

**SEXUAL DIMORPHISM IN THE PATTERNS OF LIP PRINTS AMONG STUDENTS OF  
ALEX EKWUEME FEDERAL UNIVERSITY NDUFU-ALIKE IKWO, NIGERIA**

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**ABSTRACT**

Individual identification is an important and challenging task in forensic investigation and Cheiloscopy which is the study of the furrows or grooves present on the red part of the vermilion border of the human lips which can be used in identifying individual. The present study aimed to evaluate the sexual dimorphism of the lip print among students of Alex Ekwueme Federal University Ndufu- Alike. A total of 220 subjects (100 males and 120 females). Data were collected through direct scanning method with a photo scanner. Thereafter the scanned image was cropped and transferred to the system for identification and was categorized into four quadrants as right upper quadrant, left upper quadrant, right lower quadrant and left lower quadrant. Data were analyzed using SPSS version 22.0 and graph pad to obtain the percentage distributions, mean and standard deviation. Chi-square test was used to test for association between genders in the different lip prints pattern ( $P < 0.05$ ). The result of the percentage distribution of the lip prints showed that in male Type I' (60.80%) which is partial length groove of Type I was the predominant pattern and in female Type I (66.32%) which is the complete vertical groove was the predominant in female. Width of the oral opening, height of the upper lips and height of the lower lips shows statistical significant difference ( $P < 0.05$ ). The present study revealed that type I' for male and type I for female were the predominant types of lip print patterns. Therefore, lip prints may be a potential forensic tool for gender determination. In the view of these results, this study concluded that there are inherent statistical values and variations on the morphological patterns of lip prints among students from Ikwo in Alex Ekwueme Federal University Ndufu- Alike Ikwo.

**KEYWORDS:** Cheiloscopy, lip print, Ikwo student in AE-FUNAI, Ebonyi state.

**INTRODUCTION**

In recent time, the study of the biometrics of human identification has gained much popularity. In the view of kasprzak *et al.* (1990) human beings can be identified based on their physical traits without the aid of any external key, owing to the fact that identification of human beings has become one of the most challenging subjects that man has been confronted with (Sharma *et al.*, 2009; Acharya and Sivapathasundharam, 2006). Several techniques are useful for human identification such as finger veins, face, iris, retina, skin, finger-nails recognition, palm vein (Prabhakar *et al.*, 2007; Chora, 2007), this was further buttressed by Aggrawal, (2004) that most popular prints used for human identification are fingerprints and other prints such as lip prints which are of forensic value. Lip prints are ordinary lines or fissures in –the structure of wrinkles and grooves present in the zone of transition of the human lip between the inner labial mucous membrane and the outer skin, it varies from individual to individual (Caldas, 2007). It is

unaltered from six week of intrauterine life till death. However, major trauma to the lips may additionally lead to scarring and consequently thus altering the pattern and morphology of grooves.

Identification of unknown victim or suspect will constantly be a challenging task in forensic crime cases. Sometimes, it is essential to apply lesser known and unusual techniques like cheiloscopy (Sharma *et al.*, 2009). It is required in living individuals who are missing due to amnesia or criminals hiding their identity and also in the recognition of recently deceased persons and mutilated bodies.

According to Locard's Exchange principle 1932; when two objects come into contact, there is always a transfer of material from each other and drawing from this principle, lip print is one of the evidence that can be left in crime scenes which helps in identification purposes (Reddy, 2011). During investigation, lip print can be

found over wine glasses, papers, napkins, love letters, cigarettes and on private parts (Dikshit, 2007). Lip prints changes its form according to various causes of death, however, it is a weak tool in identifying a deceased body that has stayed for a long period of time (Utsuno *et al.*, 2005). Visible and identifiable lip prints can be obtained when it is taken less than 24 hours following death (Utsuno *et al.*, 2005).

Thus, Cheiloscopy is applicable mostly in identifying living, since lip prints are usually left at crime scenes and provide a direct link to the suspect. In addition, cheiloscopy is a simple technique that does not require any complex instrumentation (Sharma *et al.*, 2009).

