Evaluation and Comparative Study of Height, Weight and Body Mass Index with Active Maximum Mouth Opening In Normal Healthy Subjects: A Hospital Based Cross Sectional Study

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Abstract

Introduction

Aim: To evaluate and correlate the relationship between the Body Mass Index (BMI) and active maximum mouth opening (AMMO) among healthy subject

Materials and Methods: Study was carried out at Department of Oral Medicine and Radiology of a dental institution in central Gujarat. All subjects attending the department were interviewed and examined by trained professionals to calculate active maximum mouth opening (AMMO) and body mass index.

Result and Observations: A total of 998 subjects participated in study. Out of it, 529 were male and 469 female with overall age range 15- 60 years. Average BMI of male participants was 22.53 Kg/m^2 and female participants was 22.52Kg/m^2. Average mouth opening in males was 49.51±7.4 and 45.3±6 in females. It was also observed that average mouth opening were maximum in the age group 25-34 years and minimum in group 45-54 years. Overall trend was reduction in mouth opening as age advances.

Conclusion: Body weight and height does not have direct relation to the AMMO, but it has decreasing trend with age.This can be attributed to morphological changes in condyle, efficiency of muscles of mastication and various other factors.

Keywords: BMI, AMMO, Weight, Height.

Introduction

Examination of oral cavity and maximum mouth opening is a simple and objective procedure performed by dentist. Limited mouth opening can be associated with TMJ dysfunction syndrome, trauma, neuromuscular disorders, odontogenic infection, congenital and developmental anomalies and advanced malignancies.[1] However,few studies of normal range of maximum mouth opening had been undertaken in different ethenic group of Indian

population.[2] The greatest distance between incisal edge of the maxillary central incisors to the edge of mandibular central incisors at midline when mouth is opened as wide as possible is defined as interincisal opening or maximum mouth opening (MMO).[3] A reduction of mouth opening may cause masticatory and social difficulties for the patient and clinically a reduction in mouth opening poses problems for the dentist. This study is aimed with normative data to evaluate and correlate the relationship between the Body Mass Index (BMI) and active maximum mouth opening (AMMO).

Materials and Methods

Study was carried out at Department of Oral Medicine and Radiology of a dental institution in central Gujarat. All subjects attending the department were interviewed and examined by trained professionals to calculate active maximum mouth opening and body mass index.

The AMMO was measured as a maximum distance between incisal edge of upper and lower central incisors using digital vernier caliper (Aerospace). The height and weight of the patients were measured using height scale (Silvi No.20 of 200cm) and digital weighing scale (Smart Care of maximum Capacity 180kg) respectively

BMI was calculated using following formula.

$$BMI = \frac{Body\ weight\ (KG)}{Height\ (m)^2}$$

A. Inclusion Criteria: All the healthy subjects above 15 years of age reporting to the Department of Oral Medicine and Radiology were included.

B. Exclusion Criteria: The subjects with missing anterior teeth, attrition of teeth, TMJ dysfunction syndrome, trauma, musculo skeletal disorders, oral submucous fibrosis, neuromuscular disorders, odontogenic infections, congenital and developmental anomalies, advanced malignancies and subjects below 15 years were excluded.

Result and Observations

A total of 998 subjects participated in study. Out of it, 529 were male and 469 female with overall age range 15- 60 years. Average age was 25.8 years for male and 25.25 years for females. Overall average age of participants was 25.54 years. Average BMI of male participants was 22.53 Kg/m^2 and female participants was 22.52Kg/m^2. Overall BMI of study population was 22.53 Kg/m^2 [Table No. 1].

Table No 1: Gender wise distribution of mean values for age, BMI and mouth opening in healthy human participants

Parameters	Male (n=529)	Female (n=469)	Unpaired students t'test P value	Total (n=998)
Age	25.80±7.05	25.25±6.92	0.219	25.54±6.99
Body mass Index	22.53±3.99	22.52±4.53	0.95	22.53±4.25
Mouth opening	49.51±7.4	45.3±6.0	1.05	47.56±7.131

Average mouth opening in males was 49.51±7.4 and 45.3±6 in females. Above table Shows statistically significant difference (p value <0.05) between mouth opening of male and female participants. No statistically significant difference (p value >0.05) in age and BMI of male and female participants was observed.

Table No 2 shows division of all participants into 5 groups based on their age. Maximum number of participants (566) were from the age group 15 to 24 years and minimum number (5) from age group 55 and above .

Table No 2: One way ANOVA for comparison of mouth opening in age wise groups in normal human participants

Parameter under study	Age wise groups and its sample size				
	15-24	25-34	35-44	45-54	55 and above
	N=566	N=319	N=90	N=18	N=5
Mouth opening (Mean±S	47.62±6.94	47.82±7.40	47.2±7.44	43.61±6.12	45.46±5.45

D)					
Mouth opening range in mm	23.45-74.03	19-85.2	25.28-66.76	34.71-56.19	38-52
One way ANOVA findings	Degree of freedom=4, Mean square (MS)= 83.122, F value=1.58 P value=0.177 (Statistically not significant)				

It was observed that average mouth opening were maximum in the age group 25-34 years and minimum in group 45-54 years. Overall trend was reduction in mouth opening as age advances. One way ANOVA gives p value >0.05 [Table No 2] accepting null hypothesis that all group means for mouth opening values were equal and not even one of the group means was different from others. This suggests that, age hardly had any effect on mouth opening.

