ORIGINAL ARTICLE

Frequency of Dental Midline Deviation in School Children of Lahore, Pakistan: A Cross- Sectional Study

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ABSTRACT

Objective: To determine the frequency of dental midline deviation in different age groups of school children of Lahore, Pakistan.

Study Design: Observational cross-sectional study.

Place and Duration of Study: The study was performed in 7 different schools of Lahore, from 11th March to 30th May 2019.

Materials and Methods: A total sample of 300 children (190 girls, 110 boys) was taken whose ages were between 8 to 16 years. Midline deviations were observed with scale in millimeters, by taking the philtrum as a reference landmark. The statistical analysis was implemented with SPSS version 20. Qualitative data like gender, midline deviation and type of dentition was presented in the form of frequency and percentage. Data was stratified for gender and dentition. Post-stratification chi -square test was applied with *p*-value ≤ 0.05 considered as significant.

Results: Frequency of midline deviation was found to be 69.7% of which mandibular midline deviation was more frequent (45.7%) followed by maxillary midline deviation (12.7%), with the severity of 2mm being most common (42.3%). Deviation of both midlines was observed in 11.3% of students. The difference of frequency of midline shift in gender (*p*=0.924) and dentition (*p*=0.109) was insignificant.

Conclusion: The study concluded that the most frequently observed dental deviation was mandibular midline deviation towards right side relative to facial midline. No significant differences were displayed regarding gender and dentition.

Key Words: *Cupid's Bow, Dental Asymmetry, Incisive Papilla, Philtrum, Smile Esthetics.*

Introduction

Frontal symmetry and balanced smile are the appraisal standards of facial appearance.[1,2] Any discrepancy in facial and dental harmony of corresponding parts can cause asymmetry.[3] Midline deviations are most obvious of all the dental and occlusal asymmetries, as dental midline is a focal point in smile esthetics. The effect of harmonized facial and dental midlines on clinical outcome of orthodontic treatment is undebatable.[4]

Orthodontists are considerably less tolerant of

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midline deviations and can even appreciate 1 mm deviation of dental midline.[5] The magnitude to which the maxillary and mandibular dental midlines deviate from the facial midline is often recorded, with an aim that these midlines should be coincident after orthodontic treatment. It is an essential aspect of functional occlusion and serves as a clinical template to achieve maximum intercuspation.[6,7,8]

An individual's facial midline (constructed from glabella, base of the nose, nasal apex, upper lip Cupid's Bow and central point of the chin) is used as a reference line to evaluate dental midline.[4,9,10] The incisive papilla between the maxillary central incisors is normally found below the center of the philtrum.[10] One of the studies reported that the patients tend to relate their maxillary midline to the upper lip.[8,11] The philtrum is generally considered to be a valid facial landmark for assessment of midline.[6,11] However, this may be misleading due to the presence of a variable degree of asymmetry in facial structures, therefore, the incisive papilla could be an alternate intraoral landmark as it follows the

direction of the deviation.[9]

Emphasis on dento-alveolar esthetics has heightened among orthodontists and patients. Although an ideal occlusion is still an important goal of treatment, the ideal esthetic outcome is crucial for patient's and orthodontist's gratification.[7,8] The treatment for existing discrepancies in midline may involve tooth movement, dental extractions, orthopedic treatment, or even orthognathic surgery.[7]

In Pakistan there has not been much previous research done to determine the frequency of maxillary and mandibular dental midline asymmetry. So, this cross-sectional survey was conducted to determine the frequency of dental midline deviation in different age groups of school children of Lahore, Pakistan. This provided some valuable local data base to create awareness among school children regarding their orthodontic treatment need.

Materials and Methods

This was an observational cross-sectional survey, performed in 7 different schools of Lahore, from 11th March to 30th May 2019. The study was done on a sample of 300 school children belonging to grade 3-10, selected via non-probability consecutive sampling technique to determine the frequency of dental midline deviation. Sharif Medical Research Center approved the study, followed by ethical approval with the letter number SMDC/SMRC/194-21. Prior permission was taken from the school principals. The inclusion criteria were children of both genders, aged 8 years and above, irrespective of the type of dentition and malocclusion. Children with unerupted or impacted incisors, missing or extracted teeth, history of orthodontic treatment, restoration of anterior teeth, craniofacial anomalies like cleft lip and/or palate, were excluded. Data was collected by clinical intraoral observation and examination of children after taking written informed consent from their parents. All data was collected by the primary researcher. To avoid visual fatigue, number of students examined per day was kept to a maximum of 30, which corresponded to the number of students in one class. Maxillary and mandibular dental midline deviations were measured with a clear plastic scale to the nearest millimeter by taking the philtrum (cupid's bow) as a reference landmark (figure 1).

Fig. 1: Measuring Maxillary Dental Midline Deviation from Philtrum of Upper Lip

Data was non-parametric and statistical analysis was performed with IBM SPSS version 25. Qualitative data like gender, midline deviation and type of dentition were presented in the form of frequency and percentage. The magnitude and side of midline deviation was also noted. Data was stratified for gender and dentition. Post-stratification chi -square test was applied with p-value ≤ 0.05 considered as significant.

