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RESEARCH ARTICLE

Dental-Facial Midline: An Esthetic Based Classification

Nischal Niraula^{1,2} , Reecha Acharya^{3,4} , Manoj Humagain¹ , Zohaib Khurshid⁵ , Necdet Adanir⁶  and Dinesh Rokaya^{*,7} 

¹Department of Periodontology and Implantology, Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal

²Department of Public Health, Torrens University Australia, Sydney, Australia

³Centre for Oral Health Outcomes & Research Translation, Campbell Street Liverpool, NSW 2170, Australia

⁴Western Sydney University, School of Nursing and Midwifery, Rydalmere NSW 2116, Australia

⁵Department of Prosthodontics and Dental Implantology, College of Dentistry, King Faisal University, Al-Ahsa 31982, Saudi Arabia

⁶Department of Restorative Dentistry, College of Dentistry, King Faisal University, Al Ahsa, Saudi Arabia

⁷Department of Clinical Dentistry, Walailak University International College of Dentistry, Walailak University, Bangkok, Thailand

Abstract:

Background:

The facial midline and dental midline play an important role in facial esthetics, cosmetic dentistry, facial plastic surgery, and anthropologic studies.

Objective:

This study studied the dental-facial midline in Nepalese subjects and to classify the midline.

Methods:

The study was conducted in 150 Nepalese subjects, mostly consisting of University students (80 males and 70 females). After obtaining ethical approval, facial and dental midlines were analyzed using a scale.

Results:

It showed 26 (18%) study subjects showed the coincidence of the facial midline with the maxillary and mandibular dental midlines. It showed that only 44 (30%) subjects showed the coincidence of facial midline with only maxillary dental midline, and 26 (17%) subjects showed the facial midline coincidence with only mandibular dental midline. The dental midline discrepancy was more prevalent in the maxillary arch and more prevalent on the right side. Midline discrepancy is seen more in males compared to females. The majority of the deviation showed 1 mm, followed by 2 mm, and 3 mm.

Conclusion:

The coincidence of the facial midline with both the maxillary and mandibular dental midlines is uncommon. Midline discrepancy is seen more in males compared to females. The majority of the subjects show a mild discrepancy of 1 mm. The midline discrepancy was more seen on the right side and in the maxillary arch.

Keywords: Esthetics, Face, Midline, Dental, Asian, Nepalese.

Article History

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1. INTRODUCTION

Facial esthetics is an inherently subjective discipline. The facial midline and dental midline play an important role in facial esthetics, cosmetic dentistry, facial plastic surgery, and anthropologic studies [1, 2]. Thus, dento-facial esthetics helps

to produce esthetic beauty and smile facial. The smile esthetics can be grouped into four sections: facial esthetics, gingival esthetics, macroesthetics, and microesthetics [3]. The facial midline forms an important part of esthetic smile design, and it is recommended to flush the dental and facial midline in orthodontic and cosmetic restorative procedures [4].

Facial and dental midlines greatly vary, and their deviation is seen among the people. Dentists and non-dental personnel can notice the deviations of facial and dental midlines. It is

* Address correspondence to this author at the Department of Clinical Dentistry, Walailak University International College of Dentistry, Walailak University, Bangkok 10400, Thailand; Tel: +66-22980244; E-mail: dineshrokaya115@hotmail.com

found that the higher the deviations, the more it is easier to detect [4]. Midline deviations more than 2 mm can be detected easily compared to 1-2 mm and ~1 mm. Furthermore, the location of the facial and dental midlines also depends on the clinician [4]. Facial and dental midlines can be located and examined clinically in patients or in 2D photographs [5, 6]. Various reference points on the face can be used to locate the midline and examine the midline deviations [7]. The dental-facial (dento-facial) midline have not been fully investigated, and there is no standard classification of midline deviation. Hence, this study aimed to study the face and dental midline and to classify the dental-facial midline using Nepalese subjects.

2. MATERIALS AND METHODS

This cross-sectional study was done on 150 Nepalese subjects (55 males and 95 females) from October 2017 till April 2019. Subjects were selected using the following criteria: (1) age of the participants: 18-35 years old, both males and females; (2) not treated with any facial surgery involving the face; and (3) obvious problems that could disfigure of the face. The details of the study subjects (Table 1). After obtaining ethical approval from the Institutional Review Committee of the Kathmandu University School of Medical Sciences (IRC-KUSMS) (29/16), the participants were recruited in this study, and confidentiality of the information was maintained.

