

THE RANGE OF INTER-INCISAL OPENING AMONG UNIVERSITY STUDENTS OF AJMAN, UAE

¹AQIB SOHAIL, FCPS, MOMSRCS (Glasgow)

²ANEELA AMJAD, BDS

ABSTRACT

The aim of this study was to investigate the average maximum mouth opening and range of mouth opening in a representative sample of the adult students of UAE. Maximum mouth opening was studied in 450 adult students age range 19-24 years of Gulf Medical University Ajman, UAE. Those with clinical history of TMJ involvement, trauma, infections, dental prosthesis on the anterior teeth, congenital anomalies in the maxillofacial region were excluded from this study. The measurements were taken twice and mean of the two values were recorded. The average mouth opening of males (59.74 ± 5.26 mm) subjects was higher as compared to female (46.50 ± 3.32 mm) with significant, p -value 0.000.

Key words: Mouth opening, Maximum mouth opening, Range of motion, Temporomandibular joint disorders (TMD)

INTRODUCTION

Interincisal opening has been defined as “the greatest distance between the incisal edge of the maxillary central incisors to the incisal edge of the mandibular central incisors at the midline when the mouth is open as wide as possible.”¹

Jaw opening capacity is often regarded as one of the important parameters for evaluating the function of the temporomandibular joint (TMJ) and masticatory muscle status.² The range of mandibular movement is a valuable measure in the examination of patients with suspected functional disorders of the masticatory apparatus.³

Normal range of mouth opening in different population studies varies from 40-60mm, 41-43mm, and 47.1mm. The average intrinsic vertical mouth opening measures 40-50mm, an opening of 25-35mm is functional, and 10-24mm is severely limiting.⁴

Severely restricted mouth opening, may occur as a result of intra or extra capsular pathology of the TMJ. Extra capsular causes of trismus include peritonsillar abscess dental infections, noma, trauma to mouth closing muscles, mandibular nerve blocks, tetanus, cancer, microstomia, osteochondroma of the mandibular coronoid process, submucous fibrosis due to chew-

ing betel nut and, masticatory muscle tendon-aponeurosis hyperplasia.⁵⁻⁸

TMD have generally been presumed to be conditions affecting only adults; however, epidemiological studies have reported signs and symptoms in children and adolescents to be as frequent as in adults.⁹

Trismus is a well recognised morbidity following head and neck cancer treatment. It has been reported to be present in 2% of all newly diagnosed patients, and induced through surgery or radiotherapy in 8% of patients.^{10,14,15}

Dijkstra et al. (2006) did not find a clear cut-off point for the subgroups dentate, partially dentate and edentulous, but a mouth opening of 35 mm or less was regarded as the cut-off point for trismus of the total group.¹⁶

Finally, Iatrogenic causes such as third molar extractions (in which the muscles of mastication may be torn, or the joint hyperextended) hematomas secondary to dental injection and late effects of intermaxillary fixation¹⁷ after mandibular fractures or other trauma can cause limitation in mouth opening.

In this study, normal mouth opening was measured in an effort to establish a normal range of mobility. Such a range is an indicator of the function of the masticatory system and the TMJ.

¹ Professor and Head of Department, Oral and Maxillofacial Surgery, Lahore Medical and Dental College, Lahore

Correspondence: ²Dr Aneela Amjad, Resident Oral and Maxillofacial Surgery. Cell: 03004234903, amjad.aneela@yahoo.com,

Rationale

Measurement of maximal mouth opening in normal subjects and different age groups are helpful for the management of individuals with maxillofacial injuries and other anomalies to restore the mouth opening to be considered normal level. During clinical examination, limitation of maximum mouth opening (MMO) is considered an important sign of a possible diagnosis of TMD. As limitation of mouth opening is one of the cardinal signs of temporomandibular disorder (TMD) therefore, evaluation of mouth opening is commonly used as part of routine function assessment of the temporomandibular joints (TMJ) and as outcome parameter in studies evaluating the efficacy of therapeutic interventions.