Therefore, the present study aimed at evaluating the sexual dimorphism of lip prints among students of Alex Ekwueme Federal University Ndufu-Alike, Ikwo, Ebonyi State Nigeria.

#### MATERIALS AND METHOD

The participant included in the present study were 220 students (100 males and 120 females) of Alex Ekwueme Federal University Ndufu -Alike Ikwo. Lip prints of all the subjects were taken using photo scanner (HP Scanjet 300 Flatbed Photo Scanner).

Individual lip was cleaned from dirt before taking prints, in other to achieve this, the subject was asked to bend

gently towards the photo scanner for the face to be scanned. The dimensions of the images captured were obtained by cropping out the interested areas; furthermore, a scale divided into centimeters was used to measure the height and width of the lips. Considerably Tsuchihashi and Suzuki mode of classification was used classify the patterns of the lip prints.

Informed consent was obtained prior to taking the lip prints. Subjects with deformities of lips like ulcers, cleft palate and traumatic injury on the lips were not considered.

#### Examination of lips prints

The lip was divided into two quadrants at the midline and then, each quadrant was further divided into two equal part as medial and lateral. Each segment was named according to the side they expressed as upper right quadrant, upper left quadrant, lower right quadrant, lower left quadrant. The lip prints was classified using the classification proposed by Tsuchihashi and Suzuki (1970). During the analysis of lip prints, the dominant pattern was considered for the classification in each quadrant. Therefore, the used classification was as follows: Type I:clear cut groove running vertically across the lip, Type I':a partial length groove of type I, Type II:branched groove, Type III:intersected groove, Type IV:reticular groove, Type V:undifferentiated groove.

#### Classification of Lip Print Pattern According to Tsuchihashi and Suzuki (1970): Authors compilation



Figure 1: Type I:vertical grooves.



Figure 2: Type I' :partial length of type I.



Figure 3: Type II:branched groove.



Figure 4: Type III: intersected groove.



Figure 5: Type IV: reticular groove.



Figure 6: Type V: undifferentiated groove.

Analysis was done by the aid of software package for social science version 22.0 and graph pad statistical software. The data was presented in simple percentage and inferential statistical of chi-square test was adopted to test for association between the variables.

## RESULTS

The present study was conducted to access the quadrant wise and gender wise predilection of lip print patterns. Lip print impression were obtained from both males and females and were classified by Suzuki's and Tsuchihashi mode of classification. Table 1 shows the percentage distribution of the types of lip print patterns. In male, the type I' (60.80%) was the highest recorded followed by Type IV (54.64%), Type III (53.73%), Type II (50.70%), Type V (47.58%) and Type I (47.58). In female the highest recorded was Type I (66.32%) followed by Type V (52.42%), Type II (49.27%), Type III (46.27%), Type IV (45.36%) and Type I (39.19).

The distribution of lip print types in males and females in each quadrant were compared in table 2 as follows.

### Right upper quadrant

The types of lip print in right upper quadrant are revealed as follows: in males Type I (12.41%), Type I' (27.81%), Type II (16.77%), Type III (11.39%), Type IV (16.21%) and Type V (10.40%). In females Type I (31.86%), Type I' (17.43%), Type II (17.61%), Type III (9.85%), Type IV (13.07%) and Type V (10.18%). The distribution of lip print types was not statistically significant at  $p < 0.05$ .

### Left upper quadrant

The types of lip print in left upper quadrant are revealed as follows: in males Type I (16.98%), Type I' (29.67%), Type II (17.15%), Type III (10.48%), Type IV (16.85%) and Type V (9.31%). In females Type I (32.86%), Type I' (17.73%), Type II (16.72%), Type III (9.48%), Type IV (13.76%), and Type V (9.44%). The distribution of lip print types was not statistically significant at  $p < 0.05$ .

### Right lower quadrant

The types of lip print in right lower quadrant are revealed as follows: in males Type I (18.27%), Type I' (31.89%), Type II (22.24%), Type III (12.10%), Type IV (11.39%) and Type V (3.66%). In females Type I (31.46%), Type I' (22.33%), Type II (20.28%), Type III (10.71%), Type IV (9.17%) and Type V (6.01%). The

distribution of lip print types was not statistically significant at  $p < 0.05$ .

