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JCHR (2024) 14(1), 3034-3038 | ISSN:2251-6727



Skeletal Malocclusion and Cheiloscopic Pattern in Odisha Population

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(Received: 27 October 2023 Revised: 22 November Accepted: 26 December)

KEYWORDS skeletal malocclusion, lip pattern, cheiloscopy, lip prints, malocclusion	ABSTRACT: Background: Among the essential diagnostic aids in orthodontics, cheiloscopic analysis is a major soft tissue analysis. Keeping this in mind, the present study was designed to establish any association between the different lip patterns and types of skeletal malocclusions.				
	Materials and methods: Around 235 study subjects aged between 18-25years were selected randomly from the out patient department records of orthodontics department. The type of skeletal malocclusion (class I, class II div 1, class II div 2, class III) was recorded for every subject based on ANB angle and W angle. This was followed by application of red lipstick and cellophane adhesive tape over the lips to record the individual lip pattern. Chi-square test was considered for test of significance (p<0.05).				
	Results: Branched lip pattern showed highest prevalence in both skeletal class I and class II div 1 and div 2 malocclusion. While vertical lip pattern was recorded highest in class III subjects. This association was found to be statistically significant with p<0.001.				
	Conclusion: The study reflects that the lip patterns are definite indicators of skeletal malocclusion.				

INTRODUCTION

Fingerprints and lip prints are used as evidence in forensic dentistry. Lip prints consists of normal lines and fissures, numerous wrinkles and grooves present between the inner labial mucosa and outer skin. Lip prints stay similar throughout the life and remain uninfluenced by environmental changes or any injuries¹. It remains unaltered from sixth week of intrauterine life till death. Thus making it possible for identification of any individual based on characteristic of their arrangement of grooves. The term "Cheiloscopy" is defined as the study of lip prints or patterns². Various oral conditions like malocclusion, periodontal diseases, cleft lip and palate and pre malignant lesions are widely associated with lip print patterns and also included in many studies ³. The Klein's zone on the lips is the minimal area which is covered with wrinkles and grooves that form the characteristics in lip prints and patterns⁴.

Tsuchihashi,1970 is as follows⁴ a) Type I: Vertical groove across lips
b) Type I': Partial vertical groove pattern
c) Type II: Branched

- d) Type III: Intersected pattern
- e) Type IV: Reticular pattern
- f) Type V: Other lip patterns

Several research studies had established that lip prints can be used as evidence in personal identification and criminal investigation in forensic dentistry. In contemporary orthodontics, an arena of vast research has been opened up after establishment of relationship between types of skeletal malocclusion and soft tissue morphology ⁵. The lip prints shows strong hereditary pattern and are unique to an individual just like the fingerprints⁹. Lip prints can be recorded using various methods like the lipstick-paper-

There are various classifications of lip print patterns.

One of them as described by Suzuki and

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JCHR (2024) 14(1), 3034-3038 | ISSN:2251-6727



cardboard method, photography, lipstick-paper method, lipstick-cellophane method, or using dental impression materials to make three-dimensional casts of the lips.

Riedel 1952 proposed ANB, which is the angular measurement for evaluating the antero- posterior relationship of maxilla to mandible⁶. Any sagittal discrepancy between maxilla and mandible is defined by the ANB angle. ANB angle between 0 and 4° is considered as 'skeletal class I' jaw relation while an ANB angle >4° is considered as 'skeletal class II' while an ANB angle <0° is considered as skeletal class II' sagittal jaw relation⁶.

Recently another important sagittal skeletal discrepancy indicator – *W*-angle was introduced. It uses 3 skeletal landmarks-Point S, Point M and Point G, present on the cranial base, mid- point of maxillary alveolus and mid-point of mandibular alveolus respectively. W-angle between 51-56° have a Class-I skeletal pattern. W-angle less than 51° have a Class-II skeletal pattern and W-angle more than 56° have a Class-III skeletal pattern⁸.

Our literature search revealed that there was a lack of evidence on the relationship between lip prints and skeletal malocclusion in the Odisha population. Hence the current study was conducted with the objective of finding the association of types of skeletal malocclusion (class I, II, III) with the lip print patterns in the orthodontic patients in Bhubaneswar, Odisha.

MATERIALS AND METHODS

A cross-sectional study was conducted among the orthodontic patients with an age range of 18–25 years who reported to the Department of Orthodontics, Hitech dental college & hospital, Bhubaneswar. Those participants who had a complete set of tooth (including and excluding 3rd molar) and gave their informed consent for participation were included in the study. While participants with systemic disease, those undergone extractions, growth abnormalities, lip lesions or congenitally missing tooth or congenital facial defect were excluded.

A sample size of 235 was selected from the OPD record of past one year. The participants were randomly selected from the OPD record using table of random numbers. The patients were then asked to visit the department during the month August-November, 2021 for participating in the study. After the assessment of lateral cephalograms, based on the ANB & w- angle the participants were classified as having skeletal class I, II, III jaw relations.

Figure 1 & 2 depict the tracing and construction of landmarks & lines for analysis of ANB angle and W-angle respectively.



Figure 1: cephalometric tracing: Lines are constructed to analyse *ANB angle*



Figure 2: Cephalometric tracing: Lines are constructed to analyse *w-angle*

The ethical clearance was obtained from the Institutional review board on 14.07.2021. Informed consent was taken from all the participants and the study protocol was explained clearly prior to study being conducted. Lip prints were recorded using the lip print cellophane technique which provides a good clarity and accuracy⁷. The participants were applied red coloured lipstick using a lip brush. This was followed by application of a cellophane adhesive tape over the lips. The tape was then stuck on a white sheet and lip prints were analyzed by using a magnifying lens.



