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ORIGINAL ARTICLE

Pattern Predominance in Cheiloscopy, Dactyloscopy and its Correlation with Blood group: An Observational Study

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Abstract:

To observe the association of lip prints and fingerprint patterns with gender and pattern predominance in the group of subjects with blood groups contrasting ABO and Rh. The study included 470 participants. Lip prints and fingerprints were recorded using lipstick and ink (stamp pad), respectively, on white bond paper. Cellophane tape was employed to transfer the lip print from the lips to bond paper. Determination of blood group was done by ABO typing using anti-A & anti-B sera. A statistically notable association was seen between gender and blood group type (p-value <.05). Type I lip print design, whorl pattern of fingerprints and B+ blood group were most commonly observed in males and females. Type I lip print pattern was most commonly found in the A+ blood group and all A- blood groups. The arch pattern was seen predominantly with type IV, whorl with type I and loop with type III. Loop pattern was more common in A+(37.3%), B-(66.7%) & O+(42.7%) while whorl pattern was common in A-(50%), B+(50.5%), AB+(53.2%) & O-(66.7%) (p value<.05). Definite association was observed between fingerprint, blood group and sex of an individual. These can be used as essential adjuncts in forensic science and mass catastrophes. And where fingerprint evaluation is impossible, then lip print and blood group can be used as a second identification line.

Keywords: Observational study; Forensic science; Lip prints; Fingerprints; Blood group and Gender determination.

Introduction:

Dental surgeons are mostly confined to examination, diagnosis, treatment and prevention of oral & maxillofacial lesions. But another undetected spectrum of their work front may be beneficial in the legal matters concerning forensic sciences.[1] Individual recognition is a crucial and critical task in forensic science and forensic analysis,[1] and it plays a vital role in inclusion or exclusion in case of a missing person, suspecting a criminal offence or in a mass disaster.[3] Locard's Exchange Rule conveys, when any two articles fall into reach, evidence is always exchanged from one to the alternative. Traces from the site may be taken anywhere by an individual and, simultaneously, may be left behind at the location.[2] "Identity" is a set of physical characteristics, normal or pathological, functional or psychic, that define an individual.[4] Personal identification is of utmost importance in forensics. Still, all means, like DNA analysis, are not feasible for every case as it is a costly, sensitive technique[5] and unavailable in rural areas.[6]

Cheiloscopy and Dactyloscopy have equal value to other types of forensic evidence for personal identification and sex determination. The word Cheiloscopy gets it's derivation from the Greek words "cheilos" which means "lips", and "e skopein" meaning "to see".[17] The grooves and furrows on the red part of the cardinal border of the human lips are considered and perceived as lip print or Cheiloscopy.[2] France's most incredible criminologist Edmond Locard in 1932 was the first to suggest of lip prints. 'Fingerprints' or 'Dermatoglyphics' can be explained as the scientific investigation of epidermal ridges and their configuration on the volar aspect of the plantar and palmar regions,[18] and they are determined genotypically.[8-10]

Karl Landsteiner discovered the blood group system in 1901.[11] ABO is classified into A, B, O & AB blood groups based on the presence of antigens in plasma. Rh positive & Rh negative are differentiated based on the existence of D antigen in plasma, known as the Rhesus technique.[2] Partial identification using any method leads to determining some facts. However, others may remain unidentified. Hence, the successful approach uses a combination of methods.[12] Therefore, these three parameters, lip prints, fingerprints and blood groups are evidence which can be used for forensic identification as they are easily identified.[5] They are unaltered, constant throughout life and unique characteristic of an individual; hence, they are lifelong markers in one's identity.[13] However, the lip prints differ in monozygotic twins,[14] and fingerprints can be altered by injuries like cuts, burns and bruises, but usually after healing, the pattern is restored.[15]

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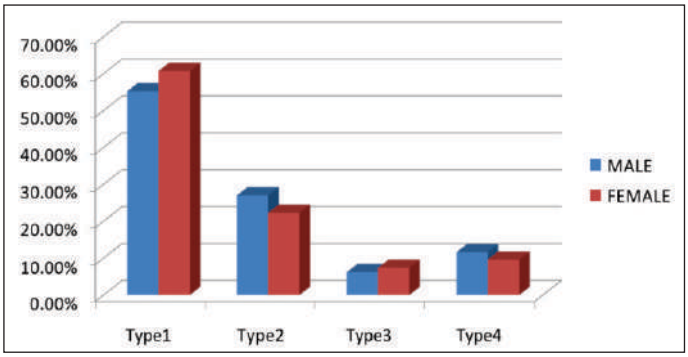
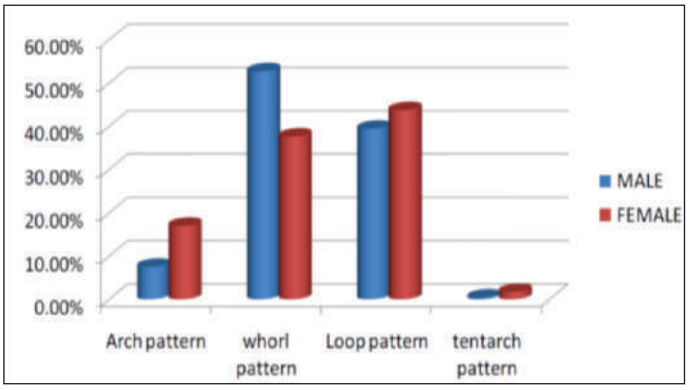


