ORIGINAL COMMUNICATION

Anatomy Journal of Africa. 2021. Vol 10 (1):1859 -1870

EARPRINT AND FINGERPRINT PATTERNS AMONG TWO ETHNIC GROUPS IN SOUTH SOUTHERN NIGERIAN

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ABSTRACT

The study investigated earprint and fingerprint patterns among the Urhobos' and Ibos' residing in Warri, South Southern Nigeria. The study was a descriptive crossectional study which involved 40 Urhobos' and 40Ibos', aged 18years and above. Ear and fingerprint patterns were obtained with a Hewlett placard G4010 Photo scanner. Chi square test was used for categorical variables and a T test was used to compare means of dermatoglyphic variables. Statistical evaluation was done using SPSS 20 Software Version. Significance was accepted at $P<0.05$ Findings showed that the ulnar loop was predominant while the radial loop was least observed in the studied population (70%,1.3%). Earprints that were common in the studied population were Type V and VI (7.5%, 38.8%). Type VII and VIII were frequent in the Ibos' while Type I and III were perculiar with the Urhobos' (X^2 = 2.804; P = 0.903). The arches found on the left fingers were significantly different among the two ethnic groups (p= 0.003). There was also a significant difference in fingerprint patterns observed on the left middle and little finger alongside AFRC of the right and left little finger among the respective tribes (p=0.009; 0.012; 0.031; 0.007). Sexual dimorphism was observed in fingerprint patterns and TFRC among the Ibos' (p=0.001; 0.001). Ear and fingerprint patterns vary among ethnic groups and can be used in criminology and forensic science.

Key Words: Warri, Earprint, Fingerprint.

INTRODUCTION

Earprints have been described as a two-dimensional replication of the basic parts of the external ear (auricle) when it comes in contact with a surface. The auricle has landmarks and features similar to fingerprints, which contributes to individuality. According to Armede Joux in 1854, the ears can forecast an individual's race, culture or ethnicity. Sebaceous substances which covers the auricle cause an impression of the ear when it comes in contact with a surface (Kasprazak, 2001; Lynn et al.,2004). Hirschi was one of the early pioneers that explained the use of ear prints in forensic investigation. Preceding to Hirschi, several studies had acknowledged the viability of using earprints for forensic study (Osterburg,1982; Lynn et al.,2004). A passive earprint can be used to acquit a person who was suspected, increase confirmation towards a given suspect or used when there is no available evidence (Lynn et al.,2004)

Another benefit of earprint is that they can be used as an additional tool with fingerprint and DNA in forensic investigations especially for legal purposes (Kennerly ,2000; Nanni and Lumini,2009). Fingerprint like ear prints have also been used for decades for forensic purposes with the uniqueness attributed to the minutiae which have been reported as ridge events and their interaction within skin print patterns are the vital elements of identification, especially as it is now known that these ridges are individualistic in nature (Moenssens, 1971; Mohammed et al., 2014; Marera, 2015; Susan and Wojceich, 2016)

Though elaborate studies on fingerprints have been undertaken, limited information on earprints exists, hence this study to our best of knowledge will for the first time investigate earprint pattern among two ethnic groups and compare their fingerprint pattern in South Southern Nigeria.

Submitted 11th June 2019. Published 1st November 2020. To cite: Ebeye OA, Jaiyeoba-Ojigho JE, Igbigbi PS. Earprint and fingerprint patterns among two ethnic groups in south Southern Nigeria. Anatomy Journal of Africa. 2021. Vol 10 (1): 1859 – 1870.

MATERIALS AND METHODS

The study was a cross-sectional study comprising of 40Urhobos' and 40Ibos' of which 20 were male and 20 were female from the respective tribes in Warri, South Southern, Nigeria. All participants were 18 years and above. Ethical consent was obtained from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, Delta State University, Abraka, Nigeria on the 8th of October 2018 (DELSU/CHS/ANA/18/08). Simple random sampling was adopted for this study. Participants were selected from public and private schools within Warri, Delta South, Southern Nigeria. Sample size was determined using the modified Cochran formula: (n= [n0/(1+(n0-1)/N), because our sample size was less than 1000. The objectives and importance of the study were explained to the participants. Participants were without deformities of the ears and hands. They were told to relax in order to get a very clear imprint using a Hewlett placard G4010 Photo scanner (Fig.1). A 500 solar power inverter which was connected to a 12 volts rechargeable battery was used to power the scanner. Ear and fingerprints were taken after participants placed ears and palms on the scanner. Ear prints were taken for both right and left ear for each participant while fingerprint of all ten digits were obtained. The prints were increased with a zooming tool on the Hewlett placard laptop connected to the photoscanner via a USB cord. Fingerprint patterns were classified as ulnar loop, radial loop, whorls and arches based on the triradius, core and radiants which are termed the three dermatoglyphic landmarks (Moenssens,1971; Mohammed et al.,2014; Marera, 2015; Susan and Wojceich, 2016). The ridge counts were done by counting the ridges, drawn from the triradius to the core of the fingerprint (Fig.2). The ATD angle was obtained by drawing lines between the triradii below the index and little finger and the most proximal triradius on the hypothenar region of the palm (Fig.3). We classified earprint into Type I, II, III, IV, V, VI, VII, VIII (Fig 5 to 12) based on the antihelix, intertragic notch and posterior auricular furrow. Type I(angulated antihelix, posterior auricular furrow, round intertragic notch)Type II (angulated antihelx, absence of posterior auricular furrow, round intertragic notch) Type III(angulated antihelix, posterior auricular furrow and V shaped intertragic notch) Type IV (angulated antihelix, absence of posterior auricular furrow and V shaped intertragic notch) Type V (Round antihelix, posterior auricular furrow and Round shaped intertragic notch) Type VI (Round antihelix, absence of posterior auricular furrow and Round shaped intertragic notch) Type VII (Round antihelix, posterior auricular furrow and V shaped intertragic notch) Type VIII (Round antihelix, absence of posterior auricular furrow and V shaped intertragic notch).

