

Unfolding the Link- Lip Prints and Finger Prints in Personal Identification

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| Received: 16.03.2019 | Accepted: 23.03.2019 | Published: 31.03.2019

DOI: [10.21276/sjodr.2019.4.3.16](https://doi.org/10.21276/sjodr.2019.4.3.16)

Abstract

Background: Lip prints and fingerprints are considered to be unique to each individual. The study of fingerprints and lip prints is very popular in personal identification of the deceased and in criminal investigations. **Aims and objectives:** The aim of the study is to find the predominant lip and fingerprint patterns in males and females in the Kadapa population and also to find any correlation between lip print and fingerprint patterns within a gender. **Materials and Methods:** The study sample comprised of 100 students of Govt Dental College & hospital, Kadapa, Andhra Pradesh, 50 males and 50 females aged between 18 to 30 years. pink colored lip stick was applied on the lips and the subject was asked to spread it uniformly over the lips. Lip prints were traced in the normal rest position of the lips with the help of cellophane tape. The imprint of the left thumb was taken on a white bond paper and visualized using magnifying lens. **Results:** This study showed that lip and finger patterns did not reveal statistically significant results within the gender. In males, branched type of lip pattern associated with whorl, loop, arch, type of finger pattern was most significant. In females, vertical lip pattern associated with loop, whorl & arch finger patterns were most significant. **Conclusion:** Lip print and finger print could be a significant important tool in the field of forensic odontology for personal identification. however, Further correlative studies between lip prints and fingerprints could be useful in forensic odontology for sex identification.

Keywords: Cheiloscopy, dermatoglyphics, forensic, gender determination.

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INTRODUCTION

Forensic dentistry plays a vital role in detection and resolution of crime, civil proceedings and personal identification. With ever-increasing demands placed upon law enforcement to provide sufficient physical evidence for crime, it makes sense to utilize any type of physical characteristic to identify a suspect of an offense. Dentist has an important role in the identification of person as oral cavity provides with infinite evidence because of the distinctive features of teeth, lips and palate [1]. Dentist has an active role in various objectives of forensic odontology like age and gender determination, personal identification of unknown deceased person, giving evidence in child abuse cases, analyzing bite marks as evidence in crime seen, participating in mass disaster etc. His/her role in personal identification and criminal investigation is very much important, as his/her evidence would be very much useful in law and justice.

The wrinkles and grooves on the labial mucosa, called as sulci laborium, forms a characteristic pattern called as lip prints. The study of lip prints is

known as cheiloscopy [2]. The wrinkles and grooves visible on the lips have been named by *Tsuchihashi* as '*sulcilabiorumrubrorum*' [3], The term finger print is an impression of epidermal ridges present at the distal end of fingers which is used as a means of establishing identification of an individual [4]. Study of finger prints is known as *dermatoglyphics* [5]. The fingerprints of a person is used as one of the vital parts of identification in both civil and criminal cases because of their unique property of absolute identity [6]. For this unique property the fingerprints of identical twins are also different [7].

Lip prints are also unique to an individual like finger prints. The present study was aimed to analyze the predominant pattern of lip and finger prints and to identify any correlation between the finger print and lip print patterns with in the gender that could help forensic odonatologists to solve the personal identification.

MATERIALS AND METHODS

The study sample comprised of 100 students of Govt Dental College & Hospital, Kadapa, Andhra

Pradesh, 50 males and 50 females aged between 18 to 30 years without any pathology of lips and fingers were included in the study. The procedure of taking lip and finger prints was explained to the participants and consent of all the individuals were obtained.

The subject was asked to rinse the mouth with water and lips were allowed to dry. Pink colored lip stick was applied on the lips and the subject was asked to spread it uniformly over the lips by gentle movement of the lips. Over the lip stick, the glued portion of the cellophane tape was dabbed first in the center and then pressed uniformly over the corner of the lips. Lip prints were traced in the normal rest position of the lips. The cellophane tape was then stuck to the white bond paper for permanent record purpose. The imprint of the left thumb was taken and they were visualized using magnifying lens.

In our study the middle-third portion of the lower lip was considered for analysis as this area is always present in a lip print. A modified classification by Nagasupriya *et al* was used in the study for comparative analysis. According to them patterns of lip prints are classified as follows Branched, Reticular, and Vertical types. Fig-2 for finger prints we followed Michael Kucken classification. Classified into loop, arch and whorl patterns. Fig-3 Association between lip prints and finger prints was statistically tested using Chi-square test.

