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Comparative study of the digit ratio and hand pattern of the Ogoni and Ikwerre ethnic groups in Rivers state, Nigeria

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Abstract

Background: This study compares the hand patterns and 2D:4D digit ratios (Index finger length divided by ring finger length) of the Ikwerre and Ogoni ethnic groups in Rivers State, Nigeria, documenting their finger measurements and prevalence of specific hand characteristics.

Methods: In this cross-sectional descriptive study, 1,925 participants, ranging in age from 15 to 60, were gathered through a straightforward random sampling method. Their index finger (2D) and ring finger (4D) lengths were measured from the basal crease to the tip using a Digital Vernier Caliper. The 2D:4D ratios were then calculated for each subject on both hands. Based on the digit ratios, the overall hand patterns were evaluated, categorized as A, B, and C types, and then examined. IBM SPSS version 24.0 was employed for the data analysis. Statistical significance was defined as a P-Value <0.05 and a 95% confidence level.

Results: The findings showed that the digit ratios of male and female Ikwerre subjects were 0.95±0.04 and 0.96±0.05, 0.97±0.08 and 0.98±0.05, respectively. The digit ratios for Ogoni males and females were 0.95±0.05 and 0.96±0.05, 0.97±0.05 and 0.97±0.05, respectively. Moreover, hand pattern A (2D<4D) showed a higher prevalence in both genders in both ethnic groups. Right hand (82.1% for Ikwerre and 80.5% for Ogoni) and left hand (74.5% for Ikwerre and 77.4% for Ogoni), followed by pattern C (2D>4D), right hand (17.5% for Ikwerre and 19.4% for Ogoni), and left hand (24.8% for Ikwerre and 22.3% for Ogoni). The least prevalent hand pattern was type B (2D=4D) for both genders across the ethnic groups.

Conclusion: The study demonstrates that both Ikwerre and Ogoni groups have similar digit ratios, with hand pattern A being the most common, pattern C less common, and pattern B rare, showing consistent hand characteristics between the two ethnicities.

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Highlights

What is current knowledge?

Previous research has demonstrated that the 2D:4D digit ratio displays marked sexual dimorphism and that significant variations in digit ratios and hand pattern distributions exist among different ethnic populations.

What is new here?

This study presents the first comparative assessment of digit ratios and hand patterns between the Ikwerre and Ogoni ethnic groups, Nigeria, confirming sexual dimorphism in both populations, with no significant inter-ethnic difference, while identifying Type A as the predominant hand pattern in both groups.

Introduction

The ratio of a hand's various digits or fingers is known as the "digit ratio," and its study has historically been regarded as pseudoscience. It is calculated by dividing the length of a hand's index finger by the length of its ring finger, the 2D:4D ratio is the most studied digit ratio. The shape of the palm and fingers when they are adducted is referred to as the hand pattern (1-3). The length of the digits is measured from the middle of the bottom crease to the fingertip (4). The male pattern, also referred to as the "A" pattern, occurs when the ratio is less than one, indicating that the ring finger is longer than the index finger. The female pattern, or "C" pattern, is when the index finger is longer than the ring finger; this ratio is greater than one. The pattern is known as a "B" pattern and can occur in both sexes when the lengths of the two fingers are equal (Ratio equal to one). According to several studies, male or female hand patterns are thought to result from prenatal exposure to either testosterone or estrogen (5).

