The relationship between maximal mouth opening and age, height and weight in Nigerians

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Abstract

Objective: To establish the range of maximal mouth opening in Nigerians and explore it's relationship with age, height and weight.

Methods: The interincisal distance in five hundred and one randomly selected healthy Nigerians between the ages of 17 and 69 years was measured using a disposable paper bite gauge. The iid measurements were taken with the subjects standing erect (basic head position) and with the head supported by the wall which had been marked for the height measurements. During both height and iid measurements the head was positioned such that the Frankfurt plane was parallel to the floor. The weight of the subjects was measured with a digital scale.

Results: Majority (66.3%) of the subjects were in the 3rd decade of life (21 30 years). The average Maximal mouth opening (iid) in males was significantly higher than that of females (54.19mm SD 6.73 versus 48.96mm SD 6.36; P < 0.001). The maximal mouth opening increased with increasing age, height and weight in both genders.

Conclusion: The normal range of maximal mouth opening (iid) in Nigerians was similar to those reported in Swedish, Greek, Nepalese and Japanese populations. Further investigations with larger sample and the use of more advanced instruments (e.g. the opto-electric jaw movement recording system) is highly recommended.

Key Words: Maximal mouth opening, Interincisal distance, Nigerians

Introduction

Maximal mouth opening has been variously defined as the interincisal distance (iid) plus the overbite or as the interincisal distance at maximal mouth opening[1] This may be determined by measurement of the distance between the incisal edges of upper and lower right central incisors (direct method), or by measurement of the distance between two points marked on the nose and chin (indirect method) [1,2]

Several instruments have been used to measure the iid; they include compass, plastic rule, Willis bite gauge, pachymeter, vernier caliper and disposable bite gauge [2-7] The measurement of iid could be used to detect pathologic restriction of mouth opening (e.g. submucous fibrosis), or to monitor postoperative morbidity and recovery (e.g. following 3rd molar surgery)[2-7] Previous studies have reported a wide variation of iid in different populations[1,3-5] This study aims to establish the normal range of maximal mouth opening (as measured by iid in Nigerians and explore any relationship with age, weight and height.

Materials and Method

The interincisal distance in five hundred and one healthy Nigerians between the ages of 17 and 69 years was measured using a disposable paper bite gauge (Figure 1) [5]. The iid measurements were taken with the subjects standing erect (basic head position) and with the head supported by the wall which had been marked for the height measurements. During both height and iid measurements the head was positioned such that the Frankfurt plane was parallel to the floor. The subjects consisted of 200 females and 301 males. They were mainly volunteer medical students and staffs at Lagos and Ibadan medical schools. Those with history of temporomandibular joint disorders, trauma, tumour, infection, congenital orofacial anomaly or previous history of surgery in the oro-facial region were excluded. Similarly excluded were those with missing central incisors or dental pathology (e.g. fracture, attrition) involving central incisors. Two iid measurements were taken and the mean value recorded. The weight of the subjects was measured with a digital scale. The statistical analysis was carried out using the SPSS statistical software on a personal computer[8].

Result

Age distribution.
Majority of the 501 subjects under study (66.27%) were in their third decade of life (20 29 years). However, a greater proportion of males (76.41%) were in this age group when compared to females (51.0%). Conversely, more females (30.0%) were in the age group 17-20 years when compared to males (9.97%). The mean age in males (26.09 SD 7.75 Range 17-69 years) was not statistically different from that of females (25.10 SD 8.80 Range 17-63 years) P = 0.317.

Interincisal distance
The mean interincisal distance in males was 54.19mm (SD 6.73) with a range of 36.0mm to 71.0mm. In females, the mean iid was 48.96mm (SD 6.36) with a range of 27.0 to 64.5mm. This gender difference was statistically significant (P<0.001) -(Table 1).

Table 1. Mean values and standard deviation of interincisal distance, age, weight and height.

	AGE	WEIGHT	HEIGHT	IID
	Mean	Mean	Mean	Mean
	26.09yrs	65.02	173.47cm	54.19mm
Males	SD	SD	SD	SD
(n=301)	7.75	10.69	8.64	6.73
	Range	Range	Range	Range
	17-69yrs	3,3.0-105.0kg	117.00-196.00cm	36.0-71.0mm
	Mean	Mean	Mean	Mean
	25.10yrs	57.31kg	162.00cm	48.95mm
Females	SD	SD	SD	SD
(n=200)	8.89	11.04	6.99	6.36
	Range	Range	Range	Range
	17-63yrs	39.0-101.0kg	145.00-190.00cm	27.0-64.50mm
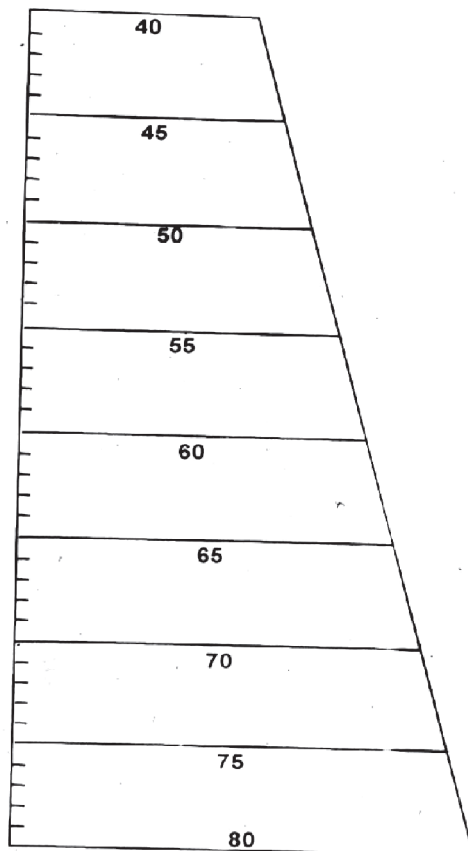
Figure 1. Disposable Mouth guage

Interincisal distance and age
In males, there were no statistically significant correlations between iid and age; Pearson correlation = 0.062 (P = 0.284); Spearman's rho = 0.107 (P = 0.063); Kendall's tau-b = 0.074 (P = 0.069). However, in females, there was a statistically significant correlation between iid and age: Pearson correlation = 0.158 (P = 0.026); Spearman's rho = 0.182 (P = 0.010); Kendall's tau-b = 0.126 (P = 0.011).

