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Cheiloscopy And Its Patterns In Comparison With ABO Blood Groups

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Abstract

Cheiloscopy, the study of lip prints, has emerged as a valuable tool in forensic investigations due to its uniqueness and permanence, similar to fingerprints. This study aimed to analyze the distribution of different lip print patterns among individuals with various ABO and Rh blood groups and assess any potential correlation. A hospital-based cross-sectional study was conducted on 150 participants aged 18–45 years at Meenakshi Ammal Dental College, Chennai. Lip prints were collected using cellophane tape and classified based on Tsuchihashi's system. Blood group analysis was performed, and statistical analysis was conducted using the Chi-square test.

The results revealed that the most common blood group was O+ (38%), followed by B+ (29.3%) and A+ (18.6%). The most prevalent lip print pattern was Type I (Vertical, 31.3%), followed by Type II (Branched, 26%), and Type IV (Reticular, 16.7%). Statistical analysis showed no significant correlation between lip print patterns and ABO blood groups ($p = 0.145$). Additionally, no significant difference was observed in lip print distribution between males and females ($p = 0.629$).

These findings align with previous studies, suggesting that lip prints and blood groups are independent traits. While lip prints remain a valuable forensic tool for personal identification, their correlation with blood groups lacks statistical significance. Further research with larger sample sizes and genetic analysis is recommended to explore potential biological links.

Keywords: Cheiloscopy, lip prints, forensic science, ABO blood group, personal identification, genetic correlation, forensic anthropology.

Introduction

The field of forensic science has evolved significantly, incorporating various biometric markers for individual identification.1 One such lesser-known yet highly significant parameter is cheiloscopy, the study of lip prints. Just like fingerprints, lip prints exhibit unique patterns that remain unchanged throughout a person's life, making them a reliable tool in forensic investigations. Although widely underutilized, cheiloscopy has garnered attention for its potential applications in criminal identification, personal authentication, and genetic studies.2

Lip prints are characterized by distinct grooves and fissures that form unique patterns, classified into various types, such as vertical, branched, intersected, and reticular.3 These patterns are believed to have a genetic basis, making them an intriguing subject for scientific inquiry. The study of lip print patterns in correlation with other biological markers, such as the ABO blood group system, adds another dimension to forensic anthropology and genetics. The ABO blood group system, one of the most studied genetic markers in human populations, is governed by well-established inheritance patterns and has been linked to various physiological and pathological traits.4 Exploring the relationship between cheiloscopy and blood groups could unveil new insights into genetic predispositions and biological linkages.

A distinct association will establish a suspect profiling in forensic cases, particularly when conventional methods, such as DNA analysis or fingerprinting, are inconclusive.5 Furthermore, it could serve as an additional parameter in personal identification and even medical diagnostics, offering insights into hereditary traits and disease susceptibility.

This study stems from the growing necessity to identify reliable, non-invasive, and cost-effective

forensic markers like cheiloscopy, a non-destructive technique that requires minimal effort to obtain and analyze, making it a feasible addition to forensic casework. Moreover, since lip prints remain unchanged throughout life and are unique to each individual, they present a viable alternative for identification purposes.6

The potential correlation between lip print patterns and ABO blood groups could strengthen forensic investigations, adding another layer of evidence that complements existing identification techniques. Additionally, the findings of this study could contribute to genetic research, shedding light on hereditary patterns that influence lip print formation.7 Investigating this association is not only pertinent to forensic science but also to medical genetics, as it could provide valuable insights into human variation and inherited traits.

Hence this study endeavors to explore the link between cheiloscopy and the ABO blood group system, with the aim of enhancing forensic science and genetic research. By investigating the patterns of lip prints in individuals with different blood groups, this research seeks to determine whether there exists a meaningful correlation that could contribute to both scientific and practical applications.

Methodology

This study aimed to determine the distribution of different lip print patterns among subjects having different ABO and RH blood groups and to determine the correlation between their characters and blood groups.

The present Hospital-based cross-sectional study was conducted on 150 out patients in Department of Oral Medicine & Radiology Meenakshi Ammal Dental College, Chennai in time period of 3 month. These eligible participants between 18 to 45 years of age groups were randomly selected by purposive sampling, and their blood groups were analyzed.

