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Comparison of Lip Print and Finger Print in Sex Determination of Salem Population

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Abstract

Background: In the field of forensic sciences, Practitioners face major problems in personal identification of humans. Lip prints and finger prints can serve as a significant tool for such identification and gender determination as they are unique and distinguishable to each individual. **Aim:** This study was aimed to evaluate the comparison of lip print and finger print pattern in Salem population for sex determination. **Methods:** This study comprises 200 lip prints (100 females and 100 males) which were randomly selected among Salem population with age ranging from 15 to 30 years and were collected with lip stick with the help of a cellophane tape on a white sheet, the same people were asked to press the cleaned fingers of right hand over ink-stained pad and the impression of inked finger was then transferred to the same white paper. Lip prints and Finger prints were examined with magnifying hand lens for pattern distribution - classified, recorded and analyzed. **Results:** Our study proved that the prevalent lip print in the males and females were Type III and type I respectively. The most prevalent finger print in the male was whorls Type and in female it was Loop type. There is statistically significant association between of these two parameters (p value=0.001) and thus these combinations can be implicated in detection of individuals. **Conclusion:** The use of lip and finger print patterns has been suggested to be consistent and reliable to suspect a fault. Correlation of these two parameters has significant association and thus the result of the present study can provide an additional tool in forensic science for gender determination.

Keywords: Finger Print, Forensic, Lip Print, Salem

1. Introduction

The process of identifying a person could be a very difficult process. Anthropometry, sex determination, estimation of age, measurement of height, identification of a specific individual, Oral dental aids, DNA comparisons and differentiation by blood groups are the most commonly employed traditional methods of personal identification, which can permits reliable and rapid identification processes. Since using DNA analysis for personal identification is sophisticated and cannot employed in all circumstances, dactylography (study of finger prints) and cheiloscopy (study of lip prints) are most commonly preferred.

Finger print patterns comprised of papillary ridges which are elevated and contain numerous pores on fingertips. Human fingers constitute friction ridges that produce impression which are termed as finger prints. The value of fingerprints should be understood in detection techniques because they have a common similarities and distinct patterns in its design.

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Lip prints constitute many depressions and elevations forms the characteristic pattern between the outer skin and labial mucosa (inner aspect). Lip print Examination is cheiloscopy. Cheiloscopy is significant as they remain unique to every individual, except in monozygotic twins. Lip prints show changes by scaring which may be due to pathos is a trauma or due to any surgical procedure. These patterns are identifiable during the sixth week of intrauterine life. In any crime scene, the presence of an individual can be confirmed, when there is evidence of consuming food or beverages, particularly if they are pooled with other evidence available.

Comparative studies between lip and finger print patterns are less documented so far. This study was aimed to evaluate the comparison of lip print and finger print pattern in Salem population for sex determination.

2. Subjects/Study Sample

The study was conducted in the Department of Oral and Maxillofacial Pathology and Microbiology, Vinayaka Mission Sankarachariyar Dental College, Salem comprising of 200 randomly selected subjects of both sexes (100 males and 100 females) aged between 15 years and 30 years in Salem population.

3. Inclusion Criteria

Participants without any diseases or abnormalities in the fingers and lips were selected for this study.

4. Exclusion Criteria

Any participants with past history of plastic surgery, inflammation, malformations, deformities or surgical scars in the lips were excluded from the study. The subjects who were allergic to lipstick and cellophane tape were also excluded from the study.

5. Ethical Considerations

Clearance and approval was obtained from Institutional Ethics committee to carry out the study. The procedure and the purpose of the study were explained to the participants and informed written consent was obtained.

6. Study Materials Used

1. Brown, Maroon and red colored lipstick.
2. Cellophane tape.
3. Cotton swabs.
4. Scissors.
5. A4 sheets.
6. Magnifying lens.
7. Stamp pad – Blue ink.

7. Technique

7.1 Recording Lip Print

Patients were informed about the procedure and asked to sit comfortably on a dental chair. Patients were examined properly wearing sterile hand gloves and mouth mask to rule out any abnormalities, past history of plastic surgery, inflammation, malformations, deformities or surgical scars in the lips. The people were asked to properly wipe the lips with wet tissue followed by drying the lips with tissue paper. Brown/maroon/red colored lip stick was applied onto the cleaned and dried lips, uniformly on the upper lip and then on the lower lip. Over the lipstick, the impressions were taken by gently pressing the glued portion of cellophane tape over the lip, followed by uniformly pressing the tape toward the corners of the lips.

