A STUDY OF FINGERNAIL PLATE SHAPE AND FINGERPRINT PATTERN AMONG THE YALA INDIGENES OF CROSS RIVER STATE

ABSTRACT

BACKGROUND /AIM: The uniqueness and consistency of fingerprints throughout life are some of the features used for personal identification. This study aims to generate data for fingernail plate shape and fingerprint pattern to determine the following indices: Furuhata's index, Dankmeijer's index, and Pattern intensity index using the frequency distribution of the required fingerprint pattern of Yala indigenes in Cross River State.

METHODOLOGY: The three indices of the current research study for both males and females Furuhata's index for females was 39.7% and 24.57% for males, the Dankmeijer's index for females was 41.8% and 32% for males, while the Pattern intensity index for females was 4.58% and 7.11% for males, in contrast, the Dankmeijer's index shows a greater value in males. Four hundred and thirty subjects (258 males and 172 females) participated in the study. A conventional method of using an ink pad was used to collect the fingerprint of the ten digits; the vernier caliper was also used to measure the nail plate shape of the thumb, index, and middle finger.

RESULT: The result of the study showed that males had 50.5% ulna loop pattern, 27.3% whorl pattern, 13.3% radial loop pattern, and 8.6% arches Pattern. For females, 61.2% ulna loop pattern, 25.0% whorl, 10.5% arch pattern, 1.7% radial loop pattern, and 1.6% double loop whorl pattern, while comparing both sexes, the Female has a high percentage of ulna loop than their male counterparts.

CONCLUSION: Furthermore, the finger's nail plate shape in both sexes of the Yala population is rectangular shaped. The Pattern in the thumb, index, middle, and ring finger. These findings will help in creating a database of fingerprints for easy identification, reference purpose, research, and forensic investigation when the need arises.

KEYWORDS: **Fingernail plate, Fingerprints, Furuhata's index, Dankmeijer's index, Yala indigenes.**

INTRODUCTION

The study of the human hand has always been fascinating, as the human skin is the largest and delicate organ of the human body that can perform many vital functions in life. The palms of the hands and the soles of the feet are covered with two totally distinct classes of marks. The most conspicuous features are the creases or folds of the skin, which interest the followers of palmistry[1]. These folds or creases could be an indicator of specific congenital abnormalities. Scientifically, the term palmistry means dermatoglyphics. The term "dermatoglyphics" was coined by Cummins and Midlo in 1926. It is derived from the Greek word "Derma" meaning skin and "glyphic" meaning carvings[2]. Dermatoglyphics deals with the study of the epidermal ridges and their configurations on the volar surfaces of fingers, palms, and soles. The volar pads are mound-shaped elevations on each finger above the proximal end on the distal metacarpal bone. The size and position of these pads are responsible for the ridge patterns to an extent[2,1]. Toward the end of the 19th century, Sir Francis Galton, a British anthropologist, began his observations of fingerprints as a means of identification and put forth a rule called "proof of no change," which states that an individual's dermatoglyphics remain unchanged throughout their lifetime. Dermal ridge differentiation takes place in the early stages of fetal development. During prenatal development, the ridges are influenced by blood vessel–nerve pairs at the border between the dermis and epidermis. These ridge patterns will be affected by inadequate oxygen supply, unusual sweat glands distribution, and epithelial growth alterations during prenatal development. The ridged skin is considered a sensitive indicator of intrauterine dental anomalies because it originates from the same fetal volar pads as the teeth, and they originate from the same ectodermal layer in the 6th–7th week of embryonic life. Hence, when intrauterine dermal damage occurs, a tooth anomaly can be expected[3]. The resulting ridge configurations are genetically determined and influenced or modified by environmental forces.

Similarly, the development of dermal ridges and congenital deafness seems to be interlinked as they develop around the same time. Herschel was the first to experiment with fingerprints in India. Schaumann and Alter's (1976) published the book "dermatoglyphics in medical disorders." Atasu M was the first to introduce dermatoglyphics into dentistry [4].