RESULTS

The predominant lip print pattern in males was found to be the branched pattern, followed by vertical and then reticular. In females, the vertical lip print pattern was predominant, followed by the branched pattern and then followed by the reticular pattern (Graph-1). The predominant fingerprint pattern in both males and females was found to be the arch pattern, followed by the loop pattern and then whorl pattern in males where as in females whorl pattern followed by loop pattern (Graph-2).

among 50 male subjects, 20 were found to have a branched lip pattern. Out of these 20 subjects, 11 (55%) were associated with the arch pattern, 5 (25%) associated with the loop pattern, and 4 (20%) associated with the whorl pattern. 16 out of 50 males had the vertical lip pattern. 8(50%) were associated with the arch pattern, 6(35.5%) with the loop pattern, and 2(12.54%) with the whorl pattern. The reticular lip pattern was seen in 14 of 50 male subjects. Out of these, 7 (50%) were associated with the arch pattern, 2(14.3%) with the loop pattern, and 5 (35.59%) were associated with whorl finger pattern.

Among 50 female subjects, 19 were found to have the vertical lip pattern. Out of these 19 subjects, 9(47.4%) were associated with the arch pattern, 3(15.8%) associated with the loop pattern, and 7(36.8%) were associated with the whorl pattern. 17 out of 50 females had the branched lip pattern. 11 (60.7%) were associated with the arch pattern, 2(11.8%) with the loop pattern, and 4(23.5%) with the whorl pattern. The reticular lip pattern was seen in 14 of 50 female subjects. Out of these, 5 (35.7%) were associated with the arch pattern, 6 (42.9%) with the loop pattern, and 3 (21.4%) were associated with the whorl finger pattern.

The overall correlations of lip prints and fingerprints in males and females are given in Tables 1 and 2 showing that the association between lip and finger print among both males and females was not statistically significant with p value 0.477 & 0.199 respectively.

We observed that the whorl fingerprint pattern in males was associated with vertical and branched lip print patterns, whereas in females loop pattern was associated with the branched and vertical lip print pattern. The whorl finger pattern was found to be the least common in males and loop finger print is least common in females, but the specific association of this pattern with different lip print patterns among males and females was also observed.

