



ORIGINAL ARTICLE

**RELIABILITY ASSESSMENT OF COMBINATION  
APPROACH FOR GENDER IDENTIFICATION USING  
CHEILOSCOPY AND DACTYLOSCOPY – A  
COMPARITIVE STUDY**

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**ABSTRACT**

**Background:** Various methods have been used for the identification of gender in forensic science. Gender determination can be done either by Morphological analysis or Molecular analysis.

**Aim:** To establish a correlation between lip print pattern (cheiloscopia) and finger print pattern (dactyloscopia) individually within gender in determination of gender.

**Methodology:** The present study was conducted in the Department of Oral Pathology and Microbiology, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow, to study cheiloscopia and dactyloscopia with gender. A total of 120 individuals selected visiting the department of oral medicine OPD with ages ranging between 20 to 30 years were considered. The present study was undertaken to correlate cheiloscopia and dactyloscopia in relation to gender. Our study elucidates the significance of cheiloscopia and dactyloscopia with gender.

**Results:** The present study concludes that dactyloscopia individually hold potential for gender identification but correlation of these parameters in the study that is lip print and finger print pattern did not yield any significant statistical significance.

**Conclusion:** The present study thereby concludes that dactyloscopia individually holds potential for gender identification.

**Keywords:** forensic, cheiloscopia, dactyloscopia

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## INTRODUCTION

Gender determination is a subdivision of forensic odontology and it is essential, especially when information relating to the deceased is unavailable.<sup>1</sup> External surface of lip has many elevations and depressions forming a characteristic pattern called lip prints, examination of which is referred to as cheiloscropy (cheilos means lips and skopien means see, in Greek) or lip print analysis.<sup>2</sup> Tsuchihashi et al named the wrinkles and grooves visible on the lips as “Sulci labiorum rubrorum” which are highly sensitive mobile folds, composed of skin, muscle, glands and mucous membrane surround the oral orifice and form the anterior boundary of the oral cavity.<sup>3</sup>

Study of finger prints is known as dermatoglyphics.<sup>4</sup> No two fingerprints have ever been found to be exactly identical even between identical twins. Therefore, a fingerprint represents a specific individual characteristic of a particular person.<sup>5</sup>

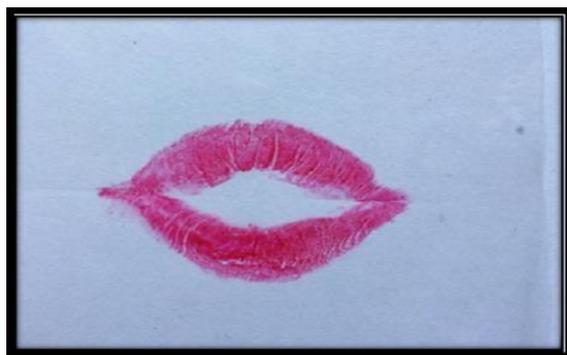
Study comparing and correlating the two variables together with respect to reliability in gender determination is minimal, although individually extensive scientific research on these parameters that is the study of the lip prints and finger prints is available. To reiterate the previous findings and in order to establish any positive correlation between these parameters this study was undertaken.

## METHODOLOGY WITH STATISTICAL ANALYSIS

For analysis of lip prints and recording the lip prints, lips were initially wiped clean using tissue paper or wet wipes following which the lipstick was applied with a mild pressure from the central to the lateral part of the lip with a single stroke. The subjects were then asked to clutch both the lips to ensure that the lipstick application was uniform. Lip prints were transferred to cellophane sheet after a gap of 2 minutes. White bond paper was used for final transfer of records for analysis by gently pressing the cellophane sheet. For further analysis each lip print was divided into 4 areas topographically. Categorization of lip prints was done by following the method proposed by Suzuki and Tsuchihashi defining five different types that are Type I presented with distinct vertical grooves that run across the entire lip, Type I' similar to type I but did not extend the entire lip surface, Type II are branched grooves, Type III showed intersected grooves, Type IV presented reticular grooves and Type V includes grooves that cannot be determined morphologically.