### Left lower quadrant

The type of lip print in Left lower quadrant are revealed as follows: in males Type I (18.08%), Type I' (32.68%), Type II (20.81%), Type III (14.46%), Type IV (9.69%) and Type V (5.22%). In females Left lower quadrant revealed Type I (33.26%), Type I' (21.81%), Type II (19.07%), Type III (11.66%), Type IV (8.95%) and Type V (5.87%). The distribution of lip print types was not statistically significant at  $p < 0.05$ .

The association between gender in lip patterns of right and left upper and lower quadrants of males and females showed no statistical significant difference in lip print patterns at  $P < 0.05$  in the different quadrants of the lips.

Table 2 shows chi square analysis of percentage distribution of the types of lip print patterns. In male, the type I' (60.80%) was the highest recorded followed by Type IV (54.64%), Type III (53.73%), Type II (50.70%), Type V (47.58%) and Type I (47.58). In female the highest recorded was Type I (66.32%) followed by Type V (52.42%), Type II (49.27%), Type III (46.27%), Type IV (45.36%) and Type I (39.19).

Table 3 revealed the descriptive result of male and female lip measurement as follows; male width of oral opening ( $5.518 \pm 0.3586$ mm), height of the upper lips ( $1.610 \pm 0.1820$ mm) and height of the lower lips ( $1.761 \pm 0.1892$ mm). Width of oral opening in female ( $5.295 \pm 0.4205$ mm), height of the upper lips ( $1.606 \pm 0.1231$ mm) and height of the lower lips ( $1.659 \pm 0.1268$ mm). and table 4 revealed result of the paired t test of male and female lip measurement as following; the width of the oral opening (mm) in male  $5.518 \pm 0.3586$  and female  $5.295 \pm 0.4205$  at p value  $< 0.001^{***}$ , the height of the upper lips (mm) in male  $1.610 \pm 0.1820$  and female  $1.606 \pm 0.1231$  at p value 0.7314, and the height of the lower lips (mm) in male  $1.716 \pm 0.1892$  and female  $1.659 \pm 0.1268$  at p value 0.0077 and this result shows that there is significant difference between width of the oral opening and height of the lower lips of male and female lip measurement, but revealed no significant difference in the height of the upper lips of male and female lip measurement at the alpha level  $p < 0.05$ .

**Table 1: Percentage distribution of the types of lip print on upper and lower lip compartment in male and female students.**

Compartment	I	I'	II	III	IV	V
Male %	33.68	60.80	50.70	53.73	54.64	47.58
Female %	66.32	39.19	49.30	46.27	45.36	52.42
Total	100	100	100	100	100	100

**Table 2: Chi-square analysis of Percentage distribution of the types of lip print on the upper and lower compartment in male and female students.**

Division	Types						P value	Remarks
	I	I'	II	III	IV	V		
RUQ Male	17.41	27.81	16.77	11.39	16.20	10.40	0.2284 Not	Significant
Female	31.86	17.43	17.61	9.85	13.07	10.18		
LUQ Male	16.98	29.67	17.15	10.48	16.85	9.31	0.1151 Not	Significant
Female	32.86	17.73	16.72	9.48	13.76	9.44		
RLQ Male	18.27	31.89	22.24	12.10	11.39	3.66	0.2649 Not	Significant
Female	31.46	22.33	20.28	10.71	9.17	6.01		
LLQ Male	18.09	32.69	20.81	14.49	9.69	5.23	0.2108 Not	Significant
Female	33.26	21.18	19.07	11.66	8.95	5.87		

**Key:** RUQ= right upper quadrant, LUQ=left upper quadrant, RLQ=right lower quadrant, LLQ=left lower quadrant.

**Table 2: Chi-square results of types of lip print in male and female students.**

Types	Male	Female	P value	Remarks
I	33.68	66.32	0.6121	Not significant
I'	60.80	39.19	0.0864	Not significant
II	50.70	49.30	0.9511	Not significant
III	53.73	46.27	0.5406	Not significant
IV	54.64	45.36	0.0058***	Significant
V	47.58	52.42	0.6547	Not significant

