

Cheiloscopy in Relation to Ethnicity, Gender and Monozygotic Twins in South-Southern Nigeria.

*D.E.O. EBOH, M.O. NWAJELI,

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

*Author for Correspondence

ABSTRACT

Present in the vermilion zone of human lip are normal lines, fissures and groves, the impression of which is called lip print. The purpose of this study was to investigate patterns of lip prints among the Urhobos and Binis; to verify if there is significant association between gender and lip print patterns; and to ascertain possible identical patterns of lip prints between uni-ovular twins. The study subjects were randomly sampled and consisted of 211 individuals (103 male and 108 females) aged between 12 to 34 years, and who belong to the Urhobo (males=53, females=52) and Bini (males=50, females=46) ethnic groups in Southern Nigeria. 10 identical twins were also studied. Lip print of every subject was taken and visualized with the aid of a magnifying lens and the combinations grooves, fissures, lines or furrows with their lengths were noted and record. Type II was the dominant pattern in both ethnic groups. No two lip prints were the same. No significant association between lip print pattern and ethnicity. No significant association between lip print pattern and gender. All identical twins showed unidentical lip prints. The ethnicity and gender of an individual cannot be determined from lip prints. This study will be of relevance in forensic science, Anthropology and genetics.

Key word: Lip print, Forensic human identification, Ethnicity, Gender, Twins, Nigeria.

Lips are two fleshy folds surrounding the oral orifice. They are soft, movable, and serve as the opening for food intake and in the articulation of sound and speech. The vermilion border is the juncture where the lips meet the surrounding skin of the mouth area and the vermilion zone is the reddish area within the borders. The line of contact between the lips (oral fissure) lies just above the cutting edges of the upper incisor teeth and on each side, a labial commissure forms the angle of the mouth, usually near the first premolar tooth. The epithelium of the vermilion area exhibits a less well-developed stratum corneum than the skin (Bindal et al 2009). Present in the vermilion zone of human lip are normal lines, fissures and groves. They are identifiable as early as the sixth week in utero, and their patterns are maintained thereafter, surviving many afflictions such as herpetic lesions (Caldas and Megalhaes 2007; El Diamati 2010).

In historic and anthropologic sources as well as other cultural documents, lips have been treated as a subject both decorative and symbolic. Personality traits or certain characteristics are often attributed to a person based on the shape and use of the lips (Romm 1984). Lips are proved to have something that characterizes the human being the same as

finger prints, which are the lip prints (Synder 1970). Lip prints are the imprints produced by these elevations and depressions, the study of which is called cheiloscopy (Bindal et al. 2009).

With the ever-increasing demands placed upon law enforcement to provide sufficient physical evidence linking a perpetrator to a crime, it makes sense to utilize any type of physical characteristic to identify a suspect of an offence. Establishing a person's identity can be a very difficult process. Dental, fingerprint and DNA analysis are probably the most common techniques used in this context, allowing fast and secure identification processes. However, since they cannot always be used, sometimes it is necessary to apply different and less known techniques (Reddy 2011). The appearance of lip prints look like finger prints and vary from individual to individual. If a definite and detailed description of the different parts of upper lip and lower lip are established for an individual by detailed study made as an anti mortem record, this anti mortem record can be used for matching the details of lip prints recorded in an unknown deceased person in post mortem records for personal identification. In comparing the lip print of anti mortem record and post mortem record, if both the lip prints

are matched, the individual can be identified. The basic features in lip print are furrows on the red part of the human lip, lip grooves, labial wrinkles and color of rouge (Adeoye 2010).

Various studies carried out across the globe (Tsuchihashi 1974; Adeoye 2010) stated that lip prints are unique to each individual and thus can be used to fix the identity of a person. Tsuchihashi (1974) reported that even the lip prints of identical twins are not identical. Such data among the Urhobos and Binis in South-Southern Nigeria are not available in the literature. This study focuses on lip print analysis of the Urhobos and Binis as well as identical twins, in South-Southern Nigeria.