Individuals' gender and race are the two most important factors that influence hand patterns, according to previous research documentation on hand patterns and digit ratios (6). Women have a higher value than men in the sexually dimorphic 2D:4D ratio. Men typically have a digit ratio of 0.96, whereas women typically have a digit ratio of 1.0. This indicates that the length of the index and ring fingers is nearly equal in females (6-11). It has been demonstrated that a low 2D:4D ratio is associated with high testosterone levels, which are typical of men, whereas a high 2D:4D ratio is associated with low testosterone levels, which are characteristic of women. The sexual difference in the digit ratio (2D:4D) is generally fixed in utero between the 13th and 14th weeks of gestation, and influenced by the prenatal secretion of testosterone and estrogen and then present in newborns. It is genetically regulated by HOX genes, which also regulate urogenital system differentiation. As a result, it may have an indirect impact on the development of the digits and the production of testicular androgen during pregnancy. Over time, an individual's 2D:4D ratio stays largely constant (6,12-15). Manning et al. (8) proposed that the 2D:4D ratio is unstable and only stabilizes after two years of age. Other population and longitudinal studies have discovered that an individuals' 2D:4D digit ratios increase with age (16). Hand patterns and the 2D:4D ratio have a direct correlation with a number of human phenotypic characteristics (Autism, physical aggression) in the medical field, special abilities (Soccer ability, musical ability), fertility, health conditions (Breast cancer, congenital adrenal hyperplasia) and behavioral skills (6,17-22).

Research conducted by experts has demonstrated that digit ratios and hand patterns may differ among various ethnic and racial groups (6,23). The Ikwerre and Ogoni are two distinct ethnic groups situated in Rivers State, South-Southern Nigeria. Despite this, there is currently no comparative research examining the digit ratios and hand patterns of these two ethnic groups. This study is designed to address this gap and

aims to provide a comprehensive comparison and documentation of the relationship between digit ratios (2D:4D) and hand patterns between the Ogoni and Ikwerre ethnic groups in Rivers State, Nigeria.

Methods

This study employed a cross-sectional descriptive design in Rivers State, Nigeria, with a specific focus on the Ikwerre and Ogoni ethnic groups. This study was approved by the Research Ethics Committee of the University of Port Harcourt (UPH/CEREMAD/REC/MM71/008). A total of 1,925 subjects between the ages of 15 and 60 years were recruited using a simple random sampling technique. The participants gave informed consent and were voluntarily recruited for the study. Those having any form of hand deformity were excluded from the study.

The index finger (2D) and ring finger (4D) lengths were measured from the basal crease to the tips using a Digital Vernier Caliper. Participants wearing rings were asked to remove their finger rings before taking measurements. The patterns were assessed and grouped based on the digit ratios as A (The ring finger is longer than the index finger), B (When both fingers are equal in length), and C (The index finger is longer than the ring finger) types. The 2D:4D ratios were then calculated for each subject on both hands. All data obtained were segregated according to gender and ethnicity.

Data were analyzed using SPSS version 24.0. Gender and ethnic differences were determined using the independent sample T-test, while side differences were determined using paired sample T-test. In addition, gender and ethnic differences in hand patterns were determined using the Chi-square (χ^2) test of association. The confidence interval was set at 95% and statistical significance level was set at 0.05

Results

A total of 1,925 subjects were involved in the study, of which 1,010 (52%) were from Ogoni group, while 915 (48%) were from the Ikwerre ethnic group. In the distribution of the subjects according to gender and ethnicity, Ikwerre males were more (460, accounting for 50.27%) than females (455 [49.73%]) in the study, compared to the Ogonis, where there were more females (515 [50.99%]) than males (495 [49.01%]).

The male Ikwerre subjects had a digit ratio of 0.95±0.04 and 0.96±0.05 on the right and left, respectively. This is a normal masculine digit ratio (5). A digit ratio of 0.97±0.08 (Right) and 0.98±0.05 (Left) was observed in the female Ikwerre subjects. The females were observed to have a higher digit ratio than the males (Table 1).

Table 2 explains the descriptive statistics of the Ogoni study group's digit lengths and digit ratios. The digit ratios of both right and left hands for the male Ogoni groups were 0.95±0.05 and 0.96±0.05, respectively. The digit ratios of both right and left hands for the female Ogoni groups were 0.97±0.05 and 0.97±0.05, respectively. The female Ogoni subjects were observed to have higher digit ratios than the males.

