Digital Dermatoglyphic Patterns of Uturu People of Abia State

ABSTRACT

Background: Dermatoglyphics is an essential tool in population studies, identification of persons and diagnosis of diseases of genetic origin. The aim of the study was to determine the characteristics of finger dermatoglyphic patterns peculiar to Uturu indigenes of Abia State.

Materials and Methods: The study was conducted among the Uturu Indigenes of Isikwuato Local Government Area of Abia State Nigeria. A total of two hundred (200) volunteers comprising 100 Males (M) and 100 Females (F) participated in the study. The fingerprints of the thumb (I), index finger (II), middle finger (III), ring finger (IV) and little finger (V) were obtained from the right and left hands using digital scanners and computers. Data were obtained for finger dermal patterns, finger ridge count (FRC) and total finger ridge count (TFRC) Analysis of data was done using Microsoft Excel Data Analysis Tool pack (2016 Edition) and Chi Square test at $p > 0.05$ was used to determine sexual dimorphism and bilateralism.

Results: The patterns observed among sampled Uturu indigenes were Arch (AR), Central pocket loop (CP.L), Double loop (DL), Spiral whorl (SP.W), Ulnar whorl (UL). Uturu people have more ulnar loops in both hands [I; (Right; R) = 55%, (Left; L = 58%), II; (R = 60%, L = 59.5%), III; (R = 75%, L = 66%), IV; (R = 63%, L = 64%), V; (R = 85%, L = 83.5%)], followed by whorls [I; (R = 25%, L = 21.5%), II; (R = 26%, L = 23%), III; (R = 18.5%, L = 20%), IV; (R = 24.5%, L = 25%), V; (R = 9%, L = 9.5%)] and arches [I; (Right; R) = 9.5%, (Left; L) = 12.5%, II; (R = 11%, L = 12.5%), III; (R = 4%, L = 9%), IV; (R = 3%, L = 3.5%), V; (R = 2.5, L = 3.5%)], while radial loop was the least observed pattern (1.5% on the left index finger). The test for bilateralism showed no significant difference in the distribution of dermal patterns in the right and left fingers. In the index finger, significant difference ($P > 0.05$) was observed in the pattern distribution for the right between males and females. Uturu indigenes have more finger ridge count in the right thumb.

Conclusion: The findings of the study will be relevant to biomedical anthropologists, Forensic Scientists and population studies experts.

Keywords: Dermatoglyphics, Fingerprints, Dermal patterns, Finger friction ridges,

1. INTRODUCTION

The term dermatoglyphics refers to the study of naturally occurring ridges on the surface of the hands and feet of primates and other animals. [1,2,3,4,5] It is also a collective name used to describe all patterns of the ridged skin of the palm and soles; though these patterns show great diversity and combination in individuals, they can be categorized into a number of different types; parallel ridges and furrows form arches, loops and whorls (ALW system) on the finger tips. [6,7,8]

Dermal ridge differentiation takes place in the third and fourth week of fetal life, and by the end of the fourth month, the ridges and their arrangements are in their complete and permanent form. From this time onward until death there is no morphological change either in the detailed structure of the ridges or in the patterns formed by them. It is also a polygenic trait and is not duplicated among species even among monozygotic twins. [1,2,9]

The fact that each individual's ridge configuration is unique has been greatly utilized as a means of personal identification (especially by law enforcement agencies), Physical anthropologists have utilized it in population studies as well as in the determination of ancestry. [1,10]

Dermatoglyphic patterns have been reported various populations, including Algerian [11] as well as, Mediterranean populations. [12] There are also several reports on dermatoglyphic patterns in Nigerian populations [10,13,14,15,16]. However, there is paucity of information about the dermal ridge pattern of Uturu indigenes of Abia in East Nigeria. Therefore, the objective of this study is to determine the characteristic dermatoglyphic pattern peculiar to Uturu indigenes of Abia State.

2. MATERIALS AND METHODS

2.1 Study Design

This was a descriptive cross-sectional study.

2.2 Study Population

The study was conducted among the Uturu Indigenes, in Isikwuato Local Government Area of Abia State Nigeria.

