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Gender Variation Studies in Dermatoglyphic Patterns (Level 2 Details) of the Ikwerre Ethnic Group in Rivers State, Nigeria

C. W. Paul[1] and J. N. Paul[1*]

[1]Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author JNP designed the study, wrote the protocol, wrote the first draft of the manuscript. Author CWP managed the literature searches and analyses of the study performed. Both authors read and approved the final manuscript.

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ABSTRACT

Background to the Study: Dermatoglyphics have had several definitions but each boils down to a simple sentence 'act, process or science of studying ridge patterns on the skin of the palm, fingers, foot and toes of primates. So much have been done on this area from the inception of the study till date. One of it is the ethnohistoric facts that can be obtained from dermatoglyphics and most recently its usefulness in tracing ancestry. There are lots of works on dermatoglyphics at level 1 details only last year we had a study on level 2 details which goes as far as revealing the uniqueness of such individuals or group of people under study.
Aims: This study was aimed at establishing whether there is a variation in gender at level 2 details in the dermatoglyphic patterns of the Ikwerre people of Rivers State, Nigeria.
Study Design: A Non-experimental analytical design.
Place and Duration of Study: Department of Anatomy, University of Port Harcourt between March 2016 and August 2016.

**Corresponding author: E-mail: nwolim_paul@uniport.edu.ng;*

Methodology: 100 subjects were used for the study which comprised 58 males and 42 females. The data was captured using the standard electronic scanner device and classified into the 10 different patterns at level 2 details. The various patterns types: bifurcation, trifurcation, ridge ending, bridge, lake, double bifurcation, island, dot, ridge crossing and opposed bifurcation were counted with the aid of a laptop zooming tool for a clearer view. Data analysis was done using z-test of proportionality.
Results: Males had the following distributions: Ridge ending 33.8%, Opposed bifurcation 2.6%, Bridge 3.1%, Lake (enclosure) 7.2% Bifurcation 43.9%, Double bifurcation 1.2%, Dot 2.5%, Trifurcation 2.2%, Island 1.4% Ridge crossing 2.1% while the females had the following: Ridge ending 10.6%, Opposed bifurcation 2.9%, Bridge 2.4%, Lake (enclosure) 9.9%, Bifurcation 51.8%, Double bifurcation 2.2%, Dot 5.9%, Trifurcation 8.2%, Island 2.9%, Ridge crossing 3.2%.
Conclusion: The results have revealed the distribution/ prevalence of the level 2 details of the dermatoglyphic patterns seen in the Ikwerre people and have also shown that there was sexual dimorphism in the distribution of these patterns. On comparison, there was a statistical significant difference (*p=.05*) between the distribution of patterns in the males and females.

Keywords: Dermatoglyphics; ethnic group; Ikwerre; level 2 details; Rivers State.

1. INTRODUCTION

Dermatoglyphics have had several definitions but each boils down to a simple sentence 'act, process or science of studying ridge patterns on the skin of the palm, fingers, foot and toes of primates. So much have been done on this area from the inception of the study till date. One of it is the ethno-historic [1] facts that can be obtained from dermatoglyphics and most recently its usefulness in tracing ancestry [2]. There are lots of works on dermatoglyphics at level 1 detail very superficial which concentrates on the arches, loops and whorls and the proportion of percentages present in the subjects under study. Only last year we had a study on level 2 details which is much more detailed by indicating the individual ridges that collectively make up the patterns which goes as far as revealing the uniqueness of such individuals or group of people under study. There are documentations about disease conditions having representations in dermatoglyphics such as Bronchial asthma [3], Malocclusions [4], Kidney diseases [5], Oral submucus fibrosis [6], Breast cancer [7], Carcinoma cervix [8] and multiple intelligence test [9].

Friction ridge skin impressions were used as proof of a person's identity in China perhaps as early as 300 B.C., in Japan as early as A.D. 702, and in the United States since 1902 [10].