Besides identifying and evidential use, lip prints may also be used in detective work, being the source of tactical and criminalistic information. A lip print at the scene of a crime can be a basis for conclusions as to the character of the event, the number of the people involved, sexes, cosmetics used, habits, occupational traits, and the pathological changes of lips themselves (Reddy 2011). Lip prints can be recovered from various objects like glasses, cigarette, and apple. These evidences can be useful in cases of complexity. The aim of this study, therefore, is to investigate the various patterns of lip prints among the Urhobos and Binis, in order to establish population differences; to verify if there is significant association between gender and lip print patterns; and to ascertain possible identical patterns of lip prints between uni-ovular twins.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted between February and September, 2011. The study subjects who were Urhobos and Binis were randomly sampled and consisted of 211 individuals (103 male and 108 females) aged between 12 to 34 years. Three groups of subjects were studied: group 1 comprised the Urhobos (53 males and 52 females) with mean age in years of 20.06 ± 4.19 ; group 2 comprised the Binis (50 males and 46 females) with mean age in years of 22.30 ± 3.93 . Group 3 comprised 10 identical (5 sets) twins who were either Urhobos or Binis.

The subjects were recruited from some secondary schools within the Urhobo and Bini nations as well as the Delta state University, Abraka and the University of Benin. Family pedigree study was carried out prior to data

collection. Voluntary informed consent was obtained from all adult subjects and parents/guardians of minor subjects prior to data collection in accordance with International Ethical Guidelines for Biomedical research involving Human Subjects. In addition, the study protocol was approved by the local Research and Ethics committee in the College of Health Sciences, Delta State University, Abraka, Nigeria.

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

Both lips were divided into 2 halves each by a midline, giving 4 quadrants. Each quadrant is further divided into 2 halves, making 8 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 segment is recorded in accordance with the classification of Suzuki and Tsushihashi (Suzuki and Tsushihashi 1970; Suzuki and Tsushihashi 1971; Tsushihashi 1974). 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, which does not fall into any of the above patterns (Fig. 3).

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

between gender and lip print patterns in both upper and lower segments. The analysis was

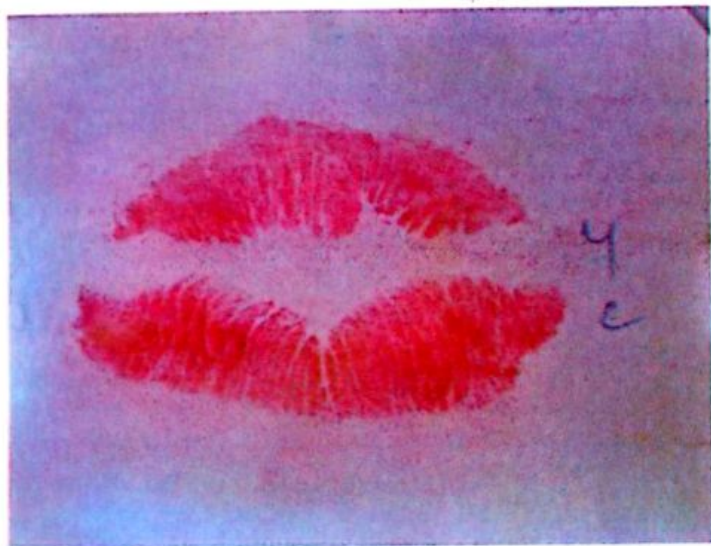


Fig 1: Photograph of upper (U) and lower lip (L) imprints of different lip print patterns

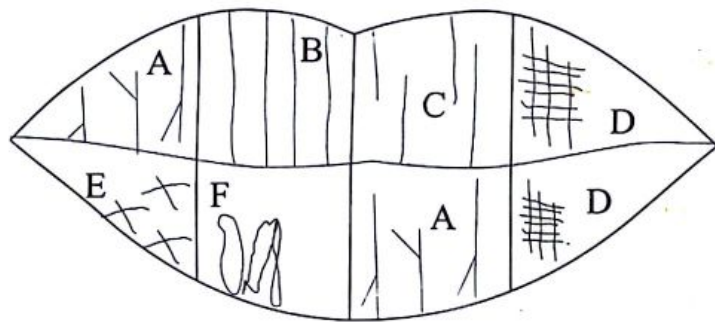


Fig. 3: Showing lip print types as given by Suzuki and Tsuchihashi : type I (B); type I' (C); type II, (A); type III (E); type IV (D); type V (F).

RESULTS

Across the study cohort, out of a total of 1,688 lip print types analyzed, no two lip prints matched each other. In the present study, the dominant pattern in the entire Urhobo population, taking both the upper and lower lips across the cohort, was type II, constituting 52.38% of all patterns. This was followed by type I' (17.02%) and the least was type I (6.91%). Among the Binis, the lip print pattern in the entire upper and lower lips across the cohort was type II (47.79%) followed by type I' (25.26%) and the least was type III (5.73%).