Uturu is a town located within latitudes 05.33°N and 06.03°N, in the northern part of Abia State, Nigeria. It has a population of over 40,000 individuals. Archaeologists have also discovered evidence of the habitation of early, middle, and late Stone Age Homo erectus, hence this town is

also known as the early man's abode. Several educational institutions are located in Uturu, which includes Abia State University, Marist Brothers' Juniorate, Uturu, Gregory University, and several post-secondary schools. [17]
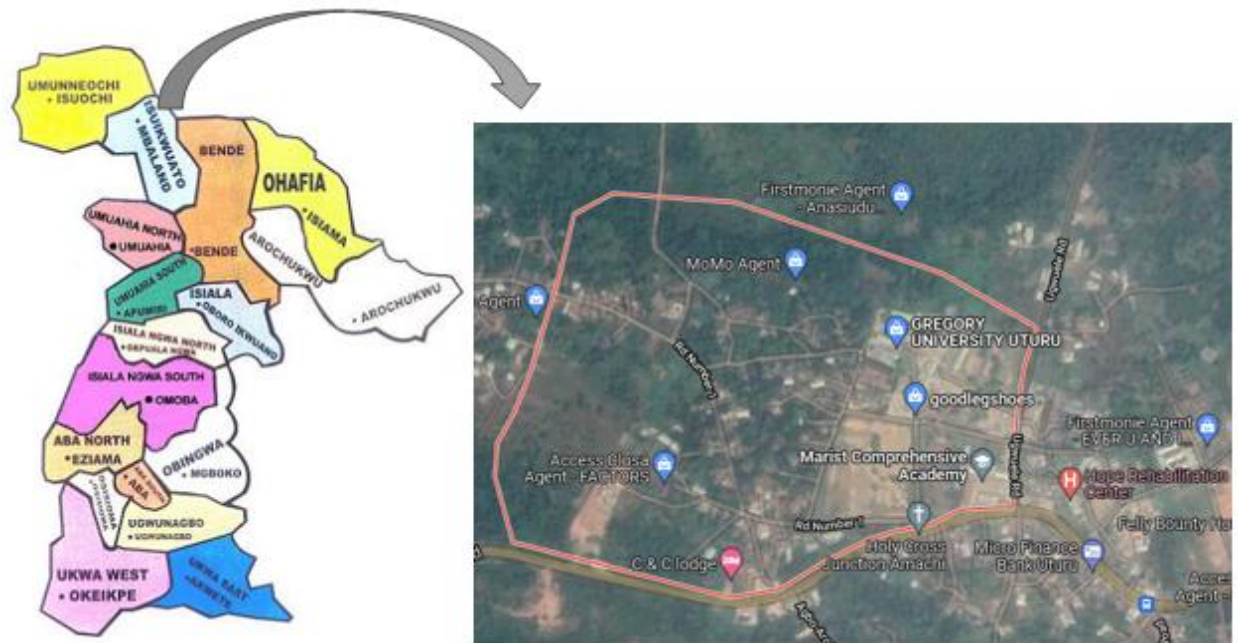
Figure 1: Map of Uturu

2.3 Sample Size Determination

The sample size for this study was obtained using Taro Yamane [18], $n = \dfrac{N}{1 + N(e)^2}$

n = minimum sample size from the population under study

N = is the study population

e = level of precision or error margin, usually 0.05

$$n = \frac{40000}{1 + 40000(e)^2} = 396$$

Hence a minimum sample size of 396 individuals were involved in the study.

2.4 Sampling Technique

A simple random sampling technique was used in selecting Uturu indigenes for the study.

2.5 Nature/source of Data

The study involved primary data. Fingerprints were obtained directly from the volunteers.

2.6 Method of Data Collection/Procedure for obtaining prints

Palmer prints were obtained from 200 subjects (100 males and 100 females) using the Hp digital scanner and AutoCAD computer software as described by Oghenemavwe and Osaat. [4]

2.7 Selection criteria

The study included;

1. Subjects with complete ten (10) digits, who never had accident or surgery involving the palmar surface of the digit.
2. Subjects with clear prints.
3. Those whose parents and grandparents are indigenes of Uturu.

2.8 Ethical Considerations

Ethical approval for this study was granted by the Research Ethics Committee of Gregory University Uturu.

Participation in the study was voluntary and the study was carried out in accordance with ethical standards. Permission was obtained from the subjects before taking their fingerprints.

