

Dental Arch Width in Children and Relationship to their Oral Habits

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ABSTRACT

Aim: Objectives: To analyze variations in dental arch width in relation to oral habits.

Materials and Methods : Cross sectional study was carried out Department of Orthodontics & Dentofacial Orthopedics of Dhaka Dental College & Hospital, Dhaka with a total number of 600 primary school children of 3-6 years ages of Bangladeshi population.

Results: This study was a cross sectional study conducted among the 600 children with 3-6 years old primary school children of Bangladeshi population. According to present study, bottle feeding causes significant reduction in maxillary intercanine width and mouth breathers show significant reduction of both arches.

Conclusion: It was observed that the children who had used a bottle had a significant reduction in maxillary intercanine width. Breathing through mouth appeared to be associated with a reduction in the size of both arches. This was more significant in the maxillary intercanine, mandibular intercanine and mandibular molar widths. Therefore to prevent malocclusions, the public should be informed of the harm caused by certain oral habits, the benefits of breast-feeding, and the need to correct bad habits at early life.

Key words: Dental arch, Oral habits, Non nutritive sucking

INTRODUCTION

Oral habits in children have a definite bearing on the development of occlusion. Frequently, children acquire certain habits that may either temporarily or permanently be harmful to dental occlusion and to the tooth supporting structures¹. It is widely believed that the deciduous dental arches are the starting point and basis for proper development of the permanent dental arches. In this sense, various oral habits have been suggested to contribute to faulty development of occlusions in the deciduous dentition, and this impaired occlusion can be carried forward to the permanent teeth. A habit can change the position of the teeth. If a habit like thumb sucking created pressure against the teeth for more than the threshold duration (6 hours or more per day), it move the teeth and affect the direction of jaw growth².

Although almost all normal children engage in non-nutritive sucking, prolonged sucking habits can lead to malocclusion. If these habits persist beyond the time that the permanent teeth begin to erupt, malocclusion characterized by flared and spaced maxillary incisors, lingually positioned lower incisors anterior open bite, and a narrow upper arch is the likely result.³

Respiratory needs are the primary determinant of the posture of the jaws and tongue. An altered respiratory pattern, such as breathing through the mouth rather than nose, could change the posture of the head, jaw & tongue. This in turn could alter

the equilibrium of pressures on the jaws & teeth and both jaw growth and tooth position.³

Similarly, the size of the deciduous dental arches is potentially a crucial factor in determining correct tooth alignment. The space in the jaws created by growth and development allows the permanent molars to erupt correctly. The same space increase will not happen to the incisors, canines, and premolars. Their final position is largely determined by the space available as already defined by deciduous dentition.²

The aim of this study therefore is to determine dental arch width and its possible variations in relation to oral habits.

Orthodontics and Dentofacial Orthopaedics is one of the most important clinical subject in dentistry which deals with the different abnormalities of the teeth and jaws for a long period. The size of the deciduous dental arches is potentially a crucial factor in determining correct tooth alignment. Various oral habits have been suggested to contribute to faulty development of occlusions in the deciduous dentition, and this impaired occlusion can be carried forward to the permanent teeth.

Various reports^{4,5} have been published about the prevalence & incidence of malocclusion & treatment facilities at Dhaka Dental College & Hospital. No previous study has reported on "Dental Arch Diameters and Relationships to Oral Habits

Habits” at Dhaka Dental College & Hospital till now. This work focuses our attention on the incidence of nonnutritive sucking habits in our population and the effects of the duration of these habits.

OBJECTIVES OF THE STUDY:

General objectives:

To analyze variations in dental arch width in relation to oral habits.

Specific objectives:

1. To measure the dental arch width of children relating oral habits.
2. To know the oral habits from their parents by questionnaire.
3. To assess variation of arch width in relation to oral habits
4. To compare the study result with other similar studies.

MATERIALS AND METHODS

Cross sectional study was carried out Department of Orthodontics & Dentofacial Orthopedics of Dhaka Dental College & Hospital, Dhaka with a total number of 600 primary school children of 3-6 years ages of Bangladeshi population.

