National Journal of Health Sciences, 2024, *9*, 255-259

Research Article

Effect of Nasal Deviation on the Perception of Upper Dental Midline by General Dentists and Orthodontists

Ittrat Haider*, Mehwish Shaheed, Yusra Shaukat, Wardah Tahir, Hafiz Muhammad Talha Arshad, Kausar Ilyas

Department of Orthodontics, Margalla Institute of Health Sciences, Rawalpindi, Pakistan.

Abstract: Background: Establishing the relationship between dental and facial midlines aids in achieving the desired dentofacial aesthetics post-orthodontic treatment.

Objective: The primary objective of this study was to assess the effect of nasal deviation on the perception of maxillary dental midline by the orthodontic practitioners and general dentists. Secondary objectives were to see if there was any significant difference between the perception of female and male participants, and orthodontic practitioners and general dentists.

Materials and Methods: This cross-sectional study was conducted in Margalla Institute of Health Sciences (MIHS) Rawalpindi after obtaining ethical approval. Morphed frontal smiling photographs of a female subject were used to assess the perception of the participants. The nasal midline was progressively altered at every 1 mm from 0 mm to 4 mm towards left while keeping the upper dental midline on. The data were analyzed by using SPSS version 26.0. P-values of < 0.05 were taken as significant.

Result: Out of 200 study subjects, 106(53%) were general dentists and 94 (47%) were orthodontic practitioners. There was a significant increase in the misperception of upper dental midline with an increase in the nasal deviation. There was no statistically significant difference found between the findings of general dentists and orthodontists, with the exception of one image (Image 2), for which the p value was 0.017. Statistically, no significant difference was observed between male and female participants' results.

Conclusion: The nasal deviation affects dental midline perception, with only minor differences between general dentists and orthodontists underscoring the necessity for comprehensive facial evaluations in dental practice to ensure accurate aesthetic and functional assessments.

Keywords: Perception, Midline, Orthodontist, Dentist, Esthetics, Photographs.

INTRODUCTION

Face, part of the body that gives us a great deal of insight into an individual; information like a person's gender, age and ethnicity can be deduced by just looking at their face [1]. Therefore, having an esthetically pleasing face has significant impact on a person's social interaction [2]. It is generally accepted that symmetry is a necessary prerequisite for achieving harmonized and balanced dentofacial aesthetics [3]. There are different ways of defining facial midline; different specialties like Plastic Surgery, oral maxillofacial surgery and orthodontics have various ways of defining it but the general concept of 'facial midline being the midline dividing the two halves of the face' is almost the same. One of the study suggests a method for establishing the facial midline by using facial flow line (FFL), which can be drawn by connecting the glabella, subnasale, philtrum and chin [4]. In the presence of asymmetry, there is a deviation of FFL towards the affected side [5]. In orthodontics, one way of determining the facial midline is by dropping a vertical line bisecting a horizontal line that meets the exocanthion of both eyes [6]. When evaluating the hierarchical arrangement for determining landmarks to establish midline, the anatomical landmark which can be regarded as the most appropriate fit for matching the facial midline was the commissural midline [7].

Determining the upper dental midline is crucial in orthodontics, prosthodontics and other dental specialties to achieve proper dental aesthetics and function [8]. With the advancement of digital technology, computer software can assist in evaluating and adjusting the dental midline on digital images [9]. Achieving a dental midline that coincides with the facial midline is a major goal of orthodontic treatment as it plays a significant role in smile esthetics. It is rare for both midlines, maxillary and mandibular, to coincide with the face midline; males exhibit a greater midline discrepancy than females do and most of the patients exhibit discrepancy of 1 mm [10].

A lot of studies have been conducted previously which highlight the perception of various groups of people in determining the upper dental midline. The perception varies between different people. The raters' gender, age, occupation and ethnicity all have an impact on how they perceive the upper dental midline abnormalities [11]. When reviewing photographs, dentists were more critical than laypeople in identifying midline deviation [12]. The acceptability of upper dental midline deviation from the facial

* Address correspondence to this author at the Department of Orthodontics, Margalla Institute of Health Sciences, Rawalpindi, Pakistan.
Email: Ittrathaider95@gmail.com

midline by the orthodontists, general dentists and laypersons differs greatly.

To a certain extent, every human face is asymmetric, so studying facial dimensions solely using straight lines may not be sufficient [4]. Many features affect the facial esthetics, some may have a more significant role than others. According to a study, the central location of nose has a significant impact on the perception of facial symmetry; nasal deviations can disturb the facial esthetics. A study highlighted that laypeople were more sensitive to nasal changes than general dental practitioners and orthodontists who were more sensitive to changes related to dental asymmetry. It also concluded that gender and ethnicity had no effect on ratings. The findings also indicated that in order to be deemed aesthetically pleasing, a dental centerline should not deviate more than 1.5 mm of the facial midline [13].