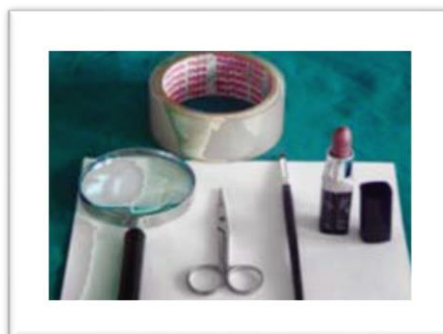


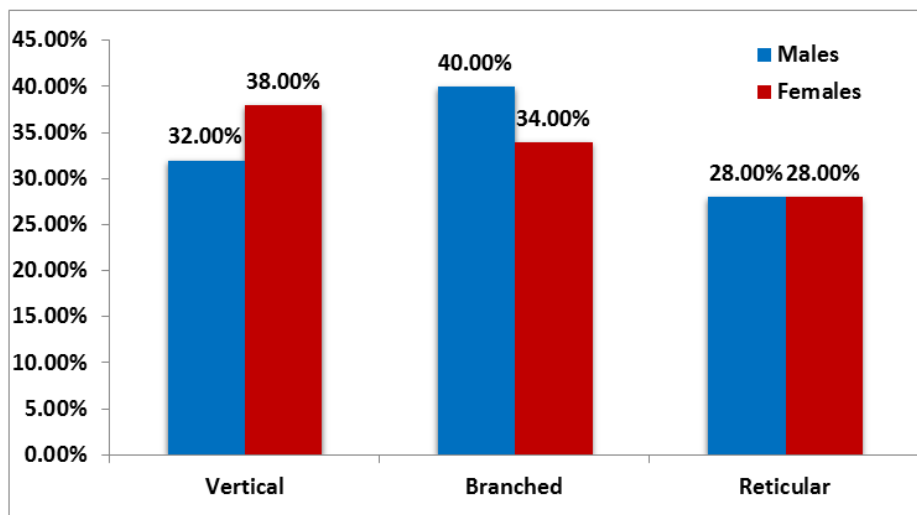
Fig-1: Materials used for the study



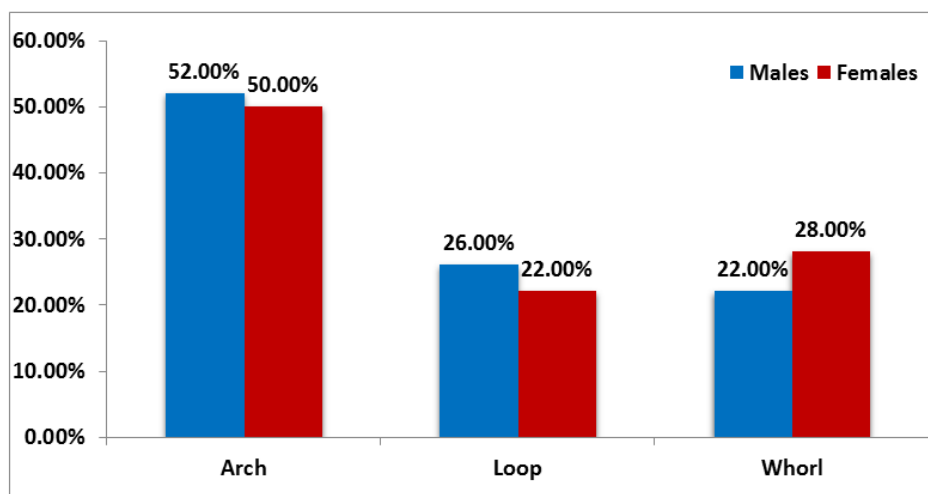
Fig-2: Types of lip prints according to the classification by Nagasupriya *et al.*, [14]



Fig-3: Types of fingerprints according to the classification by Michael Kucken



Graph-1: Distribution of lip print patterns among males and females



Graph-2: Distribution of fingerprint patterns among males and females

Table-1: Correlation of lip prints with finger patterns in males (N=50)

			FINGER_PRINT			Total
			Arch	Loop	Whorl	
LIP_PRINT	Type - I	Count	8	6	2	16
		% within LIP_PRINT	50.0%	37.5%	12.5%	100.0%
		% within FINGER_PRINT	30.8%	46.2%	18.2%	32.0%
	Type - II	Count	11	5	4	20
		% within LIP_PRINT	55.0%	25.0%	20.0%	100.0%
		% within FINGER_PRINT	42.3%	38.5%	36.4%	40.0%
	Type - III	Count	7	2	5	14
		% within LIP_PRINT	50.0%	14.3%	35.7%	100.0%
		% within FINGER_PRINT	26.9%	15.4%	45.5%	28.0%
Total		Count	26	13	11	50
		% within LIP_PRINT	52.0%	26.0%	22.0%	100.0%
		% within FINGER_PRINT	100.0%	100.0%	100.0%	100.0%
Chi-Square Tests						
Pearson Chi-Square		3.508 ^a	4	477 NOT SIG		
Likelihood Ratio		3.486	4	.480		
Linear-by-Linear Association		.583	1	.445		
N of Valid Cases		50				
a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 3.08.						

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 3.08.

Table-2: Correlation of lip prints with finger patterns in females (N=50)

			FINGER_PRINT			Total
			Arch	Loop	Whorl	
LIP_PRINT	Type - I	Count	9	3	7	19
		% within LIP_PRINT	47.4%	15.8%	36.8%	100.0%
		% within FINGER_PRINT	36.0%	27.3%	50.0%	38.0%
	Type - II	Count	11	2	4	17
		% within LIP_PRINT	64.7%	11.8%	23.5%	100.0%
		% within FINGER_PRINT	44.0%	18.2%	28.6%	34.0%
	Type - III	Count	5	6	3	14
		% within LIP_PRINT	35.7%	42.9%	21.4%	100.0%
		% within FINGER_PRINT	20.0%	54.5%	21.4%	28.0%
Total		Count	25	11	14	50
		% within LIP_PRINT	50.0%	22.0%	28.0%	100.0%
		% within FINGER_PRINT	100.0%	100.0%	100.0%	100.0%
Chi-Square Tests						
		Value	df	P Value		
Pearson Chi-Square		6.112 ^a	4	.191 NOT SIG		
Likelihood Ratio		5.688	4	.224		
Linear-by-Linear Association		.050	1	.823		
N of Valid Cases		50				
a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 3.08.						