In both Ikwerre and Ogoni groups, the Digit Ratio of 2D:4D, the Second Digit Length (2D), and the Fourth Digit Length (4D) were significant in relation to gender, according to the T-test results (Table 3).

Additionally, the Right 2D-Left 2D and Right 2D:4D-Left 2D:4D in Ikwerre ethnicity were statistically significant in both males and females, according to the paired sample T-test (Table 4).

The Ogoni male population's Right 2D-Left 2D, Right 4D-Left 4D, and Right 2D:4D-Left 2D:4D were all statistically significant, while the Ogoni female population's Right 4D-Left 4D parameter was not (Table 5).

Table 6 shows the results based on ethnic differences between Ikwerre and Ogoni males concerning digit lengths and digit ratios. Significant differences were observed in the digit lengths of both hands. No significant difference was seen in the digit ratio (t = -0.01; P-Value = 0.99) and (t = 0.83; P-Value = 0.41) of right and left hands, respectively.

However, in the female category in Table 7, parameters such as left 4D length (t = -2.58; P-Value = 0.01) and left 2D:4D (t = 3.19; P-Value < 0.001) showed significant ethnic differences between Ikwerre and Ogoni groups.

There is a difference in the pattern between the two genders (Table 8) (Right (x^2 = 33.29; P-Value < 0.001), and Left (x^2 = 32.59; P-Value < 0.001)) of Ikwerre subjects. Pattern A was predominant in both hands (Right [A = 82.1%], and Left [74.5%]), followed by C (Right [A = 17.5%], and Left [24.8%]) and B (Right [A = 0.4%], and Left [0.7%]) was the least observed pattern.

Table 1. Descriptive statistics of digit length and ratio of the Ikwerre ethnic group

Digit parameters	Male [n = 460]			Female [n = 455]			Total [n=915]		
	Min	Max	Mean± SD	Min	Max	Mean± SD	Min	Max	Mean± SD
Right digit									
2D	56.99	96.80	71.74±5.33	58.96	85.09	68.93±4.56	56.99	96.80	70.34±5.16
4D	57.05	89.77	75.49±5.48	59.86	87.20	71.11±4.71	57.05	89.77	73.31±5.56
2D:4D	0.67	1.10	0.95±0.04	0.02	1.13	0.97±0.08	0.02	1.13	0.96±0.06
Left digit									
2D	57.30	84.91	72.46±5.43	59.99	83.98	69.50±4.52	57.30	84.91	70.98±5.21
4D	46.45	92.29	75.71±5.65	45.78	88.79	71.09±5.00	45.78	92.29	73.41±5.81
2D:4D	0.82	1.45	0.96±0.05	0.79	1.49	0.98±0.05	0.79	1.49	0.97±0.05

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, N = Number of subjects, Min = Minimum, Max = Maximum, SD = Standard Deviation

Table 2. Descriptive statistics of digit length and ratio of the Ogoni ethnic group

Digit parameters	Male [n = 495]			Female [n = 515]			Total [n=1010]		
	Min	Max	Mean± SD	Min	Max	Mean± SD	Min	Max	Mean± SD
Right digit									
2D	55.91	91.91	73.12±5.06	56.93	83.64	69.01±4.47	55.91	91.91	71.03±5.19
4D	61.99	96.30	77.10±5.46	59.35	89.51	71.38±4.90	59.35	96.30	74.18±5.92
2D:4D	0.78	1.13	0.95±0.05	0.77	1.21	0.97±0.05	0.77	1.21	0.96±0.05
Left digit									
2D	58.07	97.97	74.08±5.25	56.93	86.88	69.57±4.45	56.93	97.97	71.78±5.35
4D	60.49	99.03	77.63±5.70	57.94	88.80	71.91±4.90	57.94	99.03	74.71±6.03
2D:4D	0.81	1.12	0.96±0.05	0.85	1.13	0.97±0.05	0.81	1.13	0.96±0.05

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, N = Number of subjects, Min = Minimum, Max = Maximum, SD = Standard Deviation

There is a difference in the pattern between the two genders (Right (x^2 = 25.56; p <0.001), and Left (x^2 = 15.05; p <0.001)) of the Ogoni subjects. Just like in the Ikwerre subjects, pattern A was predominant in both hands (Right [A = 80.5%], and Left [77.4%]), followed by C (Right [A = 19.4%], and Left [22.3%]) and B (Right [A = 0.1%], and Left [0.3%]) was the least observed pattern.