2.9 Data Analysis

Data was analysed using Microsoft Excel Data Analysis Tool pack (2016 Edition). Results were presented in descriptive statistics showing the mean, standard error of mean, standard deviation, variance and range (maximum and minimum values). Percentage distribution of dermal patterns was presented in frequency distribution tables, while test of significance was carried out using Chi-square test. Sexual dimorphism in finger ridge count and total finger ridge count was determined using independent sample t-test. Confidence level was set at 95% and a P-value less than 0.05 was considered statistically significant.
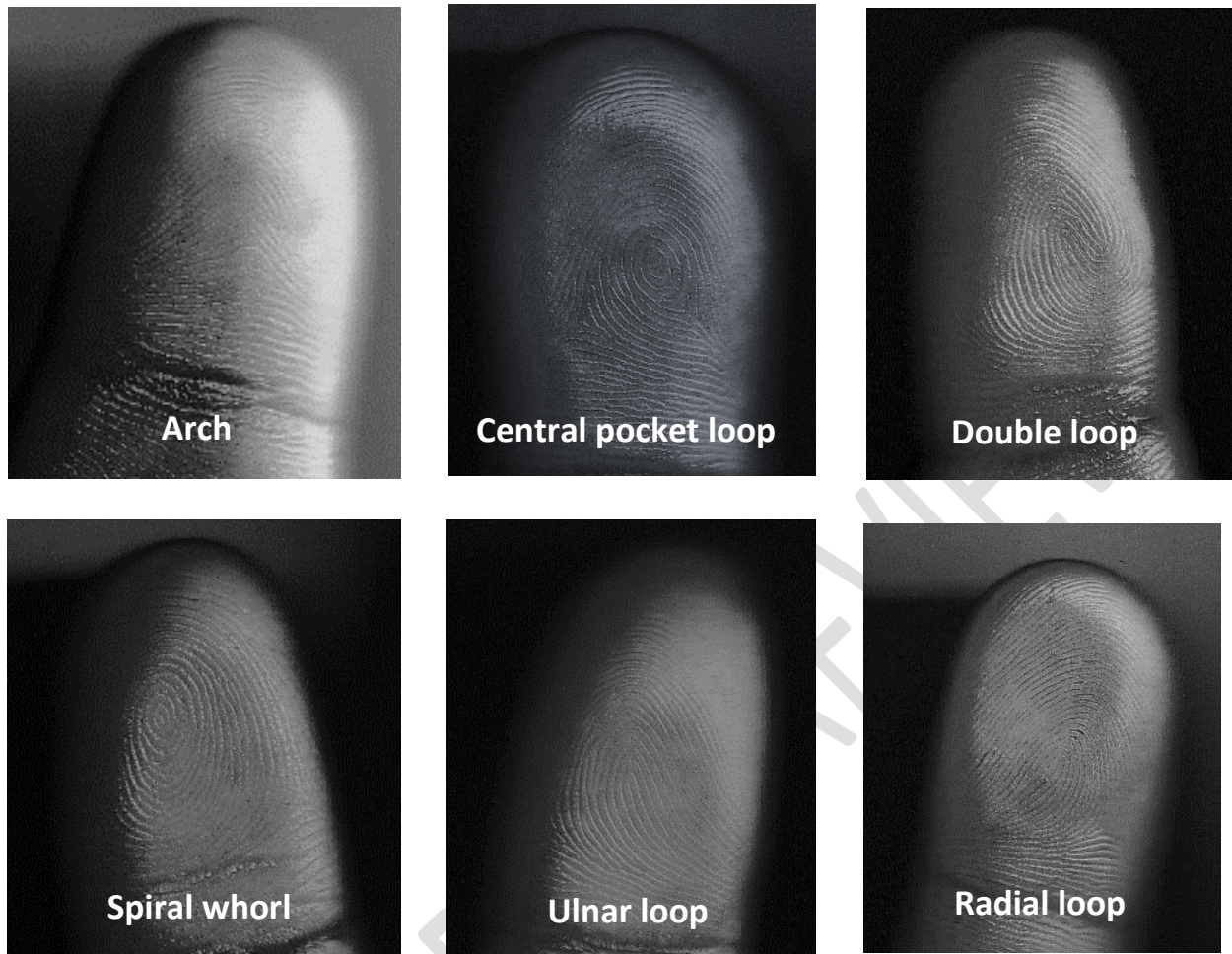
3. RESULTS

3.1 Digit patterns

The percentage distribution of dermal patterns in all subjects is presented in Table 1, while those of male as well as female subjects is presented in Tables 3 and 4 respectively.

