



CHEILOSCOPY: A TOOL FOR GENDER IDENTIFICATION

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ABSTRACT

Objective: To find out whether lip prints can be used as a tool for identification of a gender and to find the most common lip patterns which can be useful for gender prediction.

Materials and Methods: A cross sectional study was carried out among 100 individuals visiting a dental institution in New Delhi with age ranging from 18 years to 50 years. A dark, non glossy red colour lipstick was used to take lip impression. A cellophane tape was used to retrieve the lip patterns and the same was transferred on white bond sheet. Using a 10x magnifying glass, the lip patterns were recorded using Suzuki and Tsushihashi classification (1970). The data was analysed using SPSS 22 and Chi-Square test was used to find the difference among gender with p value fixed at 0.05

Results: In the study participants, overall, Type II was predominantly present (35.8%) when compared to Type I (30.8%). Even though, there was difference in the occurrence of Type II lip patterns among females (23.8%) and males (12.8%), it was not statistically significant ($p > 0.05$).

Conclusion: Lip patterns are unique and can be compared to finger prints. Type II lip patterns were found predominantly with more female predilection. Large population based studies are required to obtain lip prints from various ethnic population so that matching can be done in cases of person identification.

KEYWORDS : Cheiloscopy, Lip Patterns, Lip Prints, Tsushihashi,

INTRODUCTION

Lip patterns in recent times are researched extensively to provide evidence regarding their usefulness in identification of an individual. The labial mucosa of the human lips is made up of lines which are arranged in a characteristic pattern comprising of grooves and wrinkles. These patterns on the lips are similar to the finger patterns which are unique and individual specific in humans. Study of these grooves or furrows present on human lips is known as Cheiloscopy (1). The term "Cheiloscopy" is derived from the Greek word chelios-lips and skopein-see and thereby the term refers to the study of lip prints. Lip patterns are unique, permanent and rarely change with age, resisting many tribulations and thus can act as a potential tool in identification process (2)

Lip patterns manifests in intrauterine life (6th week) and remains constant during life time of an individual. Lip patterns recover even after trauma, inflammation and the diseases like herpes which can be recognized without difficulty (2,3) It has been suggested that lip prints of parents and children and those of siblings have some similarities which can be used for comparison (5) Other researchers (6) have also supported the theory of inheritance of lip prints where in resemblance of 58.06% of lip print patterns were found between the parents and their biological offspring where as findings of another study has inferred that lip pattern was unique to individuals and differs significantly among family members and even among twins. However, more studies are required for arriving at a proper conclusion (7).

Lip prints can be accurate and admissible in the court of law as it can be retrieved from various surfaces like tea cups, clothing, napkins, cigars, glass surfaces etc and be directly

compared with suspects (8). Lip prints have a gender, racial and ethnic predilection. A recent study among Iranian population revealed that Type V was most predominant lip pattern and no significant difference between males and females was found (9). The findings of another study conducted on Portuguese population, revealed that Type III lip pattern was most common in males where as Type II pattern was predominantly found in females. There was statistically significant difference between genders which suggests that lip patterns can be used for gender identification as well (11). A study conducted on ethnic Aryans-Dravidian and ethnic Mongols have revealed that there was difference in the pattern of upper and lower lips which can be used for identification of ethnicity (12).

Even though, substantial number of studies has been conducted among various ethnic populations as well as among gender, there are potential errors because of which the evidence gathered by lip prints may be rejected by the court of law. The reliability and validity of lip prints is often questioned and there is a necessity to provide concrete evidence which can be comparable to DNA identification. Intra and inter investigator reliability is also found to be significantly different in many studies giving rise to doubts regarding the veracity of identification of an individual. Hence, the present study was conducted with an objective to find out whether lip prints can be a valuable forensic tool for identification of gender among a select population in Delhi.

MATERIALS AND METHODS:**Study design:**

A Cross-sectional study was carried out among patients visiting a dental institution in New Delhi for two months from May 2019 to June 2019.

Study sample:

In this study, convenient samples of 100 subjects were included comprising of 67 females and 33 males. All the subjects included were of age group between 18 to 50 years and they were all population of New Delhi. Written consent was obtained from each of participant and the purpose of the study was explained to them.

Sample selection:

Inclusion criteria:

- Subjects between the age of 18 to 50 years
- Lips free from any pathology, having absolutely normal transition zone between mucosa and skin were included in this study.

Exclusion criteria:

- Hypersensitivity to lipstick.
- Subjects with congenital abnormalities /malformation.
- Subjects with deformity of scars and trauma.
- Evidence of any inflammatory disease on the lips.
- Existing viral diseases of lips.

Study materials:

In this study, Suzuki K and Tsuchihashi Y classification was applied to classify the lip prints of the subjects.

