

Relationship of thumb prints and lip prints among Nigerians

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Abstract: Establishment of association between two variables in the forensic science is of paramount importance. The study was aimed to determine association of lip prints types and left thumb prints among Nigerians. A total of 820 subjects (414 male and 406 female) participated in the study. The lip prints were obtained on microscopic glass slide and developed using carbon black powder. For finger prints normal conventional method of using ink pad was employed. The data were analyzed using chi square test and $P < 0.05$ was considered as level of significance. The result shows the percentage distribution of lip prints as Type V (31.39%) as the predominant and the least was Type I' (0.57%). For thumbprints in both sexes loop exhibit high percentages and arches the least. The association between lip prints and left thumb print shows statistically significant correlation in Lower Right Medial (LRM) ($\chi^2 = 7.95$, $P = 0.0002$) and Lower Left Lateral (LLL) ($\chi^2 = 5.42$, $P = 0.02$) compartments only. In conclusion, the lip print was found to be statistically associated with left thumb prints. Hence, relationship of finger prints and lip prints can hold potential promise as supplementary tool in personal authentication.

Key words: Finger print Lip prints, Nigeria, Personal authentication

I. Introduction

The use of conventional methods such as use of fingerprints and lip prints are of paramount importance, since personal identification by other means such as DNA analysis is sophisticated and not available in rural and developing countries. Fingerprint in its narrow sense is an impression left by the friction ridges of human fingers. The science of fingerprints had acclaimed and reputed as panacea for individualization particularly in forensic investigations [1].

The three basic patterns of fingerprint ridges are arch (plain and tented), loop (radial and ulna), and whorl (plain and others). An arch is a pattern where the ridges enter from one side of the finger, rise in the centre forming an arc, and then exit the side of the finger and the loop is a pattern where the ridge enters from one side of a finger, form a curve and tend to exit from the same side they enter. Whereas, in the whorl pattern ridges form circularly around a central point on the finger [2, 3]

The crucial events for the establishment of the epidermal ridge pattern take place from the 10th to 16th weeks of development [4, 5, 6, 7, 8, 9, 10, 11]. The 11th week marked the period of formation of primary ridges. These established the future surface patterns which become well pronounced at the 16th week. Because fingerprints patterns are encoded at the interface between dermis, the pattern cannot be destroyed by superficial skin injuries [12, 4, 9]. Various factors were suggested by numerous scientists to be the major driving forces in the pattern and formation of fingerprints, such factors include; Volar pad [13], Genetic factor, *SMARCAD1* gene, [14], Boundary effects, Merkel cells [15]. Several studies show little variation in the distribution of pattern of fingerprints across the continent and about 25-35% of the finger print is whorls, 60-65% is loops and arches is 5%. The suggested value for Negroid population was 7% arches, 28.35% whorls and 64.55% loops [16, 3]

The second prints of interest is lip prints, which are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip between the inner labial mucosa and outer skin. The appearance of lip prints, like fingerprints vary from persons to persons [17]. The biological phenomenon of systems of furrows on the red part of human lips was first noted by anthropologists; R. Fischer who was the first to describe it in 1902 [18]. Use of lip prints in personal identification and criminalization was first recommended in France by Edmond Locard [19]. The most commonly used classification scheme of lip-prints invented by Suzuki and Tsuchihashi [20] in 1970 are: Type I; a clear-cut groove vertically across the lips, type II; a partial-length groove of type I, type III; a branched groove, type IV; an intersected groove type V; a reticular pattern and finally type V; other types.

Cottone and Standish [21], reported in their book outline of forensic dentistry, that cheiloscropy (study of lip prints) is one of its special techniques used for personal identification, and Ball [22] has also reported the history of lip prints and importance of its evidence in the courts as well as its status as a source of forensic evidence. Hence, it was proved beyond doubt that lip prints are as good as fingerprints in criminal identification and can be definitely be used when no other means of traditional method of identification are available [23]. The various processes from which the face (including lips) develops can be identified at the end of 4th week and the overlying skin of the lip is derived from the ectoderm and musculature is derived from mesoderm of the second pharangeal arch [24]. The lip prints develop in the same weeks of embryological life as the lip [25].