Many researchers also prove the possible genetic influence on dental caries. Hans Muhlemann presented a philosophical view when considering the scientific evidence about caries (and periodontal diseases) in humans from the genetic point of view, and he concluded that "dental caries is a polyfactorial entity [5]. The epidermal ridge pattern depends upon the cornified layer of the epidermis and dermal Pattern. The proliferation of cells in the lower zone of the epidermis resulted in projections in the dermis as regularly spaced thickenings. The dermis also projects upwards into the epidermal hollows, referred to as "dermal papillae." This led to the appearance of elevations on the surface of the skin, known as epidermal ridges. The main driving force behind using fingerprints is the uniqueness and consistency once formed [5,6]. In addition, a non-volatile inorganic component of eccrine secretion from fingerprints has been shown to remain intact even when exposed to temperatures as high as 600°C [5,7]. The application of the new scanning Kelvin probe fingerprinting technique, which makes no physical contact with the fingerprint and does not require the use of developers, has the potential to allow fingerprints to be recorded while still leaving intact material that could subsequently be subjected to DNA analysis [8]. The sole aim of using fingerprints is to establish identity. The identity can be in the form of sex, ethnicity, and lifestyle prediction.

The fingerprints have features that can be used to determine the sex of individuals. Using fingerprint patterns, it was reported that females have more arches and males have more whorls. Males' prints tend to have higher levels of urea than women's. Males were also reported to have coarser ridges than females by approximately10%. Females had a significantly higher ulnar ridge density in the right thumb among the Hausa population of Kano state [9]. It was reported that females had higher ridge counts in all the ulnar, radial, and proximal areas among Mataco-Mataguayo Sudanese and Argentinian populations. On average, females have finer ridges compared to their male counterparts.

The present study aimed to assess the dimensions and shapes of the fingernail plate and fingerprint pattern of indigenes of the Yala Local Government Area of Cross River State.

MATERIALS AND METHODS

The present study was conducted in and Yala local government area of Cross River State, Nigeria. It was carried out among randomly selected indigenous young adults and adults in Yala of cross river state. A total of four hundred and thirty (430) adults (18-35 years of age), The sample consisting of 258 males and 172 females from Yala Local Government Area, were used. Subjects with fingernail plate shape defects were not used

To be included in the study, subjects gave informed consent, had no developmental deformities and deformities in their fingernail plate, were within the age of 18-35 years of age, and must be an indigene of Yala Local Government of Cross River State. The subject's parents must come from Yala ethnic groups in Cross River state.

MEASUREMENT PROTOCOL

Nail Plate Shape Measurement

The measurement was taken with the subject standing erect and their hand placed in a flexed line position. The measurement was taken with a vernier caliper on the nail from the cuticle to the free margin.

Figure 1. Measurement of nail plate shape

Finger Print Measurement

Firstly a fingerprint card was set up, a design on the fingerprint method, and then I would have the subject wash and dry his hands to remove dirt that may obscure the fingerprint. If soap and water are unavailable, rubbing alcohol is the second best option.

STATISTICAL ANALYSES

Results were prepared on the basis of collected data and their distributions from 430 subjects of Yala, Local Government Area, between the ages of 10-25yrs. Data were analyzed using the statistical package for social sciences (SPSS) version 20. Results are expressed as Mean ± SD. Student t-test was used to compare differences between genders. Pearson's correlation coefficient (r) was used to examine the relationship between various anthropometric parameters measured. P Value was considered significant at ($p< 0.05$).

RESULTS

The present study was carried out in and Yala local government area of Cross River State, Nigeria. It was carried out among randomly selected indigenous young adults and adults in Yala of Cross River State. A total of four hundred and thirty subjects (258 males and 172 females) within the age range of 18-35 years of age were recruited. The parameter collected includes the different individual fingerprints of the subject's right and left hands and the measurement of the length and width of the fingernail plate. The results were recorded and analyzed to get the frequency of distribution of fingerprint patterns and the mean length and width of the nail plate.

Table 1: Mean and standard deviation values of length and width of male and female right hand showing values for the nail plate of the thumb, index and Middle fingers.

