

## Original Article

# ASSESSMENT OF MAXILLARY DENTAL MIDLINE DEVIATION FROM FACIAL MIDLINE IN DENTATE PATIENTS: A LOCAL STUDY AT BACHA KHAN DENTAL COLLEGE

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**Objectives:** To evaluate the frequency of non-coincidence between the maxillary dental midline and the facial midline in dentate patients.

**Materials and Methods:** The study comprised 329 dentate individuals, male and female, aged 18 to 45 years. A comprehensive patient history was gathered, and the facial midline was identified by measuring essential features from the nasion to the pogonion, including the center of the philtrum, with a scale or dental floss. Any variation between the dental midline and the face midline was assessed, with negative values suggesting a leftward shift and positive values indicating a rightward shift.

**Results:** With a range of 18 to 45 years, the participants' mean age was  $32.39 \pm 5.71$  years; their average BMI was  $26.21 \pm 1.28$  kg/m<sup>2</sup>, their average blood count was  $4.81 \pm 0.30$  million cells/mcL, and their average duration of illness was  $4.25 \pm 1.82$  weeks. Of the participants, 36.2% had misaligned facial and dental midlines (non-coincidence).

**Conclusion:** According to the study's findings, approximately one-third of the participants had a misalignment between their maxillary dental and facial midlines, highlighting how common this misalignment is in the general population.

**Key words:** Frequency, Maxillary dental and facial midlines, Nasion, Pogonion, Population, Philtrum

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**INTRODUCTION**

A smile is one of the best gifts anyone can give, and it's crucial for both self-presentation and social engagement<sup>1,2</sup>. The alignment of the facial and dental midlines is one of the most crucial elements of facial aesthetics, and it has a significant impact on how people speak and smile<sup>3</sup>. An aesthetic smile

depends on the facial and dental midlines being in alignment<sup>4</sup>. The facial midline is defined by the nose, chin, and philtrum, which should all be in a straight line with one another. This midline should ideally be located at the middle axis of the face and align with the dental midline<sup>5</sup>.

The alignment of the dental midline along the long axis of the face is crucial for the overall appearance of the smile. It should also happen perpendicular to the papilla and the incisal plane<sup>6,7</sup>. A critical stage in the fabrication process for both fixed and removable prosthodontics is making sure the dental midline is perpendicular to the face. When the dental and facial midlines line up, the symmetry and balance of

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the face's overall appearance are improved, boosting facial attractiveness<sup>8</sup>.

Diagnosing asymmetry between the facial and dental midlines has been the subject of a significant amount of literature<sup>9</sup>. One such study made clear how important symmetry is to having a beautiful smile<sup>10</sup>. The misalignment of the dental and facial midlines can not only alter the appearance of the face but also lead to functional issues, such as irregularities of the temporomandibular joint, and complicate the prosthesis fabrication process<sup>11</sup>. Thus, this study aims to determine the frequency of non-congruence between maxillary dental midline and face midline in dentate patients.

This study aims to determine the frequency of non-coincidence between the maxillary dental and facial midlines in dentate individuals. The study's hypothesis was that the maxillary dental midline and the face midline do not coincide in a quantifiable percentage of dentate patients. These findings will contribute to the development of standards for orthodontic patients and the production of prostheses for prosthodontic patients, as well as to the improvement of clinical processes. The results could potentially lead to new understandings of the importance of symmetry and balance between the face and dental midlines for both function and attractiveness, as well as useful information for educational planning.

## MATERIALS AND METHODS

The study employed a cross-sectional study design and was conducted at the Bacha Khan Dental College Mardan. The study was conducted from February 10th, 2023, to August 10th, 2024. Ethical approval was obtained from Ethical Committee of Bacha Khan Medical College/Bacha Khan Dental College Mardan vide reference No.675/BKCD/BKMC. The sample size was calculated using the Raosoft Inc. calculator, based on the non-coincidence frequency of 52.1% from a prior study<sup>12</sup>, 329 people made up the estimated sample size, which had a 95% confidence interval and a 5.4% margin of error. Participants with anomalies, neuropathy, or facial palsy were chosen for this study using a non-probability consecutive sampling technique. The inclusion criteria included, gender of both gender between the ages of 18 and 45, have all of their anterior teeth, be free of cavities, periodontal disease, and movement. Alignment of all anterior teeth and the permanent

dentition The criteria for exclusion were Anterior teeth that have already undergone orthodontic or prosthetic treatment Dentition that is missing or crowded, a history of facial palsy, neuropathy, or congenital anomalies

Following official approval from the Ethical Review Committee, data collection was carried out. Participants were invited if they were Bacha Khan Dental College patients who satisfied the requirements for inclusion. To guarantee openness and preserve the caliber of the study, participants were briefed about the goals and methods of the research prior to data collection. Everyone who took part gave written informed consent, and their identities were kept confidential. This study was carried out for research purpose.