The upper and lower lips were also considered for the two ethnic groups. It was observed that type II pattern is dominant in both the upper and lower of the Urhobos (58.33% and 46.43%) and Binis (49.22% and 46.35%) respectively (Tables 1 and 2).

conducted with the aid of statistical package of social sciences (SPSS) version 16. P-value =

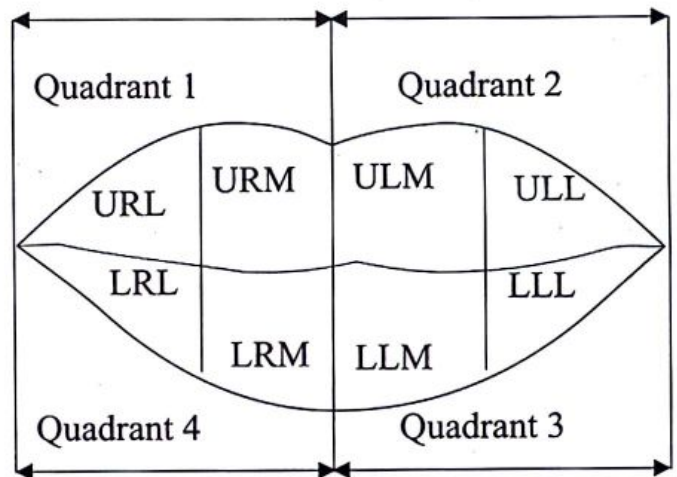


Fig. 2: Showing partitioning of upper and lower lips into quadrants and segments. URL=upper right lateral segment; URM= upper right medial segment; ULM= upper left medial segment; ULL= upper left lateral segment; LLL= lower left lateral segment; LLM= lower left medial segment; LRM= lower right medial segment; LRL= lower right lateral segment.

The present study also revealed similarities in the different segments of the lips as regards the dominant ridge pattern when the two study populations were compared; although the sequence in distribution is different. In the upper lateral lip segments of Urhobos, the predominant ridge pattern was type II (65.10%) followed by type I' and type IV (15.10% each), while in the upper medial lip segments the predominant pattern was type II (61.98%) followed by type IV (20.31%) and type I' (14.58%) (Table 1A). Among the Binis, the predominant ridge pattern in the upper lateral lip segments was type II (51.04%) followed by type I' (19.79%) and type IV (16.15%), while in the upper medial lip segments the predominant pattern was type II (47.40%) followed by type I' (27.08%) and type IV (17.71%) (Table 1B)

Considering the lower lateral lip segments of Urhobos, the predominant ridge pattern was type II (63.02%) followed by type I' (16.15%) and type III (15.10%), while in the lower medial lip segments the predominant pattern was type II (38.54%) followed by type I' (28.13%) and type IV (17.19%) (Table 2A). Among the Binis, the predominant ridge pattern in the lower lateral lip segments was

type II (63.54%) followed by type I' (16.67%), while in the upper lateral lip segments the predominant pattern was type I' (37.05%) followed by type II (29.17%) (Table 2B).

Lip print patterns were also compared between males and females among Urhobos and Binis. It was observed that among the Urhobos, type II pattern was the most predominant pattern in both males (52.59%) and females (52.16%) of all patterns. The next most common pattern in males and females was type IV (15.80%) and type I' (20.43%) respectively. Next was type I' pattern (13.68%) in males and type IV (12.27%) in females. Among the Binis, the sequence of pattern distribution is the same both genders. The most predominant pattern was type II (52.25% in males and 42.93% in females). This was followed in order by type I' pattern (18.75% in males and 32.34% in females), type IV (15.00% in males and 11.42% in females), type I (7.75% in males and 8.15% in females) and type III (6.25% in males and 5.16% in females). In both ethnic groups studied, Chi-square for contingency between gender and lip prints in the different segments of the lips revealed no significant association ($p > 0.05$).