Suzuki K and Tsuchihashi Y, in 1970 (13), devised a classification method of lip prints, which is as follows:

- Type I - A clear-cut groove running vertically across the lip.
- Type II - Partial-length groove of Type I.
- Type III - A branched groove.
- Type IV - An intersected groove.
- Type V - A reticular pattern.

The materials used were:

1. Non-glossy dark colored lip stick (Maybelline lip colour)
2. Transparent cellophane tape of 19mm.
3. Thin bond paper.
4. Magnifying lens (10x).
5. Scissors
6. Face mirror
7. Pen for labeling the individuals details

Data collection technique:

The investigators applied lipstick evenly on the lips, vermilion border, first by dabbing at the centre of lips and then applying it uniformly toward the corners of the lip. A strip of cellophane tape was pressed upon the lips after a couple of minutes to make lip impression and it was carefully lifted from one end of the lip to the other, to avoid any smudging and carefully stuck on a white bond paper to make a permanent record.

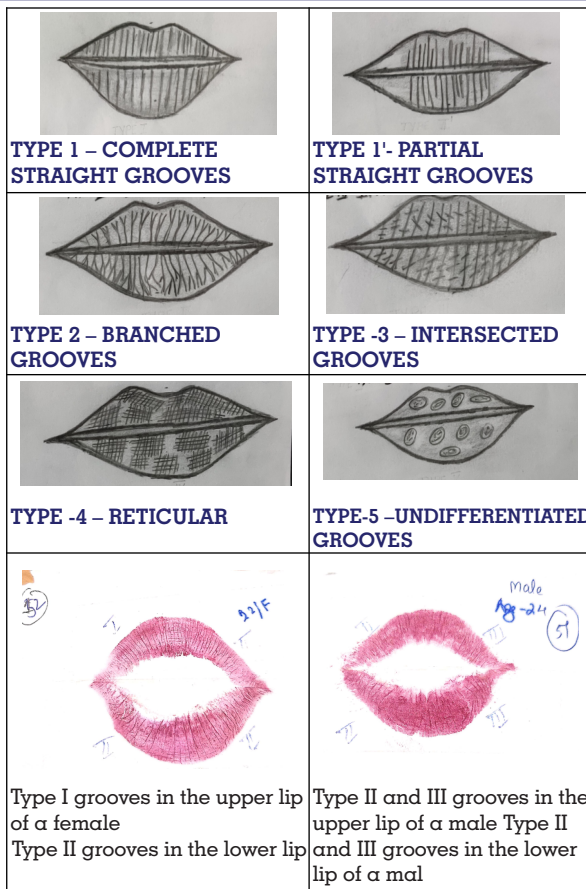
Each subject, lips were divided into four compartments; each lip divided into 2 quadrants, and named as 1 to 4 quadrants in a clock-wise sequence starting from the subjects upper right.

Upper lip right Upper lip left
 Lower lip right Lower lip left

Using a 10X magnifying glass, the lip prints were viewed by two observers who were blinded about the gender of the subjects to avoid any bias.

Statistical analysis:

The data was analyzed through IBM Statistical Package for Social Sciences (SPSS) software 22nd version. Descriptive statistics like frequencies was calculated. The data was dichotomized according to gender. Pearson Chi Square test was used to analyze the difference between the gender according to different lip patterns and a p value <0.05 was considered significant for all analysis and interpretation.



Suzuki K and Tsuchihashi Y classification of Lip Prints (1970)

RESULTS:

The study population consisted of 100 subjects among which 33% were males and 67% were females with mean age being 29.69±1.47 (Table 1). The lip patterns were unique for an individual and there was no match between them. In upper right lip, clear cut groove pattern (Type I) was predominantly found among females (40.3) when compared to males (30.3) followed by partial length groove (Type II) (36.4) and 32.8 among males and females respectively (p>0.05) (Figure 1) Where as in upper left lip, partial length groove (Type II) was predominantly present among both females (37.3%) and males (36.4%) when compared to Type I groove (32.8% and 28%) respectively among males and females. (p>0.05) (Figure 2)

In lower left lip, partial length groove (Type II) was predominantly found in males (42.4%) when compared to females (34.3%). Type I pattern was found among females (34.3%) when compared to males (18.2) (p>0.5) (Figure 3) In the lower right lip, the pattern was almost similar to lower left lip where Type II grooves were predominantly present among females (37.3%) and males (30.3%) followed by Type I pattern. (p>0.05) (Figure 4)