The results of Chi-square test showed the association for gender-ethnic differences in the hand patterns of Ikwerre and Ogoni male subjects, which was not statistically significant (P-value >0.05). Ethnic differences were not observed in the hand patterns between Ikwerre and Ogoni males. In addition, Ikwerre and Ogoni females did not show ethnic differences in the hand patterns.

Table 3. Independent sample T-test for gender differences in the digit length and ratio of the Ikwerre and Ogoni ethnic groups

Digit parameters		MD	SEMD	95% CI of the difference		df	T	P-value
				Lower	Upper			
Ikwerre	**Right digit**							
	2D	2.82	0.33	2.17	3.46	894.22	8.58	< 0.001
	4D	4.39	0.34	3.73	5.05	895.47	12.99	< 0.001
	2D:4D	-0.02	0.00	-0.02	-0.01	714.93	-3.90	< 0.001
	Left digit							
	2D	2.96	0.33	2.31	3.61	887.36	8.96	< 0.001
	4D	4.62	0.35	3.93	5.32	901.97	13.12	< 0.001
	2D:4D	-0.02	0.00	-0.03	-0.01	899.45	-6.21	< 0.001
Ogoni	**Right digit**							
	2D	4.11	0.30	3.52	4.70	981.52	13.66	< 0.001
	4D	5.72	0.33	5.08	6.37	986.63	17.52	< 0.001
	2D:4D	-0.02	0.00	-0.02	-0.01	1008.00	-6.16	< 0.001
	Left digit							
	2D	4.51	0.31	3.91	5.11	968.50	14.70	< 0.001
	4D	5.72	0.34	5.06	6.37	973.04	17.06	< 0.001
	2D:4D	-0.01	0.00	-0.02	-0.01	1008.00	-4.40	< 0.001

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, MD = Mean Difference, SEMD = Standard Error of Mean Difference, CI = Confidence Interval, df = Degree of freedom

Table 4. Paired sample T-test for side differences in the digit length and ratio of Ikwerre male and female subjects

Comparison		Paired differences				Paired T-test		
		MD	SEMD	95% CI of the difference		df	T	P-Value
				Lower	Upper			
Male	Right 2D - Left 2D	-0.71	0.12	-0.96	-0.47	459.00	-5.75	< 0.001
	Right 4D - Left 4D	-0.22	0.14	-0.49	0.05	459.00	-1.61	0.11
	Right 2D:4D - Left 2D:4D	-0.01	0.00	-0.01	0.00	459.00	-3.40	< 0.001
Female	Right 2D - Left 2D	-0.57	0.11	-0.79	-0.35	454.00	-5.07	< 0.001
	Right 4D - Left 4D	0.02	0.14	-0.26	0.29	454.00	0.12	0.91
	Right 2D:4D - Left 2D:4D	-0.01	0.00	-0.02	-0.01	454.00	-3.59	< 0.001

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, MD = Mean Difference, SEMD = Standard Error of Mean Difference, CI = Confidence Interval, df = Degree of freedom

Table 5. Paired sample T-test for side differences in the digit length and ratio of Ogoni male and female subjects

