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Original Article

Relationship between Fingerprint Patterns and Gender among Port Harcourt Residents, Rivers State, Nigeria

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ABSTRACT

The ridge like impressions noticeable on all the fingers are called finger prints, and its study is referred to as dermatogylphics. The use of finger prints as a means of identification is called dactyloscopy. For a long time studies have been focused on the morphological characteristics of fingerprints but with few conflicting evidence of significant relationship between fingerprints and gender. **Aim:** This study was undertaken to investigate the relationship between fingerprints and gender among Nigerians.**Methods:**450 individuals comprising of 212 (47.1%) males and 238 (52.9%) females within ages 16-50 years, selected from Port Harcourt city were used for this study. Adopting Oghenemavwe and Osaat (2015) digital print model the fingerprints of the subjects were captured. Clearly obtained images were magnified and then the three primary fingerprint patterns (Arch, Loop and Whorl) were then identified and recorded. Statistical analysis was performed using XLSTAT (Addinsoft Version 2015.4.01.21575). Chi-square analysis was used to determine association and trend between fingerprints and gender. P<0.05 (at 95% confidence level) was taken to be significant. **Results:** 870 (19.3%) Arches, 2058 (45.7%) Loops and 1572 (34.9%) Whorls. Out of which Arches (male = 20.4%; female = 18.4%); Loops (male = 44.5%; female = 46.8%) and Whorls (male = 35.0%; female = 34.8%) were observed. These distributions of the total fingerprint patterns in both hands were not statistically significant with respect to gender (x^2=3.76, p=0.15).**Conclusion:** The distributions of fingerprint patterns are independent of gender. Thus, there is no relationship between fingerprints and gender.

Keywords: Arches; Loops; Whorls**;** Fingerprints; Gender.

1. INTRODUCTION

The scientific study of papillary ridges and furrows on the human body has long been studied by anthropologists. Purkinje was the first to distinguished nine principal configurations of rugae and sulci present on the terminal

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phalanges of human hands. In 1892 Galton explored the hereditary aspects of fingerprints [1]. The ridge like impressions noticeable on all the fingers are called fingerprints. The study of fingerprint is called dermatogylphics and its use as means of identification is called dactyloscopy [2, 3, 4, 5, 6].

For a long time studies have been focused on the morphological characteristics of fingerprints, and recently its association to gender [7,1,8,6] but with few conflicting evidence of significant relationship (between fingerprint and gender) [9, 10].

In bit to provide more scientific evidence this research was therefore undertaken to investigate the relationship between fingerprints and gender among Nigerians.

2. MATERIALS AND METHODS

Study Sample

The study sample included 450 individuals (with no form of anatomical abnormalities or injuries of the fingers), comprising of 212 (47.1%) males and 238 (52.9%) females within ages 16-50 years, selected from Port Harcourt city.

Fingerprinting: Fingerprints were obtained using print scanner (Hp G3110 Photo scanner). The scanner was powered using 500watt solar power inverter connected to 12volts rechargeable battery. Adopting [11] digital print model the hands of the subjects as well as the glass surface of the scanner were thoroughly cleaned with sterilized tissue wiper. The palm and fingers were placed in a way that little or no contact was made on the glass surface of the scanner. This was to ensure that prints were clear and sharp yet not dented. Using the photo snapping tool of the scanner the image of the palm and fingers were captured, then magnified (to clearly observe fingerprints configuration) using the zooming tool on Hp laptop connected to the scanner via USB cords. The three primary fingerprint patterns (Arch, Loop and Whorl) were then identified and recorded.

Methods of Data Analysis

Statistical analysis was performed using XLSTAT (Addinsoft Version 2015.4.01.21575). Chi-square analysis was used to determine association and trend between fingerprints and gender. $P<0.05$ (at 95% confidence level) was taken to be significant.

3. RESULTS

Out of the 450 subjects used in this study, 212 (47.1%) male and 238 (52.9%) female were observed.

