



RESEARCH ARTICLE

STUDY OF LIP PRINT PATTERN IN KERALA SAMPLE POPULATION

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ABSTRACT

Background: Identification of a person is the goal of forensic investigation. Elevations and depressions on the lip form a characteristic pattern called lip prints, the study of which is known as Cheiloscopy. Cheiloscopy is an established forensic technique that can be used to identify a person. The lip print pattern is unique for each individual, even for monozygotic twins. The lip prints also show differences according to ethnic origin of a person.

Aim: The aim of the study was to determine the distribution of lip print patterns among males and females of Kerala sample population and to determine the most common lip pattern in the study population.

Method: The study group consisted of 100 Kerala students in the age group 17-25 years. Lip prints were obtained by applying lip liner evenly on lip. Lip impression was made on the glued side of a transparent cellophane tape which was then transferred on to a white sheet for permanent record. Lip print patterns were classified according to Tsuchihashi et al.

Results and conclusion: Type III pattern was the most common lip pattern among the whole study population. In males, the predominant lip print pattern was type III, followed by type I and type II. In females, the predominant lip print pattern was type III, followed by type II and type I'. There was no statistically significant difference between the distribution of lip print patterns in males and females.

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INTRODUCTION

Identification of a living or deceased person using unique traits and characteristics is the basis of forensic investigation. Fingerprint and DNA analysis are the most commonly used and well-established techniques used for such identification. In certain circumstances, when these evidences are not available, there is a hunt for alternative techniques that can be used (Caldas et al., 2007). A characteristic pattern called lip prints is produced by wrinkles and grooves on the lips, the study of which is known as Cheiloscopy (Acharya and Sivapathasundharam, 2009). Cheiloscopy was first described by Fischer in 1902 (Kasprzak, 1990). Locard recommended its use in personal identification (Randhawa et al., 2011) because lip prints are unique to an individual.

Le Moyne Snyder first used lip prints to solve a crime. Lip prints are found to be relatively stable throughout the life of an individual (Tsuchihashi, 1974). Cheiloscopy can be used in civil and criminal issues and in establishing the identity of a person in case of mass disaster. The lip prints also show differences according to ethnic origin of a person (Sandhu et al., 2012, Verghese et al., 2009, Koneru et al., 2013, Vats et al., 2010, Kumar et al., 2012). There are varied results when lip prints were studied in same ethnic population. Our study aimed at determining the distribution of lip print patterns among males and females of Kerala population and to determine the most common lip print pattern in the study population.

MATERIALS AND METHODS

A total of 100 Kerala students studying in our institution, comprising of 40 males and 60 females in the age group 17-25 years were included in the study. Ethnicity was confirmed by

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knowing that the previous three generations belonged to Kerala. Individuals having incompetent lips, any pathology of lips and hypersensitivity to cosmetics were excluded from the study. The purpose of the study was explained to all the individuals and consent was obtained. Institutional ethical clearance was also obtained. Wet tissue paper was used to clean the lips. Dark colored, non-glossy lip liner was evenly applied on the lips (Fig 1). Subjects were asked to rub their lips to spread the lip liner uniformly. After 2 minutes, glued side of a transparent cellophane tape strip, about 8-10 cm long, was applied over the lips in the normal rest position (Fig 2). Gentle pressure was applied over the strip for few seconds. Care was taken that the lips of the subject were in relaxed state during the process. From one end to the other, the strip was carefully removed from the lips to avoid smudging of the prints. The cellophane tape strip was then struck onto a white sheet for permanent record (Fig 3). Lip prints were examined using magnifying lens. Only 10 mm of the middle part of the lower lip was taken as study area as proposed by Sivapathasundaram *et al.*, 2001 because this area is almost always visible in any trace. Classification of lip prints proposed by Tsuchihashi *et al.*, 1974 (Fig 4) was followed. This classification clearly describes almost all the commonly appreciated lip print patterns, hence widely used in the literature.

Statistical analysis

Data was analyzed using Chi square test. P value of less than 0.001 was considered as significant.