The percentage distribution of lip patterns revealed that in the upper lip, Type II was predominantly found among males (36.4%) followed by Type III grooves (30.3%) where as among females, Type II pattern (35.1%) was found predominantly followed by Type I groove (32.5%) (p>0.05). In the lower lip, both males and females had similar lip patterns Type II followed by Type I groove (p>0.05). Overall, Type II was predominantly present in the study population (35.8%) when compared to Type I (30.8%). Even though, there was difference in the occurrence of Type II lip patterns among females (23.8%) and males (12.8%), it was not statistically significant (p>0.05). The outcome was similar with Type I patterns, where it was found in 22.5% of females when compared to 8.3% of

males. Among the study population, Type III (Branched groove) (20.3%), Type IV (Intersected groove) (7.8%) and Type V (Reticular pattern) (5.5%) was less prevalent when compared to Type I and II. (Table 2)

TABLE 1: DESCRIPTION OF THE STUDY POPULATION

MALES		FEMALES		TOTAL	
N	%	N	%	N	%
33	33%	67	67	100	100

Mean age of Males : 29.91±1.56, Mean age of females: 29.58±1.42

Mean age of study population: 29.69±1.47

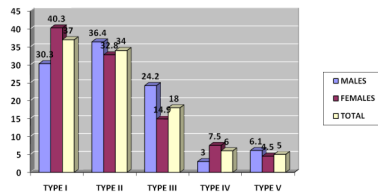


FIGURE 1: PERCENTAGE DISTRIBUTION OF LIP PATTERNS IN UPPER RIGHT LIP AMONG STUDY PARTICIPANTS

TABLE 2: PERCENTAGE DISTRIBUTION OF LIP PATTERNS (UPPER AND LOWER LIP) ACCORDING TO GENDER

Lip Patterns	Upper Lip			Lower Lip			Complete Lip		
	Male N (%)	Female N (%)	Total N(%)	Male N (%)	Female N (%)	Total N(%)	Male N (%)	Female N (%)	Total N(%)
Type (Clear-cut groove)	16 (24.2)	49 (36.6)	65(32.5)	17(25.8)	41(30.6)	58(29.0)	33(8.3)	90(22.5)	123(30.8)
Type II (Partial-length groove)	24(36.4)	47(35.1)	71(35.5)	24(36.4)	48(35.8)	72(36.0)	48(12.0)	95(23.8)	143(35.8)
Type III (Branched groove)	20(30.3)	19(14.2)	39(19.5)	13(19.7)	29(21.6)	42(21.0)	33(8.3)	48(12.0)	81(20.3)
Type IV (Intersected groove)	1(1.5)	12(9.0)	13(5)	8(12.1)	10(7.5)	18(9.0)	9(2.3)	22(5.5)	31(7.8)
Type V (Reticular pattern)	5(7.6)	7(5.2)	12(6.0)	4(6.1)	6(4.5)	10(5.0)	9(2.3)	13(3.3)	22(5.5)
TOTAL	66(33.3)	134(67.0)	200(100.0)	66(33)	134(67.0)	200(100.0)	132(33.3)	268(67.0)	400(100.0)
Statistical Inference	Pearson Chi-Square value=12.157, df=4, p=0.16			Pearson Chi-Square value=1.728, df=4, p=0.78			Pearson Chi-Square value=5.177, df=4, p=0.2		

DISCUSSION

Cheiloscopy has become an important tool in forensic identification of an individual when other evidences fail. It has an interesting history, where it has been used extensively to solve many crimes. The use of lip patterns was first suggested by famous anthropologist Fisher in 1902 (14). Later on, in France, Edmond Locard, a criminologist par excellence reported regarding the utility of lip patterns in identification of an individual in 1962. Since then, many forensic investigators have used lip prints available on the objects or surfaces to solve difficult cases (15).

The unique lip patterns which are microstructure comprised of grooves and wrinkles promises to be an adjunct identification tool in forensic investigations. Despite many disadvantages like lack of stability over a period of time due to susceptibility to various environmental factors, Hence, in many cases, lip print evidence are often rejected in cases of crime (16). None the less, the lip patterns (microstructure), size, shape of oral fissures, vermillion borders of the lips, protrusion of lips offer many advantages and have been used in conviction of many cases of robbery, assault, trespassing and murders (17).

