

Original Research Article

A comparative study of lip print patterns in monozygotic and dizygotic twins

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ABSTRACT

Background: External surface of lips has many elevations and depressions forming a characteristic pattern called lip prints, the study of which is known as cheiloscopy. This is unique for the individuals like in fingerprints.

Methods: The present study was conducted in 40 pairs of twins and their families to evaluate the possibility of variation of lip print patterns in twins and their parents to find out any similarity among twins and their families. The twins were taken as the primary subject and their parents as the secondary subjects.

Results: The subjects with congenital lip deformity and any inflammation were excluded from the study. The lip prints were taken on the cello tape and highlighted with the black printer powder of Oddyessy make. the photographs were taken for the permanent record. The prints were studied on Adobe Photoshop 7.0 software and classified under Tsuchihashi classification.

Conclusions: Comparison of lip prints showed that they are unique to each individual and among twins revealed that they are similar but not identical and their characteristics resembled either parent. Since the lip print patterns are unique, lip print analysis can be considered as a tool for personal identification.

Keywords: Cheiloscopy, Inheritance, Lip prints, Twins

INTRODUCTION

Human identification is the mainstay of civilization and identification of the individual has always been of paramount importance to the society. Identification of the individual living or dead is based on the theory that all the individuals are unique. The traditional methods for the personal identification include anthropometry, dactylography, sex determination, and differentiation by blood groups, DNA profiling and odontology.¹The study of lip print patterns is known as cheiloscopy.¹ The

term cheiloscopy is derived from the word “cheilos” which means lips and scopy means to see. In this genre cheiloscopy is a fast-emerging tool in human identification due to its uniqueness and permanence.² Lip prints were first described by Fischer in 1902, however its recommendation to be used in personal identification and criminalization was given in 1932 by Edmond Locard.^{3,4}

Cheiloscopy has been a subject of great interest to most researchers, it being the least invasive and easily

available mode for study purpose.⁵ Lip print characteristics have been widely used in forensics by experts and by the law for human identification. Apart from identifying and evidential use, lip prints may also be used in crime detection work, being the source of tactical and criminalistic information. A lip print at the scene of a crime can be a basis for conclusions as to the character of the event, the number of the people involved, sexes, cosmetics used, habits, occupational traits, and the pathological changes of lips themselves.⁶ Lip prints are usually left at crime scenes and can provide direct link to the suspect.

Lip prints can be found on the surfaces such as glass, clothing, cutlery or cigarette butts.⁷ The vermilion border of the lips has minor salivary and sebaceous glands which, together with the moisturizing done by the tongue leads to the possibility of existence of latent lip prints. So, when searching for lip prints one must always consider the presence of latent lip prints.⁸ The study of lip print patterns in twins could be of great importance as it has been mentioned by Aggrawal that uniovular twins share same proteins, same genetic information, but have different fingerprint patterns.⁴ So, any major difference found in the lip print patterns of the uniovular twins would be of great discovery in the field of forensic science.

Now days lip prints are gaining importance in the biometric systems also. Michal Choras has re-affirmed the belief in his recent studies that the lip can be used as a primary biometric modality for successful identification purposes.⁹ He has shown that geometrical analysis of the anatomical parameters of the human lip can be monitored for successful identification. Dr. Martin Santos proposed that these lip characteristics could be used in personal identification and thus devised a simple system for classifying lip prints.⁶ The classification is as follows: Santos divided lip prints into four types mainly: Straight line, Curved line, Angled Sine shaped line. Since 1950, the Japanese carried out extensive research in the matter of study of lip print patterns.

The first twin study was done by Suzuki and Tsuchihashi on 18 pairs of uniovular twins.¹⁰ The lip prints were directly obtained. The results of the observation on the lip prints of the 18 pairs of uniovular twins indicated that lip prints of the twins were extremely alike and that their characteristics were inherited from either the father or the mother. They named the lip prints as figure *alinearumlabiorumruberorum*. Mc Donnell⁴ in 1972 reported in a study of lip print patterns between two identical twins that lip prints patterns were quite different from each other.