Report

AGE	SEX		RTNPL	RTNPW	RINPL	RINPW	RMFNPL	RMFNPW
10 TO 15 YEARS OLD	MALE	Mean	12.48[A]	13.74[B]	10.04[C]	10.81[D]	9.94[E]	11.5[F]
		SD	2.81	2.17	2.58	2.03	2.69	2.03
	FEMALE	Mean	11.85[A]	12.29[B]	9.02[C]	9.67[D]	9[E]	10.06[F]
		SD	2.27	1.33	1.86	1.01	1.83	1.21
	Total	Mean	12.19	13.09	9.58	10.3	9.52	10.85
		SD	2.6	1.97	2.34	1.75	2.39	1.85
16 TO 25 YEARS OLD	MALE	Mean	12.78	13.45	10.08	10.53	9.99	11.29
		SD	2.83	2.79	2.51	2.48	2.43	2.71
	FEMALE	Mean	13.02	13.55	10.33	10.4	10.44	11.01
		SD	2.46	1.5	2.79	1.19	2.37	1.95
	Total	Mean	12.84	13.47	10.14	10.5	10.1	11.22
		SD	2.73	2.52	2.57	2.22	2.41	2.54
Total	MALE	Mean	12.57	13.64	10.05	10.72	9.96	11.43
		SD	2.81	2.38	2.55	2.19	2.6	2.27
	FEMALE	Mean	12.04	12.5	9.23	9.79	9.23	10.21
		SD	2.34	1.43	2.09		2	1.4
	Total	Mean	12.36	13.19	9.73	10.35	9.67	10.95
		SD	2.64	2.13	2.41	1.88	2.41	2.06

Values with similar superscripts along the column are significantly different at $P<0.05$

Table 2: Mean and standard deviation values of length and width of male and female left hand showing values for the nail plate of the thumb, index, and Middle fingers.

AGE	SEX		LTNPL	LTNPW	LINPL	LINPW	LMFNPL	LMFNPW
10 TO 15 YEARS OLD	MALE	Mean	12.65 [A]	13.37 [B]	10.23 [C]	10.65 [D]	10.08 [E]	11.34 [F]
		SD	2.87	2.09	2.68	2.14	2.54	2.07
	FEMALE	Mean	11.72 [A]	11.84 [B]	9.24 [C]	9.44 [D]	9.09 [E]	9.78 [F]
		SD	1.93	1.23	1.93	1.08	1.94	1
	Total	Mean	12.23	12.68	9.79	10.11	9.63	10.64
		SD	2.53	1.91	2.42	1.85	2.34	1.85
16 TO 25 YEARS OLD	MALE	Mean	12.81	13	10.41	10.55	10.38	11.08
		SD	2.64	2.71	2.49	2.51	2.43	2.53
	FEMALE	Mean	13.22	12.99	10.23	10.38	10.6	11.03
		SD	1.86	1.87	2.36	1.09	2.32	1.44
	Total	Mean	12.91	13	10.36	10.51	10.43	11.07
		SD	2.46	2.52	2.45	2.24	2.4	2.3
Total	MALE	Mean	12.7	13.25	10.29	10.62	10.18	11.26
		SD	2.79	2.31	2.62	2.26	2.5	2.23
	FEMALE	Mean	11.97	12.03	9.4	9.6	9.34	9.98
		SD	1.99	1.42	2.04	1.13	2.08	1.18
	Total	Mean	12.41	12.77	9.94	10.21	9.84	10.75
		SD	2.53	2.09	2.44	1.96	2.38	1.98

Values with similar superscripts along the column are significantly different at $P<0.05$

Table 1 and 2 shows that the thumb, index, and middle finger of the right and left nail plate shape of both males and females in the age range of 10 to 15 shows no sexual dimorphism. Still, the thumb, index, and middle finger of the right and left of the nail plate shape of both males and females in the age range of 16 to 25 years of age shows sexual dimorphism.

Table 3: Frequency and percentage distribution of the fingerprints pattern on Male right-hand fingers

MALE RIGHT HAND										
FPP	RT THUMB		RT INDEX		RT MID F		RT RING F		RT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	32	12.4	23	8.9	19	7.4	12	4.6	9	3.5
WHORL	97	33.7	91	35.3	48	18.6	73	28.3	45	17.4
ULNAR LOOP	125	48.4	121	46.9	181	70.2	167	64.7	198	76.7
RADIAL LOOP	4	1.6	23	8.9	10	3.9	6	2.3	6	2.3
DOUBLE W L	0	0	0	0	0	0	0	0	0	0

Table 3 shows that on male fingers, the most common fingerprint pattern on the right thumb is the ulnar loop [48.4%], and the least is the radial loop [1.6%]. On the right index finger ulnar loop [46.9%] was the highest, while the least was the radial loop and arch [8.9%], respectively. The right middle finger showed the highest ulna loop [70.2%] and the least radial loop [3.9%]. The right ring finger has the ulna loop [64.7%] as the highest occurrence and the radial loop [2.3%] as the lowest. On the right little finger, the ulna loop [76.7%] was the highest, while the radial loop [2.3%] was the least.