The use of friction ridge skin impressions as a means of identification has been around for thousands of years and has been used in several cultures [11]. Anthropometry is a scientific and biometric way to individualize and was used on criminals throughout most of the world from its inception in 1882 until 1914 [11]. As friction ridge skin identification became more prevalent after experimentation proved its usefulness, fingerprints were added to anthropometric records [11].

The patterns of the friction skin are individual, and, taken together, impossible to duplicate in another individual [11]. The separate ridges, too, show numerous details, which are also so individual that a small area of friction skin, taken even in the most featureless portion, cannot be matched by any other piece [11]. The Ikwerre (also spelt Ikwere) are one of the many native ethnic groups in the Niger Delta region of Nigeria [12]. The Ikwerre are said to be related or share common ancestry with the Ogba and Ekpeye people (Akalaka brothers). They constitute the majority of Rivers state, although there are other populations in neighboring states. The Ikwerre speak the Ikwerre dialect and are predominantly settled in the Ikwerre, Obio-Akpor, Port Harcourt City and Emohua local government areas [12]. They are traditionally farmers, fishermen and hunters, but in recent times, the environmental degradation and urban sprawl associated with oil exploration and exploitation has caused a sharp decline in the amount of farmland, forests and rivers available for their traditional occupations [12].

1.1 Statement of the Problem

There is a speculation that people in different geographic locations have particular dermatoglyphic patterns (levels1 & 2) peculiar to them but this has not been verified or proven yet.

1.2 Aim

This study was aimed at establishing whether there is a variation in gender at level 2 details in the dermatoglyphic patterns of the Ikwerre people of Rivers State, Nigeria.

1.3 Scope of the Study

This study was limited to the indigenes (pure breed) of Ikwerre ethnic group whose finger prints were used for the study.

1.4 Justification

There are no databases for indigenous populations in Nigeria as compared to those of Caucasians which will aid in crime investigation and serve as identity database for the nation at large.

2. MATERIALS AND METHODS

2.1 Research Design

This study was designed to be a non-experimental analytical study. 100 subjects were used for the study which comprised 58 males and 42 females. The subjects recruited for the study were only pure breeds whose ancestors were Ikwerre indigenes down to their 4th generation both maternal and paternal lineages. Questionaires were used to recruit the subjects for the study to ensure that those recruited are true (pure breed) indigenes of Ikwerre ethnic group.

Convenience purposive sampling technique was used and ethical clearance was sort from the ethics committee of the University of Port Harcourt, Nigeria.

2.2 Data Collection

Data print capturing model (HP SCANJET G3110) [14] .The data was captured using the standard electronic scanner device and classified into the 10 different patterns at level 2 details. The various patterns types: bifurcation, trifurcation, ridge ending, bridge, lake, double bifurcation, island, dot, ridge crossing and opposed bifurcation were counted with the aid of a laptop zooming tool for a clearer view. The hands of the subjects were thoroughly washed with water and detergent and dried with a clean piece of clothe before taking prints. Both hands were gently and carefully placed on the scanner for adequate contact between the hands and the scanner this was done to have a sharp finger print capture. The process was done twice and repeated for all the subjects.

