

■ ORIGINAL ARTICLE

# Correlation between Lip Print and Skeletal Malocclusion

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## ABSTRACT

### INTRODUCTION:

Lip prints, like fingerprints, are unique to each person and are simple to record. Cheiloscopy analysis has been demonstrated to be effective in both judging deformity and identifying individuals. Many studies have been conducted on lip prints and its relationship with individual's skeletal pattern.

**Aim:** The goal of this study was to see if there was a link between lip print and skeletal malocclusion, as well as how reliable it was as a forensic tool for identifying people.

**MATERIAL & METHOD:** Lip prints were collected from 180 people, 60 of whom were from Kerala, 60 from Karnataka, and 60 from Kodagu, regardless of their dental class I, class II, or class III malocclusion. Lip prints were captured using the lipstick cellophane method and categorised using Tsuchihashi's categorization system: Type I, Type I', Type II, Type III, Type IV, Type V.

**RESULTS:** We have noticed that the most common lip pattern among Karnataka and Coorg Population was type II and in Kerala population was type I.

**CONCLUSION:** We conclude our research by stating that lip prints are a useful and important diagnostic tool for identifying individuals of various ethnic backgrounds, and that there is a strong correlation between skeletal growth patterns of various ethnicities and their lip patterns.

**KEYWORDS** | Cheiloscopy; Lip prints; Skeletal malocclusion; Forensic tool

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## INTRODUCTION

Cheiloscopy comes from the Greek words "cheilos" (lips) and "skopein" (study). Individuals' fingerprints and palatal rugae are both unique, so is their lip print.<sup>1</sup> Individual lip print uniqueness also reveals a strong familial trend.

Skeletal malocclusion (Class I, Class II, and Class III) and soft tissue face morphology have

been the subject of extensive investigation.<sup>2</sup> Lip prints can be compared to oral clefts, individual periodontal conditions, malocclusion, and premalignant lesions.<sup>3</sup>

The purpose of this study was to examine if there was a link between different cheiloscopy patterns and the skeletal growth pattern in different ethnic backgrounds.

**MATERIALS AND METHODS**

The current study included 180 people aged 18 to 40 years old, divided into three groups: 60 people from Kodagu, 60 people from Karnataka, and 60 people from Kerala they are selected based on the clinical examination for skeletal growth pattern with 2 finger method (Fig 1).



**Fig. 1:** Clinical Examination for skeletal growth pattern

The lips of the participants were washed thoroughly and clinically examined for any malformations, scars, or anomalies. The examination focused on lips that were free of all these abnormalities. The many methods for recording lip prints include the lipstick paper cardboard method, photography, lipstick paper method, lipstick cellophane method, and employing dental impression materials to generate three dimensional casts of the lips. This study used the lipstick cellophane method, which produced good clarity and precision of the lip print.

**INCLUSION CRITERIA**

- Patients with skeletal patterns of class I, class II, and class III.
- Sixty individuals from Karnataka population, Sixty individuals from Kerala population and Sixty individuals from Kodagu population.

**EXCLUSION CRITERIA**

- Patients with cleft lip
- Deformities of lip
- Scar on lips

**MATERIALS USED IN THE STUDY**

- A. Bard-Parker knife (No. 15)
- B. Lipstick (ELLE 18 -Red spin)
- C. Ear buds
- D. Bond paper
- E. Magnifying lens
- F. Cello tape.
- G. Dappen dish
- H. Makeup remover (calorescence)

**METHODS TO RECORD LIP PRINT**

The participants were invited to sit in a relaxed position on a dentist chair, and their lips were cleansed with damp cotton. Then, using a bard parker knife, a quantity of red lipstick was cut and placed in the dappen dish, from which it was applied to the lips using ear buds. The participants were told to touch their lips together to spread the lipstick. The glued portion of the cellophane tape strip was placed over the lipstick, and a lip impression was made by dabbing it first in the centre and then uniformly pressing it towards the lips' corners. After the cellophane strip was glued to the white bond paper for permanent documentation, the lip impressions were examined with a magnifying lens. Every precaution was taken to avoid cross contamination. (Fig 2)