Table 4: Frequency and percentage distribution of the fingerprints pattern on Male left-hand fingers

MALE LEFT HAND										
FPP	LT THUMB		LT INDEX		LT MID F		LT RING F		LT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	51	19.7	35	13.5	25	9.7	10	3.9	10	3.9
WHORL	95	36.8	91	35.2	60	23.2	71	27.5	35	13.5
ULNAR LOOP	67	64.7	89	34.5	116	56.6	112	43.4	128	49.6
RADIAL LOOP	45	17.4	43	16.7	57	22.1	65	25.2	85	32.9
DOUBLE W L	0	0	0	0	0	0	0	0	0	0

Table 4 shows that the most common fingerprint pattern on the left thumb on male fingers is the ulnar loop [64.7%], and the least is the radial loop [17.4%]. On the left index finger, whorl [35.2%] was the highest, while arch [13.5%] was the least. The left middle finger showed the highest ulna loop [56.6%] and the least arch [9.7%]. The left ring finger also has the ulna loop [43.4%] as the highest occurrence and the arch [3.9%] as the lowest. On the left little finger, the ulna loop [49.6%] was the highest, while the arch [3.9%] was the least.

Table 5: Frequency and percentage distribution of the fingerprints pattern on Female right-hand fingers

FEMALE RIGHT HAND										
FPP	RT THUMB		RT INDEX		RT MID F		RT RING F		RT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	24	13.9	21	12.2	13	7.6	9	5.2	10	5.8
WHORL	56	32.6	52	30.2	28	16.3	46	26.7	17	9.9
ULNAR LOOP	81	47.1	90	52.3	130	75.6	115	66.9	143	83.1
RADIAL LOOP	1	0.58	9	5.2	1	0.58	1	0.58	2	1.2
DOUBLE W L	10	5.8	0	0	0	0	1	0.58	0	0

The above table shows that on female fingers, the most common fingerprint pattern on the right thumb is the ulnar loop [47.1%], and the least is the radial loop [0.58%]. On the right index finger, the ulnar loop [52.3%] was the highest, while the radial loop was the least [5.2%]. The right middle finger showed the highest ulna loop [75.6%] and the least radial loop [0.58%]. The right ring finger has the ulna loop [66.9%] as the highest, while the radial loop and double whorl[0.58%], respectively, are the lowest. The ulna loop [83.1%] was the highest on the right little finger, while the radial loop [1.2%] was the least.

Table 6: Frequency and percentage distribution of the fingerprint pattern on Female left-hand fingers.

FEMALE LEFT HAND										
FPP	LT THUMB		LT INDEX		LT MID F		LT RING F		LT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	28	16.3	32	18.6	25	14.5	11	6.4	7	4.1
WHORL	65	37.8	52	30.2	38	22.1	50	29.1	26	15.1
ULNAR LOOP	62	36.1	80	46.5	106	61.6	109	63.4	136	96.5
RADIAL LOOP	4	2.3	6	3.5	2	1.2	1	0.58	3	1.7
DOUBLE W L	13	7.5	2	1.2	1	0.58	1	0.58	0	0

From the above table, it can be seen that on female fingers, the most common fingerprint pattern on the left thumb is whorl [37.8%], and the least is radial loop [2.3%]. On the left index finger, the ulnar loop [46.5%] was the highest, while the least was double whorl [1.2%]. The left middle finger showed the highest ulna loop [61.6%], and the least is double whorl [0.58%]. The left ring finger also has the ulna loop [63.4%] as the highest occurrence and double whorl [0.58%] as the lowest. On the left little finger, the ulna loop [96.5%] was the highest, while the radial loop [1.7%] was the least.

