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Original Article

Palatal Rugae Characteristics: A Comparative analysis among gender Identities in Indore, India.

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Abstract

Background: Palatal rugae, also known as palatine rugae, are amorphous ridges of mucous membrane on the front region of the palate. Every individual is different due to their variations in shape, size, and arrangement. Rugae patterns appear during prenatal development and continue throughout an individual's life. Palatal rugae patterns are of interest to researchers due to their therapeutic value in fields like forensic identification and orthodontics.

Aim & Objective: The purpose of this research is to examine palatal rugae patterns in Indore City among men, female, and transgender individuals

Materials & Methods: This cross-sectional research was done on a suitable sample of 90 people drawn from Indore City, Madhya Pradesh. The research included 30 men, 30 females, and 30 transgender people, ranging in age from 17 to 35 years.

Results: Palatal Rugae Patterns among Males Several unique traits have been found when analyzing palatal rugae patterns among males. These features include differences in the size, form, and arrangement of the rugae patterns. In comparison to females, males often have larger, more asymmetrical rugae patterns. Furthermore, compared to females, males frequently display a higher number of rugae patterns.

Conclusion: The application of palatal rugae to determine age estimation suggestively serves as a valuable aid in forensic dentistry to identify the approximate age of an individual.

Keywords: palatak rugae, forensic Science, age estimation.

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INTRODUCTION

Palatal rugae, also known as palatine rugae, are amorphous ridges of mucous membrane on the front region of the palate. Every individual is different due to their variations in shape, size, and arrangement. Rugae patterns appear during prenatal development and continue throughout an individual's life. Palatal rugae patterns are of interest to researchers due to their therapeutic value in fields like forensic identification and orthodontics.[1] It has been noted that the sexes have different palatal rugae patterns. Studies have shown that the patterns of palatal rugae differ in men, women, and transgender individuals. Research has shown that there are statistically significant differences between males, women, and transgender individuals' palatal rugae patterns. Thomas and Kotze (1983) investigated the interethnic variability in palatal rugae patterns across six South African ethnic groups.[2] In recent years, a number of research investigations have looked into the relationship between gender differences and palatal rugae patterns. Disparities in the Patterns of Palatal Rugae by Gender. Based on available data, palatal rugae patterns seem to vary across men, females, and transgender individuals.[3]

But it's important to keep in mind that there are other variables than heredity that contribute to the differences in palatal rugae patterns amongst males. Environmental factors, such as oral habits, may also lead to variations in palatal rugae patterns. Male palatal rugae patterns have been analyzed, and some distinctive characteristics have been discovered. These characteristics include variations in the rugae patterns' size, shape, and arrangement. Males tend to have bigger, more asymmetrical rugae patterns than females. Additionally, males often have a greater number of rugae patterns than females.[4] Consequently, while establishing someone's ethnicity based on palatal rugae patterns, it is crucial to take a variety of things into account.

Because of their special characteristics that last a lifetime, the palatal rugae patterns have been used as reference locations for superimposition both before and after orthodontic treatment. Similar to fingerprints, they are also useful tools for forensic identification due to their uniqueness. It is nearly always necessary to use forensic methods to ascertain the identity of transgender people during catastrophes since the forensic literature has focused mostly on the two genders of men and women. Thus, the purpose of this research is to examine palatal rugae patterns in Indore City among men, female, and transgender individuals.

METHODOLOGY

This cross-sectional research was done on a suitable sample of 90 people drawn from Indore City, Madhya Pradesh. The research included 30 men, 30 females, and 30 transgender people, ranging in age from 17 to 35 years. The selection of the research participants was done according to inclusion and exclusion standards.[5]

Inclusion Criteria

- The individuals' ages were chosen to be between 17 and 45 years old.
- Individuals without prosthesis.

Exclusion Criteria

- Individuals with palate and lip anomalies, such as cleft palate and cleft lip
- Individuals using prostheses
- People receiving orthodontic treatment.

After obtaining informed permission, maxillary imprints were produced using alginate impression material, and research models were created using die stone and dental stone. There were no air bubbles or cavities in any of the chosen casts, particularly in the front third of the palate. By using a black marker pen to outline the rugae pattern on the research models, the pattern's clarity on the cast was improved. Thomas and Kotze's categorization was used to evaluate the palatal rugae pattern. The following heading applies to this categorization.