The percentage distribution of dermal patterns for arch was [I; (Right; R) = 9.5%, (Left; L) = 12.5%, II; (R = 11%, L = 12.5%), III; (R = 4%, L = 9%), IV; (R = 3%, L = 3.5%), V; (R = 2.5, L = 3.5%)], central pocket loop [I; (R = 3%, L = 1%), II; (R = 1%, L = 3%), III; (R = 1.5%, L = 3.5%), IV; (R = 8.5%, L = 7%), V; (R = 3%, L = 3.5%)], double loop [I; (R = 7.5%, L = 7%), II; (R = 2%, L = 0.5%), III; (R = 1%, L = 1.5%), IV; (R = 1%, L = 0.5%), V; (R = 0.5%, L = 0%)], spiral whorl [I; (R = 25%, L = 21.5%), II; (R = 26%, L = 23%), III; (R = 18.5%, L = 20%), IV;

(R = 24.5%, L = 25%), V; (R = 9%, L = 9.5%)] and ulnar loop [I; (R = 55%, L = 58%), II; (R = 60%, L = 59.5%), III; (R = 75%, L = 66%), IV; (R = 63%, L = 64%), V; (R = 85%, L = 83.5%)]. Radial loop occurred only on the left index finger (1.5%). Sexual dimorphism in fingerprint pattern distribution was only observed on the index finger (X^2 = 10.08; P = 0.04) of the right digit.

3.2 Finger ridge count

The descriptive statistics for finger ridge count and total finger ridge count is presented in Table 2 and 9. More finger ridge count (R = 8.27±4.69, L = 7.93±4.59) was observed for the thumb, followed by the ring finger (R = 7.69±3.69, L = 7.84±4.16), while the least was the right index finger (6.56±3.60) and left little finger (6.72±2.97). For the right hand, both subjects have the highest mean finger ridge count on the thumb [male (8.08±4.78), female (8.47±4.61)]. The lowest was observed on the index finger in both subjects [male (6.41±3.75), female (6.71±3.45)]. For the left, males had the highest ridge count on the ring finger (8.06±4.44), with the lowest on the little finger (6.44±3.17). Females had the highest finger ridge count (FRC) of 8.64±4.36 on the thumb, with lowest (6.98±4.36) on the index finger. Females had more total finger ridge count (74.05±24.86) compared to male subjects (72.35±27.35).

Except for the thumb (P = 0.03), sex differences in finger ridge count was not observed. Also, significant difference was not observed in total finger ridge count (Table 10).

3.3 Sexual dimorphism and bilateralism in the distribution of digit patterns

Sexual dimorphism in digit patterns is presented in Table 5 (Right hand) and Table 6 (Left hand). Chi-square test was used to determine the differences in the distribution of dermal patterns between males and females. Except for the right index finger (X^2 = 10.08; P = 0.04), statistically significant difference was not observed in all digits. No significant difference was observed on the left. And also, in Table 7 (Male) and Table 8 (Female) bilateralism in the distribution of dermatoglyphic patterns was presented. Significant difference was not observed for both sexes.

4. DISCUSSION

This study has evaluated the dermatoglyphic patterns of Uturu indigenes of Abia State, Nigeria. Ulnar loops were observed to be predominant in both fingers (right and left) followed by whorls and arches, while radial loop was the least observed pattern in both hands. These findings were

similar to other Nigerian studies carried out among various ethnic groups. Jaja *et al* [13] and Udoaka[15] in two independent studies on the Ijaw people of Southern Nigeria, also reported ulnar loop to be the most prevalent finger ridge pattern and radial loop being the least. Ujaddughe[19] made similar observations in Esan ethnic group of Edo state, Nigeria and the Igbo and Okrika people of Southern Nigeria respectively. Ojigho *et al* [20] found ulnar loop to be the predominant pattern among the Itsekiri and Urhobo people of South Southern Nigeria. This pattern is also same for Okrika and Ikwerre ethnic groups. [21] However, Igbigbi and Msamati[22] observed the contrary, they reported arch to be the predominant pattern in Malawians. Ethnic differences and sample size could be responsible for the observed differences between this study and the Malawian study.

On the average, for both sex on the right, more finger ridges were observed on the thumb, while the index finger has the least count. This was different on the left as more finger ridges were observed on the ring finger and index finger in male and female subjects respectively, while the least count was observed on the little and index finger for male and female subjects respectively. Females had more total finger ridge count compared to males. Ekanem[14] made similar findings in a study involving the Annang people of Akwa Ibom State in Nigeria, but in this case, males have higher TFRC compared to females. Igbigbi and Msamati [22], reported in a Malawian population, that males had a significantly higher TFRC compared to females. Ethnic differences and sample size could be responsible for the observed differences between Malawian study and the current study.