Studies of association between finger print and lip prints are scanty in the literature. Reference data on various forms of personal identification such as fingerprints, lip prints etc are of paramount importance in solving security findings. The present study aims to determine the percentage distribution of lip print and left thumb prints as well as the association between lip print and left thumb prints among Nigerian population

II. Materials and Methods

2.1 Subject and study location

The data was collected from 820 subjects (414 males and 406 females) aged 12-20 years from Demonstration secondary school Ahmadu Bello University, Zaria-Nigeria, After Informed consent was sought from the students whose age was 18 years and above, and from class teachers for the students whose age fell below 18 years. All the participants were apparently healthy with absence of external congenital malformations, physical deformities or inflammation.

2.2 Finger prints collection

After the left thumb was cleaned with tissue paper, the subjects were made to roll the tip of their left thumb across the surface of an already made ink-stained pad, ensuring that the ink covered the entire pattern area. The finger was then transferred to a white paper to obtain the print and analyzed using magnified hand lens [26].

2.3 Lip prints collection

The subjects were made to stand in a relax position and the lips were cleaned with the tissue paper. Care was taken to ensure that no traces of the tissue paper were left on the lips. A clear new microscopic glass slide was placed on the relaxed lips of the subject in a single motion. The glass slide was then removed from the surface of the lip and carbon black powder was poured on the surface of the slid that is in contact with the lips, then the excess powder was dusted by mouth blow, this led to the production of well developed lip prints on the slide ready for preservation and analyses. The glass slide was then placed on an area provided on the questionnaire (with left and right, superior and inferior sides in consideration). Finally, a transparent cello tape was used to cover the print as well as attaching the slide to the questionnaire. Care was taken to avoid formation of bubbles and wrinkles on the glass slide [27]. The lip print was then divided into five quadrants for both lower and upper lip for an accurate estimation of the lip prints patterns (Fig. 1). Using modified Hassan and Fahamy [28] method

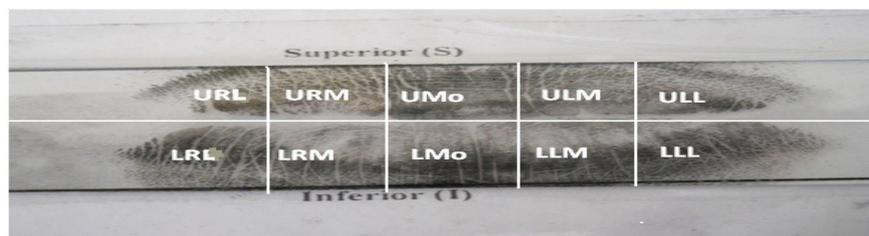


Figure 1: A well developed lip prints of a participant divided into ten quadrants ready for analysis

Key; ULL= Upper left lateral, LLL= Lower left lateral, ULM= Upper left medial, LLM= Lower left middle, UMo= Upper median, LMo= Lower median, upper, URM= Upper right medial, LRM= Lower right middle, URL= Upper right lateral and LRL= Lower right lateral compartments

2.4 Statistical analysis

The data was presented in form of chart using simple percentage and Chi-square test was used to test for association between the variables. Level of significance was considered at $p < 0.05$. Analyse it statistical software for Microsoft excel, version 2.26, 2012 was used for the analysis

III. Result

Fig. 2 shows percentage distribution of the pattern of left thumb prints according to sexes. In males the most common fingerprints pattern were loops (54.8%), followed by whorls (39.9%) and arches (5.3%). Similar pattern was seen in females as loops (52%), Whorls (39.4%) and Arches (8.6%). In both sexes loops exhibit high percentages and arches least.

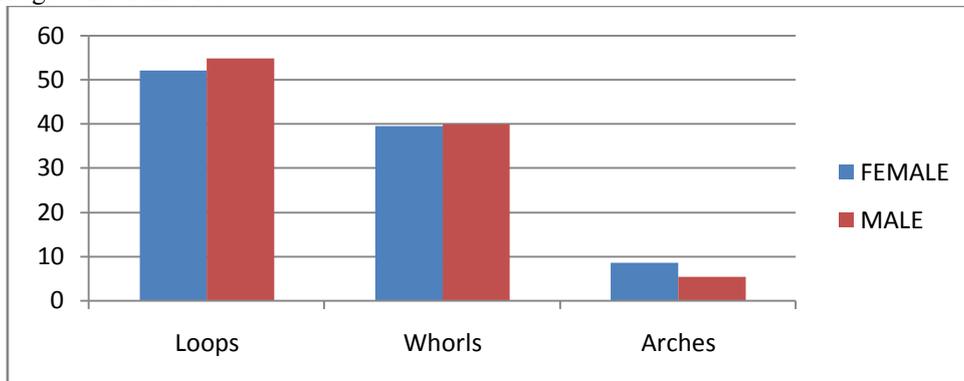


Figure 2: Percentage distribution of the pattern of left thumbprints according to sex

In Fig. 3 the percentage distribution of lip print shows that the most frequent lip pattern in the male is Type V (31.48%), followed by type III (26.60%), type I (15.99%), type IV (14.45%), type II (11.09%) and the least was type I' (0.55%). In female the type V (31.53%) was predominant, followed by type IV (22.91%), type III (21.69%), type I (13.70%), type II (9.52%) and the least was type I' (0.57%).