**Fig. 2:** A-Type I, B-Type II, C-Type III and D-Type IV.

**ANALYSIS OF LIP PRINT**

In the Department of Oral Pathology, the lip impressions were next seen using a magnifying lens. As proposed by Sivapathasundharam et al., the centre region of the lower lip, 10 mm wide, was used as the study area for classification.<sup>2</sup>

Many authors have classified the lip patterns, we have followed the most widely accepted and

used lip print pattern given by Tsuchihashi<sup>4</sup> where he has divided into 6 types according to the grooves:

- Type I – Complete vertical groove
- Type II – Partial vertical groove
- Type III – Branched groove
- Type III – Intersecting groove
- Type IV – Reticular groove
- Type V – Undetermined groove

**STATISTICAL ANALYSIS**

1. The data was collected, coded, and fed in SPSS (IBM version 23) for statistical analysis.
2. Descriptive statistics included frequency.
3. Inferential statistics included Chi square test to find out the association between the variables.
4. The level of significance was set < 0.05 at 95% confidence interval.

**RESULTS**

**Table 1:** Cheiloscopy pattern vs skeletal growth pattern of individual in Karnataka population

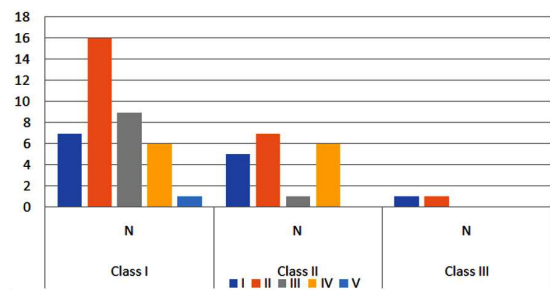
Cheiloscopy Pattern	Class I		Class II		Class III		P-Value
	N	%	N	%	N	%	
I	7	17.9	5	26.3	1	50.0	.570
II	16	41.0	7	36.8	1	50.0	
III	9	23.1	1	5.3	0	0	
IV	6	15.4	6	31.6	0	0	
V	1	2.6	0	0	0	0	

**INTERPRETATION**

Table 1 and Graph 1 shows the lip pattern correlation with skeletal relation in a Karnataka population.

1. In a Class I Skeletal growers type II lip pattern was predominant in 41.0% of total population, followed by type III in 23.1% and I lip patterns in 17.9% of population.
2. In a class II Skeletal growers, type II was predominant accounting for 36.8% followed by type IV in 31.6% and type I in 26.3% of population.

3. In a class III skeletal growers' type I and type II were seen equally.



**Graph 1:** Cheiloscopy pattern vs skeletal growth pattern of individual in Karnataka population.

**Table 2:** Cheiloscopy pattern vs skeletal growth pattern of individual in Coorg population.

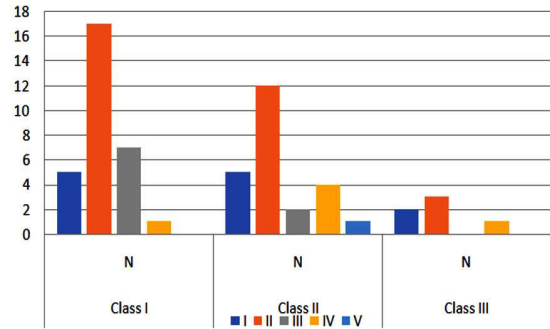
Cheiloscopy Pattern	Class I		Class II		Class III		P-Value
	N	%	N	%	N	%	
I	5	16.7	5	20.8	2	33.3	.433
II	17	56.7	12	50.0	3	50.0	
III	7	23.3	2	8.3	0	0	
IV	1	3.3	4	16.7	1	16.7	
V	0	0	1	4.2	0	0	

**INTERPRETATION**

Table 2 and Graph 2 shows the relationship between lip pattern and Skeletal growth pattern of individual in a Coorg population.

1. In a Class I skeletal growers type II lip pattern was predominant in 56.7% of the population, followed by type III lip pattern in 23.6% of population.
2. In a class II skeletal growers, the most common lip pattern was type II, which accounted for nearly 50.0% of population, followed by type I which accounted for 20.8% of population.
3. In a class III skeletal growers, type II lip

pattern in 50.0% of the total population followed by type I in 33.3% of the population.



