

Maximum Mouth Opening of Young Adult Kumaoni People

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ABSTRACT

BACKGROUND

Mouth opening is an important clinical parameter in our daily clinical practice. Mouth opening and its adequacy is an important factor in the treatment and follow up of the common conditions involving head and neck. Normal mouth opening has been defined as the inter-incisal distance at the maximal mouth opening. The purpose of this study was to determine the normal range of maximal mouth opening in the young adult Kumaoni population between the age of 20-40 years.

METHODS

The study was undertaken in the institutional hospital, Almora. A total of randomly selected 200 subjects between the age group of 20-40 years representing a sample of dentate adults was included for the study. The sample was stratified into four groups according to age followed by gender stratification. The age groups were classified as 21-25 years (Group 1), 26-30 years (Group 2), 31-35 years (Group 3), and 36-40 years (Group 4). Each group comprised 50 patients (25 males and 25 females). All particulars of patients, relevant clinical history and examination findings were recorded in the clinical proforma after taking proper informed consent. The mouth opening was measured using a standardized protocol with a calibrated ruler, and the findings were recorded in millimetres.

RESULTS

The mean MMO for males was 51.85 mm [standard deviation (SD) \pm 2.59]. The range was 48-56 mm. The mean MMO for females was 49.82 mm (SD \pm 2.32). The range was 46-56 mm. In the age group of 21-25 years, the mean MMO was 50.14 (SD \pm 2.53) mm. The mean value for males was 50.80 (SD \pm 2.67) mm and for females was 49.48 (SD \pm 2.25). In the age group of 26-30 years, the mean MMO was 50.20 (SD \pm 2.54) mm. The mean for males was 51.16 (SD \pm 2.52) mm and for females was 49.24 (SD \pm 2.22). In the age group of 31-35 years, the mean MMO was 51.56 (SD \pm 2.62) mm. The mean for males was 52.28 (SD \pm 2.66) mm and for females was 50.60 (SD \pm 2.44). In the age group of 36-40 years, the mean MMO was 50.83 (SD \pm 2.66) mm. The mean for males was 53.56 (SD \pm 2.62) mm and for females was 49.82 (SD \pm 2.32).

CONCLUSIONS

The mean maximum mouth opening for male participants was 51.85 mm (SD 2.59) (Range: 48-56 mm). The mean maximal mouth opening for female participants was 49.82 mm (SD 2.32) (Range: 46-56 mm). The maximum mouth opening was observed to decrease with age. The mouth opening of females was also observed to be lesser than the males from the corresponding age groups.

KEY WORDS

Maximum Mouth Opening, MMO, Trismus, Oral Cavity, Jaw, TMJ, Kumaon.

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DOI: 10.14260/jemds/2022/99

How to Cite This Article:

Garkoti HC, Bhandari G, Verma M, et al.

Maximum mouth opening of young adult

Kumaoni people. J Evolution Med Dent Sci

2022;11(04):495-498, DOI:

10.14260/jemds/2022/99

Submission 02-02-2022,

Peer Review 10-03-2022,

Acceptance 16-03-2022,

Published 14-03-2022.

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BACKGROUND

The normal range of mouth opening differs from person to person, varying between 40 – 60 mm and averaging between 35 – 55 mm which is equal to the width of three fingers. It has been shown that gender may be a factor in mouth opening. In general, males display greater mouth opening. Palpation of muscle and joint, occlusal and radiographic examination are performed for assessment of mandibular function. To assess temporomandibular joint (TMJ) function, the primary value to be known is how much the joints move when the mouth is opened fully that is maximum mouth opening (MMO).^[1,2] MMO is “the greatest distance between two central incisors (maxillary and mandibular) at the midline when measured from their incisal edges during the possible widest opening of the mouth” according to many researchers.^[3,4] Increasing number of patients with maxillofacial fractures, temporomandibular joint diseases, oral malignancies, reconstructed oral defects and craniofacial syndromes are encountered in clinical practice. Mouth opening and its adequacy is an important component in the treatment and follow up of all of these conditions.^[5]