Comparison		Paired differences				df	T	P-value
		MD	SEMD	95% CI of the difference				
				Lower	Upper			
Male	Right 2D - Left 2D	-0.96	0.13	-1.21	-0.70	494.00	-7.34	< 0.001
	Right 4D - Left 4D	-0.53	0.12	-0.76	-0.29	494.00	-4.38	< 0.001
	Right 2D:4D - Left 2D:4D	-0.01	0.00	-0.01	0.00	494.00	-2.95	< 0.001
Female	Right 2D - Left 2D	-0.56	0.11	-0.78	-0.33	514.00	-4.94	< 0.001
	Right 4D - Left 4D	-0.53	0.12	-0.78	-0.29	514.00	-4.29	< 0.001
	Right 2D:4D - Left 2D:4D	0.00	0.00	0.00	0.00	514.00	-0.19	0.85

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, MD = Mean Difference, SEMD = Standard Error of Mean Difference, CI = Confidence Interval, df = Degree of freedom

Table 6. Independent sample T-test for ethnic differences in the digit length and ratio of Ikwerre and Ogoni male subjects

Parameters	Ethnicity	N	Min	Max	Mean± SD	*T*-test		
						df	*t*	P-Value
Age	Ikwerre	460	15.00	61.00	20.01±10.46	770.04	3.55	< 0.001
	Ogoni	495	15.00	56.00	17.98±6.68			
Right 2D	Ikwerre	460	56.99	96.80	71.74±5.33	953.00	-4.10	< 0.001
	Ogoni	495	55.91	91.91	73.12±5.06			
Right 4D	Ikwerre	460	57.05	89.77	75.49±5.48	953.00	-4.54	< 0.001
	Ogoni	495	61.99	96.30	77.10±5.46			
Right 2D:4D	Ikwerre	460	0.67	1.10	0.95±0.04	953.00	-0.01	0.99
	Ogoni	495	0.78	1.13	0.95±0.05			
Left 2D	Ikwerre	460	57.30	84.91	72.46±5.43	953.00	-4.69	< 0.001
	Ogoni	495	58.07	97.97	74.08±5.25			
Left 4D	Ikwerre	460	46.45	92.29	75.71±5.65	953.00	-5.21	< 0.001
	Ogoni	495	60.49	99.03	77.63±5.70			
Left 2D:4D	Ikwerre	460	0.82	1.45	0.96±0.05	953.00	0.83	0.41
	Ogoni	495	0.81	1.12	0.96±0.05			

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D = Digit Ratio, N = Number of subjects, Min = Minimum, Max = Maximum, SD = Standard Deviation

Table 7. Independent sample T-test for ethnic differences in the digit length and ratio of Ikwerre and Ogoni female subjects

Parameters	Ethnicity	N	Min	Max	Mean± SD	T-test		
						Df	*T*	P-Value
Age	Ikwerre	455	14.00	58.00	18.16±7.82	4.12	968.00	< 0.001
	Ogoni	515	14.00	56.00	16.56±3.74			
Right 2D	Ikwerre	455	58.96	85.09	68.93±4.56	-0.29	968.00	0.77
	Ogoni	515	56.93	83.64	69.01±4.47			
Right 4D	Ikwerre	455	59.86	87.20	71.11±4.71	-0.88	968.00	0.38
	Ogoni	515	59.35	89.51	71.38±4.90			
Right 2D:4D	Ikwerre	455	0.02	1.13	0.97±0.08	-0.55	968.00	0.58
	Ogoni	51	0.77	1.21	0.97±0.05			
Left 2D	Ikwerre	455	59.99	83.98	69.50±4.52	-0.24	968.00	0.81
	Ogoni	515	56.93	86.88	69.57±4.45			
Left 4D	Ikwerre	455	45.78	88.79	71.09±5.00	-2.58	968.00	0.01*
	Ogoni	515	57.94	88.80	71.91±4.90			
Left 2D:4D	Ikwerre	455	0.79	1.49	0.98±0.05	3.19	968.00	< 0.001
	Ogoni	515	0.85	1.13	0.97±0.05			

2D = Second Digit length, 4D = Fourth Digit length, 2D:4D= Digit Ratio, N = Number of subjects, Min = Minimum, Max = Maximum, SD = Standard Deviation