Previous research has dictated to us many a times that dentists are more sensitive to upper dental midline changes when compared with laypersons [14]. Orthodontists are more rigorous and demanding when it comes to appearance, maybe as a result of their academic background which gives them the ability to identify lighter midline changes in teeth [15]. As for laypeople, they can detect a midline angulation change more easily compared to a transverse dental midline shift. A chin or nose deviation in the opposite direction exacerbates the axial dental midline angulation disparity, which laypeople can detect as low as 3.5° [16].

In our study, we proposed to evaluate the impact of nasal deviation on perception of upper dental midline in Margalla Institute of Health Sciences, Rawalpindi as international literature could not be generalized to local population due to ethnic background and socio-cultural differences. Moreover, local literature will aid as a basis for future research. So, the objective of this study was to assess the effect of nasal deviation on the perception of maxillary dental midline by the orthodontic practitioners and general dentists.

The present study, we aim to assess the impact of nasal deviation on the perception of the upper dental midline within our specific demographic context, recognizing that international findings may not universally apply due to variations in ethnic and socio-cultural backgrounds. This research will not only fill a gap in the local literature but will also establish a foundational resource for future studies. Specifically, the objective is to evaluate how nasal deviations influence the assessments of maxillary dental midlines by orthodontic practitioners and general dentists in our settings.

MATERIALS AND METHODS

This cross-sectional study was conducted after taking approval from the ethical review board (ERC Ref No: DI/184/23) of Margalla Institute of Health Sciences, Rawalpindi. The time period for data collection was from August 2023 to October 2023. With the aid of purposive sampling orthodontic practitioners as Group A and general dentists as Group B were enrolled in this study irrespective of their age and gender. An informed consent was taken from study participants prior to collection of the data. Using the Open Epi calculator, the mean results of group 1 was 5.4mm ± 2.18mm and the mean results of group 2 was 6.37mm ± 2.15mm, keeping 95% confidence interval, 5% margin of error and 80% power, the calculated sample size was 172 (n=86 each group). Drop off rate of 10% was kept in each group, therefore, 94 orthodontic practitioners and 106 general dentists were included [17]. The inclusion criteria for Group A was 1) orthodontic resident who was currently enrolled in a College of Physicians and Surgeons Pakistan (CPSP) recognized training institute 2) orthodontic consultants. The inclusion criteria for Group B was general dental practitioners with a minimum of one year of clinical experience.

Frontal smiling view photograph of a female subject with normal occlusion working in orthodontic department of Margalla Institute of Health Sciences was captured by using a digital camera (EOS 1000D; Canon, Tokyo, Japan). Prior consent from the female subject was also taken. The pictures were then morphed using Adobe Photoshop Software 23.5 (Adobe Systems Inc, San Jose, USA). The nasal midline was progressively altered at every 1 mm from 0 mm to 4 mm towards left. The upper dental midline coincided with the facial midline in all images. This led to a total of five photographs; Image 5 (nasal and dental midline at 0 mm), Image 4 (1mm nasal deviation to left) Image 3 (2 mm nasal deviation to left) Image 2 (4 mm nasal deviation to left) and Image 1(3 mm nasal deviation to left) as shown in Fig. (**1**). The images were altered from 0mm to 5mm in Adobe Photoshop Software. The deviation was re-assessed by 5 orthodontists to ensure accuracy. The photographs were blinded and shuffled with given codes to prevent identification discrepancy. Data was gathered using Google Forms that included demographic information of participants and their rating of all five images. Each image could be rated from 0 mm to 5 mm. The evaluation of the photographs was performed by both the orthodontic resident/consultant and general dentists. Those who marked each image value near to 0 mm difference from actual value were taken as having perception that is not affected by nasal deviations.

STATISTICAL ANALYSIS

The data were analyzed by using Statistical Package for the Social Sciences software 26.0 (SPSS Inc. Chicago, USA). Descriptive statistics was calculated for all qualitative and quantitative variables. Qualitative variables like gender and specialty were measured in terms of frequency and percentage. Quantitative variables like image perception (in mm) were presented as mean and standard deviation. Shapiro wilk test was applied to check the normality of data. The data was normally distributed hence student independent sample t test was applied to see the association between quantitative/qualitative attributes; age, gender and specialty with image perception. P-values < 0.05 were taken as significant.