Interracial distance and height
The mean height in males was 173.47cm (SD 8.64) with a range of 117.0cm to 196.0cm. In females, the mean height was 162.28cm (SD 6.99) with a range of 145.0cm to 190.0cm. In males, there was positive correlation between iid and height using the Pearson correlation = 0.126 (P = 0.029), Spearman's rho = 0.144 (P = 0.012) and Kendal tau-b = 0.096 (P = 0.015). These correlations were significant at the 0.05 level (two-tailed). Similarly, in females, iid and height were positively correlated   Pearson correlation = 0.209 (P = 0.003); Spearman's rho = 0.197 (P = 0.005); Kendal's tau-b = 0.139 (P = 0.005). These correlations were statistically significant at 0.01 level (two-tailed).

Interincisal distance and weight
In males, the mean weight was 65.02kg (SD 10.69) with a range of 65.0 to 105.0kg. In contrast the mean weight in females was 57.31kg. (SD 11.04) with a range of 39.0 to 101.0kg. There was a positive correlation between iid and weight in males: Pearson correlation = 0.223 (P = 0.000); Spearman's rho = 0.223 (P = 0.000); Kendall's tau-b = 0.153 (P = 0.000). These correlations were significant at the 0.01 level (two-tailed). Similarly in females, there was positive correlation between iid and weight. Pearson correlation = 0.228 (P = 0.001); Spearman rho = 0.220 (P = 0.002); Kendall's tau-b = 0.220 (P = 0.002). These correlations were statistically significant at the 0.01 level (two-tailed).

Discussion

The determination of maximal mouth opening (iid) may be of clinical significance to clinicians managing patients with orofacial diseases. It is important if pathologic restriction of mouth opening is to be diagnosed and if postoperative recovery from oral and maxillofacial surgical procedures is to be accurately monitored. The range reported in this study for Nigerian males (36.0 71.0mm), is comparable to that reported for healthy 20 years old Swedish males (42.0 75.0mm)[9], 18-70 year old Greek males (38.7 67.3mm)[4],15-69 year old healthy Nepalese males (28.0-64.0mm)[7] and 20-30 year old Japanese males (41.0-67.0mm)[6]. Similarly, the normal range for Nigerian females (27.0-64.5mm) was comparable to that reported for healthy Greek women (36.67-60.45mm)[4] healthy Nepalese women (37.0-64.5mm)[7] and 20-30 year old Japanese women (41-58mm)[6].However, the Zurich maxillofacial surgery clinic accepts 36.0-38.0mm as the minimum limit for adults[4].
The relationship between iid and age has been reported by Mezitis et al[4] and Cox and Walker[7]. Mezitis et al[4] reported that the mean iid decreases with age. However, Cox and Walker[7] in a study of children and adolescents aged between 5-19 years reported that the iid increases with age. In this present study, 66.3% of the subjects were

in their third decade of life (20-29 years) and there was positive correlations between iid and age in males and females. However, while the correlation in females was statistically significant (P = 0.011), that in males was not (P = 0.069).

In the literature, there is no general agreement as to the relationship between iid and height. Agerberg [9] reported that iid is related to height. Landwing [3] also reported a positive correlation between iid and height in 5-19 year old subjects. However, Ingervall [10] and Westling and Helkimo [11] reported that this relationship was not significant. Muto and Kanazawa [6] reported no correlation in both males and females. This study found that in both males and females, the correlation between iid and height was statistically significant (P = 0.05 in males and P = 0.01 in females).

The relationship between iid and body weight had not been previously explored by any author to our knowledge. In this study, there was a statistically significant correlation between iid and weight in both genders (P = 0.01 in males and P = 0.01 in females). Fukui et al [3] recently reported positive correlation between maximal mouth opening and facial morphology in 20 to 24 years old female subjects. Masumie et al [4] reported that mandibular jaw opening motion measurements could not reliably differentiate between clinical subgroups of patients with temporomandibular disorders.

Tage et al [12] reported that the degree of mandibular rotation during maximal mouth opening increased when the head position is shifted posteriorly from the anteflexed position to the maximum retroflexed position. They therefore concluded that changes in head position affect the maximal mouth opening. In order to eliminate this problem, in this study the iid measurements were taken with the subjects standing erect by a wall which had been marked for the height measurements and the iid measurements were recorded with the Frankfurt plane parallel to the floor. Thus the head was well supported and there was minimal rotation of the head.

Furthermore, the effect of gravity on the mandible will be expected to be maximal with the subject standing up, rather than sitting on a dental chair. This will limit the application of the range of iid reported in this study to clinical situations   in which iid is measured with the subjects sitting up in the dental chair with varying degrees of reclination of the chair and rotation of the head.

Conclusion

The results of this study showed positive correlations between iid, age, height and weight. This may be attributable to the relatively young and still growing subjects studied. Further investigations with larger samples and the employment of sophisticated instruments (e.g. the opto-electric jaw movement recording system) [13] is highly recommended.

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