Table 8. Chi-square test of association for gender differences in hand patterns between Ikwerre and Ogoni groups

Gender		Hand pattern			N (%)	Chi-square		
		A (%)	B (%)	C (%)		df	x^2	P-Value
Ikwerre subjects	**Right hand**							
	Male	411 (89.3)	1 (0.2)	48 (10.4)	460 (50.3)	2	33.29	< 0.001
	Female	340 (74.7)	3 (0.7)	112 (24.6)	455 (49.7)			
	Left hand							
	Male	379 (82.4)	4 (0.9)	77 (16.7)	460 (50.3)	2	32.59	< 0.001
	Female	303 (66.6)	2 (0.4)	150 (33.0)	455 (49.7)			
Ogoni subjects	**Right hand**							
	Male	430 (86.9)	0 (0.0)	65 (13.1)	495 (49.0)	2	25.56	< 0.001
	Female	383 (74.4)	1 (0.2)	131 (25.4)	515 (51.0)			
	Left hand							
	Male	409 (82.6)	1 (0.2)	85 (17.2)	495 (49.0)	2	15.05	< 0.001
	Female	373 (72.4)	2 (0.4)	140 (27.2)	515 (51.0)			

A = (2D < 4D), B = (2D = 4D), C = (2D > 4D), N = Number of Subjects, df = Degree of freedom, X^2 = Chi-square

Discussion

The present study evaluated the comparative analysis of digit ratios and hand patterns of Ikwerre and Ogoni ethnic groups of the Southern Nigerian population. There is adequate literature on digit ratios concerning 2D (Second digit) and 4D (Fourth digit) in the various Nigerian populations (11,23-25). However, none of these studies evaluated the digit ratio and hand patterns of the Ikwerre and Ogoni ethnic groups. In addition, previous studies have evaluated the relationship between the 2D:4D ratio and biological factors such as prenatal testosterone or estrogen, birth weight, metabolic syndrome, cardiovascular diseases, vitiligo, etc. (5,26-28). Some reports have depicted that the morphological and anthropometric relationships existing between different parts of the body, as well as between genders, ethnicity, and race, have been of great interest to forensic anthropologists due to the increase in cases of mass disasters, crimes, homicides and other causes of fatal catastrophes (29,30).

The reports of previous studies done by researchers on digit ratio suggest that the digit ratio of a male is lower compared to a female, even of the same ethnic and racial population (6-11). This is in agreement with the result of the present study, Tables 1-2 revealed that the digit ratios of Ikwerre and Ogoni male subjects were lower compared to females of both ethnic groups. This observation has been maintained across various Nigerian ethnic groups, as well as other racial populations (11,23-25,31,32). The study conducted by Nayak et al. (1) showed that the mean right 2D:4D ratio was higher compared to the mean left 2D:4D ratio in their male subjects. This was in contrast to the results of the present study. However, the results in their female category are in agreement with those of the present study, which showed the mean right 2D:4D ratio was significantly lower than the mean left 2D:4D ratio.