In this study, the distribution of fingerprint patterns with respect to gender revealed the following:

In table 1 on the right thumb –the females had higher distribution of arches and loops (17.6%, 40.8%); while in the whorls the males had higher distribution with 47.2%; On the left thumb –the females also had higher distribution of arches and loops (24.4%, 40.8%) while in the whorls, the males was higher with 43.9%. The distribution was not significantly associated with gender in both hands (χ^2=1.77, p=0.41) – right thumb, and (χ^2=4.23, p=0.12) – left thumb

In table 2 on the right index finger, the females had higher distribution with arches and whorls (28.2%; 37.0%) respectively, for loops the males had higher distribution with 42.9%. On the left index finger– the females again had higher distribution of arches 25.2%; in the loops the males were more distributed with, 44.3%.Whorlshad more distributions in the females36.1%. There was a significant association with gender on the right (χ^2=7.05, p=0.03)and left (χ^2=6.39, p=0.04)index fingers respectively.

In table 3on the right middle finger–the females had higher distribution for arches and loops (25.6%; 42.0%); while the males had higher distribution for the whorls 39.2%. On the left middle finger–Similarly, the females had higher figures for arches and loops (20.2%; 52.9%) respectively whereas for the whorls males had higher distribution 34.0%. In this distribution there was no significant associated with gender in the right middle finger (χ^2=2.90, p=0.23) and left middle finger(χ^2=2.71, p=0.26).

In table 4on the right ring finger –the females had the highest figures for the three patterns arches, loops and whorls (16.0%; 48.3% and 35.7%) respectively. On the left ring finger –the males had higher distribution for arches and whorls (18.9% and 38.2%) while for loops the females had higher distribution54.6%.There was significant association between left ring finger and gender (χ^2=2.65, p=0.04)whereas in the right ring finger there was no significant association with gender (χ^2=0.09, p=0.96).

In table 5 on the right little finger –the females had higher distribution for all three patterns arches, loops and whorls (17.6%; 55.9% and 26.5%) respectively. On the left little finger –for arches and whorls the females had more distributions (21.8%; 29.8%) respectively while for the loops the males had higher distribution 58.5%. This distribution showed no significant association with gender in both fingers – right little finger (χ^2=0.04, p=0.98) and left little finger (χ^2=5.70, p=0.06)

In table 6 generally, there were 870 (19.3%) Arches, 2058 (45.7%) Loops and 1572 (34.9%) and the females had higher distributions for all patterns with arches, loops and whorls (18.4%, 46.8% and 34.8%) respectively. This distribution of the total fingerprint patterns in both hands were not statistically significant with respect to gender (χ^2=3.76, p=0.15).

4. DISCUSSION

Distribution and predominance

There were more of Loops in the study population followed by Whorls and then Arches. On the right and left hands there were more of Loops and less of Arches on the Index, middle, ring, and little fingers. But there were more of Whorls and less of Arches on the right thumb and equal distribution of Loops and Whorls and less of Arches on the left thumb. Generally whorls were the predominant fingerprints found

on the thumb while loops were predominant on the other four fingers. Also the highest percentage of Loops were on the left and right little fingers, Whorls were on the left and right thumbs while Arches were on the right index finger and left thumb. [10],[9] and [8] also reported similar findings; however, it was not consistent on both hands. They found that the highest proportion of Loops and Arches occurred in the left hand whereas whorls were at the right hand.

Gender difference in distribution

In the distribution and association between fingerprint types and gender, there were variations in the proportion and distribution of fingerprint types between males and females. There were more of Loops followed by Whorls, and the least were Arches in both genders, however, Loops were predominant in females while Whorls were slightly males associated. This is in line with the findings of [3, 9] in their study of fingerprint patterns, blood group and gender. Their study reported that distributions of Whorls were almost always equal in both genders. This finding differed from that of [10], as he reported that Arches were predominant in males, however, the finding have slight deviation from that of [4] who argued that the only association between gender and fingerprint patterns was in the frequency of Loops and Arches; which they stated that Arches were high in females, while Whorls were found to be high in males.