Data were represented in frequencies and percentages to illustrate ear and fingerprint patterns in the studied population. Chi-square test was used to test for an association between gender and earprints alongside fingerprints. It was also used to test for a significant difference in fingerprint pattern among the two ethnic groups. Independent T test was used to compare means of dermatoglyphic variables among the two ethnic groups. Statistical evaluation was done using SPSS 20 Software Version. Significance was accepted at $P<0.05$.

Fig 1: Hewlett placard G4010 scanner

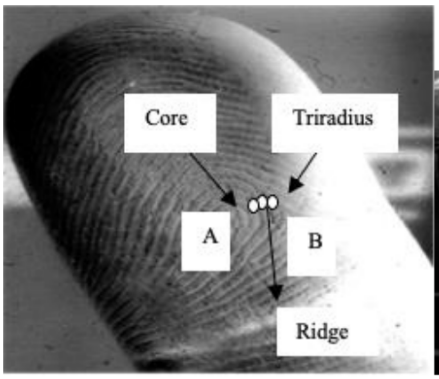

Fig 2: Illustration of total finger ridge counts

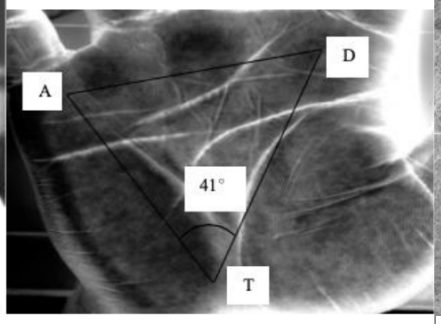

Fig 3: The palm illustrating ATD angle

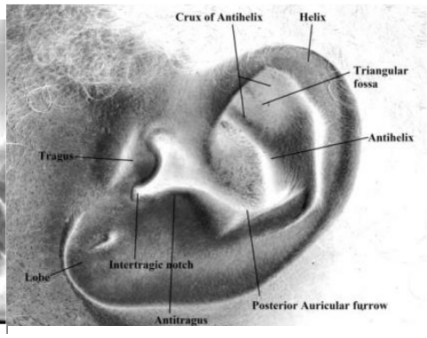

Fig 4: Anatomical landmarks of the ear

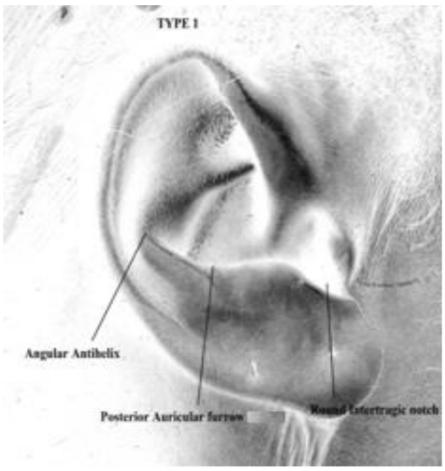

Fig 5: Type I illustrating angulated antihelix, posterior auricular furrow and round intertragic notch

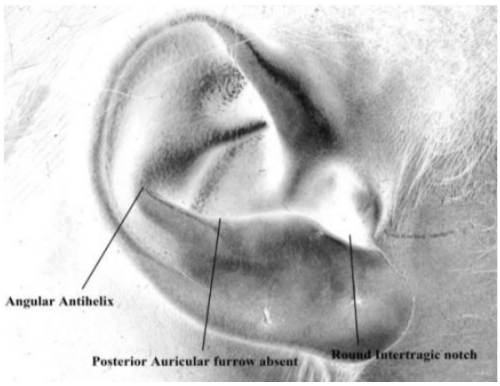

Fig 6: Type II illustrating angulated antihelix, absence of posterior auricular furrow and round intertragic notch

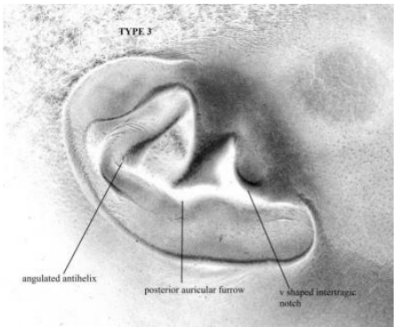

Fig 7: Type III: angulated antihelix, posterior auricular furrow and V shaped intertragic notch