The unique patterns, size, shape of lips has been extensively studied by researchers and have suggested various classification systems so as to make the identification reliable. The wrinkles, grooves, fissures of the lips have the same unique individual characteristics as finger prints and

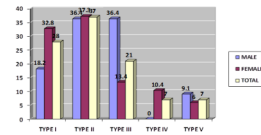


FIGURE 2: PERCENTAGE DISTRIBUTION OF LIP PATTERNS IN UPPER LEFT LIP AMONG STUDY PARTICIPANTS

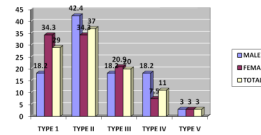


FIGURE 3: PERCENTAGE DISTRIBUTION OF LIP PATTERNS IN LOWER LEFT LIP AMONG STUDY PARTICIPANTS

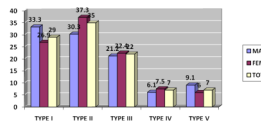


FIGURE 4: PERCENTAGE DISTRIBUTION OF LIP PATTERNS IN LOWER RIGHT LIP AMONG STUDY PARTICIPANTS

are admissible as evidence in the court. The classification of lip prints by dividing the grooves into two types and further subdividing the grooves into eight types has been suggested by Santos (18). Among all the classification, the system suggested by Suzuki K and Tsuchihashi Y in 1970 based on arrangements of lines on the vermillion zone of human lips is widely used in person identification (13).

A murder case was solved in Hungary (1962) in which lip prints found on the glass door at the scene of murder was successfully matched with the suspect. The murderer had pushed the glass door using his head and unknowingly left behind a valuable trace as he thought that his blood stained hands would leave a trail if the door was opened with his hands (19). This unique case of conviction opened the doors for forensic investigators to look for lip prints and retrieve them along with finger prints from the crime scene. In Virginia, USA, police successfully identified a peeping tom who displayed voyeurism by seeing women from the window, who left behind lip prints on the glass windows (20).

There is a debate whether lip prints are a valuable tool for person identification or not. However, researchers from different parts of the world have documented different lip patterns in various ethnic groups. Even though lip patterns have sexual dimorphism, uniformity of lip patterns among males and females which can be used for person identification is still lacking (21).

In present study, overall, Type II grooves (35.8%) were predominantly present in study population when compared to Type I (30.8%). Even though, occurrence of Type II lip patterns was more among females (23.8%) when compared males (12.8%), it was not statistically significant ($p > 0.05$). When the results of the present study was compared with relevant studies conducted on different ethnic groups in India, it revealed that there was wide variation in occurrence of lip patterns among both males as well as females. This diverse information may be useful but forensic identification will be difficult.

In a study conducted on ethnic Mangaloreans, Type I lip pattern was predominantly recorded among both males and females, followed by Type III, Type II, Type IV, and Type V patterns denoting that lip patterns did not exhibit sexual dimorphism. In present study, Type II was predominantly observed which was in contrast to other studies (22). Similarly, in another study, lip patterns of diverse ethnic groups (Caucasoid, Mongoloid, Australoid, and Negroid) of the population revealed that Type I was predominantly observed among all the ethnic groups followed by Type III, II, and V. There was no statistical difference between males and females indicating that utilising lip patterns for gender identification without other tools such as DNA may be an error (23).

In a study to find out the difference in lip patterns among various castes of North India, the findings revealed that Brahmins exhibited maximum prevalence of the groove type Y for both males and females where as among Jat males and females, it was Type III followed by type II, I', and I. Among the schedule caste groups, there was also high prevalence of Type III among males and females. There was minimum occurrence of type IV and V (24). Even though, the population was divided into to different castes, lip patterns were almost similar to each other groups giving indication of a common genetic trait which requires further studies to unravel the role of ethnicity.

Type IV and V are most uncommon lip patterns to be found in the North Indian population as well as among select ethnic groups in South India but Koneru et. al (25), have reported regarding high prevalence of Type IV and Type V lip print patterns among males of ethnic Keralian population, whereas in females, it was Type I. Furthermore, Type I pattern was found to be more in Manipuri males when compared to their counterparts. Similarly, another study has reported regarding occurrence of Type I predominantly, when compared to Type II and III in a sample of Marathi population (26).

Along with comparisons for potential matching, the lip prints also offers important identification tool such as DNA. Researchers have successfully demonstrated that biologic material like DNA can be extracted from lip prints left behind on glass mirrors, towels, cups, napkins and other such objects and the typing for Short Term Length (STR) loci can be done for potential matching (27).

Various researchers (21-26,28) have concluded that lip prints are an excellent and promising tool for person identification exclusively used in forensic identification but it is not a valid one like the DNA identification. Lip prints affect the conviction rates in crime scene investigations and arises benefit of doubt. Like other biometrics such as finger prints and iris scan, lip prints can also be obtained, stored and in suitable situation can be matched. The probability of chance occurrence of lip patterns cannot be ruled out as various studies had a small sample size and therefore a large population based studies mapping various ethnic groups is required to conclude the correlation between particular type of lip pattern with a particular population and gender.

CONCLUSIONS:

Lip patterns are unique feature of an individual and can be utilized in person identification similar to finger prints. Type II lip patterns was predominantly found followed by Type I in females and type III Lip pattern was found more in males. Large population based mapping for obtaining lip prints is essential to prepare a catalogue of lip patterns which is unique to a particular ethnic group and gender.

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