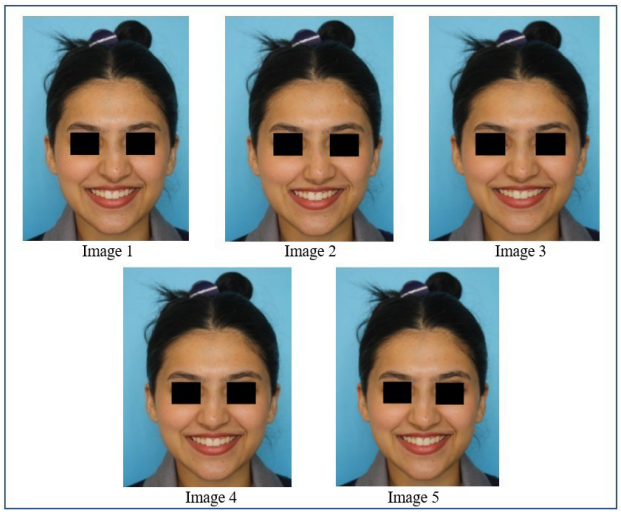

Fig. (1). Morphed images showing nasal deviation. Image 5 (nasal and dental midline at 0 mm), Image 4 (1mm nasal deviation to left) Image 3 (2 mm nasal deviation to left) Image 2 (4 mm nasal deviation to left) and Image 1(3 mm nasal deviation to left).

RESULT

A total of 94 (47.0%) orthodontic practitioners (consultants and residents) and 106 (53.0%) general dentists in the country participated in this study, made up of 52 (26.0%) men and 148 (74.0%) women. 115 participants (57.5%) belonged to the age group 21-30 years. There was an increase in the mean deviation from the actual value of dental midline as the nasal deviation was increased. With a mean value of 0.39 ± 0.838 mm, Image 5 (0 mm nasal deviation) showed the closest results to the actual value, while Image 2 (4 mm nasal deviation) was the picture with the furthest results from the actual value, with a mean value of 2.86 ± 1.474 mm. The mean and standard deviation of all images from the actual value are described in Table **1**.

Table 1. Mean Deviation in Participants' Value from Actual Value.

Image	Mean (mm)	Standard Deviation (mm)
Image 1 (3mm nasal deviation to left)	2.27	1.151
Image 2 (4mm nasal deviation to left)	2.86	1.474
Image 3 (2mm nasal deviation to left)	1.41	0.914
Image 4 (1mm nasal deviation to left)	0.69	0.720
Image 5 (0mm nasal deviation to left)	0.39	0.838

Statistically, no significant difference was observed between male and female results of any image as shown in Table **2**.

Table 2. Association of Gender with Image Perception.

Parameters (n=200)	Gender	n	Mean ± Std. Deviation (in mm)	p-value
Image 1(3mm nasal deviation to left)	Male	52	2.346±1.28	0.58
	Female	148	2.243±1.1	
Image 2(4mm nasal deviation to left)	Male	52	2.92±1.65	0.783
	Female	148	2.837±1.41	
Image 3(2mm nasal deviation to left)	Male	52	1.538±0.97	0.222
	Female	148	1.358±0.89	
Image 4(1mm nasal deviation to left)	Male	52	0.71±0.63	0.758
	Female	148	0.67±0.74	
Image 5(nasal and dental midline at 0mm)	Male	52	0.365±0.687	0.806
	Female	148	0.398±0.88	
Statistically significant (Independent sample T test applied).				

When the results of orthodontic practitioners and general dentists were compared, the p value for each image difference were as follows: 1) Image 1 had a p value of 0.303 2) Image 2 had a p value of 0.017 3) Image 3 had a p value of 0.212) Image 4 showed a p value of 0.609 5) Image 5 showed a p value of 0.654. Overall, orthodontic practitioners had results closer to the actual value but significant difference between the results of general dentists and orthodontic practitioners was observed only for Image 2 ($p < 0.05$) as shown in Table **3**.

Table 3. Difference between the Perception of Orthodontic Practitioners and General Dentists.

Parameters	Mean ± Standard Deviation (mm)		
	Orthodontic Resident/ Consultant (n=94)	General Dentist (n=106)	p-value
Image 1(3mm nasal deviation to left)	2.18±1.35	2.35±0.936	0.303
Image 2(4mm nasal deviation to left)	2.59±1.66	3.084±1.25	0.017*
Image 3(2mm nasal deviation to left)	1.319±0.98	1.481±0.84	0.212
Image 4(1mm nasal deviation to left)	0.71±0.66	0.66±0.767	0.609
Image 5(nasal and dental midline at 0mm)	0.36±0.77	0.415±0.89	0.654
*Statistically significant (Independent sample T test applied).			