A larger percentage of ulnar loop (UL) was observed on both hands for male and female subjects, with the little finger (V) having more ulnar loop compared to the other digits. The least observed pattern was radial loop (RL) which was only observed on the left index finger (3 times) in the sampled female subjects. Udoaka [15] also observed a higher percentage of ulnar loops on all fingers in male and female subjects. While George and Yassa [23], observed a higher percentage of ulnar loop, but not in all fingers. The ring finger was an exception, with a higher frequency of whorls.

Sex differences in fingerprint patterns was only observed on the right index finger. Other authors (Igbigbi and Msamati[22]; Ekanem[14]) observed sexual dimorphism in finger ridge patterns of Malawians, Tanzanians and Annang people of Akwa Ibom State Nigeria respectively.

Bilateralism test for distribution of patterns was carried out to determine side differences. Significant difference was not observed in the dermatoglyphic pattern of the right and left digits in male and female subjects. Jindal *et al* [24] made similar observations among Indian children, stating that asymmetry scores did not differ significantly.

Sexual dimorphism in finger ridge count was not observed in all fingers, except on the left thumb ($P = 0.03$). Similar findings were made by Jantz [25] in three of the six Negro samples studied and also in Indian males from Parsis. In this study, there was no significant difference in the total finger ridge count of male and female subjects. In a related study among the Urhobo and Itsekiri people of South Southern Nigeria, Ojigho *et al* [20] found otherwise. They reported that total finger ridge count was sexually dimorphic. Sample size variation and ethnic differences could be responsible for the observed differences.

5. CONCLUSION

The study examined the dermatoglyphic patterns of Uturu people of Abia State, Nigeria. Dermatoglyphic patterns as observed in the present study was similar to those of other Nigerian studies. Uturu indigenes have a higher percentage of ulnar loop, followed by whorl, arch, central pocket loop, double loop and radial loop. Except the index finger in both hands, sexual dimorphism was not observed in the dermatoglyphic patterns of Uturu indigenes.

The present study had the lowest amount of radial loop pattern when compared to previous studies. There was also a prevalence of double loop and central pocket loop as compared to previous studies. The ulnar loop was the highest in qualitative variables as seen in previous studies.

This study will be relevant in anthropology, medicine, especially in forensic investigations involving the people of Uturu.

TABLES

Table 1: The percentage distribution of dermal pattern in the fingers of all Subjects

Pattern	I(%)	II(%)	III(%)	IV(%)	V(%)
RIGHT					
AR	19(9.5)	22(11)	8(4)	6(3)	5(2.5)
CP.L	6(3)	2(1)	3(1.5)	17(8.5)	6(3)
DL	15(7.5)	4(2)	2(1)	2(1)	1(0.5)
SP.W	50(25)	52(26)	37(18.5)	49(24.5)	18(9)
UL	110(55)	120(60)	150(75)	126(63)	170(85)
LEFT					
AR	25(12.5)	25(12.5)	18((9)	7(3.5)	7(3.5)
CP.L	2(1)	6(3)	7(3.5)	14(7)	7(3.5)
DL	14(7)	1(0.5)	3(1.5)	1(0.5)	0(0)
SP.W	43(21.5)	46(23)	40(20)	50(25)	19(9.5)
UL	116(58)	119(59.5)	132(66)	128(64)	167(83.5)
RL	0 (0)	3(1.5)	0(0)	0(0)	0(0)

I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 2: Descriptive statistics for finger ridge count and total finger ridge count for all subjects

Finger	N	Mean	SEM	SD	VAR	MinV	MaxV
RIGHT							
I	200	8.27	0.33	4.69	21.97	0.00	20.00
II	200	6.56	0.25	3.60	12.94	0.00	15.00
III	200	6.98	0.23	3.30	10.89	0.00	17.00
IV	200	7.69	0.26	3.69	13.63	0.00	21.00
V	200	7.34	0.25	3.56	12.66	0.00	19.00
LEFT							
I	200	7.93	0.33	4.59	21.07	0.00	18.00
II	200	6.94	0.28	4.02	16.18	0.00	18.00
III	200	7.35	0.30	4.18	17.48	0.00	17.00
IV	200	7.84	0.29	4.16	17.30	0.00	23.00
V	200	6.72	0.21	2.97	8.81	0.00	17.00
TFRC	200	73.20	1.84	26.09	680.69	19.00	139.00

I = Thumb, II= Index finger, III = Middle finger, IV = ring finger, V = Little finger, N = Sample size, SEM = Standard error of mean, SD = Standard deviation, VAR = Variance, MinV = Minimum value, MaxV = Maximum value

