

## The Normal Range of Mouth Opening in Kurdish Population and its Correlation to Age, Sex, Height, and Weight

Submitted in : 22/2/2010

Accepted in: 26/9/2010

shahab A. Hamad\*

Reiadh K . Al Kamali\*

Handreen M. Ali\*

### ABSTRACT

**Background and Objectives:** to many dental disciplines, especially oral and maxillofacial surgeons to perform dental treatments and oral surgical procedures comfortably. This study was conducted to estimate the degree of mouth opening and its correlation to sex, age, height and weight.

**Methods:** The maximum mean mouth opening of 1262 Kurdish adult was measured using a calibrated ruler, in addition to body height and weight. Student-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.

**Results:** The mean value of mouth opening was 50.56 mm for males and 48.46 mm for females. The greatest mean mouth opening was noted in the age group of 16-24 and decreased gradually with advanced age. A significant positive correlation was noted between mouth opening and both body height and weight.

**Conclusions:** Mouth opening was higher in males than females in all age groups and decreased gradually with advancing age. It was positively correlated with body height and weight.

**Key words:** Mouth opening, body height, body weight.

### INTRODUCTION:

The range of mouth opening is a significant factor in the diagnosis of many clinical conditions and can have implications in the treatment of many maxillofacial disorders. Limited mouth opening can be associated with TMJ dysfunction syndrome, trauma, neuromuscular disorders, odontogenic infection, congenital and developmental anomalies, and advanced malignancies. A Known normal range of mouth opening is necessary to enable the clinician to conduct a thorough oral examination conveniently. 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 and the

of mandibular function is performed by means of several diagnostic tests including muscle and joint palpation, occlusal evaluation and radiographic examination. One of the elementary tests to evaluate TMJ function is the measurement of the range of motion during maximum mouth opening and lateral protrusive movements; limitation of these movements is considered a sign of dysfunction<sup>2,3</sup>. The maximum opening of the mouth can be expressed either as interincisal distance or as corrected interincisal distance, which is determined by adding the amount of vertical overlap between the upper and lower incisors to the distance. The methods for measuring the mandibular movement are varied. Although most investigators directly measured the length

\* Collage of Dentistry /hawler medical university

opening using a Boley gauge<sup>4</sup>, plastic ruler<sup>5</sup>, caliber<sup>6</sup>. Others had used more sophisticated opto-electrical instruments<sup>7,8</sup>. The number of fingers that can be introduced between anterior teeth had also been used to assess maximum mouth opening<sup>9</sup>.

Landtwig<sup>10</sup> of Zurich stated that 36-38 mm interincisal distance is regarded as the minimal limit for adults. According to Posselt<sup>11</sup>, the maximal opening capacity of the normal mouth is between 50-60 mm. Mandibular range of motion values are influenced by numerous factors, including joint and muscle structure conditions, facial morphology, ethnicity, age, weight, gender, and height<sup>12-18</sup>. The purpose of this study was to estimate the average maximum mouth opening and range of mouth opening in a representative sample of a Kurdish adult population. The other aim was to assess the association between mouth opening and age, gender, body

#### **SUBJECTS AND METHODS:**

weight and height.

The sample of this study were 1262 adult Kurdish subjects, who were visiting the dental clinics of the college of dentistry, Hawler Medical University in the center of Arbil city, Kurdistan region of Iraq. The study extended from October 2008 to March 2009. There were 628 male and 634 female with an age range of 16-85 years. The inclusion criteria were: no history of trauma to the face, temporomandibular joint symptoms, infection, congenital anomalies in the maxillofacial region. Subjects were also excluded from the study if they were in orthodontic treatment, if they had systemic disease such as rheumatoid arthritis or osteoarthritis. All subjects had their all incisors present and those with fractured, crowned or attrition incisors were not included. For all subjects maximum mouth opening, as well as weight and height were measured. A millimeter ruler was used to measure the distance between the incisal edges of the upper and lower

opened. Such a distance was measured twice for each subject and the mean of the two values was noted. The measurements were performed 5 minutes apart and were taken before any dental treatment was performed. Student-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  $P \leq 0.05$

#### **RESULT:**

Table 1 shows the range, mean and standard deviation of mouth opening in relation to age and sex. The mean value and the range for males was 50.56 mm (23.7-70.3mm) and for females, it was 48.46mm (19.8-68.4mm). The difference was highly significant. The greatest mean maximum mouth opening was recorded in the age group of 16-24 years (53.7mm for males and 52.3 mm for females). The lowest mean maximum mouth opening was recorded in the age group of 75-84 years (42.3 mm for males and 39.0mm for females).