Graph 1. Pattern predominance of lip prints about sex.



Graph 2. Pattern predominance of finger prints about sex.

Evidence expresses that rather than using fingerprints & lip prints only, correlating lip prints & fingerprints with blood groups may be of essence in forensic science for more accurate identification of an individual. It is hypothesized that there is a significant correlation between lip prints, fingerprints, blood group and the sex of an individual.

The present study thus was aimed to observe the association between lip prints and fingerprints pattern in sex determination and pattern predominance among different blood groups.

Materials and methods:

This study was undertaken in the Department of Oral Pathology, Sri Aurobindo College of Dentistry, Indore (M.P), India. It was carried over two months after approval from the Institutional Ethics Committee. The study included patients visiting the OPD of the department and students of BDS 2nd and 3rd year. Very particular exclusions were made for the study to make it a feasible one. Subjects with permanent scars on their fingers, lips, or thumb with any hand deformities due to injury, birth defect or disease, those with worn fingerprints, and extra webbed or bandaged fingers were excluded from the study. Written informed consent was obtained from the participants of the study. Lip prints and fingerprints were recorded using lipstick and ink (stamp pad). The lip and fingerprints were recorded on white bond paper. Cellophane tape was employed to transfer the lip print from the lips to bond paper. [Figure 1 & Figure 2 shows Materials required for lip print and fingerprint] To record lip prints, lipstick was thoroughly applied in a single direction, cellophane tape was pressed over the lips for a few seconds and then carefully lifted and pasted on paper to create a permanent

Figure 1. Materials required for lip print and fingerprint.

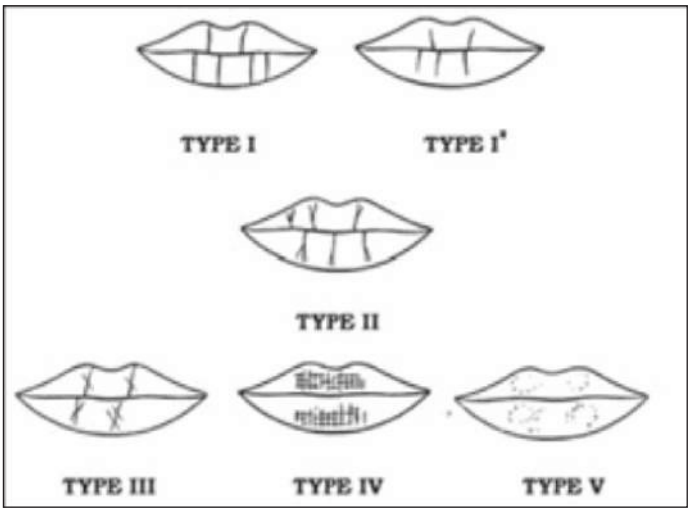


Figure 2. Classification of Lip Prints given by Tsuchihashis & Suzuki (1971)16. Type I: Vertical, comprising complete longitudinal fissures/ patterns; Type I': Incomplete longitudinal fissures; Type II: Branching Y-shaped pattern; Type III: Criss-cross pattern; Type IV: Reticular, typical chequered pattern, fence like.

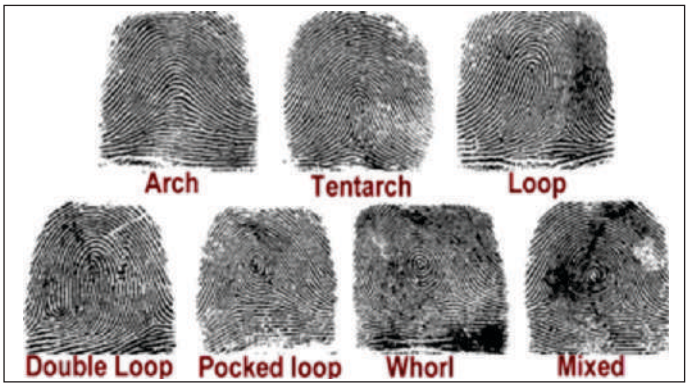


Figure 3. Classification of fingerprint by Henry's16.

record. The lip prints were classified according to criteria given by Tsuchihashis & Suzuki (1971).[16] [Figure 3 shows the Classification of Lip Prints given by Tsuchihashis & Suzuki (1971)[16]]

Type I: Vertical, comprising complete longitudinal fissures/ patterns.

