A Study of Morphological Patterns of Lip Prints among The Yorubas in Okitipupa, South-western Nigeria

Eboh DEO

Abstract

Introduction: In civil and criminal cases, human identification is a very important process. Analysis of the lip prints left at a scene of crime, and their comparison with those of the suspected person may be useful for identification.

Aim: The purpose of this study was to assess the lip print patterns of the Yorubas of Nigeria, using Okitipupa as a case study.

Materials and Methods: This cross-sectional study adopted the random sampling technique and consisted of 104 individuals (53 males and 51 females), aged between 10 and 50 years. Lipstick was applied uniformly on the lips of each subject, and allowed to dry for about two minutes, after which an impression was made on a plain white paper. The impression was subsequently visualized with a magnifying lens and the patterns of lip prints were noted and recorded. 832 lip prints were recorded and type II was found to be the dominant pattern.

Results: There was no significant association between gender and lip print patterns. This study confirms that lip prints are unique for every individual.

Conclusion: No two lip prints are the same. The sex of an individual cannot be determined from lip prints.

Keywords: *Lip print; Cheiloscopy; Human Identification; Criminology; Forensic Anthropology.*

Department of Human anatomy and Cell Biology, Faculty of Basic Medical Sciences, College of Health Sciences, Delta State University, Abraka, Nigeria

Correspondence: *Dr. Dennis E.O. Eboh Department of Human anatomy and Cell Biology, Faculty of Basic Medical Sciences, College of Health Sciences, Delta State University, P.M.B. 1, Abraka, Nigeria Tel:+2348033872254 E-mail: drebohdennis@yahoo.com*

Introduction

The vermilion border of human lip is the zone of transition between the inner labial mucosa and outer skin[1,2]. It is covered with a specialized keratinized stratified squamous epithelium which is thin near the skin, increases in thickness slightly as the mucosa is approached, and then thickens abruptly when true mucosa is reached[1]. The vermilion zone has an outer layer of stratum corneum and it is devoid of salivary glands. The skin is thin and has many capillaries, hence the redness[1]. Present in the vermilion zone of human lip are normal lines and fissures. They are identifiable as early as the sixth week in utero, and their patterns are maintained thereafter, surviving many afflictions such as herpetic lesions [3,4].

Lip prints are the imprints produced by these

lines, fissures or grooves, the study of which is termed cheiloscopy [5]. Suzuki and Tsuchihashi [6], carried out a longitudinal study on 107 Japanese families, and reported dissimilarity among individuals and suggested that the lip-groove pattern could be influenced by hereditary factors. It has been reported that even in twins, whose patterns are somewhat similar, no two lip prints are identical in detail [7]. It has also been reported that in a study on lip prints between two identical twins, it was observed that they appeared indistinguishable by every other means but their lip prints were different [2,8]. Lip print is an anatomical characteristic of the human lips.

The study of lip prints has been carried out in some populations across the globe. A curious search of the literature revealed that this study, to the best of the author's knowledge, has not been carried out in Nigeria. Even if it exists, none has been carried out among the Yoruba people resident in Okitipupa. It has also been noted that the size and curvature of the exposed red lip surfaces is subject to considerable individual, gender and ethnic variation[1]. Previous studies noted that lip prints show differences according to the race and the ethnic origins of a person. Like finger prints, lip prints can be instrumental in identifying a person positively and can be used to verify the presence or absence of a person at the scene of crime [9, 10]. Therefore, this study focuses on lip print analysis of the Yorubas in Okitipupa, South-West of Nigeria.

Identification of an individual, living or dead is based upon the theory that all individuals are unique. Personal identification is important in legal medicine, forensic science, anthropology, criminal investigation and identification and in Genetic Research. At the scene of crime, a criminal may leave no traditional evidence for personal identification, like finger prints, but lip prints may be the only clue left behind. With our law enforcement agencies unaware of cheiloscopy as a tool in positive personal identification, this may militate against verifying the presence or absence of a person at the scene of crime. The major problem this study intends to address is to verify the distribution of lip print patterns for individuality and to test the hypothesis that there is no significant association between gender and lip print patterns.

The study will be useful to the criminal investigation department for positive identification of individuals. It will provide useful material in forensic medicine and anthropology. In addition, this study will serve as normative data in this part of the world.

The purpose of this study is threefold: to determine the dominant lip print type among the Yorubas in Okitipupa, South-Western Nigeria; to assess the distribution of lip print patterns among males and females; and to ascertain lip print patterns for their individuality.