The cellophane tape was then removed carefully and stick on to the A4 sheet paper then the lips were cleaned with tissue paper.



Figure 1. Types of Lip Prints obtained in our study.

8. Examination of Lip Print

Recorded lip prints were visualized by magnifying lens. Only the center part of the lower lip was taken into consideration. In case of two dominant patterns, the most dominant one was taken for the study purpose. As Puneet kumar *et al.* suggested even though the lines and furrows are present both in the upper and lower lip, from one corner of the mouth to the other corner, only the middle portion of the lip is taken into account, since this portion is always visible in any traces[9]. Based on the classification system given by Tsuchihashis Y (1970), analysis was done. The following method was used for taking the impressions from every subject.

"Type I: Vertical, comprising of complete [end to end] longitudinal fissures/patterns.

Type I': Incomplete longitudinal fissures.

Type II: Branching Y shaped pattern.

Type III: Criss-cross pattern.

Type IV: Reticular, typical chequered pattern, fence like[12]."

9. Recording Finger Print

The people's fingers were cleaned using tissue paper, and allowed to press the fingertips over the ink stamp pad, in such a manner that the entire pattern area should be covered with ink. Majority of the individuals are right-hand users, Impressions of right hand was commonly preferred and taken by Government Agencies. The inked fingers were then rolled over the same A4 sheet white paper on which lip print impression was taken.

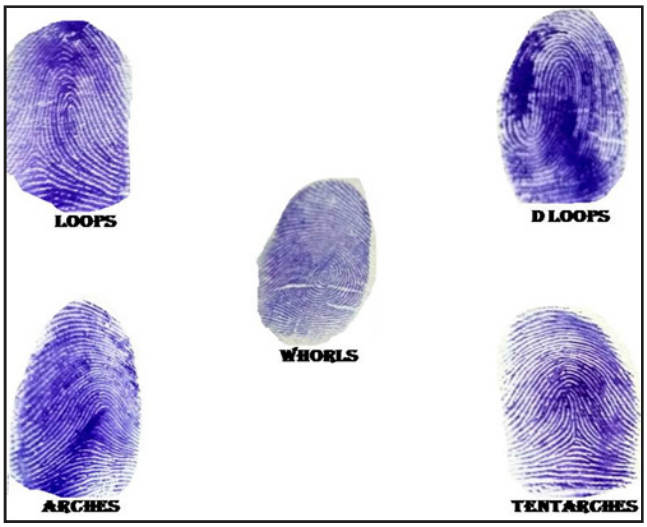


Figure 2. Types of Finger Prints obtained in our study.

10. Examination of Finger Print

The finger print patterns were analyzed using magnified hand lens according to Henrys' classification (1897).

11. Result

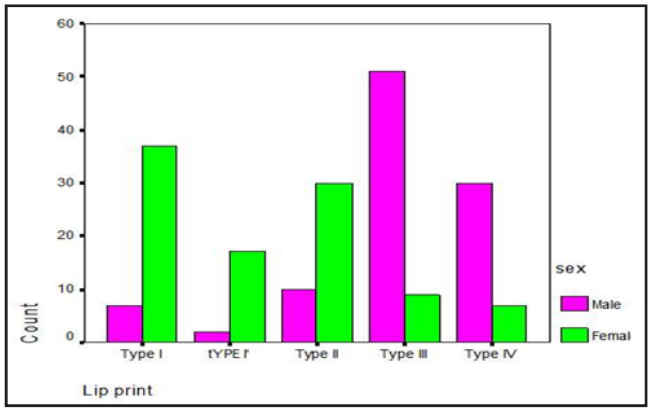
11.1 Lip Print - Male and Female

The observed results are 7% of the males and 37% of the females were of Type I lip pattern. 2% of the males and 17% of the females were of Type I' lip pattern. 10% of the males and 30% of the females were of Type II lip pattern. 51% of the males and 9% of the females were of Type III lip pattern. 30% of the males and 7% of the females were of Type IV lip pattern (Table 1).

Thus, it was concluded that Type III has the highest incidence among the males at 51% and Type I in females

Table 1. Correlation of lip prints in Male and female.