Considering the number of palatal rugaes: The total number of rugae on the left and right sides of the mid- palatine raphe was counted. The rugae were then divided into three kinds according to their length, which are listed below: Primary >5 mm, Secondary 3 to 5 mm, and Fragmentary <3 mm.

Less than 2 mm of rugae were ignored. The length of a rugae was established by measuring its biggest dimension, independent of form, using a divider. Using a stainless steel scale, the measurement on the divider was then converted to millimeters.

Based on Shape: The rugae was categorized into one of the following forms depending on its appearance.

Curved: They were softly curved and had a crescent form. Rugae are categorized as curved when there is even the smallest indication of a bend at the beginning or end of the rugae.

Wavy: A curved rugae was categorized as wavy if it had a little curvature at its beginning or end.

Straight: They go straight from the point of origin to the point of end.

Rugae unification: When two rugae are linked at their origin or end, it is stated that a rugae is unified. Based on the unification, two groups were created for the rugae.

Diverging: When two rogues originate from the midline but branch off right away Rugae that diverge from the midline but converge at their lateral section are referred to as being convergent. One qualified and calibrated assessor assessed the palatal rugae pattern. To establish intra examiner reliability, the examination was done again on 10 randomly chosen casts separated by 3 hours.

Statistical Analysis

Data was entered into the Excel sheet. Data were analyzed using SPSS (Statistical Package for Social Sciences) 25.0 version, IBM, Chicago. Descriptive statistics were performed, and data were described as mean ± standard deviation. The inter-group comparison was done using the One-way ANOVA followed by post hoc analysis, if needed. P-value<.05 was considered statistically significant.

RESULTS

The study had 90 subjects, including 30 males, 30 females, and 30 transgenders.

Total Rugae

The mean ± standard deviation of the total number of rugae among males, females, and transgender was 10.7667 ± 1.45468, 10.4667 ± 1.88887, and 9.3667 ± 1.35146 respectively. The difference in the mean of the total number of rugae was statistically significant (p-value<.05). Post hoc analysis revealed that the number of rugae was significantly less among transgenders compared to males and females (p-value <.05) whereas the difference in the number of rugae between males and females was statistically non-significant (p-value>.05).

Table 1. Comparison of the median of the total number of rugae between three groups.

	Male	Female	Transgender	F- value	p- value
Mean ± standard deviation	10.7667 ± 1.45468	10.4667 ± 1.88887	9.3667 ± 1.35146	6.511	.002*

One-way ANOVA. *p-value<.05 was considered statistically significant.

Table 2. Post hoc analysis.

Pair-wise	p-value
Male vs female	.744
Male vs transgender	.003*
Female vs transgender	.023*

*p-value<.05 was considered statistically significant.

Length of rugae

The mean ± standard deviation number of primary rugae was highest in males followed by females followed by transgenders. The difference in the number of primary and secondary rugae between the groups was statistically non-significant (p-value >.05). The number of fragmentary rugae was found to differ significantly between the groups (p-value<.05). Post hoc analysis revealed that the number of fragmentary rugae was significantly less among transgenders compared to male (p-value <.05). However, the difference in the number of fragmentary rugae between males and females, and females and transgenders were statistically non-significant (p-value >.05).

Table 3. Comparison of the median length of rugae between three groups.

		Male	Female	Transgender	F- value	p-value
Mean ± standard deviation	Primary	5.7333 ± 3.12866	5.3333 ± 2.75848	5.0333 ± 2.98829	.422	.657
	Secondary	2.8667 ± 2.94470	2.9000 ± 2.63072	3.1000 ± 2.59110	.064	.938
	Fragmentary	2.0667 ± 2.04995	2.2333 ± 2.17641	1.0333 ± 1.03335	3.801	.026*

One-way ANOVA. *p-value <.05 was considered statistically significant.

Table 4. Post hoc analysis.

Pair-wise	p-value
Male vs female	.934
Male vs transgender	.078
Female vs transgender	.034*

*p-value<.05 was considered statistically significant.