Selection criteria:

Inclusion criteria:

1. Children with 3-6 years of ages.
2. All the normal number, size & shape of teeth present .
3. No major tooth destruction or reconstruction
4. Parental completion of a questionnaire about the child's habits.
- 5.Co-operative patient

Exclusion criteria:

1. Non-cooperative patient .
2. Patient with systemic illness
3. Abnormal size, shape & position of teeth.

Study procedure:

Each of the subjects was selected in respect of inclusion and exclusion criteria. A data collection sheet with necessary measurements for each subject was filled.

Measurements:

The dental arches were measured directly in the mouth. Fine-pointed digital calipers, accurate to within 0.01mm, were used to intra orally measure the arch width. The intercanine distance was taken as the distance between the deciduous canine cusp tips or the estimated location if wear facets are present. The intermolar distance was taken as the distance between the mesiobuccal cusp tips of both second deciduous molars.

Maxillary intercanine width: Distance between the cusp tips of right and left maxillary deciduous canine.

*Maxillary intermolar width:*Distance between the mesiobuccal cusp tips of right and left maxillary second deciduous molar.

Mandibular intercanine width: Distance between the cusp tips of right and left mandibular deciduous canine.

*Mandibular intermolar width:*Distance between the mesiobuccal cusp tips of right and left mandibular second deciduous molar.

Equipment to be used:

The material used for examination include-

1. Fine-pointed digital slide calipers, accurate to within 0.01mm
2. Data collection sheet.
3. Portable spotlight.
4. Natural illumination.
5. Antiseptic solution.

PROCEDURES OF COLLECTING DATA

Maxillary and mandibular intercanine and intermolar distance were determined in relation to certain oral habits in 600 children (ages 3 to 6 years). After an oral examination, the parents of each child completed a questionnaire about oral habits, including the use of a dummy or a bottle (or both), finger sucking, mouth breathing, breast- or bottle-feeding, and duration of these habits. After collection of data the obtained data was checked, verified& edited. These were entered in a personal computer using the SPSS(statical package for social science) software. Entered data were cleaned, edited and appropriate statistical tests were done depending on the distribution of data.

DATA ANALYSIS

All data analyzed through standard statistical methods by using SPSS / STATA 10 software.

ETHICAL MEASURES

The purpose of this study is to analyze variations in dental arch width in relation to oral habits. Since this was a cross sectional study, there was no physical risk of the patients throughout the study period. All the patients in the study signed a written informed consent form. No information was withheld from the patient. No experimental drug or placebo was used. Patient had right to withdrawal himself from the study at any time for any reason.

RESULTS

This study was a cross sectional study conducted among 600 primary school children with 3-6 years old of Bangladeshi population. Out of this 50.7% were girls and 49.3% were boys. The statistical tests used for analysis of data were “t” test. In this analytical test, the level of significance, was considered at P value <0.05

Fig 1: Gender wise distribution of children

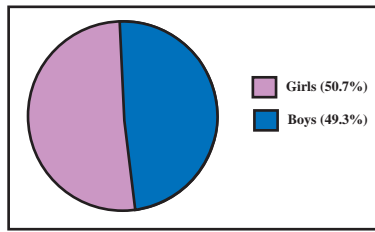


Fig 1 shows distribution of children by sex, out of which 50.67% were girls and 49.33% were boys

Fig 2: Distribution of children by age group (3,4,5,6) in years

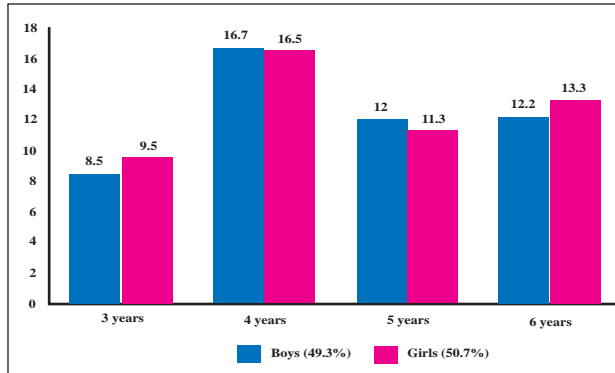


Fig 2 shows that distribution of children by age group, that means 18% are in 3years group, 33.2% in 4 years group, 23.3% in 5 years group and 25.5% in 6 years group.