Lip print	Sex		Total	%	Chi square	p
	Male	Female				
Type I	7	37	44	22	85.99	0.001
Type I'	2	17	19	10		
Type II	10	30	40	20		
Type III	51	9	60	30		
Type IV	30	7	37	19		
Total	100	100	200	100		



Graph 1. Correlation of lip prints in Male and female.

at 37%. In females the most common lip print patterns are: Types I pattern, Type I' pattern and Type II pattern. In males, the most common lip print patterns are: Type III pattern and Type IV pattern. The values were statistically significant (P = 0.001) (Graph 1).

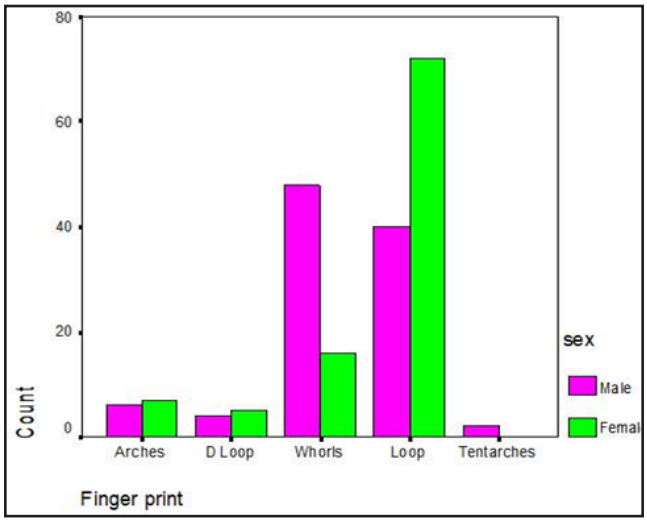
12. Finger Print - Male and Female

The observed results are 6% of the males and 7% of the females were of Arches finger pattern. 4% of the males and 5% of the females are of double loops finger pattern. 48% of the males and 16% of the females are of Whorls finger pattern. 40% of the males and 72% of the females were of Loops finger pattern. 2% of the males are of Tent arches finger pattern and not seen in females (Table 2).

Thus, it was concluded that in males, whorls (48%) and loops (40%) were found to be the most frequent finger pattern. In females, loops (72%) and whorls (16%) were found to be the most frequent finger pattern. The values were found highly significant (P = 0.001) (Graph 2).

Table 2. Correlation of Finger prints in Male and female.

Finger print	Sex		Total	%	Chi square	p
	Male	Female				
Arches	6	7	13	7	27.33	0.001
D Loop	4	5	9	5		
Whorls	48	16	64	32		
Loop	40	72	112	56		
Tentarches	2	0	2	1		
Total	100	100	200	100		



Graph 2. Correlation of Finger prints in Male and female.

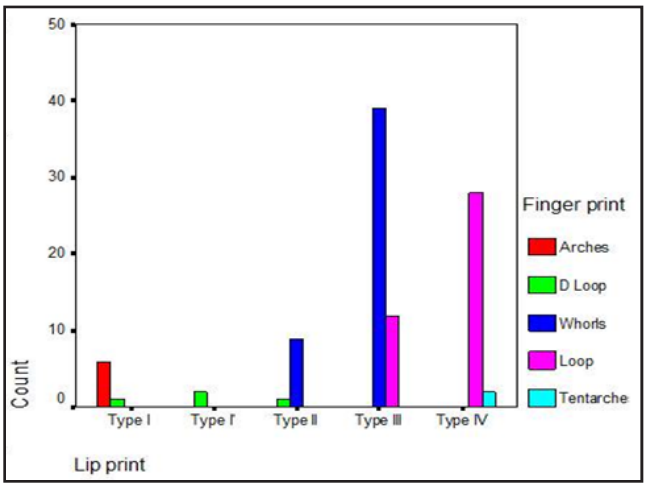
13. Lip and Finger Print

13.1 Male

Among the male population, it was observed that the males with a leading lip pattern of Type III had a leading

Table 3. Correlation of Lip and finger Prints in Male.

