



EVALUATION OF NORMAL MAXIMUM MOUTH OPENING IN INDIAN ADULT POPULATION AND ITS CO-RELATION WITH AGE, SEX, HEIGHT AND WEIGHT -A CROSS SECTIONAL STUDY

¹*Raju R. Naik, ²Mubeen Khan, ³Veena B. Pujari and ⁴Kirty R. Nandimath

^{1,3,4}Department of Oral Medicine and Radiology, Shri Dharmasthala Manjunatheshwara College of Dental Sciences and Hospital Dharwad.

²Government Dental College and Research Institute. Bangalore.



*Corresponding Author: Dr. Raju R. Naik

Department of Oral Medicine and Radiology, Shri Dharmasthala Manjunatheshwara College of Dental Sciences and Hospital Dharwad.

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ABSTRACT

Maximum Mouth Opening among different population has been shown to vary considerably and can be an important parameter in the detection of many diseases and conditions in a specific given population. The present study is an attempt to measure and analyse the Maximum Mouth Opening (MMO) in an adult Indian population and to assess the possible relationship of MMO with age, sex, height, weight.

KEYWORDS: Maximum mouth opening, Body height, Body weight, Age.

INTRODUCTION

Maximum Mouth Opening is an important diagnostic factor for dental clinicians. Maximum opening of the mouth has been described as "either the interincisal distance at maximum mouth opening or as the interincisal distance plus the overbite".^[1] Limited mouth opening can be related to many conditions, such as temporomandibular disorders, odontogenic infections, trauma, oral submucous fibrosis, oral malignancies and can cause varying degrees of difficulty in managing and treating patients. One of the elementary tests to evaluate temporomandibular joint function is measurement of range of motion during maximum mouth opening and limitation of these movements is considered a sign of dysfunction. Research has shown that measurements of maximum mouth opening can significantly vary with age, sex and stature.^[2] Age and stature may be an important predictor of maximum mouth opening measurements. There are no definite studies on establishing the normal MMO and different contrary reports are obtained by studies in different population. It is very important to establish the maximum normal mouth opening without which the diagnosis of abnormal MMO is difficult. Therefore, it becomes very necessary to establish the maximum normal mouth opening in a particular population. To the best of our knowledge there have been very limited studies on MMO in an Indian adult population and its variation with age, sex, height and weight. Hence purpose of this study was, to assess and establish the normal maximum mouth opening, to

correlate the maximum mouth opening with height, weight and sex of the individual among different age groups and to derive clinical implications, this will be helpful for a clinician for easy examination, diagnosis and treatment planning.

MATERIALS AND METHODS

This cross-sectional study was conducted on 1000 healthy adult population. The study subjects were divided into three subgroups according to age ranges: Group I: Young (20yrs-39yrs), Group II: Middle aged(40yrs-59yrs) and Group III: Elderly(60-80yrs). An ethical clearance from the institution and a written informed consent from the patient was taken prior to the conduct of study. Subjects in the age group 20-80yrs with no history of TMJ pathology, with no facial and dental developmental abnormalities were included in the study. Clinically missing anterior teeth, anterior teeth which were fractured, restored or had a full crown, subjects with inflammatory diseases related to teeth, subjects with severe malocclusion and neurological disorder, with habit of bruxism, with oral mucosal ulceration and suspected malignancy leading to reduced mouth opening, Subjects with more than 1mm of attrition on the incisal edges and those with history of joint pain were excluded from the study

METHODOLOGY

The selected subjects were made to sit in an upright position on the dental chair and a brief clinical history

was taken. Under a well illuminated light source a thorough extra oral, intra oral and TMJ examination was carried out. The maximum unassisted voluntary mouth opening was accomplished by instructing the subjects to open their mouth as wide as they could and the linear distance between the incisal edge of the same side of the upper and lower central incisors was measured using a Vernier Caliper. The measurement was read and recorded to the nearest millimetre. Two measurements were taken at the same time in mm and the average value was calculated and recorded. The weight of the individual was recorded in kilograms using a digital weigh scale. The height was measured barefoot in centimetres using a metric gauge (total height 200cms). All measurements were performed by a single examiner to eliminate the inter-examiner variability. The results were subjected to statistical analysis. Student unpaired t test was used to assess the statistical difference between males and females and Pearson correlation coefficient to assess the correlation between mouth opening and both body height and weight. Significant level was considered at $P \leq 0.05$.