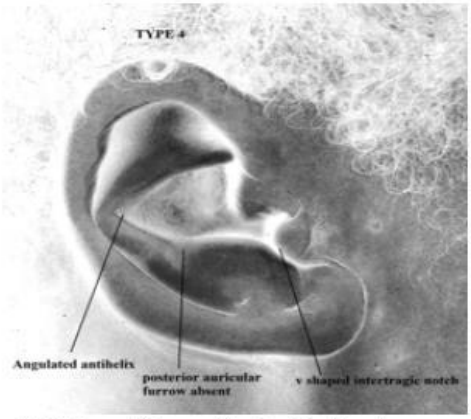

Fig 8: Type IV: angulated antihelix, absence of posterior auricular furrow and V shaped intertragic notch

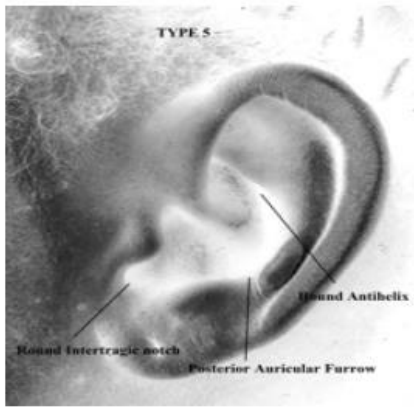

Fig 9: Type V: Round antihelix, posterior auricular furrow and Round shaped intertragic notch

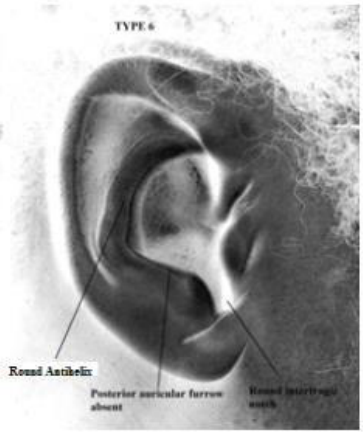

Fig 10. Type VI: Round antihelix, absence of posterior auricular furrow and round shaped intertragic notch

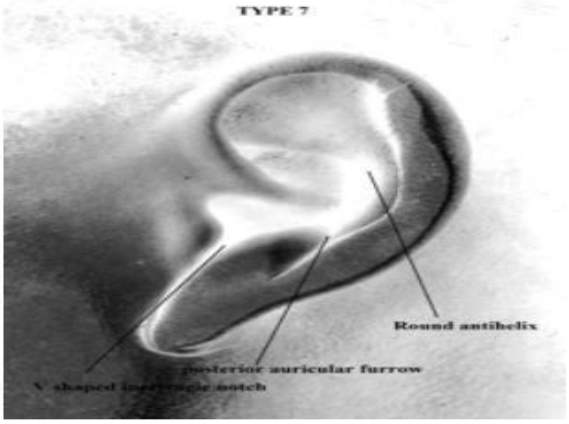

Fig 11. Type VII: Round antihelix, posterior auricular furrow and V shaped intertragic notch

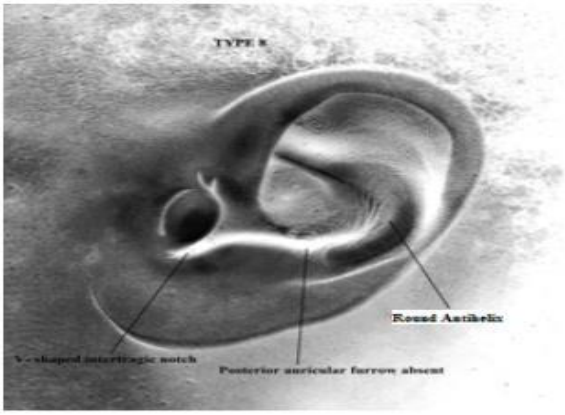

Fig 12: Type VIII: Round antihelix, absence of posterior auricular furrow and V shaped intertragic notch

RESULTS

In this study 70% of the population had the ulnar loop while the whorl, arch and radial loop was observed in 21.2%, 7.5% and 1.3% of the studied population (Table 1). Additionally, 38.8% and 17.5% of the studied population had Type VI and Type V while 5.5% each of the participants had Type VII and Type VIII (Fig 12). Table 2 showed that the percentage frequency of earprints patterns of both right and left ears were the same for the studied population.

Table 1: Distribution of Fingerprint Patterns in the Study Population

Patterns	**Frequency**	**Percent**
Ulnar Loop	560	70.0
Whorl	170	21.2
Arch	60	7.5
Radial Loop	10	1.3
Total	**800**	**100.0**

Table 2: Distribution of Earprint Patterns in the Right and Left Ear of the Study Population

Earprint	**Right**	**Left**
TYPE I	5 (6.23%)	5 (6.23%)
TYPE II	8 (10.0%)	8(10.0%)
TYPE III	7(8.8%)	7(8.8%)
TYPE IV	7 (8.8%)	7(8.8%)
TYPE V	14(17.5%)	14(17.5%)
TYPE VI	31(38.8%)	31(38.8%)
TYPE VII	4(5.0%)	4(5.0%)
TYPE VIII	4(5.0%)	4(5.0%)
Total	**80(100.0%)**	**80(100.0%)**