Tsuchihashi conducted a study on lip prints in 1974 on 49 pairs of uniovular twins.¹⁰ The study resulted that for each pair of twins the lip prints were nearly the same

but detailed comparison showed that they were not exactly identical. The study also noted that there was no change in the lip prints over a period of three years. Hirthe et al conducted study on 76 families including 22 pairs of monozygotic and 17 pairs of dizygotic twins and found that families and twins pointed to a considerable genetic factors.¹¹ Schnuth and Marry Lee¹ conducted a comparative study on 150 individuals including five pairs of identical twins and found that lip prints were not identical in the case of identical twins but similarities of lip prints between parents and children were found accounting for the heredity to play a major role and thus concluded that every individual has unique lip prints.¹²

Jaishankar et al performed a lip print study on 180 individuals including 10 pairs of twins.¹³ Comparison of lip print patterns in 10 pairs of twins revealed that they were not exactly identical although some of the characteristics were inherited from either of the parent. A study has been reported on lip prints in relation to gender, family and blood group on 10 families with siblings and other 10 families with twin children and their blood groups were also taken. The study showed no correlation between any particular lip print patterns with blood groups.¹⁴ Venkatesh R and David MP have performed a lip print study on 200 individuals comprising of 85 males, 85 females and 5 pairs of twins.¹⁵

The observation of lip prints in five pairs of twins resulted in the finding that although the lip print patterns of twins were quite similar but no two of them were exactly identical. Vats et al conducted a study of lip print patterns in North Indian population comprising of 1399 individuals including 8 pairs of monozygotic twins.² The study concluded to the findings that variation of lip print patterns could be seen in the twins and thus lip prints were unique in the monozygotic twins. Maheshwari performed a lip print study on 750 individuals for personal identification and criminalization.¹⁶

In the study of the lip print patterns in twins he found that neither the twins nor the twins with their parents had the similarity. A wide study was done on Egyptian population living in Dakhalia governorate on 955 individuals comprising of 235 males and 720 females. The population also comprised of 26 families and 3 identical twins. The study on the whole revealed that no two or more persons had similar lip print patterns not even in the identical twins.¹⁷ The aim of the present study was to do the comparative study of lip print patterns in the monozygotic and dizygotic twins.

METHODS

The present study was conducted on 40 pairs of twins (23 dizygotic twins; 17 monozygotic twins). Twin a was elder, and Twin b was younger. Only families having

twins were considered for the study. Subjects with inflammation trauma, congenital abnormalities, and surgical scars and other abnormalities of the lip were excluded because of their unsuitability for this study. Subjects with inflammation trauma, congenital abnormalities, surgical scars and other abnormalities of the lips were excluded because of their unsuitability for this study.

Method of collection of lip prints

The subject was asked to sit on a low stool for taking lip prints. Subject was advised not to change his/ her position, so that lip prints could be taken accurately. The observer stood in front of the subject while taking the lip prints. The subject was asked to keep lip muscles relaxed and jaw kept closed while the lip prints were taken. A strip of cellophane tape, 10 cm long was cut with scissors. The subject was asked to relax the lips and to keep the mouth stationary and closed during the procedure. The glued portion of the cellophane tape was applied on the upper and lower lip together. Cellophane tape was held in place (Figure 1).



Figure 1: Collection of lip prints by cellophane tape on the upper and lower lip together.

Gentle and even pressure was applied for few seconds. Then the tape was carefully lifted from the lips, from one end to the other, avoiding any smudging of the lip prints (Figure 2).



Figure 2: Collection of lip prints by lifting the tape carefully from the lips.

The black powder (computer printer powder of Oddyessy make) was then sprinkled on the lip prints to highlight the lip prints (Figure 3).

The strip of cellophane tape was glued to a piece of white paper and the photographs of the prints were then taken (Figure 4).

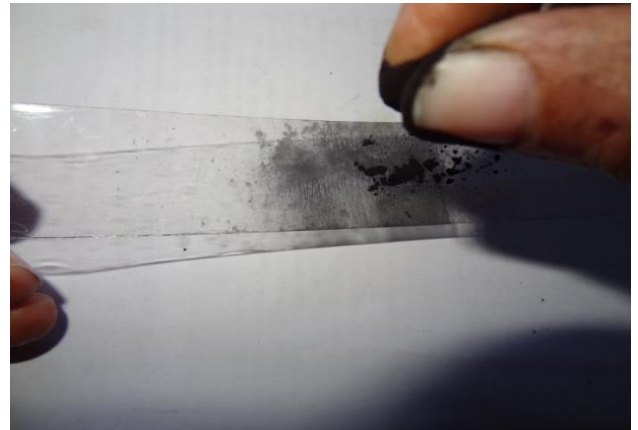


Figure 3: Highlighting lip prints by using black powder (computer printer powder of Oddyessy make).



Figure 4: The strip of cellophane tape glued on white sheet.

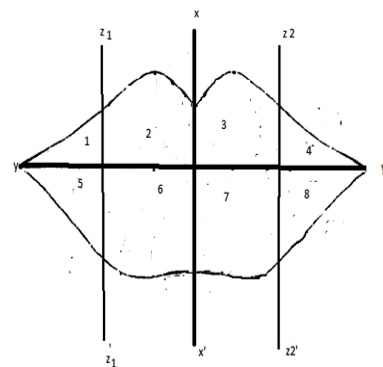


Figure 5: Formation of eight quadrants by division of lips from horizontal and vertical lines.