Table 1: Relationship between arch width and sex

	Arch Width (mm) Mean ± SD		p
	Boys (N=296)	Girls (N=304)	
Maxillary intercanine width	27.70 ± 0.39	27.48 ± 0.55	<0.001
Maxillary inter molar width	40.61 ± 0.69	40.28 ± 1.78	0.003
Mandibular intercanine width	21.98 ± 0.74	21.73 ± 0.85	<0.001
Mandibular intermolar width	35.23 ± 0.85	34.98 ± 0.93	0.001

Level of P- value significant = <0.05

Table1 shows that maxillary and mandibular intercanine and intermolar width were greater in boys than in girls, and these relationships were statistically highly significant.

Fig 3: Comparison between arch width and sex

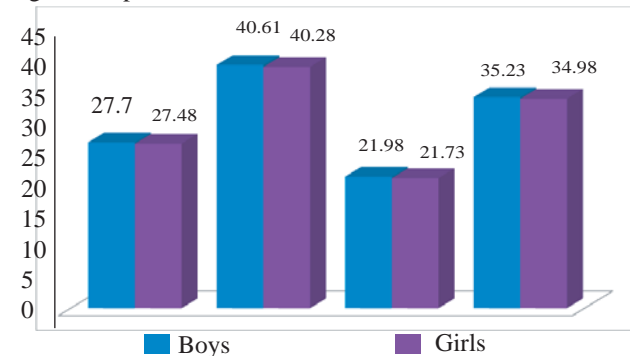


Fig 3 shows relationship between arch widths between boys and girls

Table 2: Relationship between arch width with different age group (3, 4, 5 & 6 year)

	Arch Width (mm) Mean ± SD				p
	3 Yrs (N=108)	4yrs (N=199)	5 yrs (N=140)	6yrs (N=153)	
Maxillary					
intercanine width	27.37 ± 0.50	27.47 ± 0.81	27.71 ± 0.71	27.78 ± 0.99	<0.001
inter molar width	40.24 ± 0.52	40.43 ± 0.73	40.43 ± 0.83	40.62 ± 0.90	0.19
Mandibular					
intercanine width	21.82 ± 0.38	21.67 ± 1.85	21.91 ± 0.83	22.08 ± 0.75	<0.001
intermolar width	34.72 ± 0.45	34.96 ± 1.73	35.24 ± 0.76	35.43 ± 0.83	<0.001

Level of P- value significant = <0.05

Table 2 shows relationship between arch width with different age group .Here for both maxillary and mandibular intercanine and intermolar arch width were gradually increase with age , maxillary intercanine (P=<0.001), mandibular intercanine (P=<0.001) and mandibular intermolar (P=<0.001) width were statistically highly significant

Table 3: Age group & sex wise distribution of children by breast feeding history

Breast feeding history	Age (Years)	Sex		Total	p
		Boys	Girls		
No	3.00	1 (5.0)	2 (10.0)	3 (15.0)	0.98
	4.00	3 (15.0)	2 (10.0)	5 (25.0)	
	5.00	4 (20.0)	4 (20.0)	8 (40.0)	
	6.00	2 (10.0)	2 (10.0)	4 (20.0)	
	Total	10 (50.0)	10 (50.0)	20 (100.0)	
Yes	3.00	50 (8.6)	55 (9.5)	105 (18.1)	0.83
	4.00	97 (16.7)	97 (16.7)	194 (33.4)	
	5.00	68 (11.7)	64 (11.0)	132 (22.8)	
	6.00	71 (12.2)	78 (13.4)	149 (25.8)	
	Total	286 (49.3)	294 (50.7)	580 (100)	

Table 3 shows age group & sex wise distribution of children by breast feeding history. Out of 600 children 580 (96.7%) had the breast feeding history, 49.3% were boys and 50.7% were girls.