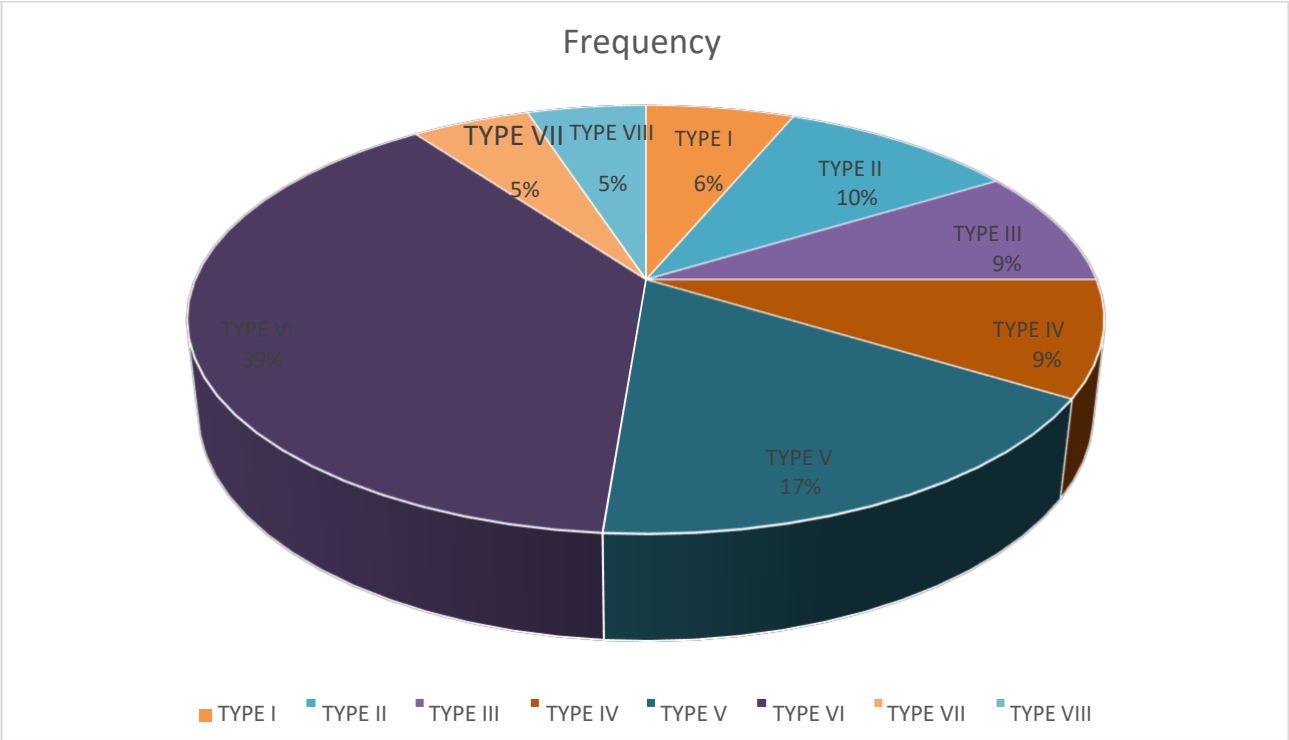

Figure 12: Frequency of the different types of ear prints

Table 3 reported earprint distribution among the Ibos' and the Urhobos'. Findings showed that Type I was seen in 40% Ibos' as compared to 60% Urhobos while Type III was manifested in 42.9% Ibos' and 57.1% Urhobos'. Type VII and VIII was detected in 75% each in the Ibos and 25% each in the Urhobos'.

Table 3: Differences in Earprint Pattern Distribution between the Ibo and Urhobo Ethnic group

Earprint	**Ibo**	**Urhobo**	**Total**
TYPE I	4(40.0%)	6(60.0%)	10(100%)
TYPE II	8(50.0%)	8(50.0%)	16(100%)
TYPE III	6(42.9%)	8(57.1%)	14(100%)
TYPE IV	8(57.1%)	6(42.9%)	14(100%)
TYPE V	12(42.9%)	16(57.1%)	28(100%)
TYPE VI	30(48.4%)	32(51.6%)	62(100%)
TYPE VII	6(75.0%)	2(25.0%)	8(100%)
TYPE VIII	6(75.0%)	2(25.0%)	8(100%)
Total	**80**	**80**	**160(100%)**

Chi-square = 2.804; Df = 7; P = 0.903

Table 4: Differences in Fingerprint Patterns in both Right and Left Fingers of Ibo and Urhobo Ethnic Group

PATTERN	Right Fingers			Left Fingers		
	Ibo	Urhobo	P-value	Ibo	Urhobo	P-value
Ulnar Loop	152(76.0%)	135(67.5%)	0.197	150(75.0%)	123(61.5%)	0.003*
Whorl	35(17.5%)	49(24.5%)		34(17.0%)	52(26.0%)	
Arch	10(5.0%)	15(7.5%)		11(5.5%)	24(12.0%)	
Radial Loop	3(1.5%)	1(0.5%)		5(2.5%)	1(0.5%)	
Total	200(100.0%)	200(100.0%)		200(100.0%)	200(100.0%)	

***Indicates significant difference between the Ibo and Urhobo ethnic groups.**

The arch pattern was discovered on the left fingers in 5.5% Ibos' while it was noticed in 20% Urhobos at $p< 0.05$. The ulnar loop was seen in 80% Ibos' and 55% Urhobos', the whorl was manifested in 20% Ibos' and 27.5% Urhobos' while the arch was present only in 17.5% Urhobos' at $p< 0.05$ for the left middle finger. The left little finger also presented the whorl and arch pattern only in 17.5% and 25% Urhobos' while the ulnar loop was noted in 100% Ibos' in contrast to 80% Urhobos' (table 5).