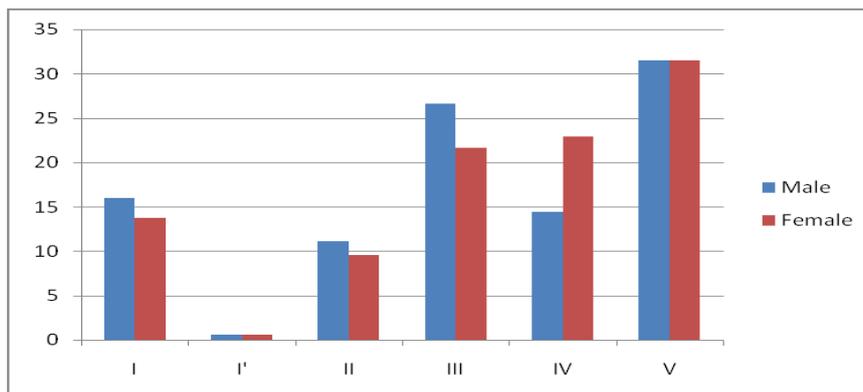


Figure 3: Percentage distribution of the types of lip prints according to sexes

The association between lip prints and finger print was shown in Table 1 to 5, the result shows that left thumb shows statistically significant association with LRM ($\chi^2 = 7.95, P = 0.0002$) and LLL ($\chi^2 = 5.42, P = 0.02$) in Tables 1 and 4 respectively and there was no statistically significant association with the rest of the compartments

Table 1: Association between left thumb prints with upper and lower left lateral (ULL and LLL) compartments

Left Thumb	Compartment	I	I'	II	III	IV	V	X ²	P
Arches	ULL	5	0	4	24	7	17	11.49	0.3207
Loops		42	0	42	160	36	158		
Whorls		39	1	30	142	21	92		
Arches	LLL	5	2	11	17	4	18	20.91	0.0217
Loops		39	0	78	121	35	165		
Whorls		45	3	68	90	25	94		

Table 2: Association between left thumb prints with upper and lower left medial (ULM and LLM) compartments

Left Thumb	Compartment	I	I'	II	III	IV	V	X ²	P
Arches	ULM	6	0	4	15	11	21	10.23	0.4208
Loops		50	3	44	133	96	112		
Whorls		41	4	32	116	64	68		
Arches	LLM	7	1	8	11	13	17	5.22	0.8759
Loops		72	2	54	73	107	130		
Whorls		61	1	43	56	81	83		

Table 3: Association between left thumb prints with upper and lower median (UM and LM) compartments

Left Thumb	Compartment	I	I'	II	III	IV	V	X ²	P
Arches	UM	14	0	0	8	22	13	11.75	0.3021
Loops		83	5	15	44	148	143		
Whorls		67	5	13	22	126	92		
Arches	LM	15	1	2	4	20	15	11.31	0.3335
Loops		119	5	16	27	145	126		
Whorls		104	0	18	12	111	80		

Table 4: Association between left thumb prints with upper and lower right medial (URM and LRM) compartments

Left Thumb	Compartment	I	I'	II	III	IV	V	X ²	P
Arches	URM	6	0	5	19	13	14	8.16	0.6136
Loops		54	4	33	129	89	129		
Whorls		52	2	23	112	52	84		
Arches	LRM	2	2	11	7	16	19	33.41	0.0002
Loops		78	0	43	78	92	147		
Whorls		57	1	40	66	73	88		

Table 5: Association between left thumb prints with upper and lower right lateral (URL and LRL) compartments

Left Thumb	Compartment	I	I'	II	III	IV	V	X ²	P
Arches	URL	7	0	6	22	3	19	5.41	0.8620
Loops		33	1	32	152	39	181		
Whorls		28	1	25	125	25	121		
Arches	LRL	6	1	14	11	6	19	10.96	0.3606
Loops		45	1	70	101	33	188		
Whorls		37	1	60	86	20	121		