Table 4: Relationship between arch width and breast feeding

Arch Width	Breast Feeding History (Mean ± SD)		p
	No (N=20)	Yes (N=580)	
Maxillary			
canine width	27.52 ± 0.75	27.59 ± 0.48	0.50
molar width	40.53 ± 0.68	40.44 ± 1.38	0.78
Mandibular			
canine width	21.69 ± 0.83	21.86 ± 0.81	0.35
molar width	35.08 ± 0.93	35.10 ± 0.90	0.93

Level of P- value significant = <0.05

Table 4 shows relationship between arch width and breast feeding. No significant relationship was found between arch widths and whether or not, children had been breast-fed

Table 5: Age group & sex wise distribution of children by bottle feeding history

Bottle feeding history	Age (Years)	Sex		Total	P
		Boys	Girls		
No	3.00	27 (6.9)	35 (9.0)	62 (15.9)	0.48
	4.00	58 (14.9)	66 (16.9)	124 (31.8)	
	5.00	47 (12.1)	49 (12.6)	96 (24.6)	
	6.00	53 (13.6)	55 (14.1)	108 (27.7)	
	Total	185 (47.4)	205 (52.6)	390	
Yes	3.00	24 (11.4)	22 (10.5)	46 (21.9)	0.47
	4.00	42 (20.0)	33 (15.7)	75 (35.7)	
	5.00	25 (11.9)	19 (9.0)	44 (21.0)	
	6.00	20 (9.5)	25 (11.9)	45 (21.4)	
	Total	111 (52.9)	99 (47.1)	210	

Table 5 shows age group & sex wise distribution of children by bottle feeding history. Out of 600 children 210 (35%) had the bottle feeding history.

Table 6: Relationship between arch width and bottle feeding

Arch Width	Bottle Feeding History (Mean ± SD)		p
	No (N=20)	Yes (N=580)	
Maxillary			
canine width	27.62 ± 0.44	27.53 ± 0.57	0.02
molar width	40.88 ± 1.59	40.35 ± 0.81	0.04
Mandibular			
canine width	21.88 ± 0.84	21.81 ± 0.74	0.29
molar width	35.14 ± 0.90	35.03 ± 0.90	0.16

Level of P- value significant = <0.05

Table 6 shows relationship between arch width and bottle feeding. It was observed that children who had used a bottle had a significant reduction in maxillary intercanine (P=0.02) and intermolar (P=0.04) arch width.

Table 7: Comparison of arch widths between breast feeding and bottle feeding group

Arch Width	Feeding Groups (Mean ± SD)	
	Breast feeding (N=390)	Bottle Feeding (N=210)
Maxillary		
canine width	27.59 ± 0.48	27.53 ± 0.57
molar width	40.44 ± 1.38	40.45 ± 0.81
Mandibular		
canine width	21.86 ± 0.81	21.81 ± 0.74
molar width	35.10 ± 0.90	35.03 ± 0.90

Table 7 shows comparison of arch widths between breast feeding and bottle feeding group

Table 8: Age group & sex wise distribution of children by finger sucking habit

Finger sucking habit	Age (Years)	Sex		Total	P
		Boys	Girls		
No	3.00	51 (10.0)	56 (10.9)	107 (20.9)	0.94
	4.00	85 (16.6)	93 (18.2)	178 (34.8)	
	5.00	55 (10.7)	56 (10.9)	111 (21.7)	
	6.00	54 (10.5)	62 (12.1)	116 (22.7)	
	Total	245 (47.9)	267 (52.1)	512 (100)	
Yes	3.00	0 (0)	1 (1.1)	1 (1.1)	0.29
	4.00	15 (17.1)	6 (6.8)	21 (23.9)	
	5.00	17 (19.3)	12 (13.6)	29 (33.0)	
	6.00	19 (21.6)	18 (20.5)	37 (42.0)	
	Total	51 (58.0)	37 (42.0)	88 (100)	

Table 8 shows age group & sex wise distribution of children by finger sucking habit. Out of 600 children 88 (14.67%) had this finger sucking habit.