This study presented the absolute finger ridge count for the right little finger of the Ibos' as 13.83 $\pm$ 4.73 and 11.18$\pm$ 5.98 for the Urhobos' at $p<0.05$ while that of the left little finger for the Ibos was observed as 14.35$\pm$ 5.40 and that of the Urhobos' as 10.93 $\pm$ 5.56 at $p<0.05$ (table 6). Table 7 revealed total finger ridge count (TFRC) of the Ibos' as 138.63 $\pm$ 46.31 and that of the Urhobos' as 115.40$\pm$ 52.39.

Table 8 reports the mean ATD angle for the right fingers of the Ibos as 43.98$\pm$ 5.20 and that of the Urhobos' as 42.58$\pm$ 4.79.

Table 9 showed that the ulnar loop was reflected in 51.7% Ibo males and 48.3% females in contrast to 52.3% and 47.7% observed in Urhobo males and females, the whorl pattern was noted in 56.5% Ibo males and 43.5% females while it was detected in 49.5% Urhobo males and 50.5% females. The arch pattern was discovered in 9.5% Ibo males and 90.5% females as compared to 39.5% Urhobo males and 61.5% females (Table 9). The total finger ridge count (TFRC) of the Ibo males was seen as 158.55$\pm$ 36.24 while the females had 102.70$\pm$ 38.05 at $p<0.05$ (table 10).

The mean ATD angles of male and female from the Ibo and Urhobo tribes respectively was reported in table 11. Findings showed that the ATD angle of the right fingers of the Igbo males was 43.85$\pm$ 6.59 as compared to 42.10$\pm$ 5.06 obtained for the Urhobos'. The ATD angles of the Ibo females was 44.10$\pm$3.48 while that of the Urhobos' was 43.05$\pm$4.59 for their right fingers. This investigation also showed that the mean ATD angles of the Ibo males for the left hands was 42.05$\pm$4.99 as compared to 41.60$\pm$5.48 observed among the Urhobos' while the Ibo females showed a mean value of 44.30$\pm$3.64 in contrast to 43.45$\pm$4.29 noted among the Urhobo females (Table 11).

The study showed that 33.3% Ibo males and 66.7% females had Type III as compared to 75% Urhobo males and 25% females while Type VI was manifested in 53.3% Ibo males and 46.7 females in contrast to 43.8% Urhobo males and 56.1% females (table 12).

Table 5: Specific differences of Fingerprint Patterns in both (Right and Left Fingers) between Urhobo and Ibo Ethnic Group.

		Right Fingers			Left Fingers		
Digit	**Pattern**	**Ibo**	**Urhobo**	**P-value**	**Ibo**	**Urhobo**	**P-value**
Thumb	Ulnar Loop	23(57.5%)	19(47.5%)	0.497	27(67.5%)	24(60%)	0.703
	Whorl	11(27.5%)	16(40%)		7(17.5%)	10(25%)	
	Arch	6(15%)	5(12.5%)		6(15%)	6(15%)	
	Total	40(100%)	40(100%)		40(100%)	40(100%)	
Index	Ulnar Loop	26(65%)	24(60%)	0.271	22(55%)	24(60%)	0.319
	Whorl	9(22.5%)	8(10%)		8(10%)	7(17.5%)	
	Arch	2(5%)	7(17.5%)		5(12.5%)	8(20%)	
	Radial Loop	3(7.5%)	1(2.5%)		5(15.5%)	1(2.5%)	
	Total	40(100%)	40(100%)		40(100%)	40(100%)	
Middle	Ulnar Loop	33(82.5%)	30(75%)	0.474	32(80%)	22(55%)	**0.009***
	Whorl	5(12.5%)	9(22.5%)		8(20%)	11(27.5%)	
	Arch	2(5%)	1(2.5%)		0(0%)	7(17.5%)	
	Total	40(100%)	40(100%)		40(100%)	40(100%)	
Ring	Ulnar Loop	31(77.5%)	24(60%)	0.184	29(72.5%)	21(52.5%)	0.102
	Whorl	9(22.5%)	15(37.5%)		11(27.5%)	17(42.5%)	
	Arch	0(0%)	1(2.5%)		0(0%)	2(5%)	
	Total	40(100%)	40(100%)		40(100%)	40(100%)	
Little	Ulnar Loop	39(97.5%)	38(95%)	0.603	40(100%)	32(80%)	**0.012***
	Whorl	1(2.5%)	1(2.5%)		0(0%)	7(17.5%)	
	Arch	0(0%)	1(2,5%)		0(0%)	1(2.5%)	
	Total	40(100%)	40(100%)		40(100%)	40(100%)	

*Indicates significant differences between Ibo and Urhobo Ethnic Group

Table 6: Specific differences of Absolute Finger Ridge Count (Right and Left Fingers) of the Ibo and Urhobo Ethnic group.