**Graph 2:** Cheiloscopy pattern vs skeletal growth pattern of individual in Coorg population.

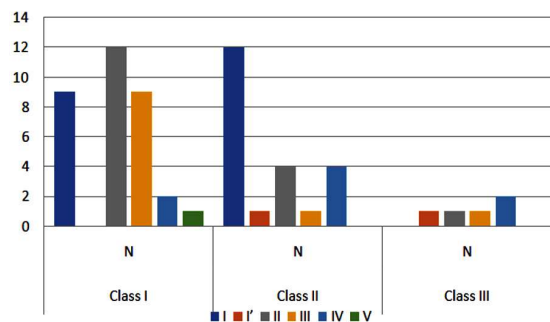
**Table 3:** Cheiloscopy pattern vs skeletal growth pattern of individual in Kerala population.

Cheiloscopy Pattern	Class I		Class II		Class III		P-Value
	N	%	N	%	N	%	
I	9	27.3	12	54.5	0	0	.024
II	0	0	1	4.5	1	20.0	
III	12	36.4	4	18.2	1	20.0	
IV	9	27.3	1	4.5	1	20.0	
V	2	6.1	4	18.2	2	40.0	
VI	1	3.0	0	0	0	0	

**INTERPRETATION**

Table 3 and Graph 3 shows the relationship between lip pattern and Skeletal growth pattern of individual in a Kerala population.

1. In a Class I skeletal growers type II lip pattern was predominant in 36.4% of the population, followed by type I and type III lip pattern in 27.3% of population.
2. In a class II skeletal growers, the most common lip pattern was type I, which accounted for nearly 54.5% of population, followed by type II and type IV in 18.2% of population respectively.
3. In a class III skeletal growers, type IV lip pattern was seen in 40.0% of population.



**Graph 3:** Cheiloscopy pattern vs skeletal growth pattern of individual in Kerala population

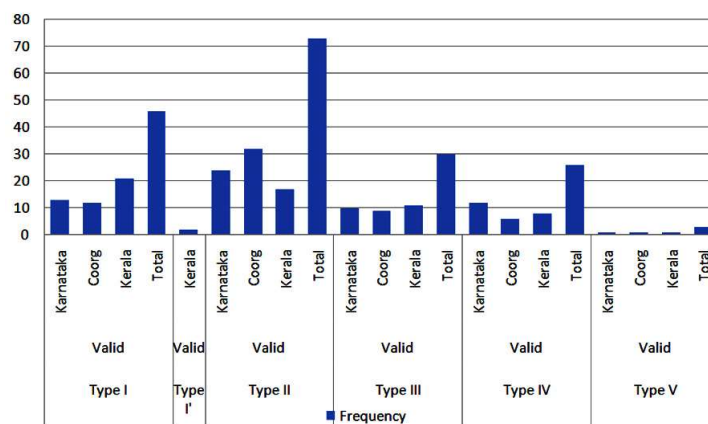
**Table 4:** Frequency of Lip pattern in all 3 populations irrespective of skeletal growing pattern of the individuals.

Lip_Pattern_Recoded	Place					
	Frequency	Percent	Valid Percent	Cumulative Percent		
Type I	Valid	Karnataka	13	28.3	28.3	28.3
		Coorg	12	26.1	26.1	54.3
		Kerala	21	45.7	45.7	100.0
		Total	46	100.0	100.0	
Type I'	Valid	Kerala	2	100.0	100.0	100.0
Type II	Valid	Karnataka	24	32.9	32.9	32.9
		Coorg	32	43.8	43.8	76.7
		Kerala	17	23.3	23.3	100.0
		Total	73	100.0	100.0	
Type III	Valid	Karnataka	10	33.3	33.3	33.3
		Coorg	9	30.0	30.0	63.3
		Kerala	11	36.7	36.7	100.0
		Total	30	100.0	100.0	
Type IV	Valid	Karnataka	12	46.2	46.2	46.2
		Coorg	6	23.1	23.1	69.2
		Kerala	8	30.8	30.8	100.0
		Total	26	100.0	100.0	
Type V	Valid	Karnataka	1	33.3	33.3	33.3
		Coorg	1	33.3	33.3	66.7
		Kerala	1	33.3	33.3	100.0
		Total	3	100.0	100.0	

**INTERPRETATION**

Table 4 and Graph 4 shows the frequency of lip pattern in all 3 populations irrespective of

skeletal growing pattern of the individuals - We have noticed that the most common lip pattern among Karnataka and Coorg Population was type II and in Kerala population was type I.