Though limitation is a common clinical feature, its early recognition is necessary for a prompt and efficient approach to a diagnosis. Nevertheless knowledge of a reliable normal range of mouth opening makes this early recognition possible.

METHODOLOGY

The proposed study employs a cross sectional design. All students from College of Medicine, College of Pharmacy, College of Dentistry and College of Allied Health Sciences of Gulf Medical University, Ajman, UAE were the study population. All students participated after filling out the questionnaire and knowing the objectives of the study.

Proposal was sent to Ethical Committee, Gulf Medical University for clearance and approval. The participants were informed about the objectives and purpose of this study and their willingness was sought before conducting the study.

Those persons who had no history of TMD, had functional occlusion with no excursive interferences, and had intact dentition were included in the study.

Patients with a history of temporomandibular dysfunction, dental or skeletal crossbites, had major dental treatment within the last 3 years (orthodontics, orthognathic surgery, or extensive restorative therapy) or gave history of craniofacial trauma, or history of bruxism and were using dental prosthesis on anterior teeth were excluded from the study. The study was conducted at Gulf Medical University, Ajman, U A E

Duration of the study was six months including questionnaire preparation, data collection, data entry, analysis and report preparation.

A questionnaire was prepared to collect information from study subjects regarding socio-demographic characteristics such as age, gender, academic program, nationality and history of TMJ. Experts reviewed the questionnaire and based on their comments, it was revised and finalized. Inter-incisal opening was measured by using millimeter ruler as a study instrument.

All students had a thorough extra oral, intra oral and complete TMJ examination. TMJ examination included the assessment of the presence or absence of joint sounds and pain, palpation of extra oral and intra oral masticatory muscles by using defined pressures and measurement of the range of mandibular motion.

Each student was asked to open the mouth as wide as possible while sitting comfortably on a chair and

TABLE 1: STATISTICS OF AGE (YEARS) AND MOUTH OPENING (MM)

	Age in years			Mouth Opening in MM		
	Male	Female	Total	Male	Female	Total
<i>N</i>	225	225	450	225	225	450
<i>Mean</i>	21.57	21.73	21.65	59.74	46.50	53.12
<i>Std. Deviation</i>	1.65	1.78	1.717	5.26	3.32	7.95
<i>95% C.I</i>	<i>Lower Bound</i>	21.35	21.49	59.05	46.06	52.38
		21.79	21.96	60.44	46.93	53.86
<i>Minimum</i>	19	19	19	50	39.90	39.90
<i>Maximum</i>	24	24	24	69.20	52.60	69.20
<i>p-value</i>	<i>0.324 (insignificant difference)</i>			<i>0.000 (significant difference)</i>		

TABLE 2: COMPARISON OF MAXIMUM MOUTH OPENING MMO VALUES FROM DIFFERENT STUDIES

Author	Country	No. of cases	Age (Years)	Mean MMO(mm)
Sheppard and Sheppard	USA	200	16-70	49.8
Agerberg	Sweden	200	18-25	55.9(male) 53.2(female)
Mezitis <i>et al</i>	Greece	1160	18-70	52.85(male) 48.34(female)
Cox and Walker	Nepal	700	18-68	47.1
Placko <i>et al</i>	France	228	18-84	50.77

maximum distance was measured from the incisal edge of the maxillary central incisors to the incisal edge of mandibular central incisors at the midline. The value was read off a graduated scale in millimeters. The examination and measurements were performed by a single examiner.

The quantitative data like age (years) and mouth opening (mm) are presented in mean \pm S.D along its minimum and maximum values. Comparison of age and mouth opening was done in males and females using independent sample test. Analysis of variance (ANOVA) was applied for the comparison of mouth opening in different nationalities. Data were stratified for gender and nationalities for the further comparison using independent sample t-test and ANOVA respectively. Bivariate Person correlation and scatter plot was used to see any relationship between age and mouth opening. P-value ≤ 0.05 was considered as significant.