DISCUSSION

The alignment of the upper dental midline with the nasal tip, known as midline harmony, is considered an important aspect of dental and facial esthetics [18]. This midline harmony is stressed as an important feature in orthodontic treatment plan-

ning [19]. This may be desired outcome by many orthodontists as orthodontic patients who have underwent a complete orthodontic treatment have a different visual perception than untreated patients; Patients undergoing orthodontic treatment can more readily identify midline deviation of the upper teeth than non-orthodontic patients because they are more sensitive to little aesthetic alterations [20].

Evaluation of upper dental midline position maybe complicated if other midline facial structures are not well-aligned [2]. Nasal deviation can create an optical illusion of a shift in the upper dental midline. Even if the dental midline is correctly aligned, the asymmetry caused by the crooked nose may give the impression of midline misalignment. Our study aimed to assess the effect of nasal deviation on dental professionals' (orthodontic residents, consultants, and general dentists) perception of upper dental midline. As hypnotized, there was a significant impact of deviated nose when ascertaining upper dental midline. A previous study has also indicated that smile aesthetics perception improves when the tip of the nose coincides with the upper dental midline [21].

A previous study [22], used eye-tracking device data to evaluate the impact of midline deviation on smile aesthetic perception and found no statistically significant difference between the results of both genders which match with our findings. Another study [23], evaluated the impact of dental midline on asymmetric faces also concluded with similar results when different gender perceptions were compared.

The results of our study stated no significant difference between the orthodontic practitioners and general dentists' perception of upper dental midline with respect to nasal deviation which match the findings of a study conducted previously [24]. Although our study showed orthodontic practitioners had closer results to the actual dental midline compared to the general dentists, only Image 2, image with maximum nasal deviation, had showed statistically significant results.

In orthodontics, treating patients with nasal deviation may present challenges in achieving optimal alignment of the dental midline [25]. Orthodontists may need to consider both dental and facial factors in treatment planning to achieve the most satisfactory results. It is important to approach each case individually, considering both functional and esthetic factors when addressing the impact of nasal deviation on the perception of the upper dental midline. Individuals with a deviated nose may be more self-conscious about their facial appearance [26]. This can affect their self-perception and confidence, particularly when it comes to the alignment of their teeth and smile. Treatment decisions may involve collaboration between orthodontists, oral and maxillofacial surgeons, and other dental specialists to achieve the best possible outcomes for both form and function.

LIMITATION

One of the study's limitation was that because it was done on an online platform, we had no control over the time a participant spent looking at an image, which might have influenced how they perceived the midlines.

CONCLUSION

The impact of nasal deviation on the perception of upper dental midline was evident in both groups without any significant difference (except Image 2) between orthodontic practitioners and general dentists. No significant difference in the perception of male and female participants was observed. Nasal deviation can impact the perceived harmony of facial features. Achieving a balance between the nose, dental midline, and other facial structures is essential for creating an aesthetically pleasing appearance.

AUTHORS' CONTRIBUTION

- **Ittrat Haider**: Concept and Study design, Data collection, Manuscript writing.
- **Mehwish Shaheed**: Research supervisor.
- **Yusra Shaukat**: Manuscript drafting, manuscript writing, Critical revision.
- **Wardah Tahir**: Pictures morphing and Data collection.
- **Hafiz Muhammad Talha Arshad**: Data analysis.
- **Kausar Ilyas**: Final editing and Revision.

CONFLICT OF INTEREST

Declared none.

ACKNOWLEDGEMENTS

I am highly thankful to Dr. Abia Ali Cheema for being the subject of our study.

REFERENCES

[1] O Ibáñez-Berganza M, Amico A, Loreto V. Subjectivity and complexity of facial attractiveness. Sci Rep 2019; 9(1): 8364.

[2] Tsikandilakis M, Bali P, Chapman P. Beauty is in the eye of the beholder: The appraisal of facial attractiveness and its relation to conscious awareness. Perception 2019; 48(1): 72-92.

[3] Devgan L, Singh P, Durairaj K. Minimally invasive facial cosmetic procedures. Otolaryngol Clin North Am 2019; 52(3): 443-59.

[4] Silva BP, Mahn E, Stanley K, Coachman C. The facial flow concept: An organic orofacial analysis the vertical component. J Prosthet Dent 2019; 121(2): 189-94.

[5] Koseoglu M, Bayindir F. Effect of variations in facial flow curves on the perceptions of smile esthetics by laypeople. J Prosthet Dent 2023; 129(3): 486-94.