Table 7: Frequency and percentage distribution of the fingerprint pattern on the Right-hand fingers irrespective of sex.

RIGTH HAND										
FPP	RT THUMB		RT INDEX		RT MID F		RT RING F		RT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	56	13	44	10.2	32	7.4	21	4.9	19	4.4
WHORL	153	33.3	143	33.3	76	17.7	119	27.7	62	14.4
ULNAR LOOP	206	47.9	211	49.1	311	72.3	282	65.6	341	79.3
RADIAL LOOP	5	1.2	32	7.4	11	2.6	7	1.6	8	1.9
DOUBLE W L	10	2.3	0	0	0	0	1	0.2	0	0

From the table above, the highest fingerprint pattern on the right hand of both Male and female subjects was recorded to be ulna loops [79.3%], particularly on their right index fingers. In comparison, double whorls were the lowest [0.2%] on the right ring finger.

Table 8: Frequency and percentage distribution of the fingerprint pattern on the Left-hand fingers irrespective of sex.

LEFT HAND										
FPP	LT THUMB		LT INDEX		LT MID F		LT RING F		LT LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	79	18.4	67	15.6	50	11.6	21	4.9	17	3.9
WHORL	160	37.2	143	33.3	98	22.8	131	30.5	61	14.2
ULNAR LOOP	129	30.0	169	39.3	252	58.6	221	51.4	264	61.4
RADIAL LOOP	49	11.4	49	11.4	59	13.7	66	15.3	88	20.5
DOUBLE W L	13	3.0	2	0.4	1	0.2	1	0.2	0	0

The table above shows that the highest fingerprint pattern occurring on the left hand of both Male and female subjects was recorded to be ulna loops [61.4%], particularly on their left index fingers. In comparison, double whorls were the lowest [0.2%] seen on the left middle and ring fingers, respectively.

Table 9: Frequency and percentage distribution of the fingerprint pattern on the fingers irrespective of sex and hand.

RIGHT and LEFT HAND										
FPP	THUMB		INDEX		MID F		RING F		LIT F	
	N	%	N	%	N	%	N	%	N	%
ARCH	135	15.7	111	12.9	82	9.5	42	4.8	36	4.2
WHORL	313	36.4	286	33.3	174	20.2	240	27.9	123	14.3
ULNAR LOOP	335	38.9	380	44.2	533	61.9	503	58.5	605	70.3
RADIAL LOOP	54	6.3	81	9.4	70	8.1	73	8.5	96	11.2
DOUBLE W L	23	2.8	2	0.2	1	0.1	2	0.2	0	0

From the table above, the highest fingerprint pattern occurring on both hands (right and left) and in both Male and female subjects was recorded to be ulna loops [70.3%], particularly on their index fingers. In comparison, double whorls were the lowest [0.1%] seen on their ring fingers.

Table 10: Frequency and percentage distribution of Males' fingerprint pattern irrespective of hand and fingers.

FPP	Number	Percentage
ARCH	226	8.6
WHORL	705	27.3
ULNAR LOOP	1304	50.5
RADIAL LOOP	344	13.3
DOUBLE W L	0	0

Table 10 shows the frequency and percentage distribution of males fingerprint patterns irrespective of hand and fingers; the highest fingerprint pattern was an ulnar loop with the number 1304 and a percentage of [50.05%], and the least fingerprint pattern was arch with the number 226 and percentage of [8.6%].

Table 11: Frequency and percentage distribution of Female's fingerprint pattern irrespective of hand and fingers.

FPP	Number	Percentage
ARCH	180	10.5
WHORL	430	25.0
ULNAR LOOP	1052	61.2
RADIAL LOOP	30	1.7
DOUBLE W L	28	1.6

From table 11, it can be seen that the frequency and percentage distribution of females fingerprint patterns irrespective of hand and fingers the highest occurring was ulnar loop 1052 with the percentage of [61.2%] and the least occurring was double loop whorl 28 with a percentage of [1.6%].

Table 12: Frequency and percentage distribution of the fingerprint pattern fingers irrespective of sex, hand, and fingers.