**Graph 4:** Frequency of Lip pattern in all 3 populations irrespective of skeletal growing pattern of the individuals

### DISCUSSION

Occlusion develops because of the interaction and synergistic impact of genetic and environmental factors. The impact of a given environmental influence on phenotypic varies based on genetic background, which in turn impacts facial and tooth appearance.<sup>5</sup> The lip, alveolus, and palate all develop fully during the first 6–12 weeks of pregnancy<sup>6</sup> or the 24th week of intrauterine life, and they all come from the same embryonic source.<sup>5</sup> It is well understood that any factor present now of genetic expression will have an impact on all structures forming at the time.

Any factor that has an impact on the development of one structure will eventually have an impact on the development of all the other structures that develop alongside it. As a result, there's a potential that alveolus-related developmental changes will show up in cheiloscopy patterns. The skeletal malocclusion was studied using several cheiloscopy patterns. Lip prints are one-of-a-kind, and the originality of patterns is determined by how the lip muscles relax to create a certain pattern.<sup>2</sup> As a result, they play a critical role in forensic identification.

Type III lip prints are more common in Japanese and Indo-Dravidian people but branching and type IV lip patterns are more prominent in North Indian and Malayalam populations.<sup>2,4</sup> This revealed that race or regional distribution could influence the pattern of lip prints.

Our findings contrast those of Vahanwalla and Parekh, who found a high prevalence of the type 1 lip pattern in the Mumbai community.<sup>7</sup>

Our findings contradict those of Verghese et al., who found that type IV lip pattern was the most common in the Kerala population.<sup>8</sup>

Our findings are consistent with those of Sivapathasundharam et al, who found that most Indo-Dravidians have a type II lip pattern.<sup>2</sup>

Our findings corroborate those of Kaushal et al., who found that the type II lip pattern was the most common (30%), while the type V lip pattern was the least common (10%).<sup>9</sup>

In his study, Raghav et al found that in

different skeletal malocclusions, type II was most prevalent in class I skeletal malocclusion subjects, which is similar to our findings in all three ethnic origins (Karnataka, Coorg, and Kerala), while class II subjects showed type II as the most prevalent type of lip print patterns,<sup>10</sup> which is similar to our findings in Karnataka and Coorg populations, but the most prevalent lip pattern noticed in Kerala population was type I.

The patients in our study were chosen based on clinical evaluation without considering the aetiology, such as hereditary or environmental factors. More research is needed to confirm the link between lip patterns and skeletal malocclusions in a larger sample of persons of various ethnicities, considering hereditary and environmental determinants of malocclusions. Each patient's lip print pattern or fingerprint pattern profiling can also be recorded and maintained in his personal database for identification purposes. Because our lip print pattern develops early in infancy, the type of malocclusion can be predicted in advance to ensure that preventive and interceptive orthodontic procedures are completed successfully.<sup>11</sup>

### CONCLUSION

A recent clinical investigation discovered a substantial link between an individual's skeletal pattern and their lip patterns.

The following are the study's principal findings:

1. Karnataka Population: In a Class I Skeletal growers and class II Skeletal growers type II lip pattern was predominant and, in a class III, skeletal growers' type I and type II were seen equally.
2. Coorg Population: Irrespective of the skeletal growth pattern all the individuals showed a type II lip pattern predominantly.
3. Kerala Population: In a Class I skeletal growers type II lip pattern was predominant, in a class II skeletal growers, the most common lip pattern was type I and, in a class III, skeletal growers, type IV lip pattern was seen predominantly.



Considering the above findings, we conclude our research by stating that lip prints are a useful and important diagnostic tool for identifying individuals of various ethnic backgrounds, and that there is a strong correlation between skeletal growth patterns of various ethnicities and their lip patterns.

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**Conflict of Interest:**

The author has made no acknowledgment in this article.

**Ethical Clearance:**

Taken from CIDS, Viraj pete

**Source of Funding:**

The author declares that this is a self-funded research project.

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