	RIGHT FINGERS			LEFT FINGERS		
	IBO	URHOBO	P –VALUE	IBO	URHOBO	P-VALUE
TFRC	65.88±24.05	59.43±25.79	0.251	64.75±23.70	55.98±27.56	0.131
THUMB	13.78±7.48	10.95±8.12	0.110	11.95±6.86	10.28±7.89	0.314
INDEX	12.28±6.41	10.13±6.82	0.150	11.05±7.30	9.53±6.76	0.335
MIDDLE	10.68±5.26	11.98±6.12	0.312	11.55±5.76	10.75±7.19	0.584
RING	15.33±6.33	15.20±6.09	0.929	15.85±5.14	14.50±6.76	0.318
LITTLE	13.83±4.73	11.18±5.98	0.031*	14.35±5.40	10.93±5.56	0.007*

Table 7: Total finger ridge counts (TFRC) in Ibo and Urhobo Ethnic Group

Ethnic Group	**Total Finger Ridge Count (TFRC)**	**P**
Ibo	138.63±46.31	0.172
Urhobo	115.40±52.39	

Table 8: ATD Angle in both right and left Fingers between the Ibo and Urhobo Ethnic Group

Ethnic Group	**ATD Angle**			
	Right Fingers	**P**	**Left Fingers**	**P**
Ibo	43.98±5.20	0.214	43.18±4.47	0.514
Urhobo	42.58±4.79		42.53±4.95	

Table 9: Gender Comparison of Fingerprint Distribution in both Ibo and Urhobo Ethnic Groups

Ethnicity	**Pattern**	**Male**	**Female**	**Total**	**P-value**
Ibo	Ulnar Loop	156(51.7%)	146(48.3%)	302(100%)	**0.001***
	Whorl	39(56.5%)	30(43.5%)	69(100%)	
	Arch	2(9.5%)	19(90.5%)	21(100%)	
	Radial Loop	3(37.5%)	5(62.5%)	8(100%)	
	Total	**200**	**200**	**400**	
Urhobo	Ulnar Loop	135(52.3%)	123(47.7%)	258(100%)	0.200
	Whorl	50(49.5%)	51(50.5%)	101(100%)	
	Arch	15(39.5%)	24(61.5%)	39(100%)	
	Radial Loop	0(0%)	2(100%)	2(100%)	
	Total	**200**	**200**	**400**	

Table 10: Gender Comparison of Total finger ridge counts (TFRC) in Ibo and Urhobo Ethnic Group

Ethnic Group	Gender	Total Finger Ridge Count (TFRC)	P
Ibo	Male	158.55±36.24	0.001*
	Female	102.70±38.05	
Urhobo	Male	120.90±54.08	0.514
	Female	109.90±51.44	

Table 11: Gender Comparison of ATD Angle in both right and left Hand in Ibo and Urhobo Ethnic group

Ethnic Group	Gender	ATD Angle			
		Right Hand	P	Left Hand	P
Ibo	Male	43.85±6.59	0.881	42.05±4.99	0.112
	Female	44.10±3.48		44.30±3.64	
Urhobo	Male	42.10±5.06	0.538	41.60±5.48	0.242
	Female	43.05±4.59		43.45±4.29	

Table 12: Gender Comparison of Earprint Distribution in both Ibo and Urhobo Ethnic Group

Ethnicity	Earprint	Male	Female	Total	P-value
Ibo	TYPE I	2(50.0%)	2(50.0%)	4(100%)	0.994
	TYPE II	4(50.0%)	4(50.0%)	8(100%	
	TYPE III	2(33.3%)	3(66.7%)	5(100%)	
	TYPE IV	4(50.0%)	4(50.0%)	8(100%)	
	TYPE V	6(50.0%)	6(50.0%)	12(100%)	
	TYPE VI	16(53.3%)	14(46.7%)	31(100%)	
	TYPE VII	2(33.3%)	4(66.7%)	6(100%)	
	TYPE VIII	4(66.7%)	2(33.3%)	6(100%)	
	Total	**40**	**40**	**80(100%)**	
Urhobo	TYPE I	2(33.3%)	4(66.7%)	6(100%)	0.789
	TYPE II	4(50.0%)	4(50.0%)	8(100%)	
	TYPE III	6(75.0%)	2(25.0%)	8(100%)	
	TYPE IV	4(66.7%)	2(33.3%)	6(100%)	
	TYPE V	8(50.0%)	8(50.0%)	16(100%)	
	TYPE VI	14(43.8%)	18(56.3%)	32(100%)	
	TYPE VII	-	2(100%	2(100%)	
	TYPE VIII	2(100%)	-	2(100%)	
	Total	**40**	**40**	**80(100%)**	

DISCUSSION

The ulnar loop from this study was the most predominant pattern observed among the Ibos' and Urhobos'. The ulnar loop was found on every finger of the Urhobos' and Ibos'. These findings were similar to other studies carried out among several ethnic groups in Nigeria (Thomas et al.,2009; Udoaka and Udoaka,2009; Eboh,2012; Guiterez et al.,2012) while it differed from a study carried out among the Malawians in East Africa which highlighted the arches as the most predominant pattern among sexes (Igbigbi and Msamati,1999). The ulnar loop has been distinguished by having one triradius with ridges running towards the little

finger in contrast to the radial loop displaying ridges towards the thumb (Jaja and Igbigbi, 2080).