[6] Khan M, Kazmi S. Coincidence of dental midline with facial midline in a sample of pakistani population. J Coll Physicians Surg Pak 2019; 29(3): 210-3.

[7] Farahani A, Jafari K, Hemmati A, Nagizadeh A, Nemati R, Farahani MH. Assessment of the relationship between facial and dental midlines with anatomical landmarks of the face and oral cavity. Turk J Orthod 2019; 32(4): 200-6.

[8] Faiz N, Jessy P, Nasim I, Maiti S. Evaluation of coincidence between facial and dental midlines in relation to esthetics-a retrospective study. Int J Dent Oral Sci 2020; 7(12): 1216-21.

[9] Coachman C, Blatz MB, Bohner L, Sesma N. Dental software classification and dento-facial interdisciplinary planning platform. J Esthet Restor Dent 2021; 33(1): 99-106.

[10] Niraula N, Acharya R, Humagain M, Khurshid Z, Adanir N, Rokaya D. Dental-facial midline: An esthetic based classification. Open Dent J 2021; 15: 405-9.

[11] Musa M, Awad R, Mohammed A, *et al*. Effect of the ethnic, profession, gender, and social background on the perception of upper dental midline deviations in smile esthetics by Chinese and Black raters. BMC Oral Health 2023; 23(1): 214.

[12] sa de Lira A de L, de Carvalho Araujo ÍI, de Carvalho II. The midline from the perspective of the layperson and dental surgeon. Arq Em Odontol 2021; 57: 132-40.

[13] Grimes K, Fleming PS, Sharma PK. The influence of nasal deviation on the perception of maxillary dental centreline and smile aesthetics. J Orthod 2023; 50(1): 18-27.

[14] Geevarghese A, Baskaradoss J, Alsalem M, *et al*. Perception of general dentists and laypersons towards altered smile aesthetics. J Orthod Sci 2019; 8(1): 14.

[15] Rezaei N, Abbasi H, Khaksar A, Golshah A. Effects of deviations in the nose and chin prominence on facial attractiveness. J Orthod 2021; 48(2): 135-43.

[16] Silva BP, Jiménez-Castellanos E, Stanley K, Mahn E, Coachman C, Finkel S. Layperson's perception of axial midline angulation in asymmetric faces. J Esthet Restor Dent 2018; 30(2): 119-25.

[17] Martins JM, Costa LG, Carvalho AL, *et al*. The impact of dental midline on asymmetric faces: Perspective of laypersons and dentists. IJERPH 2021; 18(24): 12904.

[18] Tanbakuchi B, Arab S, Niaki EA, Imani MM, Valizadeh S, Shamshiri AR. The effect of linear and angular midline deviation on smile attractiveness regarding facial height. J Dent Mater Tech 2021; 10(3): 153-63.

[19] Singh S, Singla L, Anand T. Esthetic considerations in orthodontics: An overview. Dent J Adv Stud 2021; 9(02): 55-60.

[20] Laviana A, Yh ID, Sayuti E, Mardiati E, Noviaranny IY. Differences in the visual perception of the upper dental midline deviation between orthodontically completely treated and untreated patients. Padjadjaran J Dent 2023; 35(1): 63-9.

[21] Grimes K, Fleming PS, Sharma PK. The influence of nasal deviation on the perception of maxillary dental centreline and smile aesthetics. J Orthod 2023; 50(1): 18-27.

[22] Aşik S, Kök H. Perception of dental midline deviation and smile attractiveness by eye-tracking and aesthetic ratings. Australas Orthod J 2021; 37(2): 187-96.

[23] Martins JM, Costa LG, Carvalho AL, *et al*. The impact of dental midline on asymmetric faces: Perspective of laypersons and dentists. Int J Environ Res Public Health 2021; 18(24): 12904.

[24] Jama FDA, Baloch AJ, Shaikh AG, Bari A, Shaikh I, Lal R. Comparison of smile perception by orthodontists and other specialty dentists. Pak Orthod J 2019; 11(2): 66-70.

[25] Mittal T, Singh H, Kapoor P, Sharma P. Dental midline correction using a cantilever spring: A novel approach. Int J Orthod Rehabil 2020; 11(3): 145.

[26] Duggal I, Talwar A, Duggal R, Chaudhari PK, Samrit V. Comparative evaluation of nasolabial appearance of unilateral cleft lip and palate patients by professional, patient and layperson using 2 aesthetic scoring systems: A cross sectional study. Orthod Craniofac Res 2023; 26(4): 660-6.

Received: January 11, 2024 Revised: June 19, 2024 Accepted: June 20, 2024