After collecting detailed patient histories, the dental midline was measured using a scale or dental floss to mark points from the nasion to the pogonion, including the center of the philtrum. Any deviation of the dental midline to the left or right of the facial midline was noted, with negative values denoting a deviation to the left and positive values to the right. The data were systematically recorded using a specially created proforma, and all the information was compiled into Excel spreadsheets after data collection.

Gender, left and right deviations from the coinciding midline, and instances of aligned midline coincidence were among the variables whose frequency and percentage distributions were computed. For quantitative data, mean and standard deviation or median and interquartile range (IQR) were used for non-normally distributed variables, such as age, blood count, BMI, and length of disease. The Shapiro-Wilk test was used to assess the normality of the data. SPSS version 19 was used for the statistical analysis. For clinical and demographic factors such as age, gender, BMI, length of illness, and blood count, frequencies and percentages were calculated. The associations between age, gender, and the non-coincidence of the maxillary and facial midlines were evaluated using the chi-square test. A p-value of less than 0.05 and a 95% confidence interval were considered statistically significant.

## RESULT

The study's participants ranged in age from 18

to 45, with a mean age of  $32.39 \pm 5.71$  years. The average disease duration was  $4.25 \pm 1.82$  weeks, the average BMI was  $26.21 \pm 1.28$  kg/m<sup>2</sup>, and the average blood count was  $4.81 \pm 0.30$  million cells/mcL. Of the patients in the sample, 47.7% were female and 52.3% were male. 36.2% of the patients had a maxillary dental midline that did not correspond with the face midline. Of these, 30.3% showed a rightward deviation and 69.7% showed a leftward divergence.

According to stratification analysis, 35% of females and 37.2% of males had non-coincidence between the maxillary dental midline and the face midline ( $p = 0.681$ ). Patients over 30 years of age had a greater non-coincidence rate (40.5%) than patients between the ages of 18 and 30 (27.1%) ( $p = 0.017$ ).

Patients with a BMI  $\leq 25$  (31.2%) and those with a BMI  $>25$  (38.1%) did not differ significantly ( $p = 0.237$ ). Patients with an illness duration of more

**Table 1: Participants' demographic characteristics**

Parameter	Mean $\pm$ SD
Age (years)	32.39 $\pm$ 5.71
Blood count (million cells/mcL)	4.81 $\pm$ 0.30
BMI (Kg /m <sup>2</sup> )	26.21 $\pm$ 1.28
Duration of disease ( weeks)	4.25 $\pm$ 1.82
Gender	
Male	172 (52.3%)
Female	157 (47.7%)
Total participants	329 (100%)

**Table 4: Stratification of Non-Coincidence by Demographic and Clinical Factors**

Variable	Non-Coincidence (Yes)	Non-Coincidence (No)	p-value
Gender			
Male	64 (37.2%)	108 (62.8%)	0.681
Female	55 (35.0%)	102 (65.0%)	
Age group			
18-30	38 27.1 %	102 (72.9 %)	0.017
>30 years	81 40.5%	119 (59.5%)	
BMI			
$\leq 25$	44 (31.2 %)	97 (68.8%)	0.237
$> 25$	75 (38.1 %)	122 (61.9%)	
Duration of disease			
$\leq 3$ weeks	56 (30.8%)	126 (69.2 %)	0.127
$>3$ weeks	63 (39.2 %)	84 (60.8 %)	
Blood Count			
$\leq$ Million Cells / mcL	60 (36.4%)	105 (63.6%)	0.871
$>$ Million Cells / mcL	59 (35.5 %)	107 (64.5%)	

than three weeks had a higher non-coincidence rate (39.2%) than those with a duration of less than three weeks (30.8%) ( $p = 0.127$ ). Furthermore, individuals with a blood count  $\leq 5$  million cells/mcL (36.4%) and those with a blood count  $>5$  million cells/mcL (35.5%) did not vary significantly ( $p = 0.871$ ).

