A COMPARATIVE EVALUATION OF CHELIOSCOPY AND DERMATOGLYPHICS: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Each individual's lip prints and fingerprints are said to be unique. The study of fingerprints and lip prints is widely used in both personal identification and criminal investigations. **Aim:** The purpose of this study was to identify the most common lip and fingerprint patterns in the South Indian population, as well as any correlations between lip print and fingerprint patterns. **Materials and Methods:** Two hundred students (100 males, 100 females) were included in the study. Lip prints were recorded for each individual using a dark colored lipstick and the right thumb impression was recorded using an ink pad. The lip prints and fingerprints were analyzed using a magnifying glass. The Chi square test was used for statistical analysis. **Results:** The loop pattern was shown to be the most common fingerprint pattern in both males and females, followed by the whorl pattern and then the arch pattern. Lip prints and fingeprints were shown to have no statistically significant association. **Conclusion:** In a forensic scenario, lip prints and fingerprints can be utilised for personal identification. Further research into the correlations between lip prints and fingerprints could be beneficial in forensic science.

KEYWORDS: Cheiloscopy, dermatoglyphics, forensic identification.

INTRODUCTION

In today's world, we see a lot of catastrophes, accidents, and crimes that shatter the lives of the victims and their families all over the world. To prevent these crimes, a small improvement can be made using the technology and scientific knowledge we have, which will also help to keep law and order in peace.[1] This can be accomplished through the department of forensic odontology, where dentistry plays a little but crucial role in identifying victims and crimes during disasters and criminal investigations.[2]

Forensic odontology is the study of dental applications in legal procedures, and it is multidisciplinary in nature. "Forensic odontology" is derived from Latin, which means "forum" or "place where legal topics are debated."[3] Identification methods include fingerprints, DNA profiling, bitemarks, radiography, pictures, and molecular approaches. In some cases, unconventional procedures like cheiloscopy and rugoscopy can aid in identification.[4]

Every person's fingerprints are unique and one-of-a-kind. Dermatoglyphics is the science of fingerprints. For many decades, it has been utilized for personal recognition, scandalous inquiry, and the study of genetic illnesses. Lip prints are also becoming more popular in forensic odontology. Lip prints, like fingerprints, are unique to each person. Cheiloscopy is the study of the wrinkles and grooves on the labial mucosa (called sulci labiorum). Lip prints are a distinctive pattern formed by the wrinkles and grooves on the labial mucosa (called sulci labiorum).[5]

Cheiloscopy is a forensic investigation procedure that uses lip traces to identify people. As a result, lip prints are becoming increasingly relevant in criminal investigations. Lip prints are useful for identifying suspects because they are distinctive. Lip prints are significant since they are one-of-a-kind and do not change over time. It is used to comprehend the situation based on evidence found around the crime site in order to identify the number of people involved, their nature and sex, as well as the sort of crime committed at the time of the crime.[6]

The purpose of this research was to analyze south Indian men and women in order to create the preconditions for forensic identification based on the analysis of the lips.

The aim of the research was

- To determine the type of grooves on healthy lips of men and women by analyzing lip prints in a sample of the south India population.
- To determine if there is a statistically significant difference between men and women in the types of grooves.
- To determine if there are any differences between male and female lip prints.

MATERIALS AND METHODS

A total of 200 individuals between the ages of 18 and 34 were recruited for the study. The institutional review board granted ethical clearance. For data collecting, the convince sampling technique was used.

Inclusion criteria

- The study included young adults who did not have any oral disease or diseases of the lips or mucosa.

Exclusion criteria:

- Subjects with congenital abnormalities such as cleft lip and palate were excluded.
- Subjects with any type of inflammation or who were allergic to lipstick were not included in the trial.
- Subjects who refused to participate were excluded from the study.

A dark-colored lipstick, Cellophane tape, White bond paper, Magnifying lens, Pen/pencil for labeling the individual's details are the materials used for the study.