Eligible certeria

Inclusion Criteria:

- Participants with family origin from Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh.
- Participants who gave consent voluntarily.

Exclusion Criteria:

- Individuals with hypersensitivity to lipstick.
- Individuals with lip infections.
- Individuals who have undergone surgical correction or have scars on the lip.
- Individuals unwilling to participate.

Data Collection Procedure:

Lip prints were obtained by evenly applying lipstick to the lips and then dabbing a strip of cellophane tape over them (Figure 1a). The collected prints were classified according to Tsuchihashi's system. (Figure 1b and 1c). Only the pattern present in the central portion of the lip was considered for analysis.

FIGURE 1a lip print with cellophane tape over it

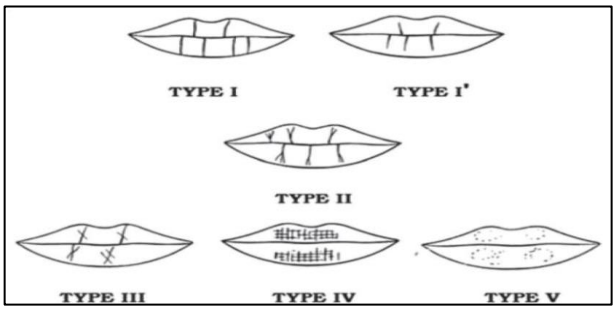

FIGURE 1b Suzuki and Tsuchihashi classification

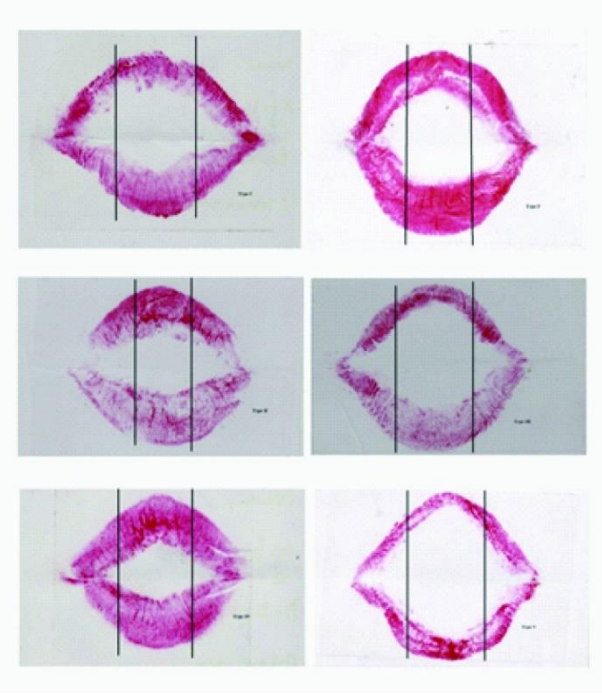

FIGURE 1 c Suzuki and Tsuchihashi classification

Statistical analysis

The data obtained was entered into a Microsoft Excel spreadsheet and analyzed using the Statistical Package for Social Sciences (SPSS, version 27, IBM, Chicago, USA). Categorical variables, such as lip print patterns and blood groups, were expressed as frequency and percentage. Descriptive statistics, including mean, standard deviation (SD), and proportion, were calculated.

The Chi-square test was applied to assess the association between lip print patterns and ABO blood groups. A p-value of less than 0.05 was considered statistically significant.

Results

The study analyzed the distribution of lip print patterns among individuals with different ABO and Rh blood groups to identify potential correlations.

Gender Distribution

Out of the 150 participants, 42 (28%) were male, and 108 (72%) were female. (Figure 2.)

Blood Group Distribution

The most common blood group among the participants was O+ (38%), followed by B+ (29.3%) and A+ (18.6%). The least common blood groups were A1B+ (0.6%) and B- (0.6%), while no participants had A- blood type (Figure 2).

Lip Print Pattern Distribution

Among the different lip print patterns, Type I (Vertical grooves) was the most prevalent, observed in 31.3% of participants. This was followed by Type II (Branched, 26%), Type IV (Reticular, 16.7%), and Type III (Intersecting, 16%). The least common patterns were Type V (Undermined, 9.3%) and Type I' (Partial length groove, 0.7%) (Table 1).