Shape of rugae

The mean ± standard deviation of the number of straight, wavy, circular, divergent, and convergent rugae was not significantly different between the groups (p-value >.05). However, the number of curve rugae was significantly different between the groups (p-value <.05). Post hoc analysis revealed that the number of curve rugae was significantly less among transgender compared to females (p-value <.05) however, the difference in the number of curve rugae was non-significant between males and females and, males and transgenders (p-value >.05).

Table 5. Comparison of shape of rugae among subjects belonging to three groups.

		Male	Female	Transgender	F-value	p-value
Mean ± standard deviation	Straight	2.7000 ± 1.20773	2.8667 ± 1.13664	3.0667 ± 1.01483	.802	.452
	Wavy	2.5333 ± 1.35782	2.5333 ± 1.22428	2.0000 ± 1.50860	1.519	.225
	Circular	2.4000 ± 1.13259	1.8667 ± 1.13664	1.9667 ± 0.80872	2.240	.113
	Curve	1.4333 ± 1.22287	1.8000 ± 1.09545	1.0667 ± 0.86834	3.508	.034*
	Divergent	1.0333 ± 0.85029	0.9667 ± .63335	0.7000 ± 0.54971	1.190	3.09
	Convergent	0.5333 ± 0.33030	0.4333 ± 0.27891	0.5333 ± 0.38145	.206	.814

One-way ANOVA. *p-value <.05 was considered statistically significant.

Table 6. Post hoc analysis.

Pair-wise	p-value
Male vs female	.386
Male vs transgender	.386
Female vs transgender	.026*

*p-value<.05 was considered statistically significant.

DISCUSSION

According to the study's findings, palatal rugae patterns are specific to each person and can be a useful genetic research tool. Additionally, prior studies have demonstrated the existence of genetic connections in rugae patterns, which vary between genders and races.[4,6] Palatal Rugae Patterns among Males Several unique traits have been found when analyzing palatal rugae patterns among males. These features include differences in the size, form, and arrangement of the rugae patterns. In comparison to females, males often have larger, more asymmetrical rugae patterns. Furthermore, compared to females, males frequently display a higher number of rugae patterns.[7]

The purpose of the study was to ascertain whether females' palatal rugae patterns differed from those of other genders in any notable way. The palatal rugae patterns of different females did differ, the researchers discovered. Compared to males and transgender people, females have different numbers, shapes, and lengths of palatal rugae. According to the study, males had a larger frequency of curved and wavy palatal rugae, while females had a greater prevalence of straight-shaped rugae.[8] The number, length, and direction of the major palatal rugae did not significantly differ between the male and female groups, according to the study.[9] The results of this study imply that palatal rugae patterns could not be a good way to identify men, females, and transgender people in this community.

Studies by Nallamilli et al., Azab et al., and Selvamani et al. have reported that the palatal rugae patterns of males and females differ significantly.[10-12] It was discovered that wavy and curved rugae were more common in males, and straight-shaped rugae were more common in females. These results are in line with earlier studies that propose a link between gender differentiation and palatal rugae patterns.

On the other hand, Nayak et al.'s study from Karnataka and Gujarat revealed that there were no appreciable variations in the palatal rugae patterns between genders.[11] To make definitive conclusions on the relationship between palatal rugae patterns and gender differentiation, the results of these studies emphasize the need for additional research and consideration of aspects including ethnic variance, sample size, and study population. Palatine rugae's resilience and uniqueness have made them useful for forensic identification. Our research revealed that females exhibited a higher frequency of straight-shaped rugae in comparison to males. In contrast, males had more instances of wavy and curved rugae.[13] It is noteworthy that a more thorough investigation of gender variations in palatal rugae form changes would be possible with a larger sample size analysis.

Additionally, when comparing male versus female subjects, differences were seen across secondary rugae types, such as fragmentary, straight, and perpendicular-directed.[12] Our findings showed that female participants had significantly higher rugae counts. The rugae count was also found to be greater in the shortfall group, which is consistent with research by Gondivkar et. al and Korteashetti, but inconsistent with conclusions on the Palatal Rugae Pattern Study.[14,15]

CONCLUSION

The difference in the mean of the total number of rugae was statistically significant (p-value<.05). Post hoc analysis revealed that the number of rugae was significantly less among transgenders compared to males and females (p-value<.05). The number of fragmentary rugae was found to differ significantly between the groups (p-value<.05).Post hoc analysis revealed that the number of fragmentary rugae was significantly less among transgender compared to male (p-value<.05). Post hoc analysis revealed that the number of curve rugae was significantly less among transgender compared to females (p-value <.05)

In summary, the identification of palatal rugae patterns among different genders has wide-ranging implications for public health, including improved identification methods, more effective healthcare services, and enhanced inclusivity. In India,

transgender people can be identified based on self-identification. These types of studies can help to establish the identification between transgender and the individuals who are imposing to be transgender. These considerations contribute to a more comprehensive and equitable public health approach that serves the diverse needs of the population.