Table 1: Fingerprint types distribution on the thumbs and test of association between male and female genders

Gender		Right thumb (%)			Chi-Square		Left thumb (%)			Chi-Square	
	%	Arch	Loop	Whorl	X^2	P-value	Arch	Loop	Whorl	X^2	P-value
Male	Count	30	82	100			40	79	93		
	Within gender	14.2	38.7	47.2	1.77	0.41	18.9	37.3	43.9	4.23	0.12
Female	Count	42	97	99			58	97	83		
	Within gender	17.6	40.8	41.6			24.4	40.8	34.9		

Table 2: Fingerprint types distribution on the index fingers and test of association between male and female genders

Gender		Right index (%)			Chi-Square		Left index (%)			Chi-Square	
	%	Arch	Loop	Whorl	X^2	P-value	Arch	Loop	Whorl	X^2	P-value
Male	Count	38	91	83			33	94	85		
	within gender	17.9	42.9	39.2			15.6	44.3	40.1		
					7.05	**0.03***				6.39	**0.04***
Female	Count	67	83	88			60	92	86		
	within gender	28.2	34.9	37.0			25.2	38.7	36.1		

Table 3: Fingerprint types distribution on the middle fingers and test of association between male and female genders

Gender		Right middle (%)			Chi-Square		Left middle (%)			Chi-Square	
	%	Arch	Loop	Whorl	X^2	P-value	Arch	Loop	Whorl	X^2	P-value
Male	Count	43	86	83			37	103	72		
	within gender	20.3	40.6	39.2	2.90	0.23	17.5	48.6	34.0	2.71	0.26
Female	Count	61	100	77			48	126	64		
	within gender	25.6	42.0	32.4			20.2	52.9	26.9		

Table 4: Fingerprint types distribution on the ring fingers and test of association between male and female genders

Gender		Right ring (%)			Chi-Square		Left ring (%)			Chi-Square	
	%	Arch	Loop	Whorl	X^2	P-value	Arch	Loop	Whorl	X^2	P-value
Male	Count	36	101	75			40	91	81		
	within gender	17.0	47.6	35.4	0.09	0.96	18.9	42.9	38.2	6.25	**0.04***
Female	Count	38	115	85			38	130	70		
	within gender	16.0	48.3	35.7			16.0	54.6	29.4		

Table 5: Fingerprint types distribution on the little fingers and test of association between male and female genders

Gender		Right little (%)			Chi-Square		Left little (%)			Chi-Square	
	%	Arch	Loop	Whorl	X^2	P-value	Arch	Loop	Whorl	X^2	P-value
Male	Count	36	119	57			31	124	57		
	within gender	17.0	56.1	26.9	0.04	0.98	14.6	58.5	26.9	5.70	0.06
Female	Count	42	133	63			52	115	71		
	within gender	17.6	55.9	26.5			21.8	48.3	29.8		

Table 6: Total distribution of fingerprints and test of association between fingerprints and gender

Gender	N		Finger print (%)			X^2	P-value
			Arch	Loop	Whorl		
Male	Count	212	433	944	743	3.76	0.15
	% within gender	47.1	20.4	44.5	35		
Female	Count	238	437	1114	829		
	% within gender	52.9	18.4	46.8	34.8		
Total	Count	450	870	2058	1572		
	% within gender	100	19.3	45.7	34.9		

N = Total number of subjects

When considering individual fingers, the right thumb had more whorls followed by Loops in both genders while on the left, Loops were more in females followed by Whorls and the reverse was observed in males. However, the variation in the proportion and distribution of fingerprint types on the both thumbs were not statistically significant. Similarly, on the right and left middle and little fingers, the distribution of the patterns were not statistically significant different in males and females despite difference in their proportional distribution; unlike on the thumb, there were more Loops followed by Whorls on the middle and little fingers of both genders in both hands. Loops were observed to be more followed by Whorls on the right and left ring fingers of both genders. Also, differences were observed in the distribution of fingerprint types on the index fingers between male and female subjects involved in the study. There are more of Loops followed by Whorls in the left index fingers of both genders and right index finger of the male subjects but more of Whorls followed by Loop on the right index finger of the female subjects. These differences were statistically significant.

Generally it was observed that fingerprint types is not associated to gender (thus, is independent on gender) and that what was seen on the left ring finger, and right and left index fingers could be mere coincidence. This is in agreement with the study of [8] when they assessed the dermatoglyphic patterns and sex distribution in Esan ethnic group of Edo State, Nigeria.

5. CONCLUSION

The distributions of fingerprint patterns are independent of genderof an individual. Thus, it may not be entirely wrong to suggest that there is no relationship between fingerprints and gender; therefore there may not be genetic linkage between them.

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