Materials and Methods

The descriptive cross-sectional method was used in this study. The study subjects were randomly sampled and consisted of 104 individuals (53 male and 51 females) aged between 10 and 50years, and who are Yorubas resident in Okitipupa, Ondo state, South-West of Nigeria. The study was conducted

between April and May, 2011. Voluntary informed consent was obtained from all prospective subjects and the parents or legal representatives of minor subjects prior to data collection in accordance with International Ethical Guidelines for Biomedical research involving Human Subjects. In addition, the Research and Ethics committee of College of Health Sciences, Delta State University, approved the method employed in the study.

The lips of each subject were thoroughly examined clinically and subjects with any deformity or history of surgery of the lip were excluded. The lips of the subject were first cleaned thoroughly and lipstick was applied uniformly, starting at the midline and moving laterally. The lip stick was allowed to dry for about two minutes, after which an impression was made on a plain white paper which served as a permanent record. The impression was subsequently visualized with the use of a magnifying lens and the combinations of lines, furrows, fissures or grooves with their lengths were noted (fig 1).

Each lip was divided into 2 halves by a midline, giving a total of 4 quadrants analogous to the dental quadrants (fig 2). Each quadrant is further divided into 2 halves, making 8 topographical areas or segments in all: upper right lateral (URL), upper right medial (URM), upper left medial (ULM), upper left lateral (ULL), lower left lateral (LLL), lower left medial (LLM), lower right medial (LRM) and lower right lateral (LRL) (fig. 2). The pattern of lip print observed in each topographical area is recorded in accordance with the classification of Suzuki and Tsushihashi [6,11]. They classified grooves into 6 Types: Type I is longitudinal grooves running through the whole width of the lip; Type $I^{'}$ is partial longitudinal grooves. Type II is branched grooves. Type III is intersected grooves, Type IV is reticular grooves and Type V is undifferentiated grooves (Fig. 3).

The data obtained were subjected to statistical analysis, using frequency and percentage of each type of lip print patterns in the 8 topographical areas. The total groove count for both the upper and lower lips were compared between males and females. Chi-square contigency was used to assess the association between gender and lip print patterns in both upper and lower segments. The analysis was conducted with the aid of

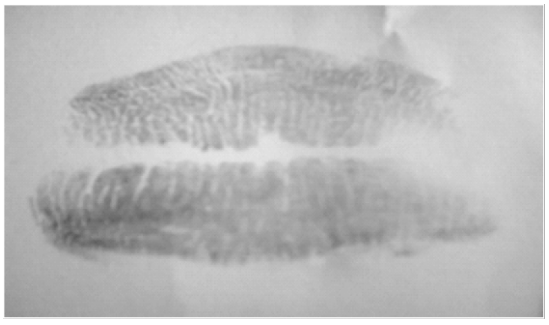

Fig. 1: *Photograph showing the upper and lower lip imprints with different lip print patterns of a Nigerian (Yoruba).*

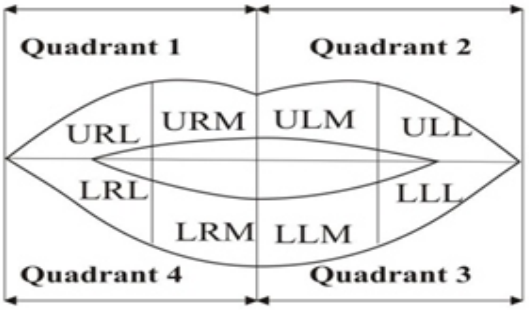

Fig. 2: *Showing partitioning of upper and lower lips into quadrants and segments.*

URL=upper right lateral segment; URM= upper right medial segment; ULM= upper left medial segment; ULL= upper left lateral segment; LLL= lower left lateral segment; LLM= lower left medial segment; LRM= lower right medial segment; LRL= lower right lateral segment.

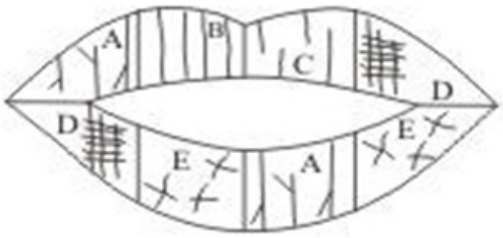

Fig. 3: Showing lip print types found among the Yorubas: type I (B); type I^{I} (C); type II, (A); type III (E); type IV (D).

statistical package of social sciences (SPSS) version 16. P-value ? 0.05 was considered statistically significant.