RESULTS

This study comprised of 450 subjects with equal male to female ratio i.e. 225 of each. Among 450, 165(36.7%) subjects were Pakistani, 160(35.6%) were Indian and 125(27.8%) subjects were national of UAE. The mean age of all subjects was 21.65 ± 1.71 with minimum and maximum ages 19 and 24 years. Moreover, the mean age of male and female subjects was 21.57 ± 1.65 years and 21.73 ± 1.78 years respectively.

The mean mouth opening of all subjects was 53.12 ± 7.95 mm with minimum and maximum mouth opening 39 and 69 mm respectively. The average mouth opening of males (59.74 ± 5.26 mm) subjects was higher as compare to female (46.50 ± 3.32 mm) with significant, p-value 0.000.

If we talk separately about three nationalities, then the mean mouth opening of males were also

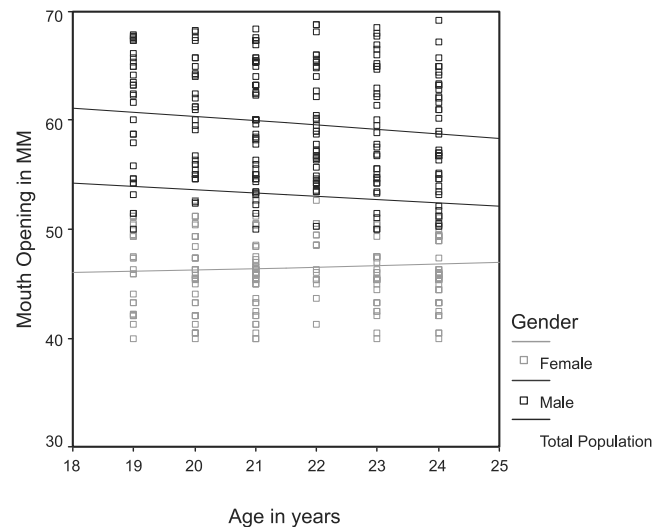


Fig 1: Scatter plot showing relationship among age and mouth opening

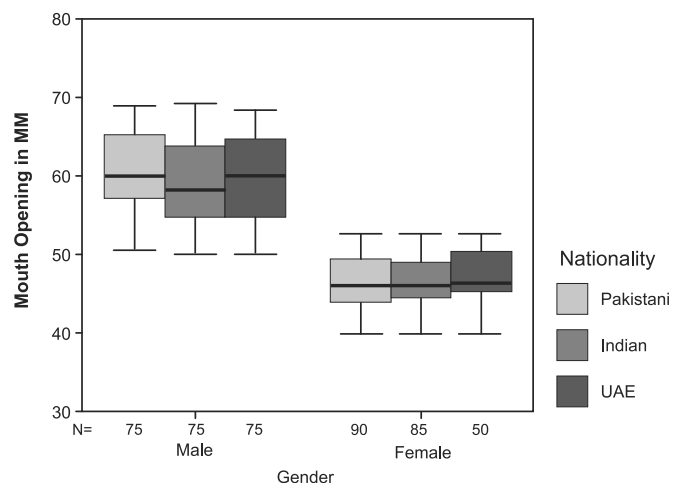


Fig 2: Comparison of mouth opening in males and females of different nationalities

higher than that of female, p-value > 0.005 . That is mean mouth opening of Pakistani males vs females was 60.80 ± 4.95 mm and 46.37 ± 3.31 mm respectively.