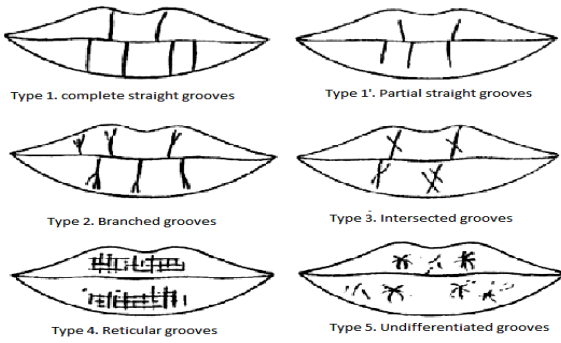


Figure 6: Tsuchihashi classification of lip print patterns.

The photograph taken served as a permanent record and the subjects' serial number were written on the back of the cellophane tape which served as their identity. The lip prints were subsequently visualized with the use of a magnifying lens and the number of lines and furrows present, their length, branching and combinations were noted.

The lip prints so obtained, were entered in Performa and the name and sex of the respective individuals were noted. The recorded data was further analyzed using Adobe Photoshop@7.0 software by dividing the prints in eight quadrants (Figure 5).

- 1-Right upper lateral
- 2-Right upper medial
- 3-left upper medial
- 4-left upper lateral
- 5- Right lower lateral
- 6- Right lower medial
- 7- left lower medial
- 8- left lower lateral

The patterns noted were entered in the Performa and classified under Tsuchihashi10 classification (Figure 6). It was found that IIIrd pattern was the commonest pattern in the monozygotic twins population which was prevalent in left lower lip quadrant (Figure 7).

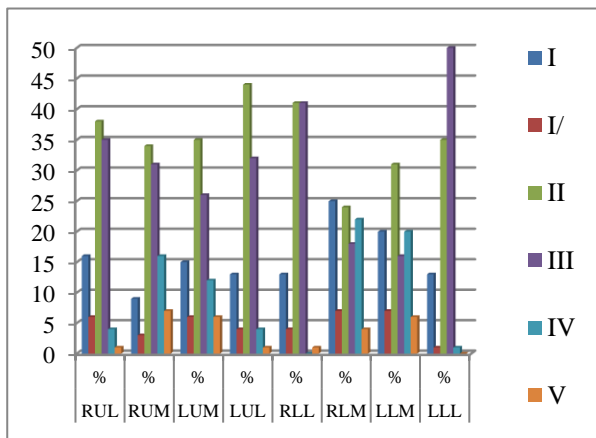


Figure 7: Most prevalent lip print pattern in monozygotic twin population.

It was also found out that out of seventeen pairs of monozygotic twins ten pairs showed 50 and more than 50% of resemblance of lip print patterns (Table 1). In dizygotic twins type II lip print pattern was the commonest which was prevalent in Left upper lip quadrant (Figure 8). The percentage of resemblance of lip print patterns amongst 23 pairs dizygotic twins revealed that only one pair didn't show any resemblance of lip print pattern with each other. Rest of the pairs showed resemblance of lip print patterns and 12 pairs showed 50 percent and more than 50 percent of resemblance of lip print patterns amongst dizygotic twins (Figure 9).

Table 1: Resemblance of lip print patterns among monozygotic twins.

Percentage of resemblance of lip print patterns in monozygotic twins	No. of monozygotic twins showing resemblance of lip print patterns
50%	3 pairs
>50%	7 pairs

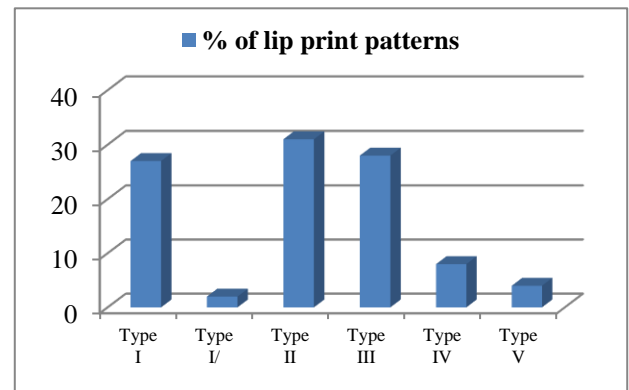


Figure 8: Most prevalent lip prints pattern in dizygotic twin's population.