METHODOLOGY

Prior to the study, all participants were explained about it, as well as the study's goal and objective, and they were all comfortable with it. The lips of the participants were washed, then a small layer of dark red lipstick was applied, which they were instructed to distribute evenly. The lipstick–cellophane technique, proposed by Sivapathasundaram et al.[7] was used to record lip prints, which delivers excellent clarity and precision. The cellophane sheet's glue portion is applied to the lips. The cellophane sheet with the lip print was carefully removed and adhered to a bonded white paper after a few seconds.

The lip print was examined for clarity, and if any smudging was discovered, the technique was repeated. The participants were instructed to use wet tissue paper to clean away any

remaining lipstick. Four quadrants were created on the lips. An expert examined his lip prints in all quadrants using a magnifying lens, and a double-check was performed before data entry. The studied area was the central section of the lower lip (10 mm wide), similar to the study of Sivapathasundaram et al.[7] The most common patterns in the above-mentioned region were counted to establish the lip print pattern. Suzuki and Tsuchihashi classifications were used to classify lip prints.[8]

• Type I - A clear-cut groove running vertically across the lip

• Type I' - Partial-length groove of Type I

• Type II - A branched groove

• Type III - An intersected groove

• Type IV - A reticular pattern

• Type V - Other patterns/ undermined

The above-mentioned materials were used to record each lip print on A-4 sized paper, and each code was allocated to each lip print, as well as the thumb and index fingerprints. Along with the lip prints, the thumb and index fingerprints of both the right and left hands were recorded on an A4 sheet using a blue inked stamp pad.

The lip prints and thumbprints were assessed by two calibrated assessors. Fingerprints were evaluated using Kucken's categorization system, which divides the fingerprint into three groups.[9]

• Loop pattern

• Arch pattern

• Whorl pattern

STATISTICAL ANALYSIS

All the statistical procedures were done using SPSS 22.0 Version SPSS INC; Chicago, IL, USA. The Chi square test was used to determine the difference between finger prints and lip patterns. It was considered significant if the p value was less than 0.05.

RESULTS

There were 100 males and 100 ladies among the total of 200 students. The participants ranged in age from 18 to 34 years (mean 22.5 +/- 3.73 years). There was no missing data.

Table 1: Distribution of finger print pattern.

	pattern	Frequency	Percent	Model fitting criteria	Likelihood Ratio Tests		
				-2 log likelihood of reduced model	Chi-square	df	sig
Right thumb	1	137	68.5	241.247	2.667	4	0.615
	2	17	8.5				
	3	46	23.0				
	Total	200	100				
Left Thumb	1	126	63.0	242.952	4.372	4	0.358
	2	25	12.5				
	3	49	24.5				
	Total	200	100				
Right index	1	110	55.0	244.204	5.624	4	0.229
	2	41	20.5				
	3	49	24.5				
	Total	200	100				
Left index	1	108	54.0	240.310	1.730	4	0.785
	2	35	17.5				
	3	57	28.5				
	Total	200	100				

p value = < 0.05 was considered significant, df= degree of freedom, sig= significance

The most prevalent lip print pattern among all participants was vertical (n = 34%), followed by branched (n = 17.5%) and reticular (n = 16.5%). The undetermined pattern (n = 14.5 %) was revealed to be the least common. (Table 1).

Table 2: Distribution of lip print pattern.

Pattern	Frequency	Percent
1	68	34.0
2	35	17.5
3	35	17.5
4	33	16.5
5	29	14.5
Total	200	100

The most prevalent fingerprint pattern on the thumb and index fingers of both the right and left hands was a loop pattern, followed by whorled and arch patterns. An arch fingerprint pattern was the least prevalent sort of fingerprint pattern. (Table 2).

Table 3: Corelation between fingerprints and lip prints.