Among Urhobos, the most common pattern in the upper lip of both males and females was type II (65.57% in males and 50.96% in females) followed by type IV (14.15% in males and 18.27% in females), type I' (9.43% in males and 17.79% in

females), type III (6.13% in males and 7.69% in females) and type I (4.72% in male and 5.29% in females). The most common pattern in the upper lip of Bini males and females was type II (52.00% in males and 46.20% in females) followed by type I' (20.00% in males and 27.17% in females), type IV (18.00% in males and 15.76% in females), type III (5.50% in males and 7.61% in females) and type I (4.50% in male and 3.26% in females).

Among Urhobos, the most common pattern in the lower lip of both males and females was type II (39.62% in males and 53.37% in females) followed by type I' (17.92% in males and 23.08% in females), type IV (17.45% in males and 6.25% in females), type III (16.04% in males and 8.65% in females) and type I (8.96% in male and 8.65% in females). The most common pattern in the lower lip of Bini males and females was type II (52.50% in males and 39.67% in females) followed by type I' (17.50% in males and 37.50% in females), type IV (12.00% in males and 7.07% in females), type I (11.00% in males and 13.04% in females) and type III (7.00% in male and 2.72% in females).

The present study also investigated the role of genetics in lip prints. Among lip prints of 10 uni-ovular twins (five sets) studied, there was some similarity in the groove types but none showed identical lip print pattern. However, two sets showed similarity up to 62.50% each, while one set 75%.

Table 1: Frequency distribution of lip prints in the different segments of the upper lip.
A: Urhobos ; Males (N=53), Females (N=52).

Lip print	Type	Gender	Lip segment				Total
			URL	URM	ULM	ULL	
Type I		Male	3	3	3	1	10
		Female	6	3	1	1	11
Type II		Male	5	6	4	5	20
		Female	8	8	10	11	37
Type I'		Male	36	35	32	36	139
		Female	26	26	26	28	106
Type III		Male	3	3	3	4	13
		Female	5	6	2	3	16
Type IV		Male	6	6	11	7	30
		Female	7	9	13	7	30
Total		Male	53	53	53	53	212
		Female	52	52	52	52	208

B: Binis; Males (N=50), Females (N=46).

Lip print	Type	Gender	Lip segment				Total
-	-	-	URL	URM	ULM	ULL	-
		Male	1	1	2	5	9
Type I		Female	3	1	01	2	6
		Male	8	12	12	8	40
Type I'		Female	10	11	17	12	50
		Male	29	24	24	27	104
Type II		Female	24	23	20	18	85
		Male	2	3	4	2	11
Type III		Female	2	2	2	8	14
		Male	10	10	8	8	36
Type IV		Female	7	9	7	6	29
		Male	50	50	50	50	200
Total		Female	46	46	46	46	184

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

Table 2: Frequency distribution of lip prints in the different segments of the lower lip.

A: Urhobos ; Males (N=53), Females (N=52).

Lip print	Type	Gender	Lip segment				Total
-	-	-	URL	URM	ULM	ULL	-
		Male	3	7	5	4	1
Type I		Female	2	7	7	2	18
		Male	9	11	12	6	38
Type I'		Female	10	17	14	7	48
		Male	28	15	15	26	84
Type II		Female	24	21	23	33	111
		Male	8	7	9	10	34
Type III		Female	4	4	3	7	18
		Male	5	13	12	7	37
Type IV		Female	2	3	5	3	13
		Male	53	53	53	53	212
Total		Female	52	52	52	52	208

B: Binis; Males (N=50), Females (N=46).

Lip print	Type	Gender	Lip segment				Total
-	-	-	URL	URM	ULM	ULL	-
		Male	5	9	6	2	22
Type I		Female	4	6	7	7	24
		Male	4	11	14	6	35
Type I'		Female	13	27	20	9	69
		Male	35	20	15	33	105
Type II		Female	26	8	13	26	73
		Male	3	2	4	5	14
Type III		Female	1	1	1	2	5
		Male	3	8	11	2	24
Type IV		Female	24	4	5	2	13
		Male	50	50	50	50	05
Total		Female	64	64	46	46	46

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

DISCUSSION

The observation in the present study that no two lip prints were the same reinforces the uniqueness of lip prints and its possible application in individual identification as reported in some previous studies (Tsuchihashi (1974; Williams 1991; Saraswathi et al 2009). Also in this study, type V lip print pattern was not found among subjects in the two ethnic groups studied. The dominant pattern in both the Urhobos and Binis was type II. This observation in the two study populations departs from Augustine et al (2008) in Aurangabad, Maharashtra, India. It is also at variance with a Japanese study (Tsuchihashi 1974); a study in the Indo-Dravidian population (Sivapathasundharam et al 2001) and a study in Kerala (Verghese et al 2009). This variation could be due to geographic, environmental, nutritional or genetic factors.