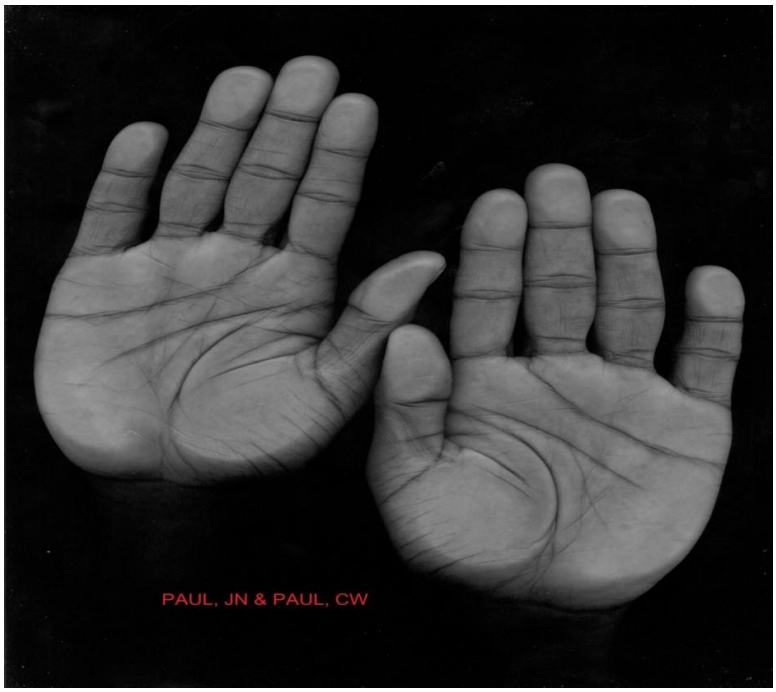

Fig. 1. A sample palm print used in the study

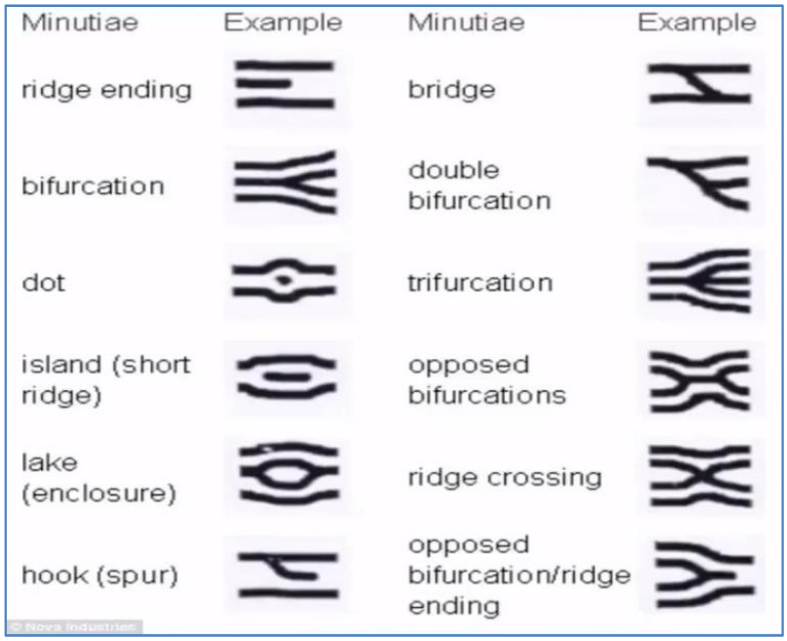

Fig. 2. The different fingerprint patterns at level 2 details [13]

2.3 Data Analysis

This was done using (IBM) SPSS Statistics version 22. Z-test of proportionality difference was used to determine the difference in the proportion of patterns in the population.

3. RESULTS

In Table 1 the prevalence of the patterns was as follows: Bifurcation 46.8% and double bifurcation 1.3% on the right hand while bifurcation was 41.3%, double bifurcation and island both had 1.2% on the left hand in the males. Whereas the females had 53.6% for bifurcation, 0.7% for opposed bifurcation on the right hand and on the left bifurcation was 50.0%, double bifurcation and island were 2.8% each.

In Table 2, the prevalence of the patterns was as follows: bifurcation 43.9% in the males and 51.8% in the females, ridge ending 33.8% in the males and 10.6% in the females and double bifurcation 1.2% in the males and 2.2% in the females.

