

ORIGINAL RESEARCH ARTICLE

MAXIMUM MOUTH OPENING OF CHILDREN IN NEWARI POPULATION OF BHAKTAPUR

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Received: 1 May, 2021

Accepted: 11 Jun, 2021

Published: 19 Jun, 2021

**Key words:** Age; Gender; Maximum mouth opening.

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Citation

Joshi U, Poudyal S, Hekka S, Lawaju N, Pradhan M. Maximum mouth opening of children in Newari population of Bhaktapur. Journal of Chitwan Medical College. 2021;11(36):88-91.



Peer Reviewed

ABSTRACT

**Background:** Mouth opening is an everyday activity which plays a vital role for mastication and speech. Restricted mouth opening may be associated with musculoskeletal disorder or some pathology in the masticatory system or due to orofacial infections and trauma, as well as chronic condition such as disorders of the temporomandibular joint and tumors. So, dentist are concerned about their patient's ability to open the mouth for oral examination and dental procedures. This study was aimed to measure the maximum mouth opening among the Newari children of Bhaktapur.

**Methods:** A descriptive cross-sectional study was conducted among the Newari school children of Bhaktapur with a sample size of 250 subjects. Descriptive statistical analysis was done using SPSS version 16.

**Results:** Among the participants, one hundred and nineteen (47.6%) were male while 131 (52.4%) were female. The mean maximum mouth opening seen in male was  $41.61 \pm 6.21$ mm and in female was  $40.22 \pm 5.85$  mm. The mean maximum mouth opening in 3 to 5 years age group was  $33.19 \pm 4.24$  mm, 6 to 8 years age group was  $37.92 \pm 4.34$  mm, 9 to 11 years age group was  $43.47 \pm 4.73$  mm, and 12 to 14 years age group was  $45.30 \pm 3.99$  mm. Mouth opening differences among different gender was compared which showed male had wider mouth opening but the difference was not statistically significant.

**Conclusions:** The maximum mouth opening in boys was slightly large than girls. The base line data was achieved in our study which needs to be validated further by conducting study in larger population.

INTRODUCTION

Maximum mouth opening (MMO) is the greatest distance between incisal edge of maxillary central incisor to the incisal edge of mandibular central incisor, when the mouth is opened without assistance and pain. Mouth opening is an everyday activity which plays a vital role for mastication and speech. Dentist are concerned about their patient's ability to open the mouth for oral examination and dental procedures.<sup>1</sup> Optimum mouth opening is required for dental procedures to perform smoothly.<sup>1</sup> In addition, it is also a guide for the management of individuals with maxillofacial trauma and/or pathologies following treatment to restore the mouth opening to values considered as 'normal'. Restricted mouth opening may be associated with musculoskeletal disorder or some pathology in the masticatory system or due to orofacial infections and trauma, as well as chronic condition such as disorders of the temporomandibular joint and tumors.<sup>7,10</sup>

In order to assess the degree of restricted mouth opening it's essential to first establish the normal range of mouth opening.<sup>2-4</sup> For all practical purposes, the maximum interincisal distance is taken as mouth opening of an individual. Studies

have shown various findings related to maximum mouth opening which varies significantly.<sup>5-7</sup> AlHaammad et al have shown mean maximum mouth opening as  $47.8 \pm 6.9$  mm.<sup>8</sup> In a study, Muller et al have shown maximum mouth opening in children to be 45mm for girls and boys.<sup>9</sup>

Research related to maximum mouth opening has shown variations with age, gender, body size, and race.<sup>5-7</sup> Such studies are very less in Nepali population<sup>11</sup> and we do not have baseline data related to children. So, this study was planned to measure the maximum mouth opening among the Newari children of Bhaktapur.

METHODS

A descriptive cross-sectional study was conducted among the Newari school children of schools of Bhaktapur. Due to Covid19 pandemics in Nepal, the data collection was commenced after opening of schools from January 17, 2021 to April 17, 2021. Based on the study of Chen HS,<sup>10</sup> taking  $\sigma=3.99$ ,  $E=0.5$  at 95% confidence interval and using formula  $n=Z^2\sigma^2/E^2$ , the sample size was calculated as 244.92. However, in the study we included 250 subjects. The convenience sampling method

was used to collect the study samples. Children having fully erupted maxillary and mandibular central incisors and able to understand and cooperate with the investigators were included in the study while children with missing maxillary or mandibular incisors, fractured, crowned or attrition incisors, children with no history of bruxism severe orthodontic problems, with signs and symptoms of temporomandibular joint disorders were excluded from the study.

Ethical clearance for the study was obtained from KMC-IRC (ref .no: 040320203). Consent and ascent were obtained from both parents and children before initiating the study. A proforma containing the socio-demographic (age, gender) information of the participants was filled.

Measurement of maximum mouth opening was carried out in the schools using the light source and digital Vernier caliper (Figure 1,2). The participants were seated in chair with their heads rested against a firm wall surface in upright position. The participants were verbally encouraged to open the mouth as far as possible, while the examiner measured the maximum distance from the incisal edge of maxillary central incisor to the incisal edge of mandibular central incisor at the midline. For each subject three readings were recorded in millimeters and the mean value was considered. All the measurements were performed by a single examiner to avoid intra-examiner variations.

Descriptive statistical analysis was done using SPSS version 16 and frequencies, mean and standard deviations were determined. Mouth opening differences among different gender was compared using independent “t” test and among different age groups was compared using one-way ANOVA. The differences between individual age groups were compared using post hoc test.