Table No 3: One way ANOVA for comparison of mouth opening in BMI wise (Underweight, Normal and overweight) groups in normal human participants

Parameters under study	BMI wise groups and its sample size		
	Underweight (N=163)	Normal weight (N=578)	Overweight (N=257)
Mouth opening (Mean±SD)	46.31±7.494	47.73±6.98	47.98±7.17
Mouth opening range in mm	29.31-85.2	19-74.03	26.62-69.45
One way ANOVA findings	Degree of freedom (df) = 2, mean square (MS)=158.36, F value= 3.129, and p value= 0.044 (Statistically significant <0.05)		

Participants were subdivided into three groups underweight, normal and overweight based on their BMI [Table No 3]. Average mouth opening in these groups were 46.31mm, 47.73mm and 47.98 respectively. Trend suggested that average mouth opening increased as BMI increased. One way ANOVA gives p value<0.05 rejecting null hypothesis that all group means were equal and concluded that at least one of the group means for mouth opening was different from others. The association of age, height weight and BMI with mouth opening was further explored using Pearson's correlation coefficient. Degrees of Coefficient of correlation (r) were graded into low ($0.29 \geq$ absolute value $r \geq 0.1$), moderate ($0.49 \geq$ absolute value $r \geq 0.3$) and substantial (absolute value of $r \geq 0.5$) [Table No 4] .

Table No 4: Showing correlation coefficient values of different demographic and anthropometric variables with mouth opening in normal human participants

Parameters	Pearson's correlation coefficient 'r' value	Grading of correlation coefficient
Age	-0.04	No correlation
height	0.263	Low positive correlation
Weight	0.22	Low positive correlation
Body mass index	0.09	No correlation

Age and BMI showed statistically non-significant association with mouth opening; but trend correlated negatively and positively respectively. Height and weight showed statistically significant low positive correlation/association with the mouth opening in study population. These observations conclude that as height and weight increases, mouth opening also increases.

Discussion

The measurement of AMMO is a valuable diagnostic tool for assessing the function of the temporo-mandibular joint. Various methods have been used to measure AMMO as interincisal distance[4,5,6,7,8,9] or interincisal distance and overbite.[10] Few authors have also used rulers, vernier callipers (manual and digital)[4,6,11]or also by using width of 3/4 fingers.[5,9] Other studies have also taken more than one measurement and recorded the highest value or mean of two to three readings as AMMO.[7,8,11]

Demographic profile of present study showed a total of 998 volunteers out of which 529 were males and 469 were females with average age of 25.8years and 25.25years respectively. Average BMI of male participants was 22.53kg/m^2 and female participants was 22.52kg/m^2. Maximum number of participants in study population fall

in the age group of 15 to 24 years and minimum fall in the age group of 55 and above.

AMMO in the present study was maximum in the age group of 25 to 34 years and minimum in 45-54 years. Overall trend of reduction in mouth opening was observed as age advances. Previous studies by various authors also has shown similar findings.[1,6,9,13](Although one way ANOVA gives p value >0.05 accepting null hypothesis which suggests, age hardly have any effect on mouth opening). It may be related to skeletal muscle atrophy , decrease in the strength and physical capacity associated with aging. Another reason could be alteration in condylar morphology with increasing age which was found on radiographs.[14]

Further, most of these studies revealed that the mouth opening increases with age until adulthood and the females have a decreased mouth opening compared to males.

Very few studies have been conducted in children and confirmed that the difference in mouth opening was observed till 14 to 15 years of age with no obvious change as age advances till third decade of life. This suggest that mouth opening becomes stable after attaining puberty.[15] Oginni et al concluded in their study that AMMO will vary with ethnic origin, weight ,height,age and BMI. A peak AMMO in adult appears to exist at about 33 years of age.[16] Present study also showed similar finding.

Overall findings by previous studies have showed AMMO more in males as compared to females which is also in accordance with the present study.[1,6,17,18] This gender difference in mouth opening may be attributed to the size of mandible and the whole skeletal difference in males and females.[13] Present study also showed similar finding with females having relatively less AMMO as compared to males. Therefore, it is important to establish normal MMO for each specific population in order to be able to make a diagnosis of reduced mouth opening.

None of the studies till now have given significant literature which supports the relation of body weight to AMMO.[19]

Fewer studies are conducted on BMI and its relation to Oral submucous fibrosis which confirmed that there is significant difference in BMI among patients with Oral submucous fibrosis and control. Therefore, lower BMI maybe considered as risk factor for Oral submucous fibrosis.[20]

Conclusion

Body weight and height does not have direct relation to the AMMO, but it has decreasing trend with age.This can be attributed to morphological changes in condyle, efficiency of muscles of mastication and various other factors.

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