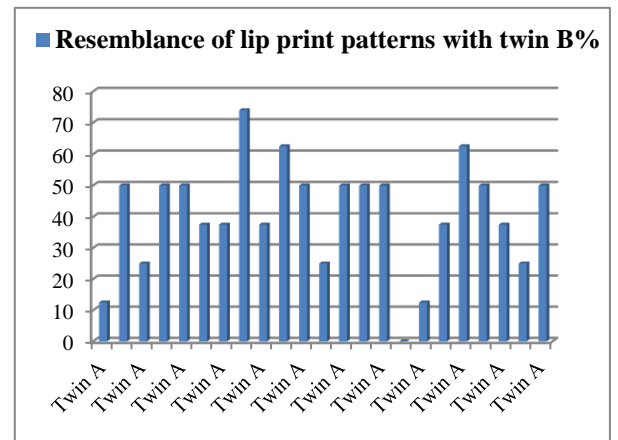


Figure 9: Percent of resemblance of lip print patterns amongst dizygotic twins.

Table 2: Shows the comparison of percentage of resemblance of lip print patterns among monozygotic twins and dizygotic twins.

Percentage of resemblance	Percentage of resemblance of lip print patterns in monozygotic twins	Percentage of resemblance of lip print patterns in dizygotic twins	p-value
≥50%	59	42	0.01*
<50%	41	47	0.67

On comparison of resemblance of lip print patterns in monozygotic and dizygotic twins showed that among monozygotic twins, percentage of resemblance was significantly more as compared to dizygotic twins for >50% of resemblance. Whereas dizygotic twins have shown highly significant resemblance among them for 50% resemblance.

DISCUSSION

Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of the human lip, between the inner labial mucosa and outer skin. These are unique for the individuals, as fingerprints.¹⁸ The present study was conducted in 17 pairs of monozygotic twins and 23 pairs of dizygotic twins. The total female twins were 40 and the male twins were also 40. The commonest lip print pattern in the present study population was type III constituting the upper and lower lip together, which constituted 35% of all the patterns (Figure 7 and 8).

Similar results have been obtained by Suzuki and Tsuchihashi in Japanese study population as they also found type III as the commonest lip print pattern in their study.¹⁰ However Hirthe et al in their German study population observed that branched pattern in the upper lip and simple pattern in the lower lip which corresponds to type II and type I according to Suzuki and Tsuchihashi classification respectively was found to be the commonest lip print patterns. This study differed from the present study.^{11,17}

On analyzing the resemblance of lip print patterns, it varied from 12.5% to 87.5% among monozygotic twins and 59% of them had 50% of resemblance with each other (table 1). On comparison, ≥50% of resemblance with each other was seen more in female twins (67%) than in male twins (50%) and the difference was significantly higher (p value-0.01). Therefore, it was found that there was resemblance of lip print patterns among monozygotic twins but were not identical in any of them and female monozygotic twins resembled significantly more with each other than male monozygotic twins. Suzuki and Tsuchihashi¹ in their studies on 18 pairs and 49 pairs of monozygotic twins respectively have also observed that the lip print patterns are similar but not exactly identical among monozygotic twins and similar results have been reported by other studies as well.^{2,13} On analyzing the lip print patterns

among dizygotic twins it revealed that lip print patterns resembled with each other except in one pair where no resemblance was seen. However, 52% of dizygotic twins had ≥50% of resemblance of lip print patterns (Figure 9).

The comparison of lip print patterns among same sex dizygotic twins and opposite sex dizygotic twins did not reveal any significant difference. On comparison of resemblance among monozygotic and dizygotic twins it was evident that ≥50% of resemblance was seen more in monozygotic twins in comparison to dizygotic twins and the difference was significantly higher (Table 2).

Augustine et al reported the resemblance of lip print patterns among 112 siblings to be 45.6% whereas in the present study this was found to be 55%.¹⁹ Therefore it can be said that twins had higher percentage of resemblance of lip print patterns in comparison to the siblings who are not twins or forensic and anthropological application.

CONCLUSION

Cheiloscopy is a name given to the study of lip prints. The lip prints are the normal lines and fissures in the zone of transition of human lip between labial mucosa and the outer skin. The present study was conducted in 40 pairs of twins comprising of 17 pairs of monozygotic twins and 23 pairs of dizygotic twins. The study was conducted with aim to develop a database for cheiloscopy with respect to twins and to compare the resemblance of lip print patterns among monozygotic and dizygotic twin. The resemblance of lip print patterns in monozygotic twins and dizygotic twins were compared. The commonest lip print pattern in the study population was type III. This pattern was also found to be the commonest in monozygotic twins whereas dizygotic twins had type II commonest lip print pattern. The comparison of resemblance of lip print patterns among monozygotic twins and dizygotic twins revealed that monozygotic twins resembled more with each other than dizygotic twins. The observation of the present study has shown a strong evidence of inheritance of, although it needs further genetic evaluation to locate the chromosome or gene responsible for inheritance.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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