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Original Research Article

Relationship between Index Finger Print and Lip Print Pattern among Nigerians in Port Harcourt

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ABSTRACT

Introduction: Genetically, genes located close to each other on the chromosome have greater chances of being inherited together, therefore influencing each other. Technological deficiencies may not permit genome mapping, however the traits that are produced from such genes are likely to show strong associations. Therefore, this study was carried out to investigate the association between index finger and lip print pattern among Nigerians.

Materials and methods: A total of 450 subjects comprising of 212 (47%) males and 238 (53%) females selected from Port Harcourt were used for this study. Oghenemavwe and Osaat digital finger and lip print capture technique were adopted for this study. Clearly obtained prints were transferred to a laptop via USB connection and the prints were magnified using the zooming tool. Finger prints were determined by observing the primary configuration (arch, loop and whorl) while lip prints were obtained by dividing the lip into four quadrants (upper quadrant [UQ] and lower quadrant [LQ]; L & R) which were independently accessed for the predominant lip print using Suzuki and Tsuchihashi's classification (Types; I, I', II, III, IV, and V). Statistical analysis was performed using XLSTAT (Addinsoft Version 2015.4.01.21575). Chi-square was used to determine the trend in the distributions, while lip print pattern and index finger print were cross-tabulated and evaluated for association. $P<0.05$ (at 95% confidence level) was taken to be significant.

Results: The predominant print type on index finger was loop; 174 (38.7%) on the right (R) and 186 (41.3%) on the left (L) which were sex determined for both fingers (R; $\chi^2=7.05$, $p=0.03$ and L; $\chi^2=6.39$, $p=0.04$). The lip print exhibited predominant differences in the upper and lower lip print. The upper lip was predominantly type III (243 [27%]) while the lower lip was type I (319 [35.4%]). The distribution in male and female was significantly different, only for the right quadrant of the upper lip ($\chi^2=16.39$, $p=0.01$).When the index fingerprint distribution was related to lip print, loop co-related more with Type III at the upper lip (URQ; 30.5%, ULQ; 29.3%) while the lower lip had a mix of Type I and whorl (LRQ; 38.6%) and loop (LLQ; 36.8%). The associations were not significant ($P>0.05$).

Conclusion: The distribution of the print patterns on the index finger and lips are independent of each other and therefore, the inheritance of lip print and finger print cannot be said to be genetically linked.

Keywords: Co-relation, Distribution, Index finger print, Lip print, Nigerians.

INTRODUCTION

The ridge like impressions noticeable on all the fingers is called finger prints. The study of fingerprint is called dermatoglyphics and its use as means of identification is called dactyloscopy.[1,2] It has been suggested that these ridge patterns could be partly determined by heredity and partly by environmental factors; hence, fingerprint is believe to be a multifactorial

trait. [2,3] Lip prints on the other hand as defined by Saraswathi *et al.* [4] are normal surface slits, wrinkles and grooves generally referred to as *sulky labarum* noticeable on the lips and formed between the inner labial mucosa and the outer skin. The examination of these features is called cheiloscopy. [5] Genetically, genes that are located close to each other on the chromosome have greater possibility of being inherited together, [6-8] thereby influencing each other. Technological deficits and funding in certain geographical areas may not permit genome mapping, however, traits that are produced from linked genes are likely to show strong association morphologically. Most studies on the morphological characteristics and arrangement of the finger and lip print, have focused on sex associated distribution patterns; however, few studies have found conflicting evidence of significant relationship [9-11] and no relationship [12-14] between finger print and lip print.

Therefore, this research was undertaken to investigate the relationship that exist between index finger print and lip print among Nigerians.

MATERIALS AND METHODS

The study sample included 450 individuals, comprising of 212 (47%) males and 238 (53%) females within ages 15-40 years, selected from Port Harcourt city. Dermatoglyphic patterns were obtained using Oghenemavwe and Osaat [15] digital print capture. In utilising this method, we discovered that lip print patterns could also be captured using digital tools rather than the conventional red coloured lip stick, white A3 sized paper, and magnifying lens. The prints were obtained using print scanner (Hp G3110 Photo scanner). The scanner was powered using 500watt solar power inverter connected to 12volts rechargeable battery. Individuals with distorted or poorly visible lip print and fingerprint patterns were excluded from the study.

Finger printing: The hands of the participants were thoroughly cleaned with sterilized tissue wiper. The photo snapping tool of the scanner was used. This was to ensure that lip print and fingerprint of the subjects were not contaminated or ill-defined as a result of direct contact with the glass surface of scanner.

Lip printing: Lip print was also obtained (in a relaxed and closed position of the lip as to get a clearer and well-defined imprint) using Hp G3110 Photo scanner in the method with that of the finger print.