Table 3: Distribution of dermal patterns in the fingers of male subjects

	I	II	III	IV	V
RIGHT					
AR	12	14	6	4	3
CP.L	2	2	3	11	4
DL	6	4	1	1	0
SP.W	25	28	20	28	12
UL	55	52	70	56	81
LEFT					
AR	18	15	10	5	6
CP.L	0	4	4	5	4
DL	5	0	2	1	0
SP.W	22	28	20	29	12
UL	55	53	70	60	78

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 4: The distribution of dermal Pattern in the fingers of female subjects

Pattern	I	II	III	IV	V
RIGHT					
AR	7	8	2	2	2
CP.L	4	0	0	6	2
DL	9	0	1	1	1
SP.W	25	24	17	21	6
UL	55	68	80	70	89
LEFT					
AR	7	10	8	2	1
CP.L	2	2	3	9	3
DL	9	1	1	0	0
SP.W	21	18	20	21	7
UL	61	66	68	68	89
RL	0	3	0	0	0

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, RL = Radial loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 5: Chi Square Test to determine differences in the distribution of dermal patterns between males and females [Right hand]

Finger	Pattern	Male	Female	X^2	*P* value	Inference
	AR	12	7			
	CP.L	2	4			
I	DL	6	9	2.58	0.63	Not significant
	SP.W	25	25			
	UL	55	55			
	AR	14	8			
	CP.L	2	0			
II	DL	4	0	10.08	0.04	Significant
	SP.W	28	24			
	UL	52	68			
	AR	6	2			
	CP.L	3	0			
III	DL	1	1	5.91	0.21	Not significant
	SP.W	20	17			
	UL	70	80			
	AR	4	2			
	CP.L	11	6			
IV	DL	1	1	4.62	0.33	Not significant
	SP.W	28	21			
	UL	56	70			
	AR	3	2			
	CP.L	4	2			
V	DL	0	1	4.24	0.37	Not significant
	SP.W	12	6			
	UL	81	89			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, RL = Radial loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 6: Chi Square Test to determine differences in the distribution of dermal patterns between males and females [Left hand]

Finger	Pattern	Male	Female	X^2	*P* value	Inference
I	AR	18	7			
	CP.L	0	2			
	DL	5	9			
	SP.W	22	21	8.32	0.14	Not significant
	UL	55	61			
	RL	0	0			
II	AR	15	10			
	CP.L	4	2			
	DL	0	1			
	SP.W	28	18	9.26	0.10	Not significant
	UL	53	66			
	RL	0	3			
III	AR	10	8			
	CP.L	4	3			
	DL	2	1			
	SP.W	20	20	0.82	0.98	Not significant
	UL	70	68			
	RL	0	0			
IV	AR	5	2			
	CP.L	5	9			
	DL	1	0			
	SP.W	29	21	5.21	0.31	Not significant
	UL	60	68			
	RL	0	0			
V	AR	6	1			
	CP.L	4	3			
	DL	0	0			
	SP.W	12	7	5.75	0.33	Not significant
	UL	78	89			
	RL	0	0			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, RL = Radial loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 7: Bilateralism test for distribution of patterns in the left and right fingers [Males subjects]

Finger	Pattern	Right	Left	X^2	*P*-value	Inference
	AR	12	18			
	CP.L	2	0			
I	DL	6	5	3.42	0.52	Not significant
	SP.W	25	22			
	UL	55	55			
	AR	14	15			
	CP.L	2	4			
II	DL	4	0	4.71	0.32	Not significant
	SP.W	28	28			
	UL	52	53			
	AR	6	10			
	CP.L	3	4			
III	DL	1	2	1.48	0.83	Not significant
	SP.W	20	20			
	UL	70	70			
	AR	4	5			
	CP.L	11	5			
IV	DL	1	1	2.52	0.69	Not significant
	SP.W	28	29			
	UL	56	60			
	AR	3	6			
	CP.L	4	4			
V	DL	0	0	1.06	0.9	Not significant
	SP.W	12	12			
	UL	81	78			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, RL = Radial loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 8: Bilateralism test for distribution of patterns in left and right fingers [Female subjects]

Finger	Pattern	Right	Left	X^2	*P*-value	Inference
	AR	7	7			
	CP.L	4	2			
I	DL	9	9	1.32	0.86	Not significant
	SP.W	25	21			
	UL	55	61			
	AR	8	10			
	CP.L	0	2			
	DL	0	1			
II	SP.W	24	18	7.12	0.21	Not significant
	UL	68	66			
	RL	0	3			
	AR	2	8			
	CP.L	0	3			
III	DL	1	1	7.82	0.21	Not significant
	SP.W	17	20			
	UL	80	68			
	AR	2	2			
	CP.L	6	9			
IV	DL	1	0	1.63	0.80	Not significant
	SP.W	21	21			
	UL	70	68			
	AR	2	1			
	CP.L	2	3			
V	DL	1	0	1.61	0.88	Not significant
	SP.W	6	7			
	UL	89	89			