RESULTS

Analysis of lip prints in this study revealed that the most common lip print pattern among the Kerala population was type III (36%), followed by type II (23%) and type I (16%). Type IV (9%) can be considered as the least common pattern as type V (3%) just indicates any undetermined impression which does not fall into any of the described patterns (Table 1). In males, the predominant lip print pattern was type III (32.5%), followed by type I (25%) and type II (20%). In females, the predominant lip print pattern was type III (38.3%), followed by type II (25%) and type I' (15%) (Fig 5). This showed that the most common pattern in both males and females was type III. On comparing the distribution of each lip print pattern between males and females, type I and type IV pattern was encountered mostly in males than females. The distribution of other lip print patterns was almost similar in both the sexes. The difference in the distribution of lip print pattern between sexes was not statistically significant.

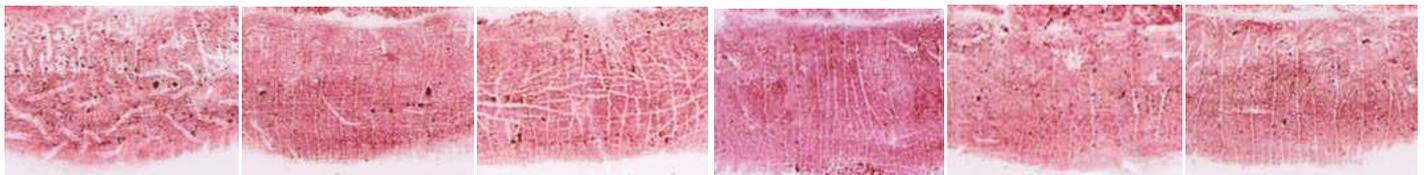


Fig. 1. Even application of dark colored lip liner on upper and lower lips



Fig. 2. Application of glued side of transparent cellophane tape strip onto the lips in normal rest position

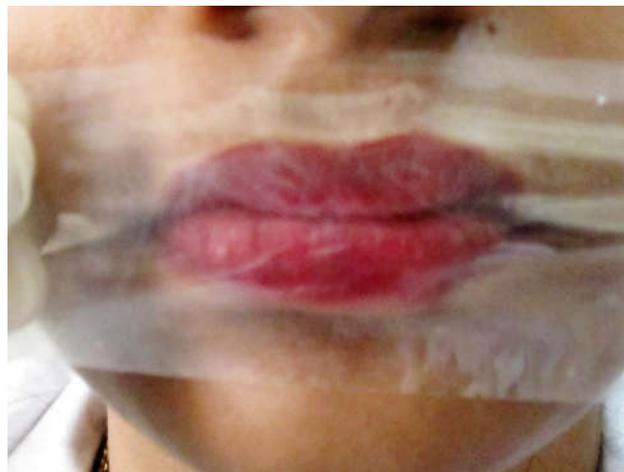


Fig. 3. Lip prints on the cellophane tape strip transferred onto a white sheet. Area inside the square shows the study area



Fig. 4. Tsuchihashi's classification of lip prints. a) Type I: Vertical grooves that run across the entire lips; b) Type I': Vertical grooves that do not cover the entire lips; c) Type II: Branched grooves; d) Type III: Intersected grooves; e) Type IV: Reticular grooves; f) Type V: Undetermined

Table 1. Distribution of lip print patterns in Kerala sample population

Lip print pattern	Males n (%)	Females n (%)	Whole population %
Type I	10 (25)	6 (10)	16
Type I'	4 (10)	9 (15)	13
Type II	8 (20)	15 (25)	23
Type III	13 (32.5)	23 (38.3)	36
Type IV	5 (12.5)	4 (6.7)	9
Type V	0	3 (5)	3
Total	40	60	100