FPP	Number	Percentage
ARCH	406	9.4
WHORL	1136	26.4
ULNAR LOOP	2356	54.8
RADIAL LOOP	374	8.7
DOUBLE W L	28	0.7

From table 12, it can be seen that on the frequency and percentage distribution of fingerprint pattern fingers irrespective of sex, hand, and fingers, the highest occurring number was ulnar loop 2356 with the percentage of [54.8%] and the least occurring number was double loop whorl 28 with the percentage of [0.7%].

FURUHATA INDEX FOR FEMALES

= Whorl/Loop X 100

= 430/1082 X 100

= 39.7

FURUHATA INDEX FOR MALES

Whorl/Loop X 100

= 705/1648 X 100

=24.57

DANKMEIJER INDEX FOR FEMALES

= Arches/Whorl X 100

= 180/430 X 100

= 41.8

DANKMEIJER INDEX FOR MALES

=Arches/Whorl X 100

=226/705 X 100

=32.0

PATTERN INTENSITY INDEX FOR FEMALE

= 2 X Whorl + Loop / N

= 2 X 430 + 1110/ 430

= 4.58

PATTERN INTENSITY INDEX FOR MALE

=2 X Whorl + Loop / N

= 2 X 705 + 1648/ 430

= 7.11

DISCUSSION

The study of the human hand has always been fascinating, as though the human skin is the largest and most delicate organ of the human body that can perform many vital functions in life. The palms of the hands and the soles of the feet are covered with two distinct classes of marks. The most conspicuous features are the creases or folds of the skin, which interest the followers of palmistry [1,5,7,9].

In this current research work, the relative study of fingernail plate shape and fingerprint pattern among the Yala population of Cross River State was investigated. The result of the fingerprint patterns of the Yala local government area of Cross river state revealed the following for males 50.05%, 27.3%, 13.3%, 8.6% for ulna, whorl, radial loop, and arches, respectively, for females, 61.2%, 25.0%, 10.5%, 1.7%, 1.6% for ulnar loop, whorl, arches, radial loop, double loop whorl respectively, for both sexes 54.8%, 26.4%, 9.4%, 8.7% and 0.7% for ulna loop, whorl, arches, radial loop, and double loop whorl respectively. This suggests that the ulnar loop is the highest occurring Pattern in males and females. For both sexes, the ulnar loop (54.8%) is the highest occurring, and the least occurring is the double loop whorl (0.7%), suggesting that there is always a 50% and above likely hood that 1 in every two people from this population has an ulnar loop.

The trend of fingerprint pattern noted in the current study is in line with the works of Subir, 2011 [10], who also found that the most prevailing digital ridge pattern for both males and females is the whorls 55.1% and 50.2% and the least occurring digital print pattern is the arch 2.75% and 1.57%in a population of North Bengal, India. Another research was carried out on the dermatoglyphic Pattern of Lebanese medical students of Beirut Arab University using 100 (50 males and 50 females) by Ezzat and Mahmoud, 2017[11]. Showed that the total distribution of fingerprint pattern for both hands were 9.4% for arches, 44.4% for ulna loop, 6.2% for radial loop and 40% for whorls for male student, and 8.6% for arches, 46.4% for ulna loop 6.6% for radial loop and 38.4%. For whorls, he also revealed that the ulna loop is the most prevailing digital ridge pattern while the radial loop is the least prevailing fingerprint pattern; these findings are not far from the findings of Ezejiofor 2015 on Igbo in South East Nigeria. The result shows that in both sex groups ulnar loop has the highest percentage and frequency distribution, followed by the whorls arch and radial loop[12]. However, Ezzat and Mahmoud, 2017[11]

revealed that the Female has the highest ulnar loop and whorls than the Male. In pattern types, the Bondos are characterized to show a preponderance of loops followed by whorls and arches. Their males possess an excess of whorls (48.16%), while the females display a high frequency of loops (48.66%) and arches (7%). The incidence of composite and tented arches does not contribute much to the sex variation among the Bondos. In the current research, loops were higher (61.2%) in females than in males (50.5%). This corresponds with the work of Ekanem 2009, which documented that 200 females of the Annang Ethnic Group in Akwa Ibom state, Nigeria had higher loops (50.1%) than the males (39.6%) [13].