Table 2, shows the mean maximum mouth opening in relation to body weight. The lowest mean (46.7 mm) was recorded in the group of 40-50 Kg body weight. The highest mean (52.4 mm) was recorded in the range of 101-110 Kg body weight. A highly significant correlation was found between body weight and maximum mouth opening ( $r=0.884$ ). Figure (1)

Table 3 shows the mean maximum mouth opening in relation to body height. The lowest mean maximum mouth opening (45.4mm) was recorded in the group of 1.50-1.55 m body height. The highest mean maximum mouth opening (52.3) was recorded in the group of 1.86-1.90 m body height. A highly significant correlation was found between body height and mean maximum mouth opening ( $r=0.948$ ). Figure (2)

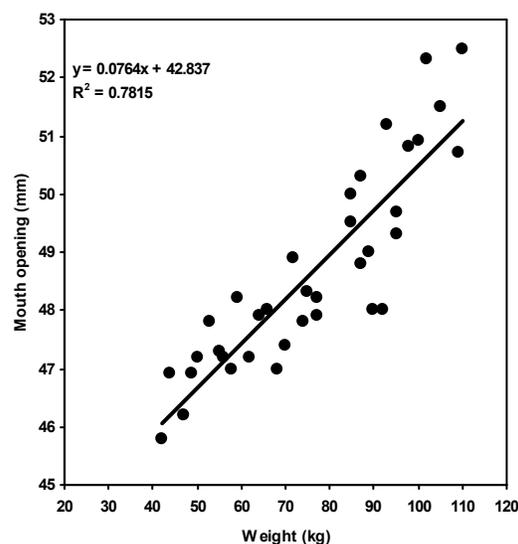
**Table 1:** Normal maximum mouth opening by sex and age groups.

Age (years)	Sex (no.)	Mouth opening (mm)		Mean ± SD	t-value	P-value
		Minimum	Maximum			
16-24	M(136)	36.3	70.3	53.7±6.3	1.982	<0.05*
	F(118)	33.6	68.4	52.3±4.7		
25-34	M(152)	34.7	62.8	51.2±7.2	2.15	<0.05*
	F(176)	35.6	63.1	49.6±6.3		
35-44	M(167)	31.9	60.9	49.6±5.5	3.60	<0.001*
	F(112)	30.6	58.5	47.3±4.8		
45-54	M(84)	30.7	60.2	50.5±5.9	2.35	<0.05*
	F(103)	31.2	57.4	48.2±7.2		
55-64	M(91)	29.6	57.4	48.7±4.2	3.62	<0.001*
	F(59)	27.7	53.2	45.3±7.3		
65-74	M(21)	26.6	58.1	44.2±3.6	3.21	<0.01*
	F(32)	25.3	53.8	39.9±5.4		
75-84	M(7)	23.7	55.3	42.3±2.9	1.57	>0.05†
	F(4)	19.8	51.6	39.0±4.1		
Total	M(658)	23.7	70.3	50.5±5.8	6.35	<0.001*
	F(604)	19.8	68.4	48.4±5.9		

M=male, F=female, SD=standard deviation, \* =significant, † =not significant

**Table 2:** Mouth opening by body weight.

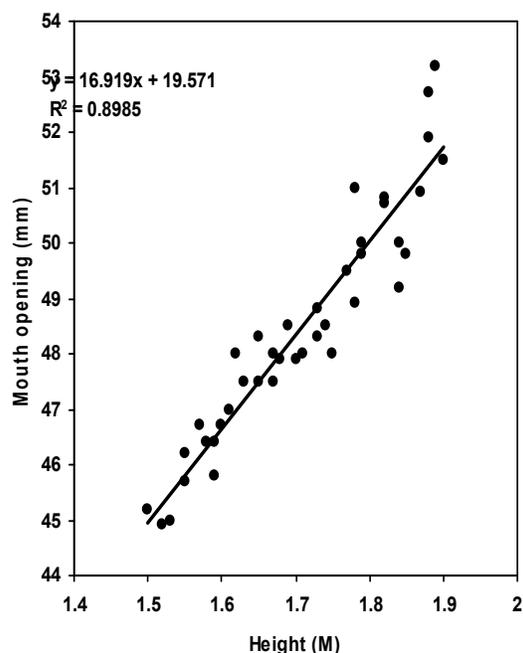
Weight (Kg)	Mouth opening	No. of
40-50	46.7	27
51-60	47.1	121
61-70	47.8	210
71-80	48.3	541
81-90	49.7	252
91-100	50.3	96
101-110	52.4	15



**Figure 1:** Linear correlation between mouth opening and body weight.

**Table 2:** mouth opening by body height.

Height (M)	Mouth opening (mm)	No. of subjects
1.50-1.55	45.4	40
156-1.60	46.3	112
161-1.65	47.7	164
1.66-1.70	47.9	302
1.71-1.75	48.2	462
1.76-1.80	49.6	152
1.81-1.85	50.1	22
1.86-1.90	52.3	8

**Figure 2:** Linear correlation between**DISCUSSION:**

mouth opening and body height.