Pattern	Lip prints	B	df	sig
1	Intercept	-.066	1	0.913
	Right thumb	0.452	1	0.156
2	Left thumb	-.426	1	0.178
	Right index	-.746	1	0.023
	Left index	0.343	1	0.267
	Intercept	-.526	1	0.366
	Right thumb	0.257	1	0.422
3	Left thumb	0.81	1	0.787
	Right index	-.332	1	0.302
	Left index	-.058	1	0.857
	Intercept	-.414	1	0.488
	Right thumb	0.318	1	0.335
4	Left thumb	-.297	1	0.353
	Right index	-.316	1	0.327
	Left index	0.128	1	0.691
	Intercept	-1.200	1	0.057
	Right thumb	.025	1	0.942
5	Left thumb	0.194	1	0.532
	Right index	-.187	1	0.572
	Left Index	0.175	1	0.594

p value = < 0.05 was considered significant, df= degree of freedom, sig= significance.

The overall correlations of lip prints and fingerprints in males and females are shown in Table 3 and indicate that the link between the lip and fingerprint in both males and females was not statistically significant (p-value less than 0.05).

Although there was no significant correlation between lip prints and fingerprints within gender, we did notice a specific association of fingerprint patterns with various lip print patterns among participants.

DISCUSSION

In forensic investigations and personal identification, lip prints are useful. Lip prints, which are analogous to fingerprints, are regarded as key forms of transfer evidence. Lip prints were originally illustrated in 1902 by R. Fischer, an anthropologist. The value of Cheiloscopy was recognized by one of France's foremost criminologists, Edmond Locard, in 1932. Le Moyer Snyder suggested the idea of using lip prints in human identification in his book ''Homicide Investigation" in 1950. The best work on lip prints has been done by Japanese doctor Suzuki. Suzuki streamlined the classification into five major groups after performing research on 107 Japanese women in 1970.[10]

Lip prints have certain drawbacks as well. Because the mucosa on the lips is thin, pressure variations can produce changes in lip patterns. Changes in lip position when capturing lip prints might sometimes result in erroneous patterns. Lip prints, on the other hand, appear to have a noticeable edge in terms of distinguishing sex over fingerprints, which can be useful in investigations.[11]

Lips having inflammation, damage, malformation, deformity, or scars were excluded from the study. These anomalies, on the other hand, serve as distinguishing characteristics. When the lip is inflamed, it might be difficult to determine the pattern of the lip prints. The fact that the lip reverts to its original pattern after healing implies that the lip print is permanent.[12]

Type I: Vertical grooves were discovered to be the most common pattern in both males and females in our study. This was followed by Type II and III. The least prevalent pattern was type IV (undetermined). Several studies in India have revealed population dominance. Sivapathasundaram et al. and Saraswati et al. analyzed lip print patterns and discovered that Type III was the most common lip pattern in the Indo-Dravidian population.[7, 13] Varghese et al. discovered Type IV as the most common pattern in both males and females in Kerala.[14, 15]

The loop type was the most common form of fingerprint pattern in our investigation, followed by the whorled and arch types. Similar to this study, Baral R et al. discovered that the loop pattern was the most common type of fingerprint, followed by the whorled and arch patterns.[16] In the current investigation, there was no significant difference in fingerprint patterns between males and females. These findings are consistent with the findings of Nagasupriya A et al. and Kumaran S et al.[17, 18]

Another goal of our research was to find a link between the lip print pattern and fingerprints. We did not, however, uncover a significant link between lip prints and fingerprints. The findings are consistent with the findings of Negi et al.[19] This could be owing to our study's tiny homozygous sample size. Nonetheless, we found that the whorl fingerprint pattern, despite being the least common, coexisted with the reticular and branched lip print patterns in both genders. This association of the fingerprint pattern with differing lip prints in males and females should be investigated further in research with large heterozygous sample sizes, which could serve as an important tool in forensic scenarios.

CONCLUSION

Accordingly, identifying lip print patterns could be a useful aid in personal identification, with the type 1 pattern being the most prominent. In the instance of fingerprints, we determined that both males and females have a loop pattern. In forensic science, a correlation study between the lip print and the fingerprint will be very valuable for personal identification; therefore, more research with large heterozygous samples could lead to positive results.

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