RESULTS

The Maximum Mouth Opening was measured in all the three different age groups (group I, II and III) and the mean MMO in the three groups is given in table 2. The estimated average MMO of Group I was 47.3 ± 7.8 mm, group II was 42.9 ± 5.7 mm, group III was 36.6 ± 3.9 mm. There was a significant decrease in MMO with increase in age. A statistically significant difference was found between the MMO and height of an individual. MMO was significantly greater in individual with increased height. There was no statistically significant difference between the MMO and weight of the individual.

Table I: Distribution of study participants according to age and gender.

Age (in years)	Male	Female	Total
Group 1	231(23.1)	253(25.3)	484 (48.4)
Group 2	152(15.2)	198(19.8)	350 (35)
Group 3	86(8.6)	80(8)	166(16.6)
Total	469(46.9)	531(53.1)	1000(100)

Table II: Mouth opening in the three groups of age.

Group	Age (Mean + sd)	Mouth opening Mean (+sd)	ANOVA test for overall comparison (Group 1 vs 2 vs 3)	Comparison, p-value and significance (Post-hoc tukey test)	Correlation between age and MMO – Pearson's coefficient
Group I	26.12 (± 4.3)	47.3 (± 7.8)	p-value - <0.001 Significant	1 Vs 2 – 0.015, S	r= -0.597 p-value - <0.001, Significant negative correlation
Group II	47.9 (± 5.4)	42.9 (± 5.7)		2 vs 3 – 0.001, S	
Group III	63.5 (± 2.2)	36.6 (± 3.9)		1 vs 3 – <0.001, S	

Note: Sd – Standard deviation; s – significant;

Table III: Comparison of Maximum Mouth Opening between males and females.

Group	MMO in males Mean (sd)	MMO in females Mean (sd)	p-value and significance using unpaired t test
Group I	52.1 (± 6.6)	43.5 (± 6.4)	<0.001, S
Group II	44.6 (± 6.8)	41.0 (± 3.5)	<0.001, S
Group III	37.8 (± 3.7)	35.8 (± 4.0)	<0.001, S
Total	45.97 (± 8.4)	40.45 (± 6.02)	<0.001, S

Note: Sd – Standard deviation; s – significant; NS – Not significant

Table IV: MMO by body Weight.

Weight (kg)	MMO	Number of subjects
40-50	47mm	32
51-60	45 mm	369
61-70	52mm	474
71-80	55mm	105
81-90	47mm	12
90-100	56mm	8

$r=0.2^*$, *p-value – 0.87

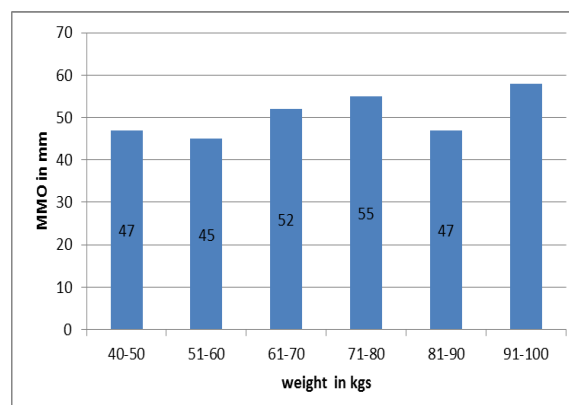
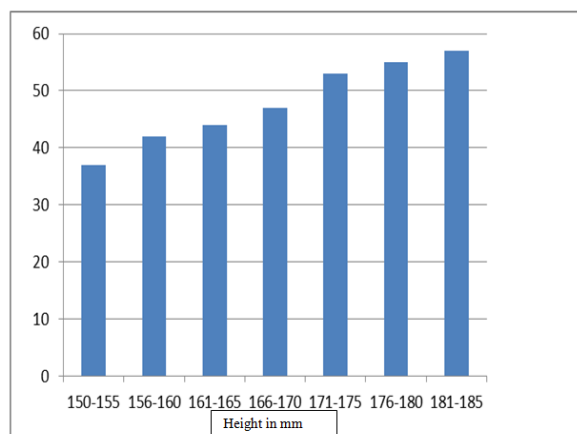


Table V: MMO by body height.