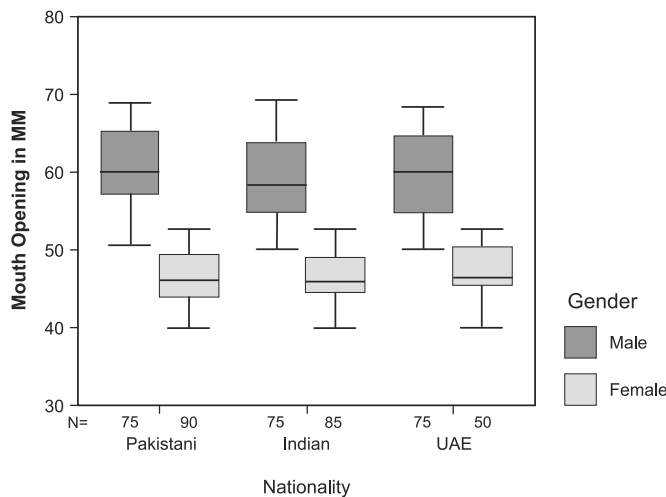


Fig 3: Comparison of mouth opening in three nationalities according to gender

Average mouth opening in Indian males vs. female was 59.01 ± 5.36 mm and 46.30 ± 3.21 mm respectively. The average mouth opening of UAE national males vs females was 59.42 ± 5.36 mm and 47.06 ± 3.55 mm.

Lastly, overall the mouth opening was insignificantly negatively correlated with age; i.e. there is decrease in mouth opening with increasing age ($r = -0.065$ with 0.172 as p-value). If we talk separately for males and females then ages of males has negative insignificant relationship with mouth opening ($r = -0.124$ with p-value as 0.063) but ages of female has insignificant moderate positive correlation ($r = 0.063$ with p-value = 0.344).

DISCUSSION

Measurements of maximal mouth opening showed greater values in males than females. Maximum mouth opening depends upon the size of the mandible which is significantly greater in males than the female. Values from 32 mm to 77 mm have been reported in the literature for adults. Gender differences have been shown, a fact that was also portrayed by the results of this study, i.e. with men having the tendency to open on average five mm more than women. Measurements range from 40 mm to 77 mm in male subjects, with more frequent values around 50-60 mm, and from 32 mm to 75 mm in female subjects, with more frequent values around 45-55 mm.¹²

It is essential to establish what constitutes the normal opening for the population. Researches have shown that this measurement varies significantly with

age, gender and race and so they fail to define an end line of limitation of mouth opening. Some researchers judge the opening to be limited if the interincisal distance is <40 mm. Others set the limit at <39 mm, at <38 mm, at <37 mm and at <35 mm. Whereas other investigators consider <35 mm for men and <30 for women as restricted opening.¹³

In addition to the factors mentioned above, racial differences are another issue of concern. Studies of MMO from different countries are described in table 2. There is a wide range of average MMO values in different studies. Although MMO values of Asians seem to be smaller than those of Caucasians¹⁸. The present study could not find any obvious racial differences when comparing the present study results with others.

The inter-incisal distance during active opening was used as the MMO measurement in most studies. An advantage of the incisal edge distance measurement is that the measuring point is relatively more permanent and more easily determined. An extraoral measurement was also used in some studies. Wood and Branco compared direct and extraoral measurements, and concluded that direct measurements using a ruler were more precise and accurate.

Among the three measurements taken for each subject, the first measurement of MMO was generally greatest in this study. This might have been caused by decreasing muscle power with succeeding measurements. However, some authors do not agree with that. Passive mouth opening by an investigator was also employed in some studies, and the value of MMO was found to be greater than that of active MMO. This may have been because of the application of external force during measurement.

The correlation between MMO and stature is controversial. Some studies described a positive relationship while others did not. Scavone H, *et al* mentioned that MMO is relatively dependent on the size of the mandible, which is obviously greater in males¹⁹. Since human males are generally taller and larger than females, it is conceivable that MMO would be larger in males. The majority of MMO studies, including the present study, demonstrated a sex difference between males and females. Whether or not the difference is attributable to a variation in stature remains unclear. Further investigation is required to clarify possible correlations among these factors.

CONCLUSIONS

A simple, quick method of assessing and recording normal range of mouth opening has been presented. Using this method clinicians may be able to more accurately distinguish “normal” from “restricted” mouth opening. However, it must be remembered that this is only one variable, and all aspects of possible dysfunction should be assessed comprehensively before a definitive diagnosis is made. Further research should be carried out to determine the underlying factors that contribute to such variations. In addition, a larger sample size from a multicentre setting should be used, and results should be compared between normal subjects and those with temporomandibular disorders.