Augustine et al (2008) observed type III pattern to be predominant in the upper and lower lips. Vahanwala and Parekh (2000) found type I and type II to be the most common in the upper right quadrant in the Indian population. They considered the most predominant pattern in the entire quadrant for classification, whereas the quadrants have been divided further into two segments in our study. Hirth *et al* (1975) observed that branched pattern was more frequently present in the upper lip and simple pattern was commonly seen in the lower lip in residents of Hamburg, West Germany.

It was observed in the present study that with regards to dominant ridge patterns, similarities exist in the different segments, when Urhobos and Binis are compared, although the sequence in distribution is different. In a related study, Augustine et al (2008) observed that the upper lip, both type III and type I patterns were more common in the lateral segments than in the medial segments while type IV, type V and type I^l were more common in the medial areas than the lateral. They noted that the lower lip showed a predominance of type I pattern in the medial segments as compared to the lateral. Type III pattern showed a predominance in the lateral segments of the lower lip while the upper lip showed a frequency of less than 55% in this region. They also observed that the medial segments of the upper lip showed a predominance of type III followed by type IV and type II patterns. It was also noted in their study that the lower lip showed type IV to be the most predominant in the medial segments followed by type I and type III. Type II pattern was more commonly observed in the upper lip and was evenly distributed in all segments, while in the lower lip it was found to be more

common in the lateral than in the medial segments.

It has been stated that the uniqueness of patterns depended on the way the lip muscles relaxed to produce a particular pattern (Sivapathasundharam *et al* 2001). Lévêque and Goubanova (2004) opined that the furrows and grooves on the lips seemed to provide routes for saliva to spread over the lips and maintain good hydration. They also noted the upper lip to be more hydrated than the lower one and posited that variations in pattern between the upper and lower lip may be attributed to these factors and might have a functional significance. They also noted that some continuity seemed to exist between the lips and adjacent skin lines and suggested a common origin. The predominance of type II pattern in the upper and lower lips in the present study could be due to functional relationship with these lines on the skin adjacent to the lips.

Considering all segments together males had a higher percentage of type II than females among Urhobo subjects and among the Binis. The pattern of other lip print types vary differently in both genders in the two ethnic groups. There was no significant association between gender and lip prints in the different segments of the lips ($p>0.05$). Augustine et al (2008) reported that statistically significant difference ($P<0.001$) existed between the lip prints of males and females. Vahanwala and Parekh (2000) made suggestions as to the differences in lip prints as an aid to sex determination.

The present study observed that in spite of some similarities in uni-ovular twins studied, no two were identical. The findings in this study are in accordance with those of Domiaty et al (2010). They also agree with Maheswari (2005) and Maheswari and Gnanasundaram (2011), who reported that no similarities were found between parents and their twins and between twins. She also added that no similarities were seen between triplets. The present study also agrees with the study of MacDonell who described two identical twins that seemed to be indistinguishable by every other means but lip prints in these twins differed (Aggrawal 2004). Vats et al (2011) reported that the lip print patterns are unique in monozygotic twins also and no significant association was found among them. On the other hand, Suzuki and Tsuchihashi (1970) recorded that there was no hereditary pattern of lip prints and that dissimilarity did not evidently exist between twins. Soon after, Tsuchihashi (1974), after analysing lip prints of 49 pairs of uniovular Japanese twins and their parents, reported that lip prints of twins and their parents were not absolutely identical.

CONCLUSION

Out of the 211 individuals' lip prints investigated, no two showed the same pattern. The lip print of every individual is unique. Every pair of the 10 uniovular twins assessed showed very high similarity in the pattern of lip prints, but no two were identical. This unique traits and characteristics confer lip prints as evidence in personal identification and criminal investigation of persons living or dead. The Urhobos and Binis showed type II lip print pattern as predominant, but the sequence of distribution is different. In spite of variation in distribution, the ethnicity of an individual cannot be determined from lip print. In spite of the disparity of lip print patterns in both genders, the sex of an individual could not be determined. Therefore, based on this study, the place of lip prints in human identification is by individualization and not by gender and ethnicity.

Conflict of interest

The authors have no conflict of interest as regards the current study.

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