## DISCUSSION

When it comes to improving facial aesthetics, the midline of the face and the maxillary dental midline coincide. Although opinions on what constitutes "normalcy" might differ greatly from person to person, little facial asymmetry and non-coincidence between the facial and dental midlines are generally seen as normal<sup>13,14</sup>. The majority of participants in this study had face and dental midlines that coincided, which is consistent with findings

**Table 3: Deviation Distribution among Patients with Non-Coincidence**

Deviation	Frequency	Percentage
Left	83	69.7 %
Right	36	30.3 %
Total	119	100 %

**Table 2: Non-Coincidence Distribution**

Non-coincidence	Frequency	Percentage
Yes	119	36.2 %
No	210	63.8%
Total	329	100%

from prior studies: 72.5% in Karnataka and 47.9% in the Pakistani population<sup>12,15</sup>. Similar to the facial midline employed in this investigation, these studies concentrated on a single face midline parameter. However, there is disagreement in dentistry studies over whether a perfect dental midline is required for the best aesthetic results. The necessity of a perfect dental midline was questioned by Kokich et al<sup>16</sup>. According to Golub, a perfectly aligned dental midline could look artificial<sup>17</sup>. Research on how midline disparities are perceived reveals a variety of results. Whereas prosthodontists usually identify changes of 3 mm, orthodontists can detect even a 1-mm variation. Conversely, laypeople frequently fail to notice differences smaller than 3 mm<sup>18</sup>.

In line with Eskelsen et al., the current investigation discovered that 47.9% of participants had a maxillary dental midline that coincided with the face midline<sup>19</sup>. However, with a 75% coincidence rate, Miller et al. discovered that the philtrum was a more accurate facial midline reference<sup>17</sup>. Jayalakshmi et al. discovered that the maxillary midline differed slightly from the facial midline by  $1.62 \pm 0.43$  mm in males and  $1.32 \pm 0.16$  mm in females<sup>20</sup>. This is consistent with the current investigation, which found that the maxillary midline occasionally deviated to the left. Such deviations are frequently tolerated in the context of facial aesthetics<sup>21</sup>.

It is commonly established in the field of esthetics that midlines can differ somewhat, especially by as little as 2 mm. Most of the time, the general public is unaware of these variances. Although Bhateja et al. found a greater frequency of mandibular midline deviations, this study concentrated on maxillary midline abnormalities since they are easier to see when smiling. Methodological differences between this study and Bhateja et al., such as the use of pre-treatment orthodontic records or the inclusion of mixed dentition cases, may be the cause of the discrepancy in the results<sup>22</sup>. Comparing this work to previous research, the use of high-definition imaging to assess midline relationships may have resulted in more accurate measurements<sup>23</sup>. Maxillary midline deviations were primarily leftward in the current investigation, which is consistent with other observations. Because it has a more direct impact on smile aesthetics, the visible deviation in maxillary midlines is more significant than mandibular abnormalities. This supports research indicating that the maxillary

midline coincidence is more important for smile beauty than the mandibular midline<sup>24,25</sup>.

Overall, this study's results highlight how crucial midline coincidence is when assessing aesthetics. The assumption that exact alignment of the dental and facial midlines may not always be required for an aesthetically pleasant appearance is reinforced by the fact that minor midline deviations are typically acceptable and frequently overlooked by non-professionals. The disparity in results between studies emphasizes how difficult it is to evaluate midline alignment because individual, methodological, and societal factors greatly influence how people perceive facial aesthetics..

## LIMITATIONS

This study used dental floss or scales for manual measurements, which could lead to human error and decrease accuracy when compared to more sophisticated imaging methods. Establishing a causal relationship between midline non-coincidence and clinical or demographic characteristics was hampered by the cross-sectional approach. Furthermore, just one institution participated in the study, which would have limited the findings' applicability to other groups or areas.

## CONCLUSION

The incidence and patterns of maxillary dental midline anomalies in relation to the face midline are highlighted in this study to highlight their effect on facial aesthetics. Small midline discrepancies, particularly those smaller than 2 mm, are generally acceptable and often unnoticeable to laypeople, according to the results, which are in accordance with previous research. These results demonstrate the subjectivity of aesthetic evaluations and the ways in which methodological and cultural variations impact the perception of facial symmetry. The impact of midline disparities on various groups and aesthetic preferences require more investigation.

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#### AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: MK, TH, ZU

Acquisition, Analysis or Interpretation of Data: TH, MK

Manuscript Writing & Approval: MK, TH, ZU

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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