The Association of Normal Mouth Opening with Gender and Height

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Abstract

The mouth opening can be used to assess the function of the temporomandibular joint. The average mouth opening differs in various populations, and the aim of this study is to investigate the mean of the normal mouth opening in the Indonesian population and to analyze the difference between gender and height groups. A cross-sectional study was conducted on 182 subjects, ages 17–22, from Universitas Indonesia. A student's t-test showed significant differences between males and females ($p < 0.05$), with males (44.8 ± 4.9mm) having significantly larger mouth openings than females (37.6 ± 4.9 mm). A one-way analysis of variance (ANOVA) test also showed a significant difference between the taller and shorter height groups ($p < 0.05$). Thus, the mean mouth opening differs significantly between gender and height groups.

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Introduction

The mouth opening often is regarded as an important parameter for evaluating the function of the temporomandibular joint.[1,2] A restricted or limited mouth opening can be related to many clinical conditions, such as trauma, odontogenic infection, neuromuscular disorder, congenital and developmental anomalies, and advanced oral malignancy.[2–5] The mouth opening can be measured by maximum mouth opening (MMO), and it is defined as the greatest distance between the incisal edge of the maxilla and mandible while the mouth is open as wide as possible.[2,6]

Research has shown that the mouth opening among different populations varies significantly with age, gender, and race.[7] There has been an agreement between authors that the mouth opening reduces with age and that females have a smaller mouth opening compared to males, while other studies have suggested a trend that populations with a shorter average stature have a smaller range of mouth opening.[3,8]

Therefore, it is important to establish the normal mouth opening in a specific population. Numerous studies across the world have characterized the normal mouth opening in their population; for example, Yao et.al., in Gallagher et al., stated that in China it is 49.1mm, Gallagher et al. stated in Ireland it is 42.2mm and in the United States it is 48.8mm.[3,9] However, there have not been any studies in Indonesia. Therefore, the authors are interested in doing research about the normal mouth opening in Indonesia and analyzing the difference between gender and stature.

Methods

This study was approved by the Ethical Committee of the Faculty of Dentistry Indonesia. The inclusion criteria for the subjects were students without TMD and with an age range of 17–22 years. It was performed with consecutive sampling. All students that participated filled out an eight-item questionnaire (by Himawan et al.) that consisted of questions about signs and symptoms of TMD. Possible answers for each question were 0 = never, 1 = rarely, 2 = often, and 3 = always. If the total score was below 3,

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the subject was categorized as a non-TMD subject.[10] After all of the procedures were completed, 182 non-TMD subjects were collected. Age, gender, and height were all recorded.

The non-TMD subjects then were divided into four height groups with a variation of approximately 10cm (145–154cm, 155–164cm, 165–174cm, and 175–184cm). Each student was seated upright on a chair and was asked to open his or her mouth as wide as possible. The maximum distance was measured from the incisal edge of the maxillary central incisors to the incisal edge of the mandibular central incisors at the midline. The measurement was performed by two examiners who previously had performed a reliability test. All data analyses were tabulated using statistical software, and a student's t-test analysis was performed to evaluate the relationship between the mouth opening and gender. An analysis of variance (ANOVA) test was performed to evaluate the differences of the mouth opening among height groups.

Results

A total of 182 students were selected: 108 females and 41 males. As for the distribution in height groups, there were 68, 67, 30, and 17 subjects for 155–164 cm, 165–174 cm, 145–154 cm, 175–184 cm groups, respectively. The mean mouth opening based on gender and height is presented in Table 1.

The result of the student's t-test analysis of the mouth opening based on gender is presented in Table 2, and the result of the ANOVA analysis among height groups is presented in Table3.

Table 1. Mean mouth opening based on gender and height groups.

Characteristic	Mean (mm) ± SD	IK95%
Gender		
Female	37.6 ± 4.9	36.7–38.5
Male	44.8 ± 4.9	43.7–45.9
Height (cm)		
145–154	36.9 ± 5.1	35.1–38.9
155 – 164	38.6±4.9	37.5-39.8
165–174	42.6 ± 6.0	41.1–44.1
175–184	46.2± 4.6	43.8–46.4
Total (n = 182)	40.5 ± 6.0	39.6–41.4

Table 2. Results of student's t-test analysis between mouth opening and gender.