As shown in Table 1, the digit ratios of both right and left hands for the male and female Ikwerre groups were 0.95±0.04 and 0.96±0.05, and 0.97±0.08 and 0.98±0.05, respectively. Similarly, Table 2 shows the digit ratios of both right and left hands for the male and female Ogoni groups, which were 0.95±0.05 and 0.96±0.05, and 0.97±0.05 and 0.97±0.05, respectively. In previous studies on Nigerian subjects, morphometric variations in digit ratios have been recorded across different ethnic groups. The Igbo males were reported to have a mean value of 0.96 ± 0.02, while the females had a mean of 1.0 ± 0.06; the Urhobos: Males = 0.96 ± 0.02, Females = 1.0 ± 0.02 (23). As for the Ikwerres in a previous study done by Gwunireama and Ihemelandu (24), their males had mean right and left 2D:4D values of 0.96 ± 0.003 and 0.96± 0.002, respectively, while the females had a right and left mean 2D:4D value of 1.0 ± 0.001 and 1.0 ± 0.005, respectively. The male category of the Andoni ethnic group had a right and left 2D:4D of 0.95± 0.002 and 0.95 ± 0.002, while the females had 0.96± 0.002 (Right hand) and 0.96 ± 0.002 (Left hand), respectively. In all reports, in addition to the present study, it is observed that females have a higher digit ratio (2D:4D) than males. The sexual dimorphism on the digit ratio in the subjects of this study summarized in Tables 3-8 was statistically significant (P-value <0.05). The same observations were made in a study by Gwuanireama et al. (11) on the digit ratio of the Andoni (Obolo) group of Ijaw ethnic nationality. The consistency in this observation buttresses the point suggested by Manning (6) that differences in the digit ratios are caused by variability in hormonal secretions between males and females. The testosterone secretion levels in male subjects had a negative relationship with their 2D:4D values, in contrast to that of estrogen secretion levels, having a slightly positive relationship with 2D:4D values in their female subjects. A window for exposure to androgens, especially testosterone, during pregnancy can be found in the sexually dimorphic digit ratio (6,33).

This study showed that there were no significant ethnic differences in digit ratios (2D:4D) between the Ikwerre and Ogoni males. However, in the female category, the left 2D:4D showed significant ethnic differences between Ikwerre and Ogoni subjects; there were no significant differences in the right. In a related study done by Gwunireama and Ihemelandu (24) on Ikwerre and Andoni ethnic subjects in a southern Nigerian population, significant ethnic differences were observed in the same geographic area attributd to the digit ratio, which was discovered to be an inherited trait from the ancestral origins. However, the present study agrees with Manning et al. (34), who stated that location has an impact on 2D:4D.

In the present study, the hand patterns were categorized into three types: Type A (2D < 4D), Type B (2D = 4D), and Type C (2D > 4D). The results of this study showed that hand pattern Type A (2D < 4D) was the most prevalent in all sexes in both ethnic groups at the right hands and left hands. The next prevalent hand pattern was Type C (2D > 4D) in all genderes in both ethnic groups at the right hand and left hand. The least prevalent hand pattern was Type B (2D = 4D) in both genders across the ethnic groups, at the right hand and left hand. Nayak et al. (1) analyzed the hand patterns in selected ethnic groups in Malaysia. They noted that Type A was more prevalent compared to others, which is in strong agreement with the results of the present study. Furthermore, a study reported by Al-Qattan et al. (35) on variations in hand patterns among Saudi medical students noted that hand pattern Type A was significantly higher in males and Type C was significantly higher in females. The observation in the male category was in agreement with the present study. However, the female observation does not agree with the present study; this may be a result of the racial differences (35).

Conclusion

The findings of this study show that the 2D:4D ratios of the male and female members of the Ogoni and Ikwerre ethnic groups differ significantly. Females tend to have a higher value in this ratio. However, no significant differences in the digit ratio (2D:4D) were observed between the Ikwerre and Ogoni males and females. Hand pattern A was the most common in both ethnic groups for both genders, followed by pattern C, while pattern B was the least observed. There were no significant differences in hand patterns between the two ethnic groups, suggesting a close ancestral relationship. The findings of this study can be used as a foundation for exploring potential correlations with various physiological, psychological, and behavioral traits among the Ikwerre and Ogoni ethnic groups in Nigeria. Additionally, a solid understanding of digit ratios and hand patterns can serve as a useful tool in identifying gender differences for forensic investigations.

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Ethical statement

This study was approved by the Research Ethics Committee of the University of Port Harcourt (UPH/CEREMAD/REC/MM71/008).

Conflicts of interest

The authors declare no conflict of interest.

Author contributions

They all contributed to various components of the study, including research design, data collection and analysis, initial and final manuscript drafting. All authors read and approved the final manuscript.

Data availability statement

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request

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