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 3.08.

DISCUSSION

It is well-established fact that finger prints are unique to each individual, similarly lip prints also unique to each individual. Then this are considered to be the most important types of transfer evidences (that is, the evidence obtained from the transfer of material from one surface to another when in contact) for examination.

Lip prints are sometimes left at crime scenes and provide a direct link to the suspect. The vermilion

border has sebaceous and sweat glands along with minor salivary glands. Their secretions and moisture from these leads to the development of latent lip prints in many crime scenes, analogous to latent fingerprints, where there was close contact between the victim and culprit [8]. Invisible lip prints can be developed and recorded by using agents like aluminum powder and magnetic powder [9].

Lip prints and finger prints form a pattern that is unique for each individual. Comparative study of lip

prints and finger prints for the interpretation in personal identification is scanty in the literature. Gender identification is very much necessary for unknown deaths in homicide, suicide, mass disasters, accidents and It is also necessary for living individuals like missing person due to amnesia and culprits hiding identity. In dead persons, usually the personal identification is done by comparing existing ante mortem record with that of post mortem records whose identity is required [10]. Apart from the dental hard tissues like teeth and their restorations, even soft tissues of oral cavity may also help in personal identification. Among the soft tissues, lip prints can be recorded and used as evidence in personal identification and criminal investigation. After death of an individual lip prints should be collected within a time period of 24 hrs so as to prevent post mortem changes [11]. Sivapathasundharam *et al.*, have commented that any major trauma to the lips and any surgical treatment for correcting abnormality that alters the size and shape of the lips there by affecting the pattern and morphology of grooves [12].

Ancient Chinese and Assyrians used Finger prints as a form of identification since 7000 to 6000 BC. However the use of finger prints for criminal identification, first done in Argentina in 1896, then at Scotland Yard in 1901, and to other countries in the early 1900's. With the introduction of inexpensive finger print capture devices and in the late 1990s, lead to development of fast, reliable matching algorithms have set the stage for the expansion of finger print matching to personal use [13].

There are various theories proposed for finger pattern formation. Kollmann in 1883 speculated that ridge pattern is formed as a result of a folding process induced by differential growth. This was promoted by Bonnevie in 1920 who stated that cylindrical cells were formed as a result of intense cell proliferation in the basal layer of epidermis which evades the dermis, resulting in the formation of primary ridges. These primary ridge system changes till 16th week of pregnancy and become permanent remains unchanged in the life time.

In our study, the predominant lip print pattern in males was found to be the branched pattern, which is similar to the study of Nagasupriya *et al.*, [14] In females, the vertical lip print pattern was predominant, which is similar with the results of by Sharma *et al.*, [15]. From the study by Gondivkar *et al.*, [16] criss-cross lip pattern was reported in 51.05% of males and branched lip pattern in 37.06% of females. Saraswathi *et al.*, [17]. Reported that intersecting pattern was most common in both males (39.5%) and females (36.5%), which was similar to that of Sivapathasundharam *et al.*, [12].

In our study, we observed that the difference in distribution of lip prints in males and females was statistically insignificant, with the branched pattern being the most predominating pattern in males and vertical in females However, the distribution of lip print patterns in females was statistically insignificant. We also observed that the difference in distribution of fingerprint patterns in both males and females was found to be statistically significant, with the arch pattern being the predominant pattern. The other aim of our study was to correlate the lip print pattern with fingerprints for gender identification. However, we did not find any significant correlation between lip prints and fingerprints within the gender. This may be due to the small homozygous sample size in our study. Still, we observed that the whorl fingerprint pattern, though being the least predominant pattern in males and loop pattern in females, with the vertical and branched lip print patterns in males, whereas in females it was associated with the branched lip print pattern. This association of the whorl pattern with different lip prints among males and females could be further explored with studies consisting of large heterozygous sample sizes can serve as an important tool for sex determination in the forensic scenario.

CONCLUSION

In conclusion identifying lip print patterns could be an important tool in personal identification the type 2 pattern of lip prints found to be significantly associated with males subjects whereas females had type 1 pattern. In case of finger prints we found arch pattern is most commonly seen in both male and females. correlative study between the lip print and finger print will be very useful in forensic science for personal identification so Further studies with large heterozygous sample may lead in a positive direction.

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