Figure 1: Digital Vernier caliper



Figure 2: Measurement of maximum mouth opening done with the digital Vernier caliper

## RESULTS

Among the participants, one hundred and nineteen (47.6%) were male while 131 (52.4%) were female. Among the participants, 33 (13.2%) fall under 3-5 years, 76 (30.4%) were 6-8 years, 78 (31.2%) fall under 9-11 years, and 63 (25.2%) fall under 12-14 years old group. The mean maximum mouth opening seen in male was  $41.61 \pm 6.21$ mm and in female was  $40.22 \pm 5.85$  mm. Mouth opening differences among different gender were compared which showed male had wider mouth opening but the difference was not significant (Table 1).

Table 1: Mean maximum mouth opening in different gender

Gender	Number	Mouth opening		Mean difference	Confidence interval	t value	p-value
		Mean	S.D.				
Male	119	41.61	6.21	1.38	-0.12 to 2.89	1.81	0.07
Female	131	40.22	5.85				

Table 2: Mean maximum mouth opening in different age years age group

Age group	Mean	Number	Std. Deviation	Minimum	Maximum
3 to 5 years	33.19	33	4.24	23.62	41.29
6 to 8 years	37.92	76	4.34	29.99	55.11
9 to 11 years	43.48	78	4.79	32.35	55.21
12 to 14 years	45.30	63	3.99	32.41	52.36
Total	40.89	250	6.05	23.62	55.21

The mean maximum mouth opening in 3 to 5 years age group was  $33.19 \pm 4.24$  mm, 6 to 8 years age group was  $37.92 \pm 4.34$  mm, 9 to 11 years age group was  $43.47 \pm 4.73$  mm, and 12 to 14 years age group was  $45.30 \pm 3.99$  mm (Table 2).

There was significant difference in the mouth opening of different age groups except between age group 9 to 11 years and 12 to 14 years (Table 3,4).

**Table 4: Difference in mouth opening in different age group using one-way ANOVA**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4378.06	3	1459.35	75.60	0.00
Within Groups	4748.59	246	19.30		
Total	9126.65	249			

**Table 5: Inter group comparison using post-hoc Tukey HD**

(I) age group	(J) age group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
3 to 5 years	6 to 8 years	-4.73*	0.92	0.00	-7.10	-2.36
	9 to 11 years	-10.29*	0.91	0.00	-12.65	-7.93
	12 to 14 years	-12.11*	0.94	0.00	-14.56	-9.67
6 to 8 years	3 to 5 years	4.73*	0.92	0.00	2.36	7.10
	9 to 11 years	-5.56*	0.71	0.00	-7.39	-3.73
	12 to 14 years	-7.38*	0.75	0.00	-9.32	-5.45
9 to 11 years	3 to 5 years	10.29*	0.91	0.00	7.93	12.65
	6 to 8 years	5.56*	0.70	0.00	3.73	7.39
	12 to 14 years	-1.82	0.74	0.07	-3.75	0.10
12 to 14 years	3 to 5 years	12.11*	0.94	0.00	9.67	14.55
	6 to 8 years	7.38*	0.75	0.00	5.45	9.32
	9 to 11 years	1.82	0.74	0.07	-0.10	3.75

\*The mean difference is significant at the 0.05 level.

## DISCUSSION

Maximum Mouth Opening (MMO) is an important diagnostic tool for evaluation of stomatognathic system, especially in those who have suspected temporomandibular joint (TMJ) disorder, neurogenic dysfunctions, orofacial infections and trauma. Limited mouth opening makes it difficult to perform various dental treatment procedures. It may also cause discomfort to patients undergoing prolonged dental treatment. MMO can also be helpful in providing necessary information for designing of dental appliances or prosthesis.

Reduced MMO needs clinical examination of masticatory muscle, TMJ and oral cavity to find its appropriate cause. Establishment of a normal range for MMO helps clinicians to evaluate the treatment outcome for limited mouth opening.

In our present study, among the participants, 33 (13.2%) fall under 3-5 year, 76 (30.4%) fall 6-8 years, 78 (31.2%) fall under 9-11 years, 63 (25.2%) fall under 12-14 years old group. Maximum mouth opening seen in male is  $41.61 \pm 6.21$  mm and in female is  $40.22 \pm 5.85$  mm which indicated it is not much difference among the gender. Studies performed on maximum mouth opening have shown differences between male and females in their studies.<sup>6-10</sup> This variation may be due to sample size, taking diverse ethnicity.

In the study, the maximum mouth opening (MMO) of 3-5-year-old participants was seen to be  $33.18 \pm 4.24$  mm which was

more than in study done by Koruyuu et al.<sup>3</sup> ( $28.63 \pm 4.34$  mm) whereas mean MMO found by Choi et al<sup>12</sup> ( $37.72 \pm 5.10$  mm) and Chen et al<sup>10</sup> ( $37.21 \pm 3.99$  mm) was similar to our study.

On analysis of results, the mean MMO in the present study showed a gradual increase with age with a mean MMO of 33.18 mm at 3–5 years to a mean MMO of 45.30mm at 12-14 years. This is in agreement with the findings of previous studies<sup>13-17</sup> conducted in pediatric population. However, the mean MMO values recorded in each age group in this study varied when compared to those of other studies. This may be attributed to the difference in the study population,<sup>13</sup> different method in the determination of MMO,<sup>14</sup> or due to variation in the tool used to measure the interincisal distance.<sup>15</sup>

The first limitation of the study is the sampling technique as we are using convenience sampling method here. At the same time the sample size was small. The third limitation of the study is this is ethnic based study so generalizability cannot be done to the whole population.

## CONCLUSION

The maximum mouth opening in boys were slightly large than girls. The base line data was achieved in our study which needs to be validated further by conducting study in larger population.

**CONFLICT OF INTEREST:** None

**FINANCIAL DISCLOSURE:** None

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