Table 1. Dermatoglyphic patterns of the left and right hands of males and females of Ikwerre ethnic group

S/N	Patterns	Males (%)		Females (%)	
		Right	Left	Right	Left
1	Ridge ending	28.9	38.1	13.6	7.6
2	Opposed bifurcation	3.2	2.1	0.7	5.3
3	Bridge	2.9	3.3	1.6	3.3
4	Lake (enclosure)	8.6	5.8	8.9	10.9
5	Bifurcation	46.8	41.3	53.6	50.0
6	Double bifurcation	1.3	1.2	1.6	2.8
7	Dot	2.7	2.3	7.7	4.2
8	Trifurcation	2.4	2.1	7.2	9.2
9	Island	1.6	1.2	2.9	2.8
10	Ridge crossing	1.6	2.6	2.2	3.9
Total		100	100	100	100

P=.05

Table 2. Comparison of the total dermatoglyphic patterns in males and females of Ikwerre ethnic group

S/N	Patterns	Males (%)	Females (%)
1	Ridge ending	33.8	10.6
2	Opposed bifurcation	2.6	2.9
3	Bridge	3.1	2.4
4	Lake (enclosure)	7.2	9.9
5	Bifurcation	43.9	51.8
6	Double bifurcation	1.2	2.2
7	Dot	2.5	5.9
8	Trifurcation	2.2	8.2
9	Island	1.4	2.9
10	Ridge crossing	2.1	3.2
Total		100	100

P=.05

There was statistical significant difference in the patterns except for the bridge pattern.

4. DISCUSSION

The males had the highest percentage distribution of the patterns in right hand which was bifurcation and the least distribution on the right hand was double bifurcation. On the left hand, the most distributed pattern was bifurcation and the least were double bifurcation and island. Comparing the result obtained in this study with that obtained by Fournier and Ross (2015), there was similarity in the distribution of the patterns with bifurcation being the most distributed pattern in both sexes in the African-american subjects (negros).

The females had their most distributed pattern as bifurcation consistently on both hands with the least being opposed bifurcation on the right hand while on the left hand double bifurcation and island were the least distributed patterns.

When you compare the work done by Ujaddughe et al. [15] with this present study you would observe that the loop pattern had the highest frequency (61.7%) followed by whorl (24.9%), arch (12.8%) and double whorl (0.6%). The loop pattern was most frequent in Ujaddughe et al. [15] as is the case in most studied populations at level 1 details whereas in our study at level 2 details, bifurcation was the most frequent pattern seen. According to Osunwoke et al. [16] in their study that compared the dermatoglyphic patterns of the Okrika with the Ikwerre people at level 1 showed that the ulnar loop had the highest occurrence, followed by the whorl, arches and radial loops. The percentage frequency distribution of the digital pattern of the ulnar loop for Okrika was 46.42%, whorl 37.77%, arch 14.12% and radial loops 1.71% while for Ikwerre the ulnar loop was 56.46%, whorl 24.42%, arch 15.89% and radial loop 3.23%. They mentioned that there was no significant difference (P>0.05) in the digital pattern between the two ethnic groups. Though their study was done at level 1 details, it showed similarity of trends in the results obtained in our study where a digital pattern is most frequent for both populations under study.

Comparison of the distribution of the patterns in the males and females showed to be statistically significant in all the patterns except the bridge pattern that seemed to have almost equal distribution in both sexes. This is suggestive of sexual dimorphism in the pattern distribution. It further tells that there is an input of the sex hormones in the distribution of these patterns during development. Comparing the outcome of this study with the result of the study done by Fournier and Ross (2015), it showed that their result was statistically insignificant when they compared the patterns between the sexes which means that they saw do difference in the distribution of the patterns in the sexes whereas in our study, there was statistical significance in the distribution of the patterns in the sexes.

Ujaddughe et al. [15] maintained that the result of their study showed that the pattern of finger prints distribution were similar for both sexes except that the males had more arches on the right hand (53%) than the females with more arches on the left hand (57.1%). In their study, results obtained showed that there was no obvious difference in the patterns seen between the males and females as compared with the result we obtained in our study where there was a clear difference in pattern distribution between males and females.