The imprints were magnified using the zooming tool on Hp laptop connected to the scanner via USB cords. Finger prints were determined by observing the primary configurations (arch, loop and whorl) while lip prints were obtained by dividing the lip into four quadrants; upper right quadrant (URQ), upper left quadrant (ULQ), lower right quadrant (LRQ) and lower left quadrant (LLQ) which were independently accessed for the predominant lip print using Suzuki and Tsuchihashi's [16] classification (Types; I, I', II, III, IV, and V).

RESULTS

Index finger print distribution

In this study, the distribution of the patterns and test for sex association revealed that; on the right - Arch (M = 38, 17.9%; F = 67, 28.2%); Loop (M = 91, 42.9%; F = 83, 34.9%); Whorl (M = 83, 39.2%; F = 88, 37.0%), the distribution was significantly associated with sex ($\chi 2=7.05$, $p=0.03$). On the left - Arch (M = 33, 15.6%; F = 60, 25.2%); Loop (M = 94, 44.3%; F = 92, 38.7%); and Whorl (M = 85, 40.1%; F = 86, 36.1%) were distributed with sex influence ($\chi^2=6.39$, $p=0.04$) (Table 1).

Lip print distribution

The distribution of the different prints of males and females at the upper lip were closely proportionate in males and females except for Type I (18% in males and 10% in females) and Type IV (15% in males and 29% in females) at the right quadrant and Type 1 (19% in males and 11% in females) and Type IV (17% in males and 27% in females) at left quadrant (Table 2). The distribution with respect to sex was

significant for the right (χ^2=16.39, p=0.01) but not the left (χ^2=9.45, p=0.09). At the lower lip, the right quadrant had similar distribution in male and female while at the left quadrant, Type III had higher distribution in males (6%) than in females (11%) (Table 3). The distribution with respect to sex was not significant for the right (χ^2=2.14, p=0.83) and the left (χ^2=6.24, p=0.28).

Table 1: Finger print distribution and Chi-square test of association

Sex	Right index			Test of association		Left index			Test of association	
	Arch	Loop	Whorl	χ^2	P-value	Arch	Loop	Whorl	χ^2	P-value
Male (%)	38 (17.9)	91 (42.9)	83 (39.2)	7.05	0.03*	33 (15.6)	94 (44.3)	85 (40.1)	6.39	0.04*
Female (%)	67 (28.2)	83 (34.9)	88 (37.0)			60 (25.2)	92 (38.7)	86 (36.1)		
Total (%)	105 (23.3)	174 (38.7)	171 (38.0)			93 (20.7)	186 (41.3)	171 (38.0)		

Table 2: Lip print distribution on the upper lip (stratified in two quadrants) and Chi-square test of association

Lip print type	Upper Lip								*Total*
	Right quadrant		Test of association		Left quadrant		Test of association		
	Male	*Female*	χ^2	P-value	Male	Female	χ^2	P-value	
Type I (%)	38 (18)	23 (10)	16.39	0.01*	41 (19)	27 (11)	9.45	0.09	*129 (14.3)*
Type I' (%)	29 (14)	37 (16)			26 (12)	30 (13)			*122 (13.6)*
Type II (%)	47 (22)	44 (18)			49 (23)	52 (22)			*192 (21.3)*
Type III (%)	61 (29)	62 (26)			57 (27)	63 (26)			*243 (27)*
Type IV (%)	32 (15)	68 (29)			36 (17)	63 (26)			*199 (22.1)*
Type V (%)	5 (2)	4 (2)			3 (1)	3 (1)			*15 (1.7)*

Table 3: Lip print distribution on the lower lip (stratified in two quadrants) and Chi-square test of association

Lip print type	Lower Lip								*Total*
	Right quadrant		Test of association		Left quadrant		Test of association		
	Male	*Female*	χ^2	P-value	Male	Female	χ^2	P-value	
Type I (%)	72 (34)	86 (36)	2.14	0.83	74 (35)	87 (37)	6.24	0.28	*319 (35.4)*
Type I' (%)	48 (23)	52 (22)			45 (21)	48 (20)			*193 (21.4)*
Type II (%)	52 (25)	52 (22)			63 (30)	62 (26)			*229 (25.4)*
Type III (%)	18 (8)	24 (10)			12 (6)	25 (11)			*79 (8.8)*
Type IV (%)	19 (9)	23 (10)			16 (8)	16 (7)			*74 (8.2)*
Type V (%)	3 (1)	1 (<1)			2 (1)	0 (0)			*6 (0.7)*