In summary, within the limits of this study, it was concluded that gender has a significant influence on the MMO value of the representative sample of this study. The results of the present study were in agreement with the previously reported studies in different countries.

REFERENCES

- Placko G, Bellot-Samson V, Brunet S, et al. Normal mouth opening in the adult French population. *Rev stomatol Chir Maxillofac* 2005;106(5):267-71.
- Fanghanel, J, Gedrange, T. On the development, morphology and function of the temporomandibular joint in the light of the orofacial system. *Ann. Anat.* 2007;189(4):314-319.
- Fanghanel, J, Gedrange, T, Proff. The facephysiognomic expressiveness and human identity. *Ann. Anat.* 2006;188(3): 261-266.
- Gallagher C, Gallagher V, Whelton H, et al. The normal range of mouth opening in an Irish population. *J Oral Rehab* 2004;31(2):110-16.
- Fasano CJ, Chudnofsky C, Vanderbeek P. Bilateral peritonsillar abscesses: not your usual sore throat. *J Emerg Med* 2005;29:45-47.
- Al Belasy FA. Ultrasound-guided drainage of submasseteric space abscesses. *J Oral Maxillofac Surg* 2005;63:36-41.
- Yano H, Yamamoto H, Hirata R, et al. Post-traumatic severe trismus caused by impairment of the masticatory muscle. *J Craniofac Surg* 2006;16: 277-80.
- Ortakoglu K, Akcam T, Sencimen M, et al. Osteochondroma of the mandible causing severe facial asymmetry: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007;103:e 21-28.
- Eipe N. The chewing of betel quid and oral submucous fibrosis and anesthesia. *Anesth Analg* 2006;115:1458-60.
- De Sousa LM, Nagamine HM, Chaves TC, Grossi DB, Regall SCH, De Oliveira AS. Evaluation of mandibular range of motion in Brazilian children and its correlation to age, height, weight and gender. *Braz Oral Res* 2008;22: 61-66.
- Dijkstra PU, Huisma PM, Roodenburg JLN. Criteria for trismus in head and neck oncology. *Int J Oral Max Surg* 2006;35:337-42.
- Cortese SG, Oliver LM, Biondi AM. Determination of range of mandibular movements in adults without temporomandibular disorders. *J Craniomandib Pratt* 2007;25: 200-205.
- Hirsh C, John MT, Lautenschlager C, List T. Mandibular jaw movement capacity in 10-17 year-old children and adolescents: normative values and the influence of gender, age, and temporomandibular disorders. *Eur J Oral Sci* 2006; 114: 465-70.
- Dijkstra PU, Sterken MW, Pater R, Spijkervet FKL, Roodenburg JLN. Exercise therapy for trismus in head and neck cancer. *Oral Oncol.* 2007;43:389-94.
- Molen L, van Rossum MA, Burkhead LM, Smeele LE, Hilgers FJ. Functional outcomes and rehabilitation strategies in patients treated with chemoradiotherapy for advanced head and neck cancer: a systematic review. *Eur Arch Otorhinolaryngol* 2009, 266:901-02.
- Dijkstra PU, Huisman PM, Roodenburg JL. Criteria for trismus in head and neck oncology. *Int J Oral Maxillofac Surg* 2006, 35:337-42.
- Rahim AU, Warraich RA, Ishfar M, Wahid A. Pattern of mandibular fractures at Mayo hospital, Lahore. *Pak Oral Dent J* 2006;26: 239-42.
- Farkas LG, Katic MJ, Forrest CR, Alt KW, Bagic I, Baltadjiev G et al. International anthropometric study of facial morphology in various ethnic groups/races. *J Craniofac Surg.* 2005;16(4):615-46.
- Scavone H, Trevisan H, Garib DG, Ferreira FV. Facial profile evaluation in Japanese-Brazilian adults with normal occlusions and well-balanced faces. *Am J Orthod Dentofacial Orthop.* 2006;129(6):721-25.
- Ajayi EO. Cephalometric norms of Nigerian children. *Am J Orthod Dentofacial Orthop.* 2005;128(5):653-56.