**FIG 1: ARMAMENTARIUM FOR CHEILOSCOPY**

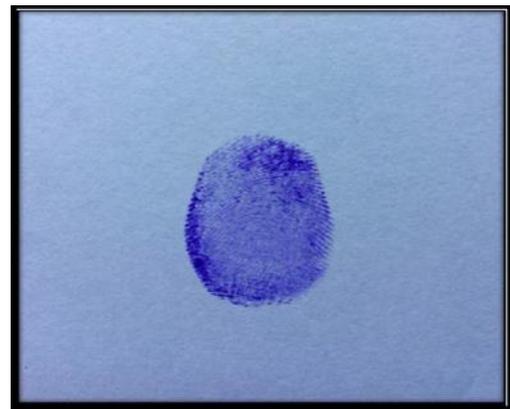


**FIG 2: LIP PRINT PATTERN RECORD**

For dactyloscopy we have used commercially available Ashoka blue ink pad, white bond paper and magnifying lens of 2X power. The imprint of left thumb impression was analyzed. The individual was asked to wash the hand and sanitizer was applied on the left thumb. Then the imprint was taken using blue ink pad and analysis was done through magnifying lens. The interpretation of result of dactyloscopy was done according to Michael and Kucken classification which classifies finger print pattern as Loop, Whorl, Arch and Composite type.



**FIG.3 ARMAMENTARIUM FOR DACTYLOSCOPY**



**FIG 4: FINGER PRINT PATTERN RECORD**

**OBSERVATION & RESULTS**

The present study was conducted in the Department of Oral Pathology and Microbiology, Career Post Graduate Institute of Dental Sciences and Hospital, Lucknow to study correlation of cheiloscopy and dactyloscopy with gender. A total of 120 individuals selected to visit the department of oral medicine OPD with ages ranging between 20 to 30 years. The distribution of study subjects is shown in the table given below:

**Table no. 1: Distribution of study subjects according to gender and mean age**

Parameters	Gender		
	MALE	FEMALE	TOTAL
No. of subjects	60	60	120
Mean age	22.63	22.63	22.57

**Table no. 2: Distribution of study subjects according to Lip print patterns in both genders**

Lip print pattern	UR		UL		LR		LL		STATISTICAL ANALYSIS	
	Male	Female	Male	Female	Male	Female	Male	Female	F-statistics	p-value
									1.123	0.899
<b>TYPE 1</b>	23	12	28	10	6	14	3	4		
<b>TYPE 1'</b>	16	23	23	29	20	25	15	22		
<b>TYPE 2</b>	15	18	4	13	10	16	10	12		
<b>TYPE 3</b>	4	0	2	1	5	2	14	15		
<b>TYPE 4</b>	1	3	2	2	11	0	11	2		
<b>TYPE 5</b>	1	4	1	5	8	3	7	5		
<b>TOTAL</b>	60	60	60	60	60	60	60	60		
<b>t test</b>	0.755		0.649		0.665		0.747			
<b>Df</b>	5		5		5		5			
<b>p value</b>	0.082		0.163		0.149		0.088			

\*p-value>0.05 is insignificant. ANOVA statistical analysis was applied to find correlation between all lip print patterns for both genders and it was found to be insignificant (p-value=0.899). One sample t-test was applied upper, lower and right left patterns; and it was found to be insignificant for all (p-value>0.05)

**Table no. 3: Distribution of study subjects according to thumb prints**

THUMB PRINT	MALE	FEMALE
<b>LOOP</b>	35	18
<b>WHORL</b>	21	9
<b>ARCH</b>	4	33
<b>COMPOSITE PATTERN</b>	0	0
<b>TOTAL</b>	60	60

**Table no. 4: Association of thumb print patterns and lip print patterns in male**

Thumb print	LIP PRINT PATTERN					
	TYPE 1	TYPE 1'	TYPE 2	TYPE 3	TYPE 4	TYPE 5
LOOP	40	32	18	16	21	13
WHORL	16	38	18	9	3	0
ARCH	4	4	3	0	1	4
COMPOSITE	0	0	0	0	0	0
TOTAL	60	74	39	25	25	17
F-statistics	1.157					
Df	29					
p value	0.358					

\*p-value>0.05 is insignificant ANOVA statistical analysis was applied to find correlation between thumb print patterns and lip print patterns in male and it was found to be insignificant (p-value=0.358).