Assessment of mouth opening is part of a routine functional assessment of the temporomandibular joints. The methods of measuring mouth opening described in the literature are almost as numerous as the studies carried out. In the present study

interincisal distance attained during active opening by the subject. Although this method has been criticized as it may underestimate the vertical distance traveled by the mandible in subjects with a deep bite. Our opinion is that, what is clinically important is the functional opening of the mouth not the vertical distance traveled by the mandible. Measurement of interincisal distance is a simple technique, but difficulties arise when the incisors are absent, traumatized, restored or incompletely erupted. In the present study, traumatized, crowned, restored, chipped or attritioned incisors were considered as an exclusion criteria in selecting patients for measuring mouth opening. Many tools have been described to measure the maximum interincisal distance. It has been found that a ruler was easier and more accurate than Willis gauge or dividers that require a longer measuring time that may lead to fatigue causing less cooperation of the subject and underestimating the mouth opening<sup>19</sup>. The average maximum mouth opening in the present study was 50.56mm for males and 48.46mm for females. Our findings come in accordance with many other previous studies. Yao et al.<sup>20</sup> on a sample of 1442 adult ethnic Chinese in Taiwan reported an average maximum interincisal distance of 49.10 mm (49.92 mm for males and 48.32 mm for females). Cox and Walker<sup>21</sup> on a sample of 700 Nepalese adults found a mean value of interincisal distance of 47.1mm. Lawaf and Azizi<sup>14</sup> found that the maximum mouth opening of 210 Iranian subjects was 49.9 mm in the entire sample (52.19 mm for men and 47.8 mm for women). On the other hand, some studies recorded a much less values for maximum mouth opening. EL-Abdin et al.<sup>22</sup>, on a sample of 1158 Saudi subjects registered a mean value of 48.19 mm for men and 44.05mm for women. In a sample of 21 adult Japanese females aged between 20 and 24 years, Fukui et al.<sup>8</sup> found that the maximum mouth opening was 41.1mm

-50.9 mm). Sawair et al.<sup>16</sup> conducted a maximum mouth opening study on 496 Jordanian subjects and reported a maximum mouth opening of 42.9 mm (45.3 mm in men and 41.5 mm in women). These variations in the maximum mouth opening between our study and previously mentioned studies may be attributed to racial differences and variation in facial morphology as well as the difference in the method of measuring mouth opening. Maximum mouth opening was greater in males than in females and also in young age groups than in older populations. This has been reported in many other studies<sup>1,16,21,22</sup>. The sex difference in maximum mouth opening may be explained by the difference in the size of the mandible and the whole skeleton between males and females.<sup>13</sup> By contrast, joint mobility, in general is greater in females than in males. Naeiji<sup>23</sup> found the angle of opening at the temporomandibular joint to be increased in women. The observation is in accordance with the general finding of greater joint laxity in women. This greater joint laxity may explain why women report more temporomandibular symptoms than men. In contrast to our study Abou-Altme et al.<sup>24</sup> found no gender significance in maximum mouth opening. In the present study, the mouth opening decreased gradually with increasing age. It was 53.7mm for males and 52.3mm for females in the age group of 16-24 years, and diminished to 42.3mm in males and 39.0mm for females in the age group of 75-84 years. It has been noted by other studies that maximum mouth opening increases until adult age and after adulthood, maximum mouth opening decreases with age<sup>1, 10, 12, 16, 20, 24</sup>. Yao et al.<sup>20</sup> estimated that for every 10 years, maximum mouth opening decreased by about 1.4 mm in males and 0.9 mm in females. The reason for this diminution of mouth opening with aging may be related to skeletal muscle atrophy, declining strength, and physical frailty associated with aging. A strong positive correlation

has been made by others who reported a relationship between maximum mouth opening and body weight and height.<sup>10, 16, 20, 22, 24</sup> In contrast to our findings, Gallagher et al.<sup>1</sup> found no correlation between mouth opening and stature.