A known normal range of mouth opening is necessary to enable the clinician to conduct a thorough oral examination conveniently. Limitation of mouth opening is one of the early signs of many pathological and traumatic conditions. Early recognition of decreased or limited mouth opening is necessary for a prompt and efficient approach to diagnosis and to plan out the treatment options judiciously.^[6]

Limitation of mouth opening is also commonly known as trismus. The term trismus is defined in Taber’s Cyclopedic Medical Dictionary as a tonic contraction of the muscles of mastication. In the past, this word was often used to describe the effects of tetanus, also called ‘lock-jaw’. But it has now been taken to represent any restriction to mouth opening. It is a fairly common problem with many causes, which may result in difficulty in eating, talking, oral care and alteration of facial appearance. Trismus is not a disease in itself, but a symptom of another problem. Many studies have found that normal mouth opening among different population vary considerably and its range is specific for a given population. The purpose of this study was to calculate the normal mouth opening in the young adult population of the Kumaon region.

Objectives

1. To calculate the range of maximum mouth opening according to age group.
2. To calculate the mean maximum mouth opening according to age and sex group.

METHODS

This is a hospital-based observational cross-sectional study. It included the subjects in the age group 21-40 years visiting the outpatient clinics of the surgery department. The data of 200 patients collected from January 2021 to December 2021 were analysed and studied.

Sample Data

The sampling method used was convenient sampling. All patients in the age group of 20-40 years visiting the outpatient clinics of the surgery department meeting the inclusion criteria were enrolled in the study.

Inclusion Criteria

1. Patients with age more than 21 years and less than 40 years.
2. Completely erupted and functional maxillary and mandibular central incisors, anterior teeth with normal positioning.
3. Attrition on the incisal edges not more than 1 mm.
4. No dental prosthesis on upper and lower anterior teeth.

Exclusion Criteria

1. History of jaw pain either at rest or during function.
2. History of maxillofacial trauma.
3. History of temporomandibular joint disorders, oral submucous fibrosis, oral malignancy.
4. History of facial or dental developmental abnormalities.
5. History of tobacco, pan, betel nut.
6. Patients not giving consent to be part of the study.

The study was undertaken in the Department of General Surgery. A total of randomly selected 200 patients in the age group of 20-40 years representing a sample of dentate adults were included for the study. The sample was stratified into four groups according to age followed by gender stratification. The age groups were classified as 21-25 years (Group 1), 26-30 years (Group 2), 31-35 years (Group 3), and 36-40 years (Group 4). Each group comprised 50 patients (25 males and 25 females). Written consent was obtained from all the participants for the study.

All particulars of patients and examination findings were recorded in the clinical proforma after taking proper informed consent. The mouth opening was measured using a standardized protocol. The participants were asked to open their mouths maximally till no further opening was possible. The distance from the incisal edge of the upper incisor teeth to the incisal edge of the lower incisor teeth was measured using a calibrated ruler, and the findings were recorded in millimetres.

Statistical Analysis

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables were presented as mean \pm SD, and categorical variables were presented as absolute numbers and percentages. Tables were created using MS Excel 2021.

RESULTS

A total of 200 participants were equally divided according to their age and gender into 4 groups consisting of 25 male and 25 female participants in each group. The mean MMO for males was 51.85 mm [standard deviation (SD) \pm 2.59]. The range was 48–56 mm. The mean MMO for females was 49.82 mm (SD \pm 2.32). The range was 46–56 mm [Table 1].

| | Male | Female |
|--|--------------|--------------|
| Mean MMO ± SD | 51.85 ± 2.59 | 49.82 ± 2.32 |
| Range in mm | 48-56 | 46-56 |
| MMO: Maximum Mouth Opening, SD: Standard Deviation | | |

Table 1. Mean Maximum Mouth Opening, Standard Deviation, Range of Maximum Mouth Opening in mm for All Males and Females