**Table no. 5: Association of thumb print patterns and lip print patterns in Female**

Thumb print	LIP PRINT PATTERN					
	TYPE 1	TYPE 1'	TYPE 2	TYPE 3	TYPE 4	TYPE 5
LOOP	11	37	13	02	06	03
WHORL	6	7	20	2	0	1
ARCH	23	55	26	14	1	13
COMPOSITE	0	0	0	0	0	0
TOTAL	40	99	59	18	7	17
F-statistics	2.305					
Df	29					
p value	0.076					

ANOVA statistical analysis was applied to find correlation between thumb print patterns and lip print patterns in female and it was found to be insignificant (p-value=0.076)

## DISCUSSION

The theory of uniqueness is a strong point used in analysis of fingerprint, lip print and palatal prints and their correlation for estimation of gender.[6] In table 1 we have assessed 60 males and 60 females with a mean age of 22.63. Thus, as in the study conducted by Nitin Gautam et al [2] in the year 2017 and also by the study conducted by Jaishankar Pillai [3] in year 2018 where equal number of subjects were included for assessment of male and female. This data is following reduction in statistical biases for establishing a correlation between both genders.

In table 2 lip print pattern was analyzed to determine correlation for identification of male and female. It was seen that type I was most common in male upper lip while Type I' was common in lower lip of males. Type I' was most commonly seen pattern in upper and lower lip in females. Thus, Type I was most common pattern in upper lip in males while Type I' was most common pattern in females and lower lip of males. In a study by Prabath Ramakrishnan et al<sup>7</sup> Type I lip pattern was most common in female population followed by Type I'. In males Type I was more prevalent followed by Type II. In a study by Neeti Kapoor et al<sup>8</sup> in a year 2017, 200 healthy individuals were analysed for lip prints and Type I pattern was found to be most common pattern in males and female. In another study by Nasreen Ishaq et al<sup>9</sup>, the Type I pattern was most commonly seen for males. In a study by Saraswathi T R et al<sup>10</sup> intersected pattern was most common in males and females.

## CONCLUSION

In our study also p value was insignificant. This could be concluded from above researches that there is a wide range of variation in different population groups of different regions in India. A bigger sample size including the sample from different region of India could be better analysed for establishment of correlation between male and female lip print. In table 3 most common pattern for thumb print in male was established to be loop. Similarly, in males the most common thumb print was established to be arch. In a study by Nagasupriya et al<sup>11</sup> in 2016 Andhra population was studied and loop pattern was found to be most common in males. In a study by Rashmi Metgud et al<sup>12</sup> on establishment of correlation of between finger print and lip print pattern in Gujarati population. It was found that loop pattern was most commonly seen in males. In a study by Safaa M George et al<sup>13</sup> in an Egyptian population it was found that in females the most common pattern was loop followed by arch pattern. Various other studies also showed loop pattern to be the most common pattern in females as in contrast to our study in which the loop pattern was the second most common pattern. In table 4 a non-significant p value was seen in association of thumb print and lip print in male. Table 5 also shows association between thumb print and lip print in female. They both were found statistically non-significant. Thus, the present study is coincident with the study by Nagasupriya a et al<sup>11</sup> which showed there was no significant correlation between lip and finger print pattern among Andhraite population. In another study by Murugan et al<sup>14</sup> the same correlation was found between Dactyloscopy and Cheiloscopy. There was no significant association between both for gender determination. Subramani Ratish Kumar Nandan et al<sup>15</sup> showed weak correlation between lip and finger print with gender. Thus, combination of dactyloscopy and cheiloscopy could not be used for individual identification but rather they can be used to substantiate facts in crimes when there are few evidences.

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