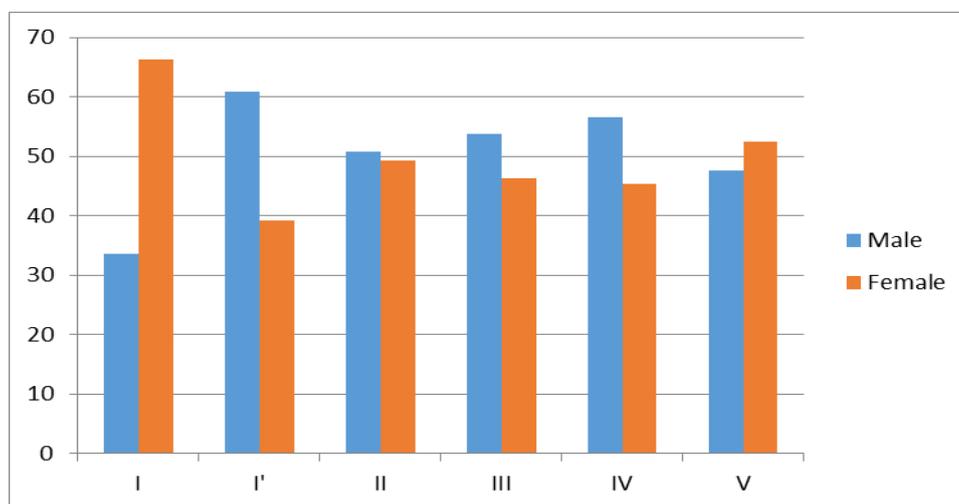
**Table 3: Descriptive result of male and female lip measurement.**

Variable	Male			Female		
	Mean ±SD	Minimum	Maximum	Mean ±SD	Minimum	Maximum
Width of oral opening	5.518±0.3586mm	4.700	6.910	5.295±0.4205mm	4.290	6.670
Height of upper lips	1.610±0.1820mm	1.210	2.450	1.606±0.1231mm	1.390	1.960
Height of lower lips	1.716±0.1892mm	1.260	2.270	1.659±0.1268mm	1.460	1.990

**Table 4: Paired T test of male and female lip measurement.**

Variable	Mean±SD	t <sub>cal</sub>	P value	Remarks
Width of the oral opening Male	5.518±0.3586mm	4.6040	<0.001***	Significant
Female	5.295±0.4205mm			
Height of th upper lips Male	1.610±0.1820mm	0.3684	0.7314	Not significant
Female	1.606±0.1231mm			
Height of the lower lips Male	1.716±0.1892mm	2.7200	0.0077***	Significant
Female	1.659±0.1268mm			

Significant level of P<0.05.



**Graph 1: Representing the percentage distribution of male and female lip print patterns.**

## DISCUSSION

Human body presents physical parts that can be used for physical evidence in forensic investigation and human identification. Successful identification of individual and investigation of crime depends largely on examination of fingerprints, dental records, plantar arch and DNA and on occasion lip prints. The present study established sex differences of lip prints among Students of Alex Ekwueme Federal University Ndufu-alike Ikwo, Ebonyi State and it also confirms the uniqueness of lip prints of Students in Alex Ekwueme Federal University Ndufu-alike Ikwo, Ebonyi State as no identical lip print patterns appeared in any two participants, in agreement with the studies of different populations around the world.