Figure 3: Record of Lip print on a Cellophane paper of class I, class II and class III

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JCHR (2024) 14(1), 3034-3038 | ISSN:2251-6727



STATISTICAL ANALYSIS

The data collected was entered into Microsoft Excel data sheet and analyzed using Statistical Package for Social Sciences (SPSS, IBM Version 20.0). Chi square test was used for statistical analysis. The confidence interval and P value were set at 95% and ≤ 0.05 respectively.

RESULTS

In the present study, majority of the participants had class I skeletal malocclusion (41%) in comparison to other types [Table I].

 Table I: Prevalence of types of skeletal malocclusion

 in the study population

Types of Skeletal malocclusion	n (%)
Class I	96 (41)
Class II div 1	38 (16)
Class II div 2	44 (18.6)
Class III	60 (25.4)
Total (n)	235

Among the lip patterns, branched lip pattern was

observed in most of the participants while lowest prevalence was observed in undermined lip pattern [Graph1].



Graph 1: Prevalence of types of lip pattern in percentage.

Branched grooves were reported highest in class I, class II div 1 and div2 skeletal malocclusion while vertical grooves were reported highest in class III skeletal malocclusion and this association was found to be highly significant (p<0.001) [Table II].

Table II:	: Compari	ison of the	types of	skeletal malocclusion	with the	various type	es of lip patterns.
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	Vertical	Branched	Intersecting	Reticular	Undermined	
Types of Skeletal	grooves	grooves	grooves	grooves	grooves	Р
malocclusion	n (%)	n (%)	n (%)	n (%)	n (%)	value
Class I	10 (10.4)	52 (54.2)	25 (26.1)	8 (8.3)	1 (1)	
Class II div 1	2 (5.5)	20 (54.1)	8 (22)	6 (16.2)	1 (3)	
Class II div 2	5 (12)	21 (50)	12 (28.6)	4 (9.4)	0 (0)	
Class III	30 (50)	25 (41.8)	4 (6.6)	1 (1.6)	0 (0)	0.001*

(*) – statistically significant difference (chi-square test)

DISCUSSION

The study of lip patterns gained popularity in forensic medicines for personal identification. During 24th week of intrauterine life, lip alveolus and palate start to develop at the same time, from same embryonic origin¹. It is possible for any change during development of a particular structure to affect the other structures along with it. Therefore the development changes in alveolus, also affects the cheiloscopy pattern. The foundation of studies on analyzing the relationship between skeletal malocclusion and cheiloscopy pattern was based on this fact.

Highest prevalence of branched (forked) lip pattern (50%) was reported in the present study, followed by intersected (21%), vertical (20%), reticular (8%) and undermined (1%). Similar results were observed in the study by Kaushal et al ¹¹(2018) were branched lip pattern showed highest prevalence (30%). Branched lip pattern was also found to be prevalent in the study by Pandey et al¹² (2020) as well as in the North Indian population^{12,13}. Undermined pattern was reported to be

least prevalent (<3%) in other studies by Raghav et al⁷ (2013), Kaushal et al¹¹ (2018) and were not found at all by Pandey et al¹² (2020) and Aditi et al¹ (2019). Vertical lip pattern was reported highest by Ize et al (2017) and Parikh et al (2019) ^{15,16}. Tsuchihashi¹⁷ (1974) declared intersected lip pattern to be the most frequent in Japanese population while Verghese et al¹⁸ (2010) reported reticular grooves as highly prevalent in Kerala population . This difference in types of lip pattern among various study populations in India could be reasoned due to regional variation and this could be used for identification of ethnicity.

In the current study, branched groove pattern was highly associated with skeletal class I and class II div 1 and div 2 malocclusion while vertical groove pattern with skeletal class III malocclusion (p<0.01). Branched groove pattern was also found to be most prevalent in class I malocclusion followed by reticular groove pattern as reported by Raghav et al⁷ (2013) and Sujatha et al¹⁹ (2017). Our study findings were similar with the ones by Aditi et al¹ (2019), Raghav et al⁷ (2013) and Pal et al¹⁶ (2018) where vertical lip pattern was

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JCHR (2024) 14(1), 3034-3038 | ISSN:2251-6727



reported highest in class III malocclusion (p<0.005). Branched grooves were also reported highest in skeletal class II malocclusion by Raghav et al⁷ (2013) and Allani et al²¹ (2019). While in our study skeletal class II malocclusion was divided into two subtypes div 1 and div 2, where branched grooves were reported highest in both divisions followed by intersecting grooves.

The strength of the study is it being the first research on relationship between cheiloscopy and skeletal malocclusion in Odisha population. Randomization of the participants using table of random numbers helped in equal chance of selection of subjects and bias elimination. The limitation of the study could be the generalizability for which further studies are indicated in a much wider population.

Further research among various population groups is necessary for the establishment of the varying distribution of lip print patterns. Comprehensive databases should be maintained for comparison of individual lip patterns. Focus should also be on training of forensic personnel in collection and identification of lip prints. The method of collecting lip prints from individuals needs to be standardized for minimizing degree of variation using different methods. This could also aid in creating reliable software for lip print identification.

CONCLUSION

The present study findings reflect us that in the eastern zone population, branched lip pattern was highly prevalent in skeletal class I, class II div 1 and div 2 malocclusions while vertical lip pattern was highly prevalent in class III skeletal malocclusion. A strong association was observed between cheiloscopy and skeletal malocclusion indicating cheiloscopy to be definitepredictor of malocclusion.

Conflicts of interest

None

Funding

None

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