Right finger and lip print

In co-relating the distribution of right index finger to lip print pattern, the results showed that at the URQ of the lip, loop+Type III (30.5%) was mostly observed next to whorl+Type III (28.1%) and Type IV (26.3%) while the least observed was arch+Type V (1%) (Table 4). Similar pattern was also observed at the ULQ of the lip (loop+Type III, 29.3%; whorl+Type IV, 27.5% and Type III, 26.3%) while the least observed was arch+Type V (1%) (Table 5). At the LRQ of the lip, the most co-related pattern was whorl+Type I (38.6%) next to loop+Type I (33.9%) and arch+Type I (31.4%) while the least observed was loop+Type V (0.6%) (Table 6). Similar pattern was also observed at the LLQ except that loop+Type I (36.8%) was the most observed next to arch+Type I (35.2%) then whorl+Type I (35.1%) while arch+Type V was not observed (0%) (Table 7). The test of association in the distribution showed that none of the quadrants of the upper or lower lip had significant relationship with the right index finger print (URQ [χ^2=10.148, p=0.428], LRQ [χ^2=10.405, p=0.406], LRQ [χ^2=5.768, p=0.834] and LLQ [χ^2=5.704, p=0.84]).

Left finger and lip print

In co-relating the distribution of left index finger to lip print pattern, the results showed that at the URQ of the lip, whorl+Type III (34.5%) was mostly observed next to arch+Type II (28.0%) and loop+Type III (26.3%) while the least observed was arch+Type V (1.1%) (Table 8). Similar pattern was also observed at the ULQ of the lip (whorl+Type III, 32.2%; arch+Type II, 30.1% and Loop+Type III, and IV [25.3%]) while the least observed was whorl+Type V (0.6%) (Table 5). At the LRQ of the lip, the most co-related pattern was arch+Type I (35.5%), whorl+Type I (35.1%) and loop+Type I (34.9%) while arch+Type V was not observed (Table 10). At the LLQ, loop+Type I (37.6%) was the most observed next to whorl+Type I (35.7%) then arch+Type I (32.3%) while arch+Type V was also not observed (0%) (Table 11). The test of association in the distribution showed that none of the quadrants of the upper or lower lip had significant relationship with the left index finger (URQ [χ^2=17.931, p=0.056], LRQ [χ^2=12.593, p=0.247], LRQ [χ^2=8.506, p=0.580] and LLQ [χ^2=11.532, p=0.315]).

Table 4 Test of association between the print on right index finger and right quadrants of the upper lip (URQ)

Right index finger	Upper right quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	13 (12.4)	19 (18.1)	27 (25.7)	22 (21.0)	23 (21.9)	1 (1.0)		
Loop (%)	26 (14.9)	25 (14.4)	35 (20.1)	53 (30.5)	32 (18.4)	3 (1.7)	10.148	0.428
Whorl (%)	22 (12.9)	22 (12.9)	29 (17.0)	48 (28.1)	45 (26.3)	5 (2.9)		

Table 5: Test of association between the print on right index finger and left quadrants of the upper lip (ULQ)

Right index finger	Upper left quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	14 (13.3)	17 (16.2)	27 (25.7)	24 (22.9)	22 (21.0)	1 (1.0)		
Loop (%)	27 (15.5)	20 (11.5)	44 (25.3)	51 (29.3)	30 (17.2)	2 (1.1)	10.405	0.406
Whorl (%)	27 (15.8)	19 (11.1)	30 (17.5)	45 (26.3)	47 (27.5)	3 (1.8)		

Table 6: Test of association between the print on right index finger and right quadrants of the lower lip (LRQ)

Right index finger	Lower right quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	33 (31.4)	26 (24.8)	22 (21.0)	13 (12.4)	10 (9.5)	1 (1.0)		
Loop (%)	59 (33.9)	43 (24.7)	43 (24.7)	13 (7.5)	15 (8.6%	1 (0.6)	5.768	0.834
Whorl (%)	66 (38.6)	31 (18.1)	39 (22.8)	16 (9.4)	17 (9.9)	2 (1.2)		

Table 7: Test of association between the print on right index finger and left quadrants of the lower lip (LLQ)

Right index finger	Lower left quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	37 (35.2)	23 (21.9)	26 (24.8)	12 (11.4)	7 (6.7)	0 (0.0)		
Loop (%)	64 (36.8)	38 (21.8)	51 (29.3)	9 (5.2)	11 (6.3)	1 (0.6)	5.704	0.84
Arch (%)	60 (35.1)	32 (18.7)	48 (28.1)	16 (9.4)	14 (8.2)	1 (0.6)		

Table 8: Test of association between the print on left index finger and right quadrants of the upper lip (URQ)