From the current research, sexual dimorphism was recorded in the present population in the mean values of length and width of males' and females' right hands at different age groups (table 1). The result also revealed no significant disparity in gender values of the mean total values of length and width, although males have higher values than females $P<0.05$ (table 1).

Data obtained in this study also showed that fingerprint patterns irrespective of sex, hand, and finger. The ulnar loop is the highest-occurring fingerprint pattern among the Yala people. This result is in semblance to the previous work carried out by Ezza*et al.*, 2017[11]. On the other hand, the present results were in contrast to the studies conducted by some authors in Australia, NewZealand, India, by Ching Cho 2000, Ching Cho 1998, Bansal et al., 2014[14-16] where the whorls predominate over the ulnar loop in both sexes.

The three indices of the current research study for both males and females Furuhata's index for females was 39.7% and 24.57% for males, the Dankmeijer's index for females was 41.8% and 32% for males. In contrast, the Pattern intensity index for females was 4.58% and 7.11% for males. Furuhata's index (FI) proposes the whorls/ loop index[17,18]; it gives an idea about the number of whorls in the loop. Dankmeijer's index proposes the arch/ whorls index[19] Pattern intensity index proposes the addition of whorls and loop/number of subjects. Das & Kundu in 1984[20] also carried out research, and the result showed that pattern indices among the Bondos of Orissa show mean value for the males (14.73±0.29) than females (13.50±0.28), thereby signifying sex dimorphism. The value of Dankmeijer index in females is almost double that noted in males; in contrast, Furuhata's index shows a greater value in males than females. Thus the amount of variation in individual pattern frequencies influence variation in individual patterns frequencies influences the variation of the quantitative character. Also, Ezzat 2017 [11] carried out another research, and the result for Pattern Intensity Index was 13.02 for both sexes

for Dankmeijer's was 22.95%for both sexes, and Furuhata's Index was 75.676. Another researcher named Subir *et al.*, 2011[10] carried out research among the Dhimals of North Bengal, India. The pattern intensity index is higher (15.24 for males and 14.86 for females) because of the high proportion of whorls and loops compared to the arch. For Furuhata's index, the sex difference is greater, having 130.7 for Males and 104.7 for females, because of the higher proportion of whorls than the loop. The Dankmeijer's index exhibits more sex difference having more value for males 4.98 than their female counterparts 3.13 because of the comparatively higher proportion of arches for males and females [11].

As the frequency of arches and loops decreases, another experimental finding on fingernail plate shape among the Yala population has also shown that both males and females have a rectangular pattern in the thumb, index, middle, and ring finger but their insignificant difference in the little fingers. The result corresponds or agrees with the previous work done by Divya 2007 [21] among the Indian population, which shows that males and females tend to have rectangular Patterns in the thumb 61% and 66%, respectively. A triangular pattern dominates in both males and females on the index middle and ring finger. In contrast, in the case of the little finger, the Pattern varies—the nail pattern of the right-hand repeats in the left hand of an individual and vice versa.

CONCLUSION

This study has shown the fingerprint pattern, irrespective of sex, hand, and fingers, of the indigenes of the Yala local government area of Cross River state. The ulnar loop fingerprint is the highest occurring than the whorls and arches, respectively. Also, the current research indicates that the males have the highest loop fingerprint than the females of the Yala population. More so, the ulna loop print in both sexes, irrespective of the hand, is significantly higher than the radial loop fingerprint. Each fingerprint was different from what was shown by this study, collaborating with all the earlier studies. Furthermore, the fingernail plate shape in both sexes of the Yala population is a rectangular-shaped pattern in the thumb, index, middle, and ring finger. Hence they may be useful as means of identification.

There is a need for similar research with a larger sample size for each local government area in Cross River state and, by extension Nigeria in its entirety in order to establish and give a detailed explanation of fingerprint pattern among indigenes of Yala Local Government of Cross River State and Nigeria at large thereby creating a database of fingerprints for easy identification, reference purpose, research and forensic investigation when the need arises. There is also a need for similar research with a large sample size and different measurement tools to be done in other parts of the country.

CONSENT

Before the study, the subjects' informed consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval was obtained from the Faculty of basic medical science CRUTECH Okuku campus. Permission to conduct the study was obtained from the community and the subjects involved in the research via verbal consultation and approval.

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