In the age group of 21-25 years, the mean MMO was 50.14 (SD ± 2.53) mm. The mean value for males was 50.80 (SD ± 2.67) mm and for females was 49.48 (SD ± 2.25). In the age group of 26-30 years, the mean MMO was 50.20 (SD ± 2.54) mm. The mean value for males was 51.16 (SD ± 2.52) mm and for females was 49.24 (SD ± 2.22). In the age group of 31-35 years, the mean MMO was 51.56 (SD ± 2.62) mm. The mean for males was 52.28 (SD ± 2.66) mm and for females was 50.60 (SD ± 2.44). In the age group of 36-40 years, the mean MMO was 50.83 (SD ± 2.66) mm. The mean for males was 53.56 (SD ± 2.62) mm and for females was 49.82 (SD ± 2.32). [Table 2 and 3]

| Group | Age(in Years) | MMO (mm) |
|-------|---------------|--------------|
| | | Mean ± SD |
| 1 | 21-25 | 50.14 ± 2.53 |
| 2 | 26-30 | 50.20 ± 2.54 |
| 3 | 31-35 | 51.56 ± 2.62 |
| 4 | 36-40 | 50.83 ± 2.66 |

Table 2. Maximum Mouth Opening Range in mm, Mean Maximum Mouth Opening, Standard Deviation in Relation to Age Group

| Group | Age(in Years) | MMO Male (mm) | MMO Female (mm) |
|-------|---------------|---------------|-----------------|
| | | Mean ± SD | Mean ± SD |
| 1 | 21-25 | 50.80 ± 2.67 | 49.48 ± 2.25 |
| 2 | 26-30 | 51.16 ± 2.52 | 49.24 ± 2.22 |
| 3 | 31-35 | 52.28 ± 2.66 | 50.60 ± 2.44 |
| 4 | 36-40 | 53.56 ± 2.62 | 49.82 ± 2.32 |

Table 3. Maximum Mouth Opening Range in mm, Mean Maximum Mouth Opening, Standard Deviation in Relation to Age and Gender

DISCUSSION

To make a diagnosis of decreased mouth opening it is essential to establish what constitutes the normal opening for the population. [7] Research has shown that the measurement of mouth opening varies significantly with age, gender and race. [8-12] Mouth opening among the different population has been shown to vary considerably and its range is specific for a given population. [7] Numerous studies across the world have characterized the mouth opening in their population. It is fairly common to report the mouth opening in terms of finger breadth in our daily practice.

A known normal range of mouth opening is necessary to enable the doctor to conduct a thorough oral examination and treatment efficiently. The limitation of mouth opening is one of the early signs of many pathological and traumatic conditions. Early recognition of decreased or limited mouth opening is necessary for a prompt and efficient approach to the diagnosis and to plan out the treatment options judiciously. The increasing number of patients with maxillofacial fractures, temporomandibular joint diseases, oral malignancies, oral submucous fibrosis, reconstructed oral defects, and craniofacial syndromes are now reported for the diagnosis and treatment to oral medicine and oral surgery speciality. Mouth opening and its adequacy is an important component in the treatment and follow-up of all these conditions.

Clinical examination without evaluation of the oral cavity is incomplete. Mouth opening is a mandibular function

involving the temporomandibular joint & related musculature. This function is affected by various acute or chronic disorders including trauma, tumours & infections. Surgical procedures- oral, dental, maxillofacial, ear, nose & throat along with anaesthesia-airway access and cardiopulmonary resuscitation are all concerned with maximum mouth opening (MMO). Another importance of MMO is in designing prostheses and instruments for oral & related surgeries.

The oral examination is one of the most important parameters in clinical examination. Examination of the oral cavity reveals many clinical symptoms and signs of local & systemic pathology. Mouth opening is restricted, compromised or limited by a wide range of factors ranging from ethnicity, morphological, anatomical, pathological factors- local or systemic. Since a variety of factors are responsible for the extent of mouth opening in a particular population of a geographical region, knowing the standard range or average limit of mouth opening will be helpful to predict the abnormalities and plan the diagnosis & treatment. Assessment of the mouth opening is one of the less researched topics considering its importance in daily practice. Normal maximal mouth opening in healthy subjects of age range 21-40 years was measured in this study in 100 males & 100 females all being the original residents of the Kumaon region.