Results

In this study, it was observed that no two lip prints matched each other. A total of 832 lip prints were recorded, including type I, I^{I}, II, III, and IV. No type V was found (tables 1 and 2). The dominant lip print was type I^{I}, making 48.3% (upper lip = 26.2%; lower lip = 22.1%) of all lip prints in both lips. Type II was the second dominant pattern constituting 26.0% (upper lip = 12.0%; lower lip = 14.0%).

In the upper lip, type I^{I} constituted 53.0% (right side = 26.5%; left side = 26.5%), while in the lower lip, type I^{I} was 45.0% (right side = 24.0; left side = 21.0%). In the upper lip, type II was 13.0% and 11.0% on the right and left side respectively. In the lower lip, type II prints was 14.0% and 13.0% on the right and left sides respectively.

In the upper lip, type I was more dominant in the ULL in male (23.0%) and in female (26.0%). The segments with type I^{I} dominance were URM, ULM in males and URL in females with 14.0% each, followed by ULL in females 13.0%.

The tests of association were also carried out.

Table 1: Distribution of lip print patterns in different segments of the upper lip.

LIP PRINT TYPE	GENDER	N	URL	URM	ULM	ULL	TOTAL
Type I	Male	53	5	4	3	9	21
	Female	51	4	2	2	10	18
Type I^{I}	Male	53	26	29	29	25	109
	Female	51	29	25	27	28	109
Type II	Male	53	18	13	9	15	55
	Female	51	13	11	11	8	43
Type III	Male	53	1	0	2	0	3
	Female	51	3	3	1	2	9
Type IV	Male	53	3	7	10	4	24
	Female	51	3	10	10	3	25
Total	Male	-	53	53	53	53	212
	Female	-	51	51	51	51	204

URL= upper right lateral, URM= upper right medial, ULM=upper left medial,
ULL= upper left lateral.

Table 2: *Distribution of lip print patterns in different segments of the lower lip*

LIP PRINT TYPE	GENDER	N	LRL	LRM	LLM	LLL	TOTAL
Type I	Male	53	6	11	14	7	38
	Female	51	6	10	7	12	35
Type I^{I}	Male	53	27	23	12	26	88
	Female	51	21	26	23	26	96
Type II	Male	53	18	9	24	10	61
	Female	51	22	5	19	5	51
Type III	Male	53	0	0	0	0	0
	Female	51	1	1	0	0	2
Type IV	Male	53	2	10	3	10	25
	Female	51	1	9	2	8	20
Total	Male	-	53	53	53	53	212
	Female	-	51	51	51	51	204

LRL=lower right lateral, LRM= lower right medial, LLM= lower left medial, LLL= lower left lateral.

Chi-square for contingency between gender and lip prints in the different segments of the lips revealed no significant association ($p > 0.05$).

Discussion

This study revealed that of all lip prints registered, no two lip prints matched each other. This confirms the report that cheiloscopy is one of the special techniques to be used for personal identification [2]. It is also in agreement with other studies done on different populations' previously which reported that lip prints had different patterns that were apparently unique to the individuals. Tsuchihashi [12], after examining lip prints of Japanese subjects, came to conclusion that, though the lip print consisted of a combination of various types of grooves, no two lip prints were identical. It has been proved that lip prints could be certainly used in criminal cases [13]. It was also reported in another study that the lip-print characteristics could be used for identification similar to finger prints, palm prints and footprints [14].

It was noted that type I^{I} was dominant in both genders and in all quadrants of the lips (48.3%). This was followed by type II (26.0%), type I (14.0%), type IV (12.0%), Type V was not found. In a related study in Kerala [15], type IV was reported to be the dominant pattern. In another study in Japan [12], type III was the most common pattern, which was corroborated by

yet another study in the Indo-Dravidian population [16]. The different reports on the dominance of lip print types in the various studies could be attributed to racial, environment and genetic factors. The racial differences can make cheiloscopy a useful aid in personal identification.

In a study in Kerala, it was reported that the middle portion of the lower lip showed type IV as the dominant type [15]. The present study noted that type I is the most frequently seen pattern in the middle portion.