Gender	Mean (mm) ± SD	p-value
Female (n = 104)	37.6 ± 4.9	0.000
Male (n = 78)	44.8 ± 4.9	

*Variables with significant association ($p < 0.05$

Table 3. The results of ANOVA analysis among height groups

		n	Mean (mm) ± SD	p-value
Height group (cm)	145–154	30	36.9 ± 5.1	0.000
	155–164	68	38.6 ± 4.9	
	165–174	67	42.6 ± 6.0	
	175–184	17	46.2 ± 4.6	

*Variables with significant association ($p < 0.05$)

According to the results shown in Table 2, there was a significant difference between the mouth opening of males and females, with males (44.8mm) having a larger mouth opening than females (37.6mm). Also, in the ANOVA test results, there was a significant difference among the height groups; hence, there were at least two groups that had a large average difference in the mouth opening.

Discussion

This study was conducted on 182 subjects from Universitas Indonesia. The aim of this study was to investigate the mean of the normal mouth opening in the Indonesian population and to analyze the difference between gender and height groups. The mouth opening can be influenced by several factors, including age, race, gender, and height.

This study focused on gender and height. The numbers of subjects in this study were not significant enough to see a difference in age. Regarding the race factor, the research was conducted without a questionnaire to determine the variation of race; therefore, the diversity could be seen. The selected age range was 17–22 years. This was supported by previous research conducted by Fishman et al., which found that the final stage of accelerated growth in skeletal maturation halts at the age of 16–17 years for females and 17–18 years for males.[11]

The growth spurt or the acceleration of growth lasts approximately 3–4 months, and the growth spurt in females is earlier than males.[12] It has been concluded that females and males are considered to have stopped the process of skeletal maturation at the age of 17 years.[11]

All subjects were chosen by using consecutive sampling, in which every subject that meets the criteria of inclusion is selected until the required sample size is achieved. The mouth opening was measured by using digital calipers, which is a very easy and simple yet accurate instrument. Each student was seated upright on a chair and was asked to open his or her mouth as wide as possible.

The maximum distance was measured from the incisal edge of the maxillary central incisors to the incisal edge of the mandibular central incisors at the midline. Height was obtained by measuring subjects standing upright next to a wall without foot wear by using a stature meter attached to the wall.

According to this study, the mouth opening in both females and males varied from 28.3mm to 55.1mm, with an average of 40.5mm SD=6mm). The normal range for mouth openings is between 40mm and 50mm;[11] hence, the average mouth opening in this study (40.5mm) is still within normal limits for mouth openings. With the same age category, the mean of the mouth opening in Indonesia was different from other countries. The mean mouth opening in the Malaysian population for ages 19–29 years is 45.6 mm.[12] For the United Arab Emirates, India, and Pakistan ages 19–24 years, it is 53.2mm, 52.6 mm, and 53.6mm, respectively.[1,12]

Based on the data, Indonesia has the smallest mouth opening compared to the other countries. This difference could be due to different methods of measuring and the number of subjects.[2,5] Indonesia and Malaysia have a similar mean mouth opening; this could be due to the race and body posture.

In this study, the mean mouth opening in males (44.8mm) was significantly larger than females (37.6mm). This result is the same with several other similar studies. For example, Gallagher et al. found that the mouth opening in males (43.4mm) in Ireland was larger than females (41.3mm).[3]

Khare et al. also found the same result with males in India, who had mouth openings of 51.3mm, compared to females with 44.3mm.[7] The different mouth openings between males and females could be due to the size of the body because males have a larger body posture; hence, the size of the mandible is also larger and affects the mouth opening.[2]

The subjects were divided into four groups with a range of 10 cm: 145–154 cm, 155–164 cm, 165–174 cm, and 175–184 cm. The ANOVA analysis showed that there was a difference between height groups. Groups with the shortest height had the smallest mouth opening and vice versa. It also showed that there was an increase in the mouth opening from the shortest group to the tallest.

This result corresponds to those in the study by Sousa et al. that suggested there was an increase in the mouth opening of the first to the fourth group: 39.6mm, 42.3mm, 44.5mm, and 46.4mm, respectively.[13]

Conclusion

This study showed that the mean normal mouth opening in the Indonesian population is 40.5mm, and it is still within the range for normal mouth openings. The mouth opening in males (44.8mm) was significantly larger than in females (37.6 mm). Also, the mouth opening between groups significantly increased as the height group increased, with Group 4 (175–184 cm) having the largest mouth opening (46.2 mm).

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