groups in Nigeria. *Ann Ibd Pg Med*. 2019; 17(2): 130-7.
8. Iturriaga V, Bornhardt T, Arias A, Antiao M, Aravena Y, Navarro P, et al. Mandibular range movement in pediatric patients. *Int J Odontostomat*. 2017 Apr;11(1):83-7.
9. Sawair FA, Hassoneh YM, Al-Zawawi BM,Baqain ZH. Maximum mouth opening. Associated factors and dental significance. *Saudi Med J.* 2010; 31: 369-73.
10. Dosumu OO, Ibeabuchi NM, Arotiba JT, Arotiba GT. The relationship between maximal mouth opening and age, height and weight in Nigerians. *Nig Dent J*. 2008; 16: 91-3.
11. Wood GD, Branco JA. A comparison of three methods of measuring maximal opening of the mouth. *J Oral Surg*. 1979; 37:175-7.
12. Kumar A, Mehta R, Goel M, Dutta S, Hooda A. Maximal mouth opening in India children using a new method. *J Cranio Max Dis*. 2012; 1:79-86.