IV. Discussion

In forensic sciences dermatoglyphic has traditionally been used to differentiate between populations, due to their unchanging genetic base and differences between populations [29, 30, 31]. However, establishment of association between two dermatoglyphic variables in forensic sciences is scanty in the literature. The result of the present study shows that the percentage distribution of left thumbprints patterns falls close to the expectation of 25-35% of the finger prints as whorls, 60-65% as loops and arches as 5% and also not far from suggested value for Negroid population which shows the percentage as 7% arches, 28.35% whorls and 64.55% loops [3, 16]. The finding is also similar to the finding of Danborno and Idris [32] in Hausa ethnic group with the result showing that Hausa males had 30.15% as whorls, 65.91% as loops and 3.95% arches. In females 29.33% had whorls, 61.27% had loops and 9.29% were having arches. Osunwoke *et al.* [33] on Okrika and Ikwerre ethnic

groups of Nigeria also showed that the ulnar loops for Okrika population were 46.42%, whorls 37.77%, arches 14.12% and radial loops 1.71%. The Ikwerre population had the ulnar loops of 56.46% which was higher than that of the Okrika population, whorl 24.42%, arches 15.89% and radial loops 3.23%

In the percentage distribution of the lip prints little variation was noticed with respect to previous studies. Hassan and Fahmy [28] in their studies of the pattern of lip print in upper Egyptians found that type IIa was the most frequent one in the upper lip in males with a percentage of 39%. Type IV was the most frequent type in the upper lip in females with a percentage of 44.4%. Type Ia and IIc were of a higher percentage (32.2%) in the lower lip in males. Type Ia was the most frequent one in the female lower lip. In lower Egyptians it was reported that inheritance of lip prints in cleft lip and plate in children shows the following pattern among the parents. In fathers: type IIa is significantly higher in the upper lip. In mothers: type IIa was significantly higher in both the upper and lower lips. Type O (a new type) which is under type V was significantly higher in mothers than the fathers [34]

It was also reported that type I was dominant in females in the lower lips and that males tend to have different patterns in all compartments and the female tend to have the same patterns in all compartments [35]. According to Mahaswari [36] males recorded that the maximum number of individuals has Type II lip prints (31.61%) and the minimum number of individuals had type IV lip print (0.57%). It is recorded that among females maximum numbers of individuals have type II lip prints (43.79%) and minimum of individuals had type IV (0.99%). Saraswathi *et al.* [37] also noted that males and females had 39.5 and 36.5% intersecting pattern, respectively. El Dormaty *et al.* [38], stated that a total of 72.67% of lip prints showed the same groove pattern in the upper right and upper left areas (78.89% of females and 64.79% of males), while 75.36% of the prints showed the same groove pattern in the lower right and lower left areas (74.81% of females and 76.06% of males). Nine types of grooves were recorded in Saudi Arabia at Almedinah Al-monawarah province lips. Horizontal groove with other forms was the highest (68.7% in females and 42.7% in males). It was recorded that males 25.29% had Type I, 31.61% with Type II, 14.94% with Type III, 0.57% with Type IV and 27.59% with Type V lip prints. In females 22.89% were having Type I, 43.79% with Type II, 12.94% with Type III, 0.99% with Type IV and 19.40% with Type V lip prints [39]. These variations of distribution of the lip prints and finger prints may be linked to the genetic influences which vary with respect to different races.

Several studies established association of lip prints and sex [40, 41, 42], the present study further analyzed the association of left thumb prints and lip prints. The result have shown statistically significant association between left thumb prints and lip prints in LLL and LRM compartment, the main importance of this association is that the thumb prints is related to the lip print types and both the two prints have relationship of been controlled by genetic factors. This study is in agreement with the study of Nagasupriya *et al.*, carried out on Indian population [43] despite the different methods employed in the analysis of the lip prints. Lip prints, as one of the dermatoglyphics like fingerprint, have also been used as genetic makers in many congenital and clinical disorders [44].

V. Conclusion

The percentage distribution of the prints gives an idea about different pattern of the predominance of the lip prints across the globes. Despite the use of different methodology in thumbprint and lip prints collection, the left thumb print was found to be statistically associated with some compartment of the lips. Hence, relationship of finger prints and lip prints can hold potential promise as supplementary tool in personal identification as well as genetic makers in many congenital and clinical disorders

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