Correlation Between Lip Print Pattern and Blood Group

The distribution of lip print patterns among different blood groups is presented in Table 2. The highest occurrence of Type I (Vertical) lip prints was found in individuals with O+ blood group (11.3%), followed by B+ (8.6%) and A+ (6.6%). Similarly, Type II (Branched) was most commonly associated with B+ (11.3%) and O+ (9.3%) blood groups.

A Pearson Chi-square test was conducted to assess the statistical significance of the correlation between lip print patterns and blood groups. The Chi-square value was 40.439, with 32 degrees of freedom (df) and a p-value of 0.145, indicating that the correlation was not statistically significant ($p > 0.05$) (Table 2a).

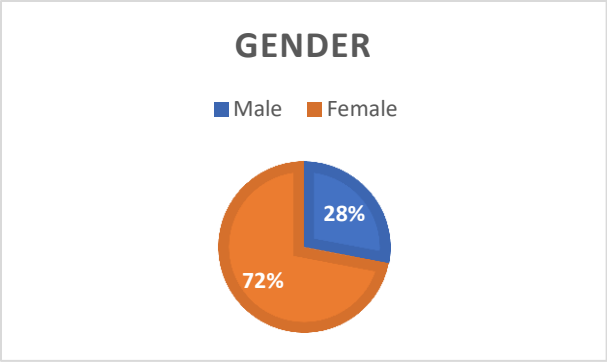

Figure 2 Gender distribution

Lip print	N	%
I (Vertical)	47	31.3
I'(Partial length groove)	1	0.7
II(Branched)	39	26
III (Intersecting)	24	16
IV(Reticular)	25	16.7
V(Undermined)	14	9.3
TOTAL	150	100

Table 1. Distribution of Lip print

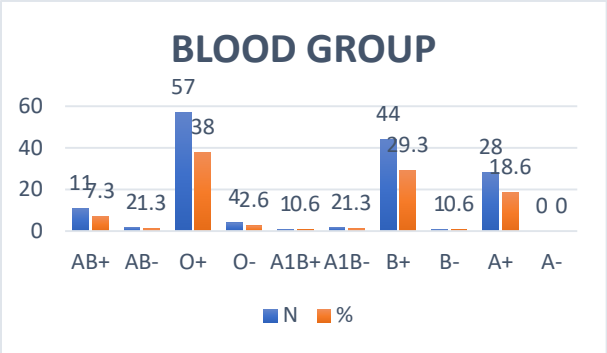

Figure 3 Distribution of Blood Group

X`x`	A+	A-	A1B+	A1B-	B+	B-	AB+	AB-	O+	O-	TOTAL
I (Vertical)	10(6.6%)	0	0	0	13(8.6%)	1(0.6%)	2(1.3%)	2(1.3%)	17(11.3%)	2(1.3%)	47(31.3%)
I'(Partial length groove)	0	0	0	0	0	0	0	0	1(0.6%)	0	1(0.6%)
II(Branched)	5(3.3%)	0	0	0	17(11.3%)	0	1(0.6%)	0	14(9.3%)	2(1.3%)	39(26%)
III (Intersecting)	3(2%)	0	1(0.6%)	0	5(3.3%)	0	5(3.3%)	0	10(6.6%)	0	24(16%)
IV(Reticular)	7(4.6%)	0	0	2(1.3%)	6(4%)	0	1(0.6%)	0	9(6%)	0	25(16.6%)
V(Undermined)	3(2%)	0	0	0	3(2%)	0	2(1.3%)	0	6(4%)	0	14(9.3%)
TOTAL	28(18.6%)	0	1(0.6%)	2(1.3%)	44(29.3%)	1(0.6%)	11(7.3%)	2(1.3%)	57(38%)	4(2.6%)	150(100%)

Table 2. correlation of lip print with blood group

Pearson chi square	df	p-value
40.439	32	0.145

Table 2 a Correlation of lip print and blood group

Discussion

The present study explored the distribution of different lip print patterns among individuals with various ABO and Rh blood groups and assessed any potential correlation between them. Lip prints, like fingerprints, are unique and remain unchanged throughout a person's life, making them valuable in forensic investigations. Blood group classification is another important parameter in forensic science and medical research. Establishing a correlation between lip print patterns and blood groups could provide an additional tool for personal identification and criminal investigations.