Table 9: Relationship between arch widths and finger sucking habit

Arch Width	Bottle Feeding History (Mean ± SD)		p
	No (N=512)	Yes (N=88)	
Maxillary			
canine width	27.58 ± 0.51	27.63 ± 0.38	0.38
molar width	40.46 ± 1.15	40.33 ± 2.25	0.41
Mandibular			
canine width	21.85 ± 0.81	21.91 ± 0.79	0.53
molar width	35.09 ± 0.88	35.18 ± 1.00	0.40

Level of P- value significant = <0.05

Table 9 shows relationship between arch widths and finger sucking habit. No significant differences in dental arch widths were seen between children with and without this habit.

Table 10: Age group & sex wise distribution of children by mouth breathing habit

Mouth Breathing	Age (Years)	Sex		Total	P
		Boys	Girls		
No	3.00	39 (7.9)	54 (11.0)	93 (18.9)	0.54
	4.00	79 (16.0)	83 (16.8)	162 (32.9)	
	5.00	58 (11.8)	53 (10.8)	111 (22.5)	
	6.00	59 (12.0)	68 (13.8)	127 (25.8)	
	Total	235 (47.7)	258 (52.3)	493 (100)	
Yes	3.00	12 (11.2)	3 (2.8)	15 (14.0)	0.14
	4.00	21 (19.6)	16 (15.0)	37 (34.6)	
	5.00	14 (13.1)	15 (14.0)	29 (27.1)	
	6.00	14 (13.1)	12 (11.2)	26 (24.3)	
	Total	61 (57.0)	46 (43.0)	107 (100)	

Table 10 shows age group & sex wise distribution of children by mouth breathing habit. Out of 600 children 107 (17.83%) had this finger sucking habit.

Table 11: Relationship between arch widths and mouth breathing habit

Arch Width	Mouth Breathing Habit (Mean ± SD)		P
	No (N=493)	Yes (N=107)	
Maxillary			
canine width	27.60 ± 0.49	27.49 ± 0.51	0.03
molar width	40.51 ± 0.74	40.10 ± 2.81	0.004
Mandibular			
canine width	21.88 ± 0.79	21.73 ± 0.89	0.08
molar width	35.14 ± 0.89	35.94 ± 0.91	0.04

Level of P- value significant = <0.05

Table 11 shows relationship between arch widths and mouth breathing habit. Arch width was reduced in children who breathed through their mouths. This relationship was statistically significant in maxillary intercanine (P=0.03), maxillary intermolar (P=0.004) and mandibular intermolar (P=0.04) arch widths.

DISCUSSION

Maxillary and mandibular intercanine and intermolar distance were determined in relation to certain oral habits in 600 primary school children (ages 3-6 years). In this study the mean maxillary and mandibular intercanine diameters were, 27.59± 0.49 mm and 21.85± 0.81mm, respectively, which were close to those noted by Aznar et al². In their study, mean maxillary and mandibular intercanine diameters were 27.48± 2.42 mm and 22.70± 2.02 mm, respectively. In a study by De Nova et al^{14,15} mean maxillary and mandibular intercanine diameters were found as 27.45± 1.95 mm and 22.16± 1.78 mm, respectively.

This study shows, mean maxillary and mandibular intermolar diameters are 40.44± 1.37 and 35.10± 0.9 mm, that were also in concordance with Azner et al² as 40.40 ± 2.96mm and 35.78± 2.61mm respectively. The study by De Nova et al^{18,19} maxillary and mandibular intermolar diameters were 40.05± 2.30 mm and 34.49± 2.16 mm. When the sample was divided by sex, in this study boys' maxillary diameters are still similar to those of Aznar et al² and De Nova et al^{18,19}. Here mean maxillary intercanine diameter is 27.70±0.39 mm, where in Aznar et al² it was 28.01±2.38 mm and in De Nova et al^{18,19}, 27.71±1.86 mm. This study reveals maxillary intermolar diameter 40.61±0.69 mm as compared to 41.05±2.92 mm in Aznar et al² and 40.52±2.23mm in De Nova et al^{18,19}.