All patients read the instructions carefully and they were examined. The facial and dental midlines were located and analyzed using a scale. The facial midline, which divides the face into a right half and left half, was taken as the line passing through the glabella, nose tip, the midpoint of the philtrum, and middle

of the chin [8]. The maxillary midline is taken the line passing between the upper central incisors and the mandibular midline is taken the line passing between the lower central incisors [8]. All the examination was performed by one examiner. The occurrence with an explanation of the face and dental midline of the patients was as follows (Figs. 1 and 2).

Table 1. Details of the study subjects in the study.

Subjects details	Frequency
Total subjects	150
Male	80 (53.33%)
Female	70 (46.67%)
Mean age	26.5 years
Range	18 – 35 years

Analysis of the data was done using SPSS version 18 for Windows. The comparison of midline was made using Chi-squared Test at a 95% confidence interval.

3. RESULTS

Table 1 shows the details of the study subject and the mean age of the subjects was 26.5 years old (range 18-35 years old). It showed only in 16% (24 subjects), the facial midline was coinciding with both the upper and lower midline, as shown in Figs. (1 and 2). Females (13, 54.16%) showed greater coincidence of facial and dental midlines than males (11, 45.83%). It showed that dental midline discrepancy was seen more in the maxillary arch compared to the mandibular arch and seen more on the right side. It showed that most subjects showed a discrepancy of 1 mm, followed by 2 mm, and 3 mm.

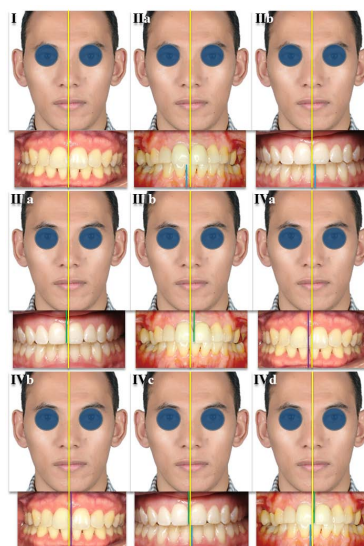


Fig. (1). The diagrammatic representation of classification of the dental-facial midline.

Class I. The facial midline is coinciding with the both maxillary and mandibular dental midline (I). **Class II.** The facial midline is coinciding with only the maxillary dental midline. The mandibular midline is shifted to the right side (IIa). The mandibular midline is shifted to the left side (IIb). **Class III.** The facial midline is coinciding with only the mandibular dental midline. The maxillary midline is shifted to the right side (IIIa). The maxillary midline is shifted to the left side (IIIb). **Class IV.** The facial midline is not coinciding with the both maxillary and mandibular dental midline. The maxillary and mandibular midline shifted to the right side (IVa). The maxillary and mandibular midline shifted to the left side (IVb). The maxillary midline shifted to the right side and mandibular midline shifted to the left side (IVc). The maxillary midline shifted to the left side and mandibular midline shifted to the right side (IVd). **Class V.** Other than those in the Class I, II, III or IV.

Classification of dental-facial midline
Class I. The facial midline is coinciding with the both maxillary and mandibular dental midline.
Class II. The facial midline is coinciding with only the maxillary dental midline. a. The mandibular midline is shifted to the right side. b. The mandibular midline is shifted to the left side.
Class III. The facial midline is coinciding with only the mandibular dental midline. a. The maxillary midline is shifted to the right side. b. The maxillary midline is shifted to the left side.
Class IV. The facial midline is not coinciding with the both maxillary and mandibular dental midline. a. The maxillary and mandibular midline shifted to the right side. b. The maxillary and mandibular midline shifted to the left side. c. The maxillary midline shifted to the right side and mandibular midline shifted to the left side. d. The maxillary midline shifted to the left side and mandibular midline shifted to the right side.
Class V. Other than those in the Class I, II, III or IV.

Fig. (2). The classification of the dental-facial midline.

Table 2. Results of the facial-dental midline in the study.