AR = Arch, CP.L = Central pocket loop, DL = double loop, SP.W = Spiral whorl, UL = Ulnar loop, RL = Radial loop, I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger

Table 9: Descriptive Statistics for Finger ridge count and total finger ridge count in male and female subjects

Finger	Sex	Mean	SEM	SD	VAR	MinV	MaxV
				RIGHT			
I	M	8.08	0.48	4.78	22.80	0.00	19.00
	F	8.47	0.47	4.61	21.26	0.00	20.00
II	M	6.41	0.38	3.75	14.08	0.00	15.00
	F	6.71	0.34	3.45	11.88	0.00	14.00
III	M	6.93	0.33	3.31	10.97	0.00	17.00
	F	7.02	0.33	3.30	10.91	0.00	17.00
IV	M	7.71	0.38	3.84	14.75	0.00	21.00
	F	7.66	0.36	3.56	12.65	0.00	17.00
V	M	7.76	0.39	3.92	15.38	0.00	19.00
	F	6.91	0.31	3.11	9.70	0.00	15.00
				LEFT			
I	M	7.24	0.47	4.73	22.39	0.00	16.00
	F	8.64	0.44	4.36	18.97	0.00	18.00
II	M	6.90	0.41	4.09	16.76	0.00	17.00
	F	6.98	0.40	4.36	18.97	0.00	18.00
III	M	7.11	0.42	4.20	17.67	0.00	17.00
	F	7.58	0.42	4.17	17.36	0.00	15.00
IV	M	8.06	0.44	4.44	19.67	0.00	23.00
	F	7.62	0.39	3.87	15.01	0.00	20.00
V	M	6.44	0.32	3.17	10.07	0.00	17.00
	F	7.00	0.27	2.73	7.47	0.00	14.00
TFRC	M	72.35	2.73	27.35	747.95	0.00	139.00
	F	74.05	2.49	24.88	618.86	0.00	135.00

I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger, N = Sample size, SEM = Standard error of mean, SD = Standard deviation, VAR = Variance, MinV = Minimum value, MaxV = Maximum value, M = Male, F = Female

Table 10: Independent T test to determine sexual dimorphism in finger ridge count and total finger ridge count

Finger	Sex	Mean±SD	*P* value	Inference
		RIGHT		
I	M	8.08 ±4.78	0.56	Not significant
	F	8.47±4.61		
II	M	6.41±3.75	0.55	Not significant
	F	6.71±3.45		
III	M	6.93±3.31	0.85	Not significant
	F	7.02±3.30		
IV	M	7.71±3.84	0.92	Not significant
	F	7.66±3.56		
V	M	7.76±3.92	0.09	Not significant
	F	6.91±3.11		
		LEFT		
I	M	7.24±4.73	0.03	Significant
	F	8.64±4.36		
II	M	6.90±4.09	0.89	Not significant
	F	6.98±4.36		
III	M	7.11±4.20	0.43	Not significant
	F	7.58±4.17		
IV	M	8.06±4.44	0.46	Not significant
	F	7.62±3.87		
V	M	6.44±3.17	0.25	Not significant
	F	7.00±2.73		
TFRC	M	72.35±27.35	0.71	Not significant
	F	74.05±24.86		

I = Thumb, II= Index finger, III = Middle finger, IV = Ring finger, V = Little finger, SD = Standard deviation, M = Male, F = Female

6. COMPETING INTERESTS DISCLAIMER

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

7. REFERENCES

1. Kumbani. Anthropology Today. Trends, scope and applications. *Anthropologist special*. 2007; 3: 285-295.

2. Kiran, K., Rai, K., and Hegde, A.M. Dermatoglyphics as a non-invasive diagnostic tool in predicting mental retardation. *Journal of international oral health*. 2010; 2(1).

3. Oghenemavwe, L.E. and Tagar, G.A. Plantar dermatoglyphics in down syndrome. *African Journals Online*. 2018; 16 (2)

4. Oghenemavwe LE, Osaat RS. An improvise easy digital method for palmar and plantar dermatoglyphics. *Bioscience and Bioengineering*. 2015; 1(3): 85-89.