Type I': Incomplete longitudinal fissures. Type II: Branching Y-

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shaped pattern Type III: Criss-cross pattern.

Type IV: Reticular, fence typical chequered pattern.

In pursuance of fingerprints, the subjects were asked to press their fingers on the ink pad and then on the bond paper. Finger prints of both right and left hands were studied. Henry's classification (1897) was used to classify fingerprints.[16] [Figure 4 shows the Classification of fingerprints by Henry's]. Determination of blood group was done by ABO typing using anti-A & anti-B sera. A blood specimen was missed with the antisera on a microscopic plate. A derivation of blood group A was done by a positive reaction (agglutination) of the blood with anti-A sera. Reaction with anti-B sera was suggestive of blood group B. No agglutination was suggestive of blood group O, and agglutination with both antisera conveyed blood group AB. The data was analysed using SPSS (Statistical Package for Social Sciences) 20.0 version, IBM, Chicago.

Results:

The study included 470 participants aged 20-50, comprising 241 males and 229 females. Results of the study revealed a statistically significant association between gender and the blood group type (p-value <.05). [Table 1 indicates Pattern predominance of Blood group among male & female] The type of blood group and pattern of lip print and fingerprint were also found to be significantly associated with each other (p value<.05). [Table 2 indicates association of blood group with different patterns of fingerprints in the study population] Type I lip print design, whorl pattern of fingerprints and B+ blood group were most commonly observed in both males and females. [Graph 1 shows the pattern predominance of lip prints about sex and Graph 2 shows the pattern predominance of fingerprints about sex]. A- blood group was found in 4 individuals; all were type I lip print patterns, while in others A+ blood group was predominantly associated with lip print type I. The arch pattern was seen predominantly with type IV, whorl with type I and loop with type III. Loop pattern was more common in A+ (37.3%), B- (66.7%) & O+ (42.7%), while whorl pattern was typical in A- (50%), B+ (50.5%), AB+ (53.2%) & O- (66.7%). [Table 2 indicates the association of blood groups with different patterns of fingerprints in the study population]

Table 1. Pattern predominance of Blood group among male & female.

Blood Group type	Male N (%)	Female N (%)	p value Ω
A+(A Positive)	34 (14.1%)	41 (17.9%)	<0.001*
A- (A Negative)	0 (0.0%)	4 (1.7%)	
B+ (B Positive)	123 (51.0%)	79 (34.5%)	
B- (B Negative)	0 (0.0%)	6 (2.6%)	
AB+ (AB Positive)	26 (10.8%)	21 (9.2%)	
AB- (AB Negative)	0 (0.0%)	2 (0.9%)	
O+ (O Positive)	56 (23.2%)	75 (32.8%)	
O- (O Negative)	2 (0.8%)	1 (0.4%)	
Total	241 (100.0%)	229 (100.0%)	

Ω Chi-squaretest. *p value<0.05 was considered statistically significant.

Table 2. Association of blood groups with different patterns of fingerprints in the study population.

Blood group types	Fingerprint pattern				
	Arch pattern	Whorl pattern	Loop pattern	Tentarch pattern	p valueΩ
A+ (A Positive)	16 (21.30%)	27 (36.00%)	28 (37.30%)	4 (5.30%)	<.05*
A- (A Negative)	1 (25.00%)	2 (50.00%)	1 (25.00%)	0 (0.0%)	
B+ (B Positive)	13 (6.40%)	102 (50.50%)	86 (42.60%)	1 (0.50%)	
B- (B Negative)	0 (0.0%)	2 (33.30%)	4 (66.70%)	0 (0.0%)	
AB+ (AB Positive)	4 (8.50%)	25 (53.20%)	18 (38.30%)	0 (0.0%)	
AB- (AB Negative)	1 (50.00%)	0 (0.0%)	1 (50.00%)	0 (0.0%)	
O+ (O Positive)	22 (16.80%)	53 (40.50%)	56 (42.70%)	0 (0.0%)	
O- (O Negative)	0 (0.0%)	2 (66.70%)	1 (33.30%)	0 (0.0%)	
Total	57 (12.10%)	213 (45.30%)	195 (41.50%)	5 (1.10%)	

ΩChi-squaretest* p value<0.05 wasconsidered statistically significant.