Dental-Facial Midline	N (%)	P value
Facial midline coinciding with both the maxillary and mandibular dental midline.	24 (16%)	
Facial midline coinciding with the maxillary dental midline. Mandibular dental midline shifted to the right side. Mandibular dental midline shifted to the left side.	26 (18%) 18 (12%)	<0.0001
Facial midline coinciding with mandibular dental midline a) Maxillary dental midline shifted to the right side. b) Maxillary dental midline shifted to the left side.	17 (11%) 9 (6%)	<0.0001
The facial midline not coinciding with the both maxillary and mandibular dental midline. a) Maxillary and mandibular dental midline shifted to the right side. b) Maxillary and mandibular dental midline shifted to the left side. c) Maxillary midline shifted to the right side and mandibular dental midline shifted to the left side. d) Maxillary midline shifted to the left side and mandibular dental midline shifted to the right side.	31 (21%) 18 (12%) 5 (3%) 2 (1%)	<0.0001

Comparison was done using Chi-squared Test. * Significant difference at $P < 0.05$.

Table 2 shows the results of the dental-facial midline in the study. It showed that only in 24 (16%) subjects, the facial midline was coinciding with the both the maxillary and the mandibular dental midlines. In 44 (30%) subjects, the facial midline was coinciding with the maxillary dental midline only and in 26 (17%) subjects, the facial midline was coinciding with the mandibular dental midline only. The majority of the upper and lower dental midlines were located on the right side compared to the left side. In 56 (37%) subjects, the facial midline was not coinciding with both upper and lower dental midline. There was no significant difference between among the groups in class II-IV (P value < 0.0001).

4. DISCUSSION

The facial and dental midlines have an essential role in facial esthetics and facial beauty [9 - 11]. The dental midline deviation with gender also affects young people's esthetic perception [12]. The facial anatomic landmarks are important for measuring the facial and dental midlines discrepancy [13]. Besides, 2D photographs can also be used to study the dental midline discrepancy from reference points [7]. Still, the clinical assessment of anatomical landmarks and midline is a practical method to identify the facial and dental midlines and quantify discrepancies. Hence, in this study, we assessed the dental-facial midline clinically.

The results of the midline in our study are similar to the results obtained from the study done by Mille *et al.* [5] where they found that the upper and lower midlines were not coinciding in almost 3/4th of the studied subjects. Similarly, Janson *et al.* [14] mentioned that a small deviation (2 mm) in the dental midline is acceptable by both dentists and orthodontists and patients. But a small axial midline angulation (10°) is already easily noticeable. Furthermore, Khan *et al.* [15] studied the dento-facial midline in Pakistani subjects, and they found that the upper midline was coinciding with the lower midline only in 2/3rd of the subjects and facial midline was coinciding with the dental midlines in <50% of the subjects. But they found that dental midline deviations were more on the left side, which was in contrast to our study. Similarly, a study was done in India on dental-facial midline found that only 20% of the subjects show upper and lower midlines coincidence [6]. Besides, a deviation of 0–1 mm was seen more in girls (55%) than boys (45%), a deviation of 1–2 mm was seen more in boys (54%) than girls (33%), and a deviation of 2–3 mm was seen more in boys (37%) than girls (8%). Similarly, in our study, the coincidence of facial and dental midlines was slightly greater in females than males.

In this study, the reliability and validity of the method and the classification of dental-facial midline were tested. The dental-facial midlines of three subjects were measured by two different researchers, and there were high correlations among the measurements (0.95). This shows the reliability of the method. To evaluate the validity of the method and the classification of dental-facial midline, the study details were presented to the three experts in this field to evaluate the validity. The mean score for each component given by the experts was above 3.5 out of 4. The method and the classification of dental-facial midline was rated as “appropriate”.

CONCLUSION

The dental-facial midline plays an important parameter for facial and dental esthetics. It was found that most of the subjects show a mild discrepancy of dental-facial midline and the coincidence of the dental and facial midlines is uncommon. Females show a slightly greater coincidence of the facial and dental midline compared to males. The discrepancy of the midline was more prevalent in the upper arch and more prevalent on the right side. Mild dental-facial midline discrepancy (1-2 mm) is acceptable and most often may not be perceived.

In this study, the participants who participated were subjects from different parts of the country. One limitation of this study was that this study was conducted on only 150 subjects from Nepal. This study can be performed also in a larger population and may be applied on other Asian subjects to find the most common type of dental-facial midline in Asia.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study received ethical approval from the Institutional Review Committee of the Kathmandu University School of

Medical Sciences (IRC-KUSMS), Nepal.