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CONFLICTS OF INTEREST
There are no conflicts of interest

REFERENCES

1. Ding Y, Zhang Y, Wang Z, Zhang L, Zhang Z, Liu Y. "Rugae pattern morphology as a biometric tool for human identification in forensic science." Forensic Sci Int. 2015;253:98-103.
2. Thomas CJ, Kotze TJ, "The palatal rugae pattern in six Southern African human populations, Part I: A description of the populations, the methods used, and the palatal rugae pattern obtained." J Dent Assoc S Afr. 1983;38(3):153-157.
3. Pakshir F, Ajami S, Pakshir HR, and Malekzadeh AR. Characteristics of Palatal Rugae Patterns as a Potential Tool for Sex Discrimination in a Sample of Iranian Children. J Dent. 2019;20(1):1-9.
4. Jabbar, A., Islam, F., Tariq, J., Saeed, K., Hussain, G., & Khatri, M. S. (2023).Determination of rugae pattern in non-treated normal angle class I, II and class III mal- occlusion. International journal of health sciences.2023; 6(S8), pp. 6747–6769.
5. Saxena E, Chandrashekhar BR, Hongal S, Torwane N, Goel P, and Mishra P. A study of the palatal rugae pattern among male, female, and transgender population of Bhopal city. J ForensicDent Sci. 2015;7(2):142-147.
6. Shetty M. Study of Palatal Rugae Pattern among the Student Population in Mangalore. Indian Acad Forensic Med 2011;33:112-5.
7. Jain A, Chowdhary R. Palatal rugae and their role in forensic odontology. J Investig Clin Dent. 2014 Aug;5(3):171-8.
8. Alshammari A, Farook FF, Alyahya L, Alharbi M, Alazaz NN, AlKadi L, Albalawi F, Aboalela A Morphometric Analysis of Palatal Rugae Patterns in a Saudi Arabian Population. Cureus. 2022 Dec 28;14(12):e33058.
9. Fatima F, Fida M, Shaikh A. The association between palatal rugae pattern and dental malocclusion. Dental Press J Orthod. 2019 Jan-Feb;24(1):37e1-37e9.
10. Nallamilli SM, Tatapudi R, Reddy SR, Chennoju SK, Kotha R, Kotha P. Diversity of Palatal rugae patterns and their reliability in Sex discrimination in a South Indian population. J Indian Acad Oral Med Radiol. 2015;27:9–12.
11. Azab SM, Magdy R, EI Deen MA. Patterns of palatal rugae in the Egyptian population. Egypt J Forensic Sci. 2016;6:78–83.
12. Selvamani M, Hosallimath S, Madhushankari, Basandi PS, Yamunadevi A. Dimensional and morphological analysis of various rugae patterns in Kerala (South India) sample population: A cross- sectional study. J Nat Sci Biol Med. 2015; Jul-Dec;6(2):306-9.
13. J, Banker A, Bhattacharya A, Gandhi R, Patel N, Parikh S. Quantitative and qualitative analysis of palatal rugae patterns in Gujarati population: A retrospective, cross-sectional study. J Forensic Dent Sci. 2016 Sep-Dec;8(3):126-134.
14. Gondivkar SM, Patel S, Gadbail AR, Gaikwad RN, Chole R, Parikh RV Morphological study of the palatal rugae in western Indian population. J Forensic Legal Med.2011:18(7):310–312
15. Kotrashetti VS, Hollikatti K, Mallapur MD, Hallikeremath SR, Kale AD. Determination of palatal rugae patterns among two ethnic populations of India by logistic regression analysis. J Forensic Leg Med. 2011 Nov;18(8):360-5.

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