In our study, a total of 200 participants were enrolled and equally divided according to their age and gender into 4 groups consisting of 25 male and 25 female participants in each group. The mean MMO for males was 51.85 mm (standard deviation [SD] ± 2.59). The range was 48-56 mm. The mean MMO for females was 49.82 mm (SD ± 2.32). The range was 46-56 mm [Table 1]. The overall range for all patients was 46-56 mm. In the study by Korane VV et al. the overall range was found to be 36-56 mm. [13] Their study comprised a total of 800 individuals, 400 males and 400 females, in the age group of 18-60 years.

In the age group of 21-25 years, the mean MMO was 50.14 (SD ± 2.53) mm. The mean for males was 50.80 (SD ± 2.67) mm and for females was 49.48 (SD ± 2.25). In the age group of 26-30 years, the mean MMO was 50.20 (SD ± 2.54) mm. The mean for males was 51.16 (SD ± 2.52) mm and for females was 49.24 (SD ± 2.22) mm. In the age group of 31-35 years, the mean MMO was 51.56 (SD ± 2.62) mm. The mean for males was 52.28 (SD ± 2.66) mm and for females was 50.60 (SD ± 2.44) mm. In the age group of 36-40 years, the mean MMO was 50.83 (SD ± 2.66) mm. The mean for males was 53.56 (SD ± 2.62) mm and for females was 49.82 (SD ± 2.32). [Table 2 and 3]. In the study by Korane VV, the range was 39-56 mm for males and 51.63 (SD ± 2.33) mm and range 38-53 mm for females (SD ± 3.12).[13] The findings of the index study are in sync with various studies in the Indian population that have found the range of MMO from 37 to 56 mm.[13,14]

The mean mouth opening in a study comprising of Pakistani, Indian and Arab population was found to be 53.12 ± 7.95 with the range of 39 to 69 mm as minimum & maximum mouth opening.[15]

Mouth opening is limited by various conditions like submucous fibrosis, temporomandibular joint diseases, infections, malignancies and facial trauma. MMO in males is seen more than females in our study. Similar observations

have been consistently recorded in many previous studies. The difference in muscular strength and skeletal anatomy has been attributed to this observation. Maximal mouth opening among different racial groups has been found to vary from 43.3 to 59.0 mm. MMO increases from birth to adulthood and then decreases with increasing age. Anatomical changes of development and regression may be responsible for a change in the range of MMO with age. The interincisal distance was used as the actual functional opening capacity of the mouth.

The interincisal distance at the maximal, voluntary, unassisted mouth opening is known as the normal mouth opening. The range of mouth opening varies among different populations, owing to the differences in facial structure and anatomy. It is also influenced by ageing, gender and racial origin of the individuals. In routine clinical practice, mouth opening is presented in terms of fingerbreadth. The objective assessment in terms of scalar standard units is not discussed routinely. Several studies have tried to measure the range of maximal mouth opening to define the standard normal mouth opening. Several methods of measuring the mouth opening have been applied and described by different authors in the literature. Dijkstra et al. have stated that the variable force applied to obtain passive mouth opening introduces error.^[16] The clinically relevant measurement is the active opening achieved by the patient without assistance.^[7] Many different instruments have been used to measure linear mouth opening. Wood and Branco examined three methods of measuring interincisal distance and concluded that direct measurement using a ruler was the most accurate.^[17] Assessment of mouth opening by direct measurement of interincisal distance by a ruler scale is the most widely used and accepted method. Hence, the authors decided to choose this method as it is easy, reproducible, precise and accurate.

CONCLUSIONS

The mean maximum mouth opening for male participants was 51.85 mm (SD 2.59) (Range: 48-56 mm). The mean maximal mouth opening for female participants was 49.82 mm (SD 2.32) (Range: 46-56 mm). The maximum mouth opening was observed to decrease with age. The mouth opening of females was also observed to be lesser than the males from the corresponding age groups. The study has shown similar trends in observations as in the previous studies in other populations.

Limitations

Authors agree that the maximal mouth opening depends on various factors like height, jaw length, anatomy of TMJ etc. which were not correlated in the present study. The study is also limited by its small sample size.

Recommendations

The current study provides the scientific basis for the assessment. The findings will serve as a baseline data guide for future studies. Further studies on a larger scale, large sample size inclusive of anthropometric parameters will be

helpful to determine the accurate measurements of maximal mouth opening.

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