5. Oghenemavwe, L.E. and Uche, D.A. Dermatoglyphics of the Digits and Inter-digit Areas in Down Syndrome Patients of a Sampled Nigeria Population. *Asian Journal of Medicine and Health*. 2010; 18 (11): 1-8.

6. Adebisi, S.S. Fingerprint studies the recent challenges. *International Journal of Biological Anthropology*. 2009; 4:1-2.

7. Banik, S.D., Pal, P. and Mukherjee, D.P. Finger dermatoglyphic variations in Rengma Nagas of Nagaland India. *Collegium antropologicum*. 2009; 33(1): 31-5

8. Bozhchenko A.P. Medical evaluation of forensic dermatoglyphic sig of fingers to authentication personality. 2009; 22.

9. Ahmed I, Yasin I. Dermatoglyphic pattern study. AMPC. 2010; 4 (2): 107-110.

10. Oladipo, G.S. Dermatoglyphic patterns in idiopathic (primary) dilated cardiomyopathy, in South Southern Nigeria. *Scientific research and essay*. 2007; 2 (10): 416-420.

11. Neggaz L.A., Meroufel D.N., Deba T., Bekada A., Hammadi M., Benchekor S.M, Rosa, A and Benhamamouch, S. Digital dermatoglyphic study in three west Algerian populations: Reguibates, Zenata, Oran. *Canadian Society of Forensic Science Journal*. 2017; 50 (4): 164-174.

12. Esteban, E and Moral, P. Finger dermatoglyphics in a Mediterranean population (Murcia, Spain): Pattern types and pattern intensity index. *Anthropologischer Anzeiger*. 1993; 51 (2): 159-167.

13. Jaja B.N.R., Olabiyi, O., Noronha, C.C. and Okanlawon., A. Asymmetry and pattern polarization of digital dermal ridges amongst Ogoni people of Nigeria. *Scientific Research and Essay*. 2008; 3(1): 051-056.

14. Ekanem, E., Eluwa, M., Udoffah, G., Ekanem T. and Akpantah A. Digital Dermatoglyphic Patterns of Annang Ethnic Group in Akwa Ibom State of Nigeria. *The Internet Journal of Biological Anthropology*. 2008; 3(1).

15. Udoaka, A.I. Digital dermatoglyphics in Ijaw Students of University of Port Harcourt, Nigeria. *Continental J. Biomedical Sciences*. 2009; 3:1-5.

16. Etta H., Petu, I., Etukudo, I. and Uyannah, D. Dermatoglyphic Variations in a Nigerian Population. Journal of Science. *Engineering and Technology*. 2014; 3; 25 – 28.

17. Chigbu, U.E. Fostering rural sense of place: the missing piece in Uturu, Nigeria. *Development in Practice*. 2013; 23 (2): 264-277.

18. Yamane, T. *Statistics: An Introductory Analysis*. 1967; 2nd Edition, New York: Harper and Row.

19. Ujaddughe, M.O. Assessment of Dermatoglyphic patterns and sex Distribution in Esan Ethnic Group of Edo State, Nigeria. *International journal of Basic, Applied and innovative Research. IJBA*. 2015; 4(1): 9-14.

20. Ojigho, J.E., Odokuma, I.E. and Igbigbi, P.S. Comparative Study of Fingerprint Patterns of Two Ethnic Groups: A Nigerian Study. *Journal of College of Medical Sciences-Nepal*. 2019; 15 (4): 270-275.

21. Osunwoke, E.A., Ordu, K.S., Hart, J., Esomonu, C. and Tamunokuro, F.B. A study on the dermatoglyphic patterns of Okrika and Ikwerre ethnic groups of Nigeria. *Scientia Africana*. 2008; 7 (2)

22. Igbigbi, P. S. and Msamati B. C. Plantar and digital dermatoglyphics in Malawians. *Central Africa J Med.* 1999; 45 (10): 264-268.

23. George, SM and Yassa, H.A. Sexual dimorphism in fingerprint pattern: a tool for sex identification. *Zagazig J. Forensic Med.& Toxicol*. 2018; 16 (1).

24. Jindal G, Pandey R.K., Gupta S., Sandhu M. A comparative evaluation of dermatoglyphics in different classes of malocclusion. *The Saudi Dental Journal*. 2015; 27 (2): 88-92.

25. Jantz, R.L. Sex and race differences in finger ridge-count correlations. *American Journal of Biological Anthropology*. 1977; 46 (1): 171-176.