Discussion:

Human identification is one of the most challenging and tiring jobs now, where people face difficulties.[17] Personal identification of any individual is because of their specific traits, which become a marker in forensic cases. They vary from macroscopic structures to molecular DNA typing, which are permanent and persistent from birth to death.[5]

Fingerprints and lip prints are essential in forensic investigation and personal identification.[14] Blood falls into the same category as essential and the most common evidence for identifying and verifying one's identity.[17]

Recently, a lipstick has been developed that does not leave any visible trace after contact with surfaces such as glass, clothing, cutlery or cigarette butts. However invisible, these prints can be lifted using magnetic and aluminium powder. There was the development of "latent" prints similar to latent fingerprints due to secretions of oil and moisture from the edges of the lips containing sebaceous glands with sweat glands.[14]

In our study, we found a definite association between fingerprint, blood group and sex of an individual. Srilekha N et al.[18] conducted a study in which they found no significant correlation between lip print, fingerprint and blood group. Karim B et al.,[3] Verghese AJ et al.[19] and Murkey PN et al.[20] conducted studies that found no correlation between lip print pattern and blood group.

In the present study, whorl was found to be the most predominantly observed fingerprint pattern in males, while the loop pattern was more common in females, and the type I lip print pattern was most common in males (55.2%) and females (60.7%). Bansal N et al.[16] conducted a study in which they found whorls were of a high frequency in males and females presented with a high frequency of loops similar to our study. But in contrast, they found that type I lip print pattern was most predominant in females while type III was predominant in males.

In the given study, the type I lip print pattern was most common in males and females. Contrary to our study, Sultana Q et al.[21] found that the type III lip print pattern was most common among males and type I was among females. Khanapure SC et al.[14] found that the commonly observed lip print pattern among males was type IV and among females was type II. Sharma P et al.[1] & Dongarwar GR et al.[4] conducted a study where they reported that the type I pattern was most commonly seen in females, whereas the type IV pattern was commonly seen in males. Gupta S et al.[7] found that type III was most commonly seen in females and type II in males. Lip print patterns are unique to different populations, and therefore, the variation can be explained by the ethnic, racial and

geographical differences in the study population. In the present study, the subjects were in different parts of India. Some other reasons for discrepancy can be the employment of different classification systems of lip print patterns or the employment of different methods for lip print analysis in these studies.[5]

We found a significant correlation between fingerprint and blood group. In our study, Sangam MR et al.[22] also found a significant association between fingerprint patterns and blood groups. The present study revealed that the whorl pattern of fingerprints was most commonly seen in males & loop pattern in females. In contrast to our study, Ekanem AU et al.[11] found the highest number of males with loop patterns and females with arch patterns. In our study, the whorl pattern occurred more frequently in males ans loops in females, and the loop pattern was predominantly seen in persons with B- blood group followed by those having O+ blood group and the whorl pattern was more commonly seen in people with O- blood group followed by those with AB+ blood group. Raloti SK et al.[8] found results similar to our study on fingerprint patterns in gender determination. Still, in contrast, they found the loop pattern to be predominant in persons with blood group B+ and whorl pattern was predominant in persons with O+ blood group.

In our study, we found that loop patterns were common in females and whorls were common in males, and Loop patterns were more common in people with A+ (37.3%), B- (66.7%) and O- (42.7%) blood group types and whorl pattern was commoner in people with in A-(50%), B+(50.5%), AB+ (53.2%) & O- (66.7%) blood group types. Rastogi P et al.[10] and Bhavana D et al.[9] conducted a study in which a loop pattern was found in a more significant number of females and a whorl pattern in a more significant number of males, which is by our study. They also concluded that loop pattern dominated in all Rh+ & Rh- blood groups but whorls in the O- blood group. Bharadwaja A et al.[23] in their study found that more people with blood group A showed a loop pattern (Rh+ 54.2% & Rh- 60%) while more subjects with blood group AB had a whorl pattern(Rh+ 43.3% & Rh- 60%). As its clinical relevance, fingerprint and blood group are unique, and they do not change, but the amount of weightage received by fingerprints was more than the blood group. Further, the scope of the study is that it should be conducted on a larger sample size and in a particular state for determining specificities about rare blood groups, i.e. A-.

Conclusion:

A definite association was observed of fingerprint, blood group & sex of an individual. These can be used as essential adjuncts in forensic science and mass catastrophe. In case where fingerprint evaluation is impossible, then lip print and blood group can be used as a second identification line.

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