Left index finger	Upper right quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	11 (11.8)	16 (17.2)	26 (28.0)	15 (16.1)	24 (25.8)	1 (1.1)		
Loop (%)	26 (14.0)	22 (11.8)	37 (19.9)	49 (26.3)	47 (25.3)	5 (2.7)	17.931	0.056
Arch (%)	24 (14.0)	28 (16.4)	28 (16.4)	59 (34.5)	29 (17.0)	3 (1.8)		

Table 9: Test of association between the print on left index finger and left quadrants of the upper lip (ULQ)

Left index finger	Upper left quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	11 (11.8)	14 (15.1)	28 (30.1)	18 (19.4)	21 (22.6)	1 (1.1)		
Loop (%)	28 (15.1)	21 (11.3)	39 (21.0)	47 (25.3)	47 (25.3)	4 (2.2)	12.593	0.247
Whorl (%)	29 (17.0)	21 (12.3)	34 (19.9)	55 (32.2)	31 (18.1)	1 (0.6)		

Table 10: Test of association between the print on left index finger and right quadrants of the lower lip (LRQ)

Left index finger	Lower right quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	33 (35.5)	21 (22.6)	18 (19.4)	12 (12.9)	9 (9.7)	0 (0.0)	8.506	0.58
Loop (%)	65 (34.9)	36 (19.4)	51 (27.4)	18 (9.7)	14 (7.5)	2 (1.1)		
Whorl (%)	60 (35.1)	43 (25.1)	35 (20.5)	12 (7.0)	19 (11.1)	2 (1.2)		

Table 11: Test of association between the print on left index finger and left quadrants of the lower lip (LLQ)

Left index finger	Lower left quadrant						Test of association	
	Type I	Type I'	Type II	Type III	Type IV	Type V	χ^2	P-value
Arch (%)	30 (32.3)	23 (24.7)	22 (23.7)	10 (10.8)	8 (8.6)	0 (0.0)		
Loop (%)	70 (37.6)	28 (15.1)	61 (32.8)	16 (8.6)	10 (5.4)	1 (0.5)	11.532	0.315
Whorl (%)	61 (35.7)	42 (24.6)	42 (24.6)	11 (6.4)	14 (8.2)	1 (0.6)		

DISCUSSION

It has been well-established that lip prints just like fingerprints are individualistic and the most common and important human transfer evidences. [14] The presence of ridges and glands which produces oil and leave latent prints makes them analogous, [17] and capable of leaving partial or whole prints which can be used to establish the identity of the investigated individual. Lip print and fingerprint may have varying sizes and visibility with changes in age and surface abrasion; however, the patterns remain static which makes them a very useful forensic tool. The relationship between lip print and fingerprints has been studied for quite some time and diverse findings have been reported.

The study observed a significant difference between the predominant index fingerprint pattern among the males and females. Males were predominantly looped on the right and left while females were predominantly whorl on the right and loop on the left; however, a significantly higher proportion of arch was observed in females when compared to males. Adamu *et al*., [9] Metgud *et al*.,[10] Kumaran *et al*.,[11] Srilekha et al.,[12] Nandan *et al*.,[13] Negi and Negi[14] all reported loop as the predominant fingerprint, but Bansal *et al*. [18] observed whorl to be predominant in males and loop in females. Sex influenced distribution was also reported. [2,9]

In this study, the predominant lip type was Type I followed by Type III. Except for Negi and Negi,[14] who reported Type I as being the commonest type, Nandan *et al*.,[13] Gondivkar *et al*.,[19] Nagasupriya *et al*.,[20] Kumar *et al*.,[21] all reported Type II then Type IV as the predominant lip pattern. Their findings suggested racial variability. In this study, the predominant print type at the upper lip was Type III while Type I dominated the lower lip. The distribution of the lip pattern was sex influenced for only the upper right quadrant of the lip, with males having higher proportion of Type III while females had Type IV. Negi and Negi, [14] reported Type I as being dominant in males and Type II in females.

This study did not observe any significant association between the index fingerprint and lip print types in all four quadrants of the lip, but the co-distribution of the patterns was apparently similar in the quadrants of a lip while the upper and lower lip expressed great dissimilarity in the distribution patterns. Srilekha *et al*., [12] Nandan *et al*., [13] Negi and Negi, [14] and Mutalik *et al*.,[22] also reported no association between lip print and fingerprint. But Metgud *et al*., [10] Bansal *et al*. [18] and Nagasupriya *et al*., [20] found significant correlation while Adamu *et al*., [9] reported specifically that the predominant thumb print type was associated with the predominant lip print.

CONCLUSION

The distribution of the print patterns on the index finger and lips are independent of each other; however, independently, sex influenced the print pattern on the index finger and the upper right quadrant of the lip. Therefore, inheritance of lip print and

finger cannot be said to be genetically linked.

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