In male, the Type I' lip pattern with a percentage of (60.80%) was the highest recorded as the predominant and it was followed by Type IV (54.64%), Type III (53.73%), Type II (50.70%), Type V (47.58%) and Type I (33.68%) in descending order. In females, the predominant is type I lip pattern with a percentage of (66.32%) followed by Type V (52.42%), Type II (49.30%), Type III (46.27%), Type IV (45.36%) and Type V (39.19%) in descending order. In buttressing this view, researchers such as Malik and Goel (2011) and Kautiliya *et al.* (2013) reported that Type I with a percentage of (30%) to (35.33%) were the most common pattern in females. Randhawa *et al.* (2011) revealed that the most predominant lip pattern in females was Type I (32.33%). Jeergal *et al.* (2016) revealed that Type I' (57%) was the most predominant lip print pattern in male. Conversely, the study conducted by Bindal *et al.* (2014) in Malaysia demonstrated that Type II (72.50%) was predominant. It is not in line with the work done by Kapil *et al.* (2014) who investigated on lip print patterns among the students of Maharshi dayanand university rohtak, Haryana and revealed that the predominant pattern in male was Type III (42.5%) and Type V (2.5%) as the least commonly occurring. Whereas Prabhu *et al.* (2013) conducted a study in 100 students from Goa, India and their findings revealed that Type V (35.30%) was predominant pattern followed by Type I (30.30%). In the same vain, Sharma *et al.* (2009) stated that the predominance of patterns in males differed from that in females.

This study also showed the association between gender in lip patterns of right and left upper and lower quadrants of males and females, the result showed no statistical significant difference in lip print patterns at  $P < 0.05$  in the different quadrants of the lips. In buttressing this view, Bhuvan *et al.* (2015) on comparative evaluation of lip prints between Indian and Malaysian showed no statistical difference in both the genders in lip print pattern, also Prabhu *et al.* (2013) on digital method for lip print analysis on 100 students showed no statistical difference in the pattern of the lips. This findings is in contrast with the research work done by Adamu *et al.* (2015) on the study of lip print types among Nigerians which shows statistically significant association at

$p < 0.05$  of lip print types, Moshfeghi *et al.* (2016) on the morphological patterns of lip prints in an Iranian population showed no statistically significant difference in the lip print patterns of males and females also Remya *et al.* (2016) on the cheiloscopy with a study group of 200 undergraduate students stated that their result was statistically significant in determining the gender in the lip print pattern at  $p < 0.001$ . The result of the paired t test of male and female lip measurement showed the following; the width of the oral opening (mm) in male  $5.518 \pm 0.3586$  and female  $5.295 \pm 0.4205$  at  $p < 0.001$ , the height of the upper lips (mm) in male  $1.610 \pm 1.820$  and female  $1.606 \pm 0.1231$  at p value 0.7314, and the height of the lower lips (mm) in male  $1.716 \pm 0.1892$  and female  $1.659 \pm 0.1268$  at p value 0.0077 and this result shows that there is significant difference between width of the oral opening and height of the lower lips of male and female lip measurement, but revealed no significant difference in the height of the upper lips of male and female lip measurement at the alpha level  $p < 0.05$ . This implies that the width of the oral opening and height of the lower lips of male and female lip measurement share no similarities while in height of the lower lips of male and female lip measurement the values share close similarities. Neo *et al.* (2012) on the Lip Prints in Sex and Race Determination reviewed Width of oral opening and the height of lower lip both indicated significant differences between sexes ( $p < 0.001$ ) while the height of upper lip and lower lip each indicated no significant differences between races ( $p < 0.05$ ).

This present study shows that the distribution of lip prints patterns is generally similar for males and females, with less predominance in the lip pattern. The differences in the results of our study may be because of different genetic and ethnic background of the study population. This suggests that lip print patterns may vary geographically. Furthermore hereditary factors (cleft lips) have also been suggested as having possible influence on lip prints.

The present study revealed that type I' for male and type I for female were the predominant types of lip print patterns. However, this present study provides more digital method to Cheiloscopy by adopting the use of photo scanner model HP300 which proved a clearer, convenient and accurate way of visibility, identifying and storing lip print pattern.

## CONCLUSION

Lip print plays an important role in identifying an individual comparable to finger prints. It is a unique tool in identifying an individual and due to the fact of its uniqueness; it can be used to provide detailed information on sexual dimorphism of lip prints among students of Alex Ekwueme federal university Ndufu-alike Ikwo. This information also provide useful insight on the percentage distribution of the types of lip print on the upper and lower compartment in male and female also there was no statistical significant difference

between the upper and lower quadrants of the male and female lip prints.

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