Journal of Morphological Sciences
J Morphol Sci
Brazilian Society of Anatomy

Original Article
J Morphol Sci 2021;38:372-381

Palmar Crease Variations and Total Degree of Transversality Among Two Ethnic Groups In Southern Nigeria.

Jaiyeoba-Ojigho Jennifer Efe,[1] Ominde Beryl Shitandi,[1] Okolie Ikechukwu Emmanuel,[1] Igbigbi Patrick Sunday[1]

[1]Department of Human Anatomy and Cell Biology, Delta State University Abraka, Nigeria

Disclose and conflicts of interest: none to be declared by all authors

ABSTRACT

Introduction: Palmar creases are useful in diagnostic medicine and their variations have been useful parameters to cultural, physical and forensic anthropologists. In this regards, the knowledge of the normal palmar creases and their variations in a given population is important. This study therefore aimed at qualitatively and quantitatively investigating the palmar flexion creases and their variants.

Material and Methods: An improved method was used to capture the palmar creases with the aid of a Hewlett placard G4010 scanner. A total of 120 volunteers (240 palms) comprising of 60 Urhobos and 60 Itsekiris were investigated. Chi-square was used to test association for non-parametric variables.T-test was used to compare T-DOT parameters among tribes.

Results: Findings showed that Lines A and C were present on all palms while there was a reduction in frequency for Lines D to O in the studied populations. Lines E and F were found only among the Urhobos' while G and L were found only among the Itsekiris'. Simian crease was seen in 5.00% of the participants while Suwon and Sydney lines were not found. Sexual dimorphism was observed in Lines D and O among the Urhobos' and Itsekiris' respectively (p=0.006;0.016). Sexual dimorphism was also seen in T-DOT among the Itsekiris' (1.83 + 0.39,1.59 + 0.15; t=3.233; p=0.002). Simian crease showed significantly higher T-DOT than normal creases (t=59.222; p=000).

Conclusion: Simian crease was present among healthy Itsekiris indicating that its' presence may not be a definite indicator for some genetic conditions such as Down's syndrome.

Keywords: Palmar crease; Itsekiri; Urhobo; Delta State.

Introduction

Palmar creases form a largely recognized unit in the field of dermatoglyphics and play a vital role in the non-invasive diagnosis of certain medical conditions.[1]Several authors defined them as epidermal lines that give rise to usual or unusual patterns on the palmar facet of the hand.[2] The usual patterns were reported as the major creases and they were termed the radial longitudinal crease (RLC), proximal transverse crease (PTC) and distal transverse crease (DTC).[3-4] Milton[5] and Cummins[6] described these creases as Line A,B and C. Their connections and branching (bifurcation, forked and accessory) produce variations on the surface of the palms.[3] The unusual patterns reported are the Simian, Suwon and Sydney creases alongside other variants.[7-11] The presence of these creases have been strongly associated with mental, psychological and chromosomal aberrations.[7-8] The Simian crease has been described as a transverse crease that originates from the joining of PTC and DTC and it crosses the entire breadth of the palm, with DTC appearing normal.Simian crease has been correlated with chromosome 9 mutation as well as Poland, Down's and Robinow syndromes. Sydney crease on the other hand has been associated with mental retardation.[7-11]

Palmar creases can be identified at birth during perinatal examination for congenital malformations.[2] They can also be used in the identification of individuals and races based on the many variants of palmar creases documented among individuals from different ethnic groups.[1] According to Narendra *et al.* palmar creases can reveal anthropological features of different ethnic groups.[2] Their findings were consistent with those of Dar *et al.* who discovered differences in the palmar creases among the Caucasians and Negrods.[9] This could be based on the fact that palmar creases start developing at the end of the second trimester during intrauterine life and they further remain unchanged throughout life.[10-12] Nevertheless, there could be deviations from the normal creases because it has been established that creases are determined by the association of genetic and environmental constituents.[12] However, the appearance of an abnormal crease occasionally found in healthy individuals may not connote an abnormality.[4]