Height(cms)	MMO	Number of subjects
150-155	37mm	35
156-160	42mm	145
161-165	44mm	288
166-170	47mm	284
171-175	53mm	209
176-180	55mm	22
181-185	56mm	17

$r=0.41^*$, $*p<0.045$

A significant positive correlation seen between MMO and height



DISCUSSION

Assessment of mouth opening is a part of the routine functional assessment of the function of the masticatory system, the craniomandibular index and research diagnostic criteria for TMJ disorders.^[3-5] A large number of methods have been described in the literature to measure the MMO. The measurement most often used to assess the MMO is the interincisal distance attained during active opening by the subject. However, this method underestimates the movement of the mandible as it doesn't include the overbite. Interincisal distance plus the overbite has been used as the measure of mouth opening and is thought to be more accurate reflection of the vertical distance travelled by the mandible. However, as pointed out by Mezitis *et al.*^[6] The functional opening of the mouth which in effect is the interincisal distance without the overbite is considered more important, because this is the value that actually affects chewing and dental treatment. Hence this method is used in our study to assess the MMO and the inter-incisor distance was measured using a Vernier Caliper. The various methods reported in the literature to measure MMO are Boley gauge, plastic ruler, dividers caliper and opto-electrical instruments. The number of fingers that can be introduced between anterior teeth had also been used to assess maximum mouth opening. A study by Wood and Branco^[1] compared direct and extra oral measurements, and concluded that direct measurements using a ruler were more precise and accurate as other methods require

a longer measuring time that may lead to fatigue causing less cooperation of the subjects.

The present study evaluated the MMO in various age groups in relation to sex, height and weight in an adult Indian population. The results in our study showed MMO of 45.97 (± 8.4) in males and 40.45 (± 6.02) in females. In our study there was significant difference between the MMO of males and females in all the age groups with p value <0.05 . Our findings is in accordance with many other previous studies conducted in Indian, Chinese population^[7], Nepalese^[8], Iranian^[9] adult population with an average MMO range of 47-54mm. However, studies recorded a much less values for MMO in Saudi, Japanese, Jordanian population^[10-12] and reported a MMO of 42.9 mm (45.3 mm in men and 41.5 mm in women). The difference of result in various studies is attributed to racial differences and variation in facial morphology as well as the difference in the method of measuring mouth opening. The MMO was greater in males and younger age group than in females and older population. This has been reported in many other studies.^[8,10,12,13] The gender difference in MMO is explained by the difference in the size of the mandible and the whole skeleton between males and females.^[14] Since males are generally taller and larger than females, it is conceivable that MMO would be larger in males.

Various studies reported that MMO increases until adult age and after adulthood, MMO decreases with age.^[2,7,12,16] Yao *et al.* estimated that for every 10 years, maximum mouth opening decreased by about 1.4 mm in males and 0.9 mm in females. Similar results observed in our study a definite decline in the MMO with age at an interval of 20 years could be related to skeletal muscle atrophy, declining laxity of the TMJ joint, and physical frailty associated with aging.^[17] In our study a statistically significant difference with a p value 0.045 was found between the MMO and height of an individual. MMO was significantly greater in individual with increased height. Similar findings have been reported by Land wing, Scavone H *et al* who explained that the increased size of the mandible and overall skeletal built of an individual accounts for the increased MMO.^[18]

There was no statistically significant difference between the Maximum Mouth Opening and weight which is substantiated by the fact that weight only increases the body mass which does not influence the Maximum Mouth Opening.

CONCLUSION

The observation made in our study are mean MMO of 45 \pm 8.4mm in males and 40 \pm 6.02mm in females. The Maximum Mouth Opening is influenced by age, sex and height. Weight showed no co-relation to Maximum Mouth Opening. There is a progressive decrease in Maximum Mouth Opening as age advances. Hence

further investigation is required to conclude the above results with a multicentric large sample size study.

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