Wijerathne et al. [17] in their study mentioned that the loop pattern was observed more frequently with (59.72%), whorl (35.53%) and arch (4.75%) in the Sinhalese population. That the females had (58.71%) ulnar loop pattern than males (56.73%). The plain whorl pattern was observed more frequently in males (25.81%) compared to females (23.69%). The double loop pattern was observed more frequently on the right and left thumb (digit 1) of both males and females. They maintained that the

dermatoglyphic patterns of Sinhalese are similar to North Indians and other Caucasoid populations. In our study sexual dimorphism was also seen in the distribution of the patterns at level 2 details where the females had higher distribution of the patterns than the males. This therefore suggests that the result of our study is consistent with the trend of pattern distribution seen in Wijerathne et al. [17].

Otobo and Tarimobo-Otobo [18] in their study stated that the highest dermatoglyphic pattern frequency was radial loop (RL) 2.7±1.22 with least occurrence of ulnar loop pattern (UL) 1.37±0.60. This result is consistent with the trend that has been noted in other works and our study as well even though the study was done at level 1.

With respect to the study done by Abue et al. [19] the result obtained showed that the ulnar loop had the highest percentage frequency in both thumbs of both hands (79.5%), followed by the whorls (42.4%), Arch (12.6%) and radial loop (9.3%) respectively. The mean percentage of patterns frequencies in all the ten digit of the hand was in this order; ulnar loop = 58.93%, whorls = 29.63%, Arch = 8.86% and radial loop = 2.5%. This again re-emphasis the trend that a particular pattern is consistently higher in distribution than others in populations that have been studied so far. It agrees with the result obtained in our study where bifurcation was the most frequent pattern seen in Ikwerre people and most predominant in males and females.

5. PROPOSITION OF INDEX FOR DERMATOGLYPHICS AT LEVEL 2

The authors wish to propose an index called Paul's Index.

This index indicates the proportion of bifurcations relative to the ridge endings present in individuals or populations under study. It would be used as a tool for dermatoglyphic comparisons at level 2 details.

When the value of the index is high, it suggests that the individuals or populations under investigation/study have a high distribution of bifurcations relative to ridge endings and vice versa.

The index is usually higher in females than males which indicate sexual dimorphism. The reason for this difference in males and females stems from the contribution of the testosterone during the development of the ridges in-utero. The role of this hormone is vital in the formation and distribution of the ridges especially the bifurcation and ridge ending. Prenatal testosterone in dermatoglyphic development arises from the fact that two of the hormones subsidiary effects include the stimulation of both Nerve Growth Factor (NGF) and Epidermal Growth Factor (EGF). Both are polypeptide hormones associated with neural development which is pivotal to dermatoglyphics (patterns). (Mobley et al. and Montalcini) [11]. The higher the testosterone level the lesser the frequency distribution bifurcations, ridge endings and other patterns. Meaning that the more the level of testosterone the lesser bifurcation and ridge endings. Under normal conditions, the males would have low frequency distribution and the females' higher frequency distribution of the bifurcations and ridge endings. A reverse of this trend suggests an anomaly.

5.1 Calculation of Paul's Index (PI)

Steps

1. Sum up the frequencies of the bifurcations in the entire population being investigated
2. Sum up the frequencies of the ridge endings in the entire population being investigated
3. Calculate the ratio of the bifurcations to ridge endings
4. Multiply by 100.

The index is calculated thus:

$$\text{PI} = \frac{Bifurcation}{Ridge\ ending} \times 100$$

In this very study, the Paul's Index (PI):

For males' = $\frac{352}{271} \times 100$ =129.8

Females' = $\frac{522}{107} \times 100$ = 487.8

This is to say that the females had higher PI index than the males which is considered to be the normal trend.

6. CONCLUSION

The results have revealed the distribution/ prevalence of the level 2 details of the dermatoglyphic patterns seen in the Ikwerre

people and have also shown that there was sexual dimorphism in the distribution of these patterns. On comparison, there was a statistical significant difference between the distribution of patterns in the males and females.

CONSENT

Written informed consent was obtained from the subjects for publication of this study and accompanying images.

ETHICAL APPROVAL

Both authors hereby declare that all studies have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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