In the present study, it was observed that, in males, type I^{I} was the dominant pattern (46.4%), followed by type II (27.4%), type I (13.9%), type IV (11.6%) and type III (0.7%). The sequence is the same in females as type I^{I} was also the most dominant (50.3%) followed by type II (23.0%), type I (13.0%), type IV (11.0%) and type III (2.7%). This supports Singh et al (2011) who reported that partial length groove was dominant in males (31.61%) and in females (43.79%) [17]. In contrast, the present study failed to support Saraswathi et al [2], who reported type IV (intersecting pattern) as most common in males (39.5%) and in females (36.5%). This study also departs from Shilpa [18] in Udaipur, India in which the sequences in both genders were different, as type I was the most prominent pattern in males, followed by type II, type IV, type I^{I} and type III; while the most prominent pattern in females was type II, followed by type I^{I}, type I, type III, type IV and type V. Ghondivkar et al [19] observed type III and type II patterns to be dominant in males and females respectively.

Assessment of the 4 quadrants was made in males and females. Among males, it was observed that type I^{I} lip print was most common in quadrants 1-4 with 52.0%, 51.0%, 48.0%, and 36.0% respectively; while the least common pattern in quadrants 1-4 was type III with 1.0%, 2.0%, 0.0% and 0.0% respectively. Among females, type I^{I} was the most common pattern in quadrant 1-4 having 53%, 54%, 46%, and 48.0% respectively; while the least common type in quadrants 1-4 were types I and type III with (6.0%) each, type I (3.0%), type III (1.0%) and 0.0% respectively. This is not in line with Saraswathi et al [2] who observed that among males intersected groove was the most common in quadrants 1-4, being more common in quadrant 3; while the least common pattern in quadrants 1, 2, and 4 was reticular pattern. They also observed that in quadrant 3, branched groove was the least common. They noted that among females, compartments 1, 2 and 3 showed intersected groove to be most common being most in quadrant 2. In quadrant 4, branched grooved was most common. They also observed that quadrants 1, 3, and 4 of females exhibited reticular groove as least common while vertical lip prints were least common in quadrant 2.

In the present study, the upper lip exhibited a dominance of type I^{I} pattern (52.4%) followed by type II (23.5%), type IV (11.8%), type I (9.4%) and type III (2.9%). This sequence is slightly different in the lower lip. Type I^{I} pattern was also more dominant (44.2%) followed by type II (26.7%), type I (17.5%), and type IV (10.8%) and type III (0.5%). In an Indian study, Augustine et al (2008) [20] reported a dominance of type III followed by type II, type IV, type I, type I^{I} and type V in the upper lip. In that study, lower lip also has dominance of type III followed in order by type IV, type I, type II, type I^{I} and type V. It was also noted in

the study that in the upper lip, type I^{I} and type II were the commonest patterns in that order in the lateral and medial segments. In the lower lip, type I^{I}, type II and type IV were more frequent in the lateral segment, while in the medial segments, frequent occurrence were type I^{I}, type II and type I in that order.

In upper lip, type I^{I} was more common in the lateral segments of females than in males while type I^{I} was more common in the medial segments of males than in females. Augustine et al [20] reported that type IV was more common in the lateral segments of females that in males while type I was more common in the lateral segments of males than in females.

In the lower lip, type I^{I} was more common in the lateral segments of males than in females while type I was more common in the medial segments of females than in males. Chi – square tests for degree of association between gender and lip prints in the respective segments of the upper and lip was not significant ($p > 0.05$). This result agrees with the study of Rubio and Villalain in 1980 as quoted in Augustine *et al* [20] which did not find significant differences in lip prints based on sex. However, our study differs from Augustine *et al*[20] who reported significant difference in chi-square test between the sexes in the lateral segments of upper lip. The reason for this difference could be attributed to the difference in sample size, population difference due to geographic or environmental factors. More important reason for the difference may be attributed to ethnic differences since they represent the gene pool and genotype. It was reported that variations in patterns among males and females could be useful in sex determination[21].

The assessment of lip print patterns among the Yorubas of Nigeria has been undertaken. The Null hypothesis which states that there is no significant association between gender and lip print types in the different segments of the lips is accepted. The patterns exhibited were individual as no two lip prints matched each other. Type I^{I} was the dominant pattern of the entire collection. This pioneer study will provide normative data in this part of the world and it will be useful in forensic science and anthropology.

It is suggested that a great effort should be made to record the lip prints of all individuals in a certain location so as to establish a database that might be of great value in civil and criminal issues. In addition, lip print should be studied in other ethnic groups to establish further facts to give room for comparison, and to make cheiloscopy a basic tool in forensic human identification process.

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