The radial loop from this investigation, was the least pattern discovered. This conforms with the reports of Boroffice (1978) who carried out a work on a Nigerian population and Ekanem et al. (2009) who investigated fingerprint patterns among the Annang ethnic group in Akwa Ibom, Nigeria. On the contrary, findings were different from those of Igbigbi and Msamati (1999). According to their study among Kenyans and Tanzanians in East Africa, the arches, which are characterized with the absence of a triradius, were the least pattern noted. The whorl and arch patterns from this study displayed ethnic variation because they were associated more with the Urhobos' as compared to the Ibos'. These findings were similar to the study carried out by Eboh (2012), which showed that fingerprint patterns unveiled ethnic disparity among ethnic groups.

The study showed that the most predominant earprint patterns were Type VI and Type V which are both characterized with a rounded antihelix and intertragus notch. This implies that majourity of the Urhobos' and Ibos' in Nigeria have their antihelix and intertragus notch rounded. Kaushal and Kaushal (2011) stipulated that variation in shape of the antihelix exist among individuals and with the upper and lower crus, it can be grouped into several categories. According to Meijerman et al. (2004) imprints of the antihelix is one of the features of the ears that are most commonly found on earprints and they are considered vital anthropological parameters for forensic identification. They further stated that earprints could be associated majorly with crimes that involved burglaries as most criminals tended to leave earprints on surfaces. Kennerley (2000) reported that these prints have an advantage over fingerprints and DNA because criminals can interfere with fingerprints alongside DNA. Genetic and falsified fingerprints can be placed at a crime site, as compared to earprints. Findings from the study observed no inter variation of earprint patterns among individuals from the Urhobo and Ibo ethnic group.

The study also showed that Type VII and VIII earprints were predominant among the Ibos' while Type I and III were associated more with the Urhobos'. The most predominant landmark of Type VII and VIII was the rounded antihelix and V shaped intertragic notch. This implies that when a rounded antihelix and a V shaped intertragic notch is observed in a Nigerian, there is a probability that such a person is from the Ibo ethnic group in Nigeria. While an angulated antihelix and the presence of posterior auricular furrow which are the common features seen in Type I and III describes an individual from the Urhobo ethnic group. Findings conforms to the principle of Meijerman et al., (2004) which states that inter variation of earprints exist among individuals. Variation of earprints from our study also conforms to the generalization of several studies that explored nonmetric and metric differences of earprints among individuals (Kennerley ,2000; Kasprazak ,2001; Lynn,2004; Nanni & Lumini 2009).

The study showed that the arches found on the left hands in the studied population was significantly different among the two ethnic groups. The Urhobos' had more arches on their left fingers in contrast to those of the Ibos'. Findings were similar to a previous study by Igbigbi et al., (1994). The study also showed that the left middle and little finger showed a significant difference in fingerprint pattern among the respective tribes. The ulnar loop was associated more with the Ibos' while the whorls was observed more in the Urhobos for the left middle finger. This implies that if an ulnar loop is seen on the left middle finger of a Nigerian, there is a possibility that such a person is an Ibo while the whorl pattern indicates an Urhobo person. Findings were not in concordance with the assumption of fingerprint pattern by Cummis and Midlo (1961).

According to them, the whorl patterns are associated more with the right fingers as compared to the left fingers. The arches from this study was noted on the left middle finger while the whorl and arch patterns were discovered for the left little finger only among the Urhobos'. Therefore, these patterns on the left middle and little finger can be used to differentiate the Urhobos' from the Ibos'.

The little finger from this study showed a significant difference in absolute ridge count between the Ibos' and the Urhobos'. The total finger ridge count of the Ibos' in the studied population was higher than those of the Urhobos' while the atd angle of the Ibos from this study was higher than those of the Urhobos'. Sexual dimorphism in total finger ridge counts (TFRC) was observed among the Ibos' as compared to the Urhobos'. Also, Ibo males and females from this research showed a higher atd angle as compared to Urhobo males and females.

Sexual dimorphism in fingerprint pattern was observed among the Ibos' as compared to the Urhobos'. The whorl patterns were observed more among the Ibo males as compared to its predominance among the Urhobo females. Findings from the Ibo males was similar to that of Mohammed et al. (2014) who discovered that the whorl patterns were predominant among the Kanuri's males as compared to the females. The ulnar loop was associated more with the males from respective tribes while the arch was common among the females. Findings were different from that of Eboh (2012) who carried out a study among the Anioma ethnic group in Nigeria. Findings from his study demonstrated that the Anioma males had more arches as compared to the females. On the contrary findings were similar to a study carried out among a Thai population. The frequency of the arches in the Thai population was more in females as compared to males (Somsong et al.,2013).

Earprints that were peculiar to Ibo males were Type VI, VII and VIII and the most predominant feature was a rounded antihelix while those associated with Urhobo males were Type III and IV characterized predominantly with an angulated antihelix. Hence a rounded or angulated antihelix can be used to differentiate males from either tribe in Nigeria. The study also highlights Type III, IV, VIII common with the Ibo females as compared to Type I and VI linked with the Urhobo females. The V shaped intertragic notch was associated with Type III, IV, VIII while a rounded intertragic notch was seen in Type I and VI. Therefore, earprints can be used to distinguish females from either tribe in forensic studies.