In this study, Boys' mandibular diameters are concordant with, those of De Nova et al^{18,19} but little lower than Aznar et al². Here intercanine diameter is 21.98±0.74 mm where in Aznar et al² it was 23.00±2.12 mm and in De Nova et al^{18,19} 22.17±1.67 mm. Similarly our intermolar diameters 35.23±0.85 mm as compared to 36.24±2.58 mm in Aznar et al² and 34.61±2.11mm in De Nova et al^{18,19}.

Girls' maxillary diameters are also slightly higher here than those of Aznar et al² and De Nova et al^{18,19}. Our mean maxil-

lary intercanine diameter is 27.49±0.55 mm where in Aznar et al² it was 27.05±2.37 mm and in De Nova et al^{18,19} 27.15±1.96 mm. This study revealed maxillary intermolar diameter 40.48±1.78 mm as compared to 39.88±2.89 mm in Aznar et al² and 39.54±2.30mm in De Nova et al^{18,19}.

In this study, girls' mandibular diameters are little bit lower than Aznar et al² and De Nova et al^{18,19}. Here intercanine diameters are 21.73±0.85 mm where in Aznar et al² it were 22.47±1.89 mm and in De Nova et al^{18,19} 22.16±1.90mm. Similarly our intermolar diameters 34.98±0.93 mm as compared to 35.42±2.57 mm in Aznar et al² and 34.36±2.21mm in De Nova et al^{18,19}.

Maxillary intermolar and intercanine distances are greater than the corresponding mandibular values. Boys have highly statistically significant larger dental arches than girls. This study is consistent with work by authors such as Woods²⁰, Foster et al²¹, Knott²² and Beltri et al²³, in which boys have larger dental arches than girls. The finding of this study agreed with those of Woods²⁰, Foster et al²¹ that maxillary and mandibular arch widths gradually increased with age. The statistical significant of this relationship between arch widths and different age groups are in maxillary intercanine width, mandibular intercanine and mandibular intermolar width.

The result of this study revealed that, no significant relationship is found between arch widths and whether or not, or for how long, children had been breast-fed. No significant differences in dental arch widths are seen between children with or without finger sucking habit.

In this study, we notice that, children who had used a bottle has a significant reduction in maxillary intercanine (P=0.02) and intermolar (P=0.04) arch width, as similar as Aznar et al². The finding of this study agreed with those of Aznar et al² with regard to mouth breathing habit. In this study, we found mouth breathers had lesser maxillary arch width than normal children. Paul and Nanda¹⁷ reported that the effect of mouth breathing was directly related with the contraction of maxillary arch dimension. In this study, we found that there is a relationship between dental arch width and oral habits.

LIMITATION OF STUDY

1. The study group was selected from different primary schools in Dhaka city and Dinajpur. So the findings may not represent the whole national situation.
2. The study was not done in a specific race of population.
3. The size of the sample of the study was very small to represent the situation prevailing nationality.

CONCLUSION

From the result of the present study, in conclusion, it may be suggested that the children who had used a bottle had a significant reduction in maxillary intercanine width. Breathing through mouth appeared to be associated with a reduction

in the size of both arches. This was more significant in the maxillary intercanine, mandibular intercanine and mandibular molar widths. Therefore to prevent malocclusions, the public should be informed of the harm caused by certain oral habits, the benefits of breast-feeding, and the need to correct bad habits at early life.

RECOMMENDATION

As the size of the sample of this study is limited in relation to the great number of population in Bangladesh, and convenience sampling method was chosen, study duration and resources were insufficient; so recommendation is put forward for future researcher to do additional in depth research consisting of large sample size, using random sampling method, with longer period of study and enough resources for greater acceptability of the study.

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