## REFERENCES:

- Gallagher G, Gallagher V, Whelton H, Cronin M. The normal range of mouth opening in an Irish population. *J Oral Rehabil* 2004;31:110-116.
- Dworkin SF, Huggins KH, LeResche L, von Korff M, Howard J, Truelove E, and others. Epidemiology of signs and symptoms in temporomandibular disorders: clinical signs in cases and controls. *JADA* 1990; 120(3): 273-281.
- Okeson JP. Management of temporomandibular disorders and occlusion. 4<sup>th</sup> ed. St. Louis: Mosby; 1998.
- Miller VJ, Bookhan V, Brummer D, Singh JC. A mouth opening index for patients with temporomandibular disorders. *J Oral Rehabil* 1999; 26:534-537.
- Juca KF, Suazo GIC, Guimaraes AS. Mandibular condyle position in maximum mouth opening. A magnetic resonance imaging evaluation. *Int. J. Morphol.* 2009; 27(3):867-871.
- Jager-Wittenaar H, Dijkstra U, Vissink A, van Oort RP, Roodenburg JLN. Variation in repeated mouth-opening measurements in head and neck cancer patients with and without trismus. *Int. J. Oral Maxillofac. Surg.* 2009; 38:26-30.
- Tokiwa H. Evaluation of the clinical accuracy of an optical recording system for mandibular movement. *Journal of Japanese Society of Stomatognathic Function* 2001; 7:13-25.
- Fukui T, Tsuruta M, Murata K, Wakimoto Y, Tokiwa H and Kuwahara Y. Correlation between facial morphology, mouth opening ability, and condylar movement during opening-closing jaw movements in female adults with normal occlusion. *European Journal of Orthodontics* 2002; 24:327-336.
- Zawawi KH, Al-Badawi EA, Lobo SL, Melis M, and Mehta NR. An index for the measurement of normal maximum mouth opening. *Journal of Canadian Dental Association.* 2003;69(11):737-741.
- Landtwin K. Evaluation of the normal range of vertical mandibular opening in children and adolescents with special reference to age and stature. *J Maxillofac Surg* 1978; 6:157-162.
- Posselt U. Physiology of occlusion and rehabilitation. Oxford: Blackwell Scientific Publication, 1962;56 & 181.
- Lewis RP, Buschang PH, Throckmorton GS. Sex differences in mandibular movements during opening and closing. *Am J Orthod Dentofacial Orthop* 2001;120(3):294-303.

13. Muto T, Kanazawa M. The relationship between maximal jaw opening and size of skeleton: a cephalometric study. *J. Oral Rehabil* 1996; 23 (1):22-24.
14. Lawaf Sh, Azzizzi A. Evaluation of maximum mouth opening in healthy subjects presented to dental school of Ahvas university of medical sciences. *Sci. Med. J.* 2010;9(1):1-6.
15. Reicheneder C, Proff P, Baumert U, and Gedrange T. Comparison of maximum mouth-opening capacity and condylar path length in adults and children during the growth period. *Annals of Anatomy* 2008;190(4):344-350.
16. Swair FA, Hassoneh YM, Al-Zawawi BM, Baqain ZH. Maximum mouth opening. Associated factors and dental significance. *Saudi Med. J.* 2010;31:369-373.
17. Goldstein M, Maxymiw WG, Cummings BJ, Wood RE. The effects of antitumour irradiation on mandibular opening and mobility: a prospective study of 58 patients. *Oral Surg. Oral Med. Oral Pathol. Oral radiol. Endod.* 1999.;88:365-373.
18. Scibba JJ, Goldenberg D. Oral complications of radiotherapy. *Lancet Oncol* 2006;7:175-183.
19. Wood GD, Branco JA. A comparison of three methods of measuring maximal opening of the mouth. *J Oral Surg* 1997; 37:175-180.
20. Yao KT, Lin CC, and Hung CH. Maximum mouth opening of ethnic Chinese in Taiwan. *Journal of Dental Sciences.* 2009;4(1):40-44.
21. Cox SC, Walker DM. Establishing a normal range for mouth opening: its use in screening for submucous fibrosis. *Br J Maxillofac Surg* 1997; 35:40-45
22. El-Abdin H, Al-Shalan T, Al-Bisher G. Normal mouth opening in the Saudi population. *Saudi Dent J* 1991; 3(3):99-101.
23. Naeije M. Local kinematic and anthropometric factors related to the maximum mouth opening in healthy individuals. *J. Oral Rehabil.* 2002;29 (6):534-539.
24. Abou-Atme YS, Chedid N, Melis M, Zawawi KH. Clinical measurement of normal maximum mouth opening in children. *Cranio* 2008; 26(3):191-196.