In conclusion, ear and fingerprint patterns vary among ethnic groups and can be used in criminology and forensic science. Similarly, our findings also showed that the most prevalent earprint pattern were Type VI and V. This is an indication that majority of the Urhobos' and Ibos' had their antihelix and intertragus notch round.

Acknowledgment: We wish to acknowledge Professor Igho Emmanuel Odokuma for his contribution towards this research work.

REFERENCES

1. Boroffice RA. 1978. Digital dermatoglyphic patterns in a sample of Nigerian population. Am J. Phy Anthropol., 49 (2): 167-70**.**
2. Cummins H, Midlo C. 1961. Fingerprints, Palms and Soles: An Introduction to Dermatoglyphics. New York: Dover Publications.
3. Eboh DEO. 2012. Digital dermatoglyphic patterns of Anioma and Urhobo students in two tertiary institutions of Delta State Southern Nigeria. J.Med.Biomed.Res.,11 (2): 90–96.
4. Ekanem EP, Eluwa MA, Udoaffah GU, Ekanem TB, Akpantah AO. 2009. A review in int J. of research in Med Sci., 2(1): 31-37.
5. Gutierez SB, Lucenario JLS, Yebes MJT. 2012. Dermatoglyphic studies among the Dumagat-Remontado tribal population of the Philippines. J of Ant**.**
6. Igbigbi PS, Msamati BC. 1999. Plantar and didtal dermatoglyphics in Malawians. Cent. Afr. J. Med., 45 (10): 264-268.
7. Igbigbi PS, Didia BC, Agan TU, Ikpae RE. Palmer and digital dermatoglyphics in two ethnic communities in Nigeria.1994. West Afri. J. Anat., 23: 147 – 178.

8. Ingleby M, Mason J, Turner D, Langdell S.2000. Ear-prints: A neglected forensic resource? University of Huddersfield, unpublished.
9. Jaja BN, Igbigbi PS. 2008. Digital and palmar dermatoglyphics of the Ijaw of Southern NigeriaAfr. J. Med. Sci., 37(1):1-5.
10. Kasprazak J.2001. Identification of ear impressions in polish forensic practice. Problems of For. Sc., 57: 168-174.
11. Kennerley J .2000. Ear prints in criminal investigation. The European Commission Community Research
12. Lynn M, Sarah S, Francesca De C, Marta G, Cor van der L, Andrea D, Peter V, George M. 2004. Exploratory study on classification and individualization of earprints. For. Sc. Int, 91–99
13. Maat GJR. 1999. Ear Print Project—Brief report on the pilot study period September–November, Barge's Anthropologica, Leiden University Medical Centre, 1999 unpublished.
14. Marera DO, Oyieko W, Agumba G. 2015. Variation in dermatoglyphic patterns among diabetics in western Uganda Population. Afr J Sci Res., 7(3):20-25**.**
15. Moenssens AA. 1971. Fingerprint Techniques. 1st ed. Chilton Book Co. Philadelphia. Thomas Nelson & Sons, Ltd. Ontario, Canada.
16. Mohammed BS, Gorbo H, Adeyemi LB.2014. Digital dermatoglyphics patterns of the Kanuri Ethnic Group of North Eastern Nigeria. Int. J. Inn. App. Sc., 9(2):985-988.
17. Mohammed BS, Gorbo H, Adeyemi LB. 2014. Digital dermatoglyphics patterns of the Kanuri Ethnic Group of North Eastern Nigeria. Int. J. Inn. App. Sc.,2014. 9(2):985-988.
18. Nanni L, Lumini A. 2009. Fusion of color spaces for ear authentication. Patt. Recog.,42: 1906-13.
19. National Population Commission (2006). Report of Nigeria's National Population Commission on the 2006 Census. Population and Development review. 33(1); 206-210.
20. Nitan K, Purnima K. 2011. Human Earprints: A Review. J Biomet Biostat., 2(5) 1-5.
21. Osterburg JW. 1982. The Crime laboratory: Case Studies of Scientific Criminal Investigations, second ed., Clark Boardman Company Ltd., New York, pp. 34–35.
22. Pasescu G, Tanislav E. 1997. Person identification on the basis of earprints in the activity of Bucharest Police Department, Info. Bull. SP/TM Examiners 3, 10–14.
23. Susan W, Wojceich B. 2016. Hot on the trials of genes that shape our fingerprints. J of Inv.Derm.,.136(4): 740-742.
24. Somsong N, Wibhu K, Kusuma C. 2013. An Exploration of Fingerprint Patterns and Their Concordance Among Thai Adolescents. Chiang Mai J. Sci., 40(3): 332-343.
25. Thomas KA, Olugbega OE, Gbenga E. 2009. Prevalence of Fingerprint Patterns in Multiple and Single Births Women of Igbo-Ora, Nigeria, West Africa. American Sci.Res.J of Eng.53(1):64-74.
26. Udoaka AI, Udoaka EG. 2009. Digital dermatoglyphics in Ijaw Students of University of Port Harcourt, Nigeria. Contin J. Biomed. Sc., 3:1-5.