In this study, 150 individuals were analyzed, with a higher representation of females (72%) compared to males (28%). The distribution of blood groups followed a pattern commonly observed in various populations, with O+ being the most prevalent (38%), followed by B+ (29.3%) and A+ (18.6%). Blood group A1B+ and B- were the least common (0.6%). The lip print analysis revealed that the most frequently occurring pattern was Type I (Vertical grooves) in 31.3% of individuals, followed by Type II (Branched) at 26%. Type IV (Reticular) and Type III (Intersecting) patterns were observed in 16.7% and 16% of the participants, respectively. A study by Jeergal PA et al. (2016) reported that

Type I and followed by Type II and III lip prints were most commonly associated with blood group O, which is similar to the findings of this study7. However Study by Tsuchihashi et al of lip prints of 1364 Japanese men and women ,found that in both genders, Type III predominated followed in descending order by Types I, II, IV and V.8Sivapathasundharam et al studied 200 people's lip prints in Chennai, India, revealing Type III pattern as the most predominant and Type IV as least commonly occurring.9Whereas Prabhu et al. studied 100 students from Goa, India, finding Type V to be the predominant pattern followed by Type I.10 This suggests that lip print patterns may vary geographically.

The results of this study demonstrated no significant correlation between the distribution of lip print patterns and ABO blood groups (P = 0.71). These findings align with previous studies conducted by Telagi et al. in South India 11 and Sandhu et al.12 in the Punjabi population, both of which also reported no statistically significant association.The correlation between lip print patterns and blood groups remains uncertain. Lip print formation is believed to be influenced by genetic and environmental factors. The patterns observed in lip prints result from the fusion of epithelial cells and connective tissue during embryonic development. Blood group antigens, on the other hand, are determined by genes located on chromosome 9, whereas genes influencing dermal and epidermal structures, including lip prints, may be located on different chromosomes. This genetic distinction makes a direct biological correlation between lip prints and blood groups unlikely.13 However, shared genetic factors related to embryonic development and epithelial differentiation could contribute to population-level trends in lip print distribution, though not in a statistically significant manner.

Comparative studies have yielded mixed findings regarding the relationship between lip prints and blood groups 14,15. Such discrepancies highlight the need for more extensive studies with larger, ethnically diverse populations to establish more definitive conclusions. Variations in sample size, methodology, and classification criteria across studies may also contribute to these differences.

From a forensic perspective, lip prints remain a valuable tool for personal identification, particularly in cases where fingerprints or DNA evidence may be unavailable. The uniqueness and permanence of lip prints make them useful in criminal investigations, and their classification can aid in narrowing down potential suspects. While the findings of this study indicate that lip print patterns and blood groups should be considered independent variables, lip prints, when used alongside other forensic evidence, can still contribute to identification processes.

Limitations

The study has certain limitations that should be acknowledged. The sample size of 150 participants may not be large enough to establish definitive statistical correlations. A larger sample, along with a more diverse representation of ethnic backgrounds, would enhance the reliability of findings. Additionally, external factors such as age, genetics, and environmental influences on lip print formation were not considered in this study. The subjective nature of lip print classification is another potential limitation, as minor variations in interpretation could impact the results. Future studies should explore advanced image analysis techniques, including artificial intelligence and machine learning, to enhance accuracy in lip print classification and analysis.

Future recommendations

Further research should also focus on the genetic and developmental basis of lip print formation. Investigating whether specific genes involved in epithelial differentiation contribute to lip print patterns could provide deeper insights into their biological basis.

Conclusion

The study found no statistically significant correlation between lip print patterns and blood groups, despite observing certain distribution trends. These findings suggest that while lip prints and blood groups are independent characteristics, lip prints remain a valuable forensic tool. Future research with larger populations and advanced methodologies may provide further insights into the genetic and developmental factors influencing lip print patterns.

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