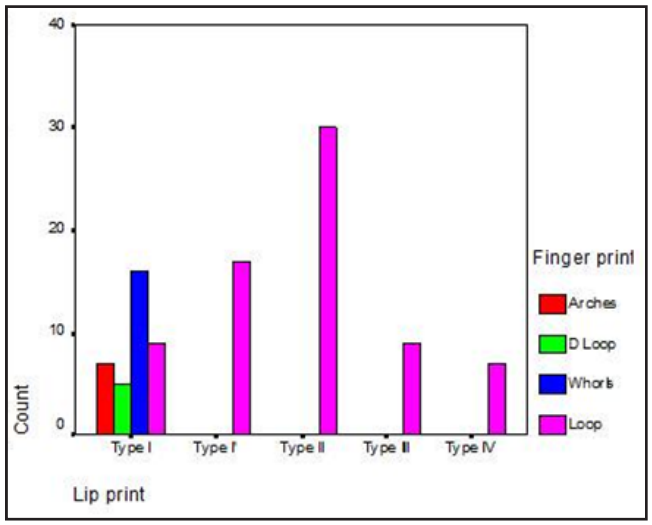
Lip print	Finger print - Male					Total	Chi square	p
	Arches	D Loop	Whorls	Loop	Tent arches			
Type I	6	1				7	199.85	0.001
Type I'		2				2		
Type II		1	9			10		
Type III			39	12		51		
Type IV				28	2	30		
Total	6	4	48	40	2	100		



Graph 3. Correlation of Lip and finger Prints in Male.

Table 4. Correlation of Lip and finger Prints in Female

Lip print	Finger print - Female				Total	Chi square	p
	Arches	D Loop	Whorls	Loop			
Type I	7	5	16	9	37	66.22	0.001
Type I'				17	17		
Type II				30	30		
Type III				9	9		
Type IV				7	7		
Total	7	5	16	72	100		



Graph 4. Correlation of Lip and finger Prints in Female.

Finger Pattern of Whorls with 39%. The p value was showing that these results were statistically significant. The relationship between lip prints and finger prints in males was given in Table 3 and Graph 3.

14. Lip and Finger Print

14.1 Female

Among the female population, it was observed that the males with a leading Lip Pattern of Type II had a leading Finger Pattern of Loops numbered 30%. The p value was showing that these results were statistically significant. The relationship between lip prints and finger prints in females was given in Table 4 and Graph 4.

15. Discussion

In case of detecting unknown person, missing individuals and culprit, suicide and in disaster, personal identification of a person is necessary[1]. Usually the personal identification is made by comparing the antimortem record with that of the postmortem record[1]. Every individual has some unique traits in him/her, which can help in their identification[2].

In cheiloscopy, we can identify humans based on their lip traces[3]. Lip prints are a characteristic pattern of numerous depression and elevation on the external surfaces of lip[4]. Lip prints can be recognized as early as the 6th week of the fetal stage and remain permanent; resisting environment changes, pathologies, minor traumas, and inflammation[5]. This was confirmed by a study by Nagrale *et al.* in India, who concluded that features of lip print relative to surrounding anatomy was proved to be stable, recordable emphasizing on its value as a forensic tool[6].

The distinctive pattern of grooves and wrinkles in lips has made cheiloscopy a reliable procedure for antemortem personal identification[7]. During crime investigation, the lip print can be obtained from dresses, cups, glass wares, cigarettes, windows, doors, etc[4]. There was no significant difference in pattern distribution among different ages which supports the fact that lip print pattern is stable across years[6]. The use of lip print in person identification in criminal investigation is very much scanty in forensic dentistry.

Kaushal *et al.* reported that in forensic science, the validity of the finger print as a key evidence was always been challenging for news reporters and criminologists. In earlier anthropometric systems, identification through fingerprint was advancement for matching subjective nature, in spite of very low error rate, special training and procedures were put foreword to improve the forensic practice[8]. Lip print and finger print play a vital role in the field of forensics as an identification tool in sex determination[9].

In Ahmed *et al.* this is the first study carried out regarding correlation of lip prints and finger prints. The variation in distribution of lip print pattern with other old studies may be due to the genetic changes in different individuals[11]. In this comparison study of lip print and finger print in Salem population, type III and type I lip pattern were found to be leading in males and in females respectively.

As Neha *et al.* reported that in both male and female population, the leading lip print pattern finger print patterns were correlated with each other. Therefore it is likely to find out the gender of an individual in forensic investigations with the accessibility of this lip and finger print patterns[10,12].

16. Conclusion

All the methods that assist in the field of forensic studies should be reliable and easy to demonstrate for investigation of crime. The use of lip and finger print patterns has been suggested to be consistent and reliable to suspect a fault. Correlation of these two parameters has significant association and thus the result of the present study can provide an additional tool in forensic science for gender determination.

17. References

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