Results

Overall, the sample consisted of 300 students (190 females, 110 males) out of which, 157 (52.3%) were in the mixed dentition group and 143 (47.7%) were in the permanent dentition group. The mean age of the sample was 11.5 ± 2.5 years, ranging from 8-16 years. Frequency of midline deviation was found to be 69.7% (Table I) of which mandibular midline deviation was more frequent (45.7%) followed by maxillary midline deviation (12.7%). Deviation of both midlines was observed in 11.3% of students. Table II represents the severity of dental midline deviation. In most of the patients, dental midlines were shifted from the facial midline by 2mm (42.3%), that was more likely towards right side of the face. Table III shows the difference of midline deviation among gender ($p = 0.924$) and dentition ($p = 0.109$), which was statistically insignificant.

Table I: Frequency of Midline Deviation

Midline Deviation	Frequency	Percentage
Overall midline deviation	209	69.7%
Mandibular midline deviation	137	45.7%
Maxillary midline deviation	38	12.7%
Maxillo-mandibular midline deviation	34	11.3%

Table II: Severity of Midline Deviation

Midline Deviation	Severity of Midline Deviation N (%)			
	1mm	2mm	3mm	>3mm
Maxillary Midline deviation towards right	19 (6.3%)	18 (6.0%)	2 (0.7%)	0 (0%)
Maxillary Midline deviation towards left	12 (4.0%)	21 (7.0%)	0 (0%)	0 (0%)
Mandibular Midline deviation towards right	20 (6.7%)	47 (15.7%)	16 (5.3%)	6 (2.0%)
Mandibular Midline deviation towards left	35 (11.7%)	41 (13.7%)	4 (1.3%)	2 (0.7%)
Total	86 (28.7%)	127 (42.3%)	22 (7.3%)	8 (2.6%)

Table III: Stratification of Midline Deviation with respect to Gender and Dentition

		Midline Deviation				p-value
		No		Yes		
Gender	Male	33	11.0%	77	25.7%	0.924
	Female	58	19.3%	132	44.0%	
Dentition	Mixed	54	18.0%	103	34.3%	0.109
	Permanent	37	12.3%	106	35.3%	

p-value > 0.05 shows insignificant statistical difference.

Discussion

This cross-sectional study was conducted to provide valuable local database of maxillary and mandibular dental midline deviation and to give awareness of orthodontic treatment among school children. We used philtrum as a reference for the evaluation of dental midline deviation as this is a valid facial landmark and patients generally relate their midline to the upper lip.[11]

Dental midline is a vital element in smile design. Midline should be perpendicular to incisal plane and incisive papilla.[12,13] The parallelism between the maxillary dental midline and facial midline is more fundamental than the coordination between these midlines. A minor midline deviation is acceptable if connector between the maxillary central incisors is vertical.[4]

Dentofacial attractiveness is reduced by discrepancies between dental and facial midlines. The maximum amount of deviation acceptable to orthodontists before it has negative impact on smile esthetics, has been documented to be 1mm to 2mm.[5,7,8,14,15] Ker et al and Springer et al observed that almost 3 mm of deviation is acceptable by layperson.[16,17] Beyer and Lindauer reported that 2mm midline shift was detectable by almost everyone.[18] According to Kokich and Shapiro, a 4mm maxillary midline deviation was not noticed by laypersons, whereas a 2mm deviation in incisor angulation was regarded as remarkably unattractive.[4,5] Therefore, dental and facial esthetics are of fundamental concern in orthodontics.[7,16]

In the present study, lack of midline coincidence was found to be 69.7%. Sheats et al conducted a study at Virginia Commonwealth University and found 46% lack of midline coincidence in orthodontic population.[7,19] They also concluded that the most frequently seen trait of asymmetry was mandibular midline deviation from the facial midline and maxillomandibular midline deviation. Thilander et al registered midline deviation in 13.2% subjects.[20] They found that it increased with age and was more frequent in lower arch. Borzabadi et al observed non-coinciding dental midlines in 23.7% of urban Iranian sample.[21]

This study also concluded that mandibular midline deviation was the most seen asymmetry (45.7%). Jain et al. noticed midline deviation in 77% of orthodontic patients.[22] Of overall dental midline deviation, 21% patients had maxillary midline deviation and 43% had mandibular midline deviation which is almost twice of maxillary midline deviation.[22] Bhateja and Fida observed that most frequent asymmetry seen was non-coinciding dental midlines in 78.2% of patients.[23] Mandibular midline deviation was observed in 67.5% of patients whereas, maxillary midline deviation was found in 14.3% of patients.[23] However, the side of deviation was not recorded.

The severity of midline deviation in majority of patients was found to be 2 mm in this study, which is similar to the findings of Bhateja et al who reported the severity of about ¼ of lower incisor width.[23] Moreover, this study found that midline deviation was mostly towards right side of the face which is in contrast to Khan et al and Eskelsen et al who revealed that dental midline is mostly shifted towards left side of the face.[24,25]

The current study, having a cross-sectional design, had some limitations. The method of evaluating midline deviation was relatively inadequate at times, mostly in the evaluation of centric occlusion and centric relation (Co-Cr) shifts. The Co-Cr shift was not investigated in this study, therefore, a possibility of mandibular midline deviation due to underlying

functional shifts was there. Exact assessment of Co-Cr is essential to evaluate the probable origin of such deviations.

Conclusion

This study concluded that mandibular midline deviation was the most frequently observed midline deviation followed by maxillary midline deviation. The common severity of deviation was 2mm most likely towards right side of the face. No statistically significant differences were displayed regarding gender and dentition.

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DATA SHARING STATMENT
The data that support the findings of this study are available from the corresponding author upon request.

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