DISCUSSION

Lip prints develop around 6th week of fetal life. Since development, they remain unchanged and resist climatic changes, inflammation and minor traumas (El Domiaty *et al.*, 2010, Castelló *et al.*, 2005). Lip print pattern may be inherited from either parent (Vats *et al.* 2011). The reliability of lip prints in identification of a person has been well established as they are unique for each individual. However, studies on lip prints in identification of population or ethnic group such as Kerala population have provided controversial results (Verghese *et al.*, 2009, Koneru *et al.*, 2013). Hence this study was aimed to identify the most common lip print pattern in Kerala population and to determine the sexual dimorphism in lip prints. In our study, type III pattern was found to be the most common lip print in the study population, followed by type II and I. The least common pattern was type IV. This finding was in accordance with that of Saraswathi *et al.*, 2009 & Sivapathasundaram *et al.*, 2001 who also found type III pattern to be predominant in Indo- Dravidian population. On the contrary, Verghese AJ *et al.* in 2009 reported that type IV pattern was the most common lip print pattern among males and females of Kerala origin. Also Koneru *et al.*, 2013 have found that type I pattern is predominant in Kerala population, followed by type I' and type IV.⁸ Studies on Kerala population including our study have provided varied results. Analysis of lip prints has been done in various other ethnic groups as well. Type I followed by type II pattern was predominant in Punjabi population (Sandhu *et al.*, 2012). Type III pattern was found to be common in Marathi community (Kapoor *et al.*, 2013). Type II pattern was predominant in Pondicherry population (Kumar *et al.*, 2010) and type IV was common among North Karnataka population (Patil *et al.*, 2013). Therefore, lip print patterns differ in different ethnic groups.

In males, the predominant lip print pattern was type III (32.5%) in the present study. This was in accordance with various studies done in North Indian and South Indian population (Kumar *et al.*, 2012, Gondivkar *et al.*, 2009, Singh *et al.*, 2012). In females, the predominant lip print pattern was type III (36%), while type I and type II patterns were predominant in aforementioned studies (Kumar *et al.*, 2012, Gondivkar *et al.*, 2009, Singh *et al.*, 2012). The findings of the present study were not in accordance with that of Koneru *et al.*, 2013 who found that type IV and type V were predominant in Keralite males while type I and I' were common in Keralite females. On comparing the distribution of lip prints in males and females in this study, type I and type IV were more common in males than females whereas distribution of type I', type II and type III lip prints were similar in both sex. Vahanwala *et al.*, 2000 have shown that type I, I' and II are dominant in females and type III and IV are dominant in males. There was no statistically significant difference between lip print patterns of males and females in the present study. Overall type III pattern was most common in both males and females in this study which is similar to the study done by Tsuchihashi *et al.*, 1974 and Augustine J *et al.*, 2008. Study in Punjabi population (Sandhu *et al.*, 2012) also failed to reveal any statistically significant difference between males and females, similar to the present study (Sandhu *et al.*, 2012). Nevertheless, many studies have shown that cheiloscopy can be used in sex determination on the contrary. Gondivkar *et al.*, 2009 have shown that gender of the individual can be assessed using the dominant lip print pattern in each sex. Similar results were obtained by Sharma *et al.*, 2009.

Lip print analysis in Malay, Indian and Chinese races did not reveal any statistically significant difference between races. However, significant statistical difference was observed

between sexes by Xu *et al.*, 2012. Such variations in different studies could be attributed to differences in the method of recording lip prints and also to different classification methods used for analysing. Recording of lip print is technique sensitive. The position of the lip during recording is important. When the lips are in closed mouth relaxed position, the grooves are well-defined and provide an accurate impression. Pressure and direction of taking the impression can also alter the prints. In case of males, prominent facial hair interferes with proper recording of lip prints (Kavitha *et al.*, 2009).

Conclusion

Studies done in Kerala population have reported varied results. Though our study didn't show any statistically significant differences between males and females, we found that the most common lip print pattern among both males and females was Type III. Type I was more predominant in male (25%) when compared to female (10%). This warrants further research on a larger sample population and establishment of database to determine the reliability of lip prints in population identification. The use of lip prints in determination of sex and ethnic groups is questionable.

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