HUMAN AND ANIMAL RIGHTS

No Animals were used in this research. All human research procedures were followed in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all the participants prior to data collection.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author, [D. R.], upon reasonable request.

FUNDING

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REREFERENCES

- [1] Bhuvaneshwar M. Principles of smile design. *J Conserv Dent* 2010; 13(4): 225-32. [http://dx.doi.org/10.4103/0972-0707.73387] [PMID: 21217950]
- [2] Chen YR, Lo LJ, Kyutoku S, Noordhoff MS. Facial midline and symmetry: Modified face bow. *Plast Reconstr Surg* 1992; 90(1): 126-8. [http://dx.doi.org/10.1097/00006534-199207000-00021] [PMID: 1615073]
- [3] Morley J, Eubank J. Macroesthetic elements of smile design. *J Am Dent Assoc* 2001; 132(1): 39-45. [http://dx.doi.org/10.14219/jada.archive.2001.0023] [PMID: 11194397]
- [4] Cardash HS, Ormanier Z, Laufer BZ. Observable deviation of the facial and anterior tooth midlines. *J Prosthet Dent* 2003; 89(3): 282-5. [http://dx.doi.org/10.1067/mpr.2003.68] [PMID: 12644804]
- [5] Miller EL, Bodden WR Jr, Jamison HC. A study of the relationship of the dental midline to the facial median line. *J Prosthet Dent* 1979; 41(6): 657-60. [http://dx.doi.org/10.1016/0022-3913(79)90065-9] [PMID: 374721]
- [6] Jayalakshmi NS, Ravindra S, Nagaraj KR, Rupesh PL, Harshavardhan MP. Acceptable Deviation between Facial and Dental Midlines in Dentate Population. *J Indian Prosthodont Soc* 2013; 13(4): 473-7. [http://dx.doi.org/10.1007/s13191-012-0234-6] [PMID: 24431778]
- [7] Alarabi AM, Revie GF, Bearn DR. Quantification of maxillary dental midline deviation in 2D photographs: Methodology trial. *Int Orthod*

- 2019; 17(2): 312-23.
[<http://dx.doi.org/10.1016/j.ortho.2019.03.014>] [PMID: 31023588]
- [8] Daskalogiannakis J. Glossary of orthodontic terms. London: Quintessence 2000.
- [9] Rokaya D, Kitisubkanchana J, Wonglamsam A, Santiwong P, Srihavaj T, Humagain M. Nepalese esthetic dental (NED) proportion in nepalese population. *Kathmandu Univ Med J (KUMJ)* 2015; 13(51): 244-9. [KUMJ]. [PMID: 27180372]
- [10] Humagain M, Rokaya D, Srii R, Dixit S, Kafle D. Gender based comparison of gingival zenith esthetics. *Kathmandu Univ Med J (KUMJ)* 2016; 14(54): 148-52. [KUMJ]. [PMID: 28166072]
- [11] Malcmacher L. Facial aesthetics in dentistry. *Dent Today* 2009; 28(3): 114-, 116-117. [PMID: 19323327]
- [12] Zhang YF, Xiao L, Li J, Peng YR, Zhao Z. Young people's esthetic perception of dental midline deviation. *Angle Orthod* 2010; 80(3): 515-20. [PMID: 20050746]
- [13] Bidra AS, Uribe F, Taylor TD, Agar JR, Rungruanant P, Neace WP. The relationship of facial anatomic landmarks with midlines of the face and mouth. *J Prosthet Dent* 2009; 102(2): 94-103. [[http://dx.doi.org/10.1016/S0022-3913\(09\)60117-7](http://dx.doi.org/10.1016/S0022-3913(09)60117-7)] [PMID: 19643223]
- [14] Janson G, Branco NC, Fernandes TM, Sathler R, Garib D, Lauris JR. Influence of orthodontic treatment, midline position, buccal corridor and smile arc on smile attractiveness. *Angle Orthod* 2011; 81(1): 153-61. [<http://dx.doi.org/10.2319/040710-195.1>] [PMID: 20936969]
- [15] Khan M, Kazmi SMR. Coincidence of dental midline with facial midline in a sample of pakistani population. *J Coll Physicians Surg Pak* 2019; 29(3): 210-3. [<http://dx.doi.org/10.29271/jcpsp.2019.03.210>] [PMID: 30823943]

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