They can also be studied from a quantitative aspect since it has been shown by Dar and Schmidt,[13] that qualitative analysis is not sufficient in describing the spectrum of variants of palmar crease disposition.[13]According to them, quantitative analysis which includes total degree of transversality of these creases have some clinical significance. Their study documented that individuals with a simian crease with or without Down's syndrome showed a higher degree of transversality compared with normal individuals. They further deduced that quantitative approach

DOI: 10.51929/jms.38.65a.2021
ISSN 2177-0298

gives an additional information towards evaluating the clinical importance of these creases in patients with medical and genetic disorders. [13]

In order to be objective, we decided to investigate palmar creases and their variants both qualitatively and quantitatively, because the incorporation of both approaches has not been documented on any ethnic group in Nigeria. Similarly, we are also suggesting that this may give a more accurate result. Few studies in Nigeria have reported the qualitative features of palmar creases.[1,4] This study therefore, focused on the Urhobo and Itsekiri people who are resident in Delta State, Nigeria. Qualitative findings will be useful to cultural, physical and forensic anthropologists and will also create a baseline data for the Urhobo and Itsekiri people of Delta State while quantitative findings will provide additional information in diagnostic medicine.

Materials and Methods

The study was a cross-sectional study which involved participants from the Urhobo and Itesekiri ethnic groups of Delta State. The State is one of the provinces in Nigeria, situated in a geopolitical zone termed South South. The Urhobos and Itsekiris are some of the tribes that predominantly inhabit this State with historians documenting that they have a common ancestry which dates back to the ancient Benin Kingdom of Nigeria.[14]

Convenience and simple random sampling was used while the sample size formula for prevalence studies by Naing *et al*. was adopted for this study.[15] The precision value was 5% with a 95% confidence interval. The total population studied was 120 (240 palms) which comprised of 30 males and 30 females each from the respective tribes. Prior to this investigation, Ethical approval was obtained from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, Delta State University, Abraka, Nigeria (DELSU/CHS/ANA/18/09). Only healthy individuals were recruited for the study while those with hand deformities or one form of medical disorders were excluded. Participants were also 18years and above and were mainly from the Urhobo or Itsekiri ethnic groups.

The method of obtaining palmar prints was adopted from Jaiyeoba-Ojigho *et al*.[16] Palmar prints were obtained with a Hewlett placard G4010 photoscanner connected to a Hewlett placard laptop via a USB cord.[16] The source of light was an inverter which was connected to a rechargeable battery.[17] Participants were instructed to place both palms on the scanner in order to capture the palmar creases. The creases were further magnified with the aid of the zooming tool on the Hewlett placard laptop. Qualitative analysis of the creases was done by observing the zoomed prints which were classified according to those of Milton and Cummins while variants were classified according to Adetona *et al*.[1,5] (Figs.1-9).

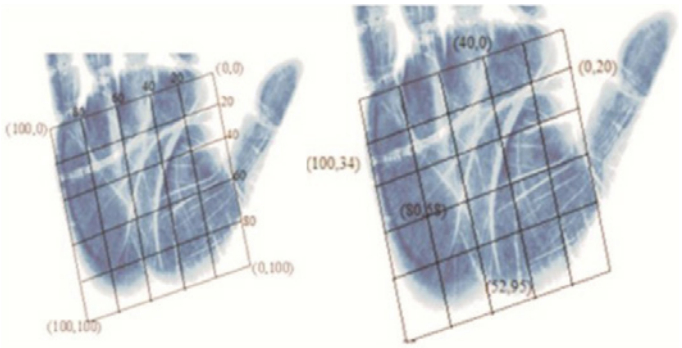

Figure 1. 1a,b: (a) palm illustrating X and Y coordinate (b) X and Y coordinates of radial longitudinal (I), proximal transverse (II), distal transverse crease (III), and total degree of transversality (T-DoT). T-DoT=(the sum of X-axis distances of I, II, III)/(the sum of Y-axis distances of I, II, III). A grid drawn on the palm in the manner that the zero point (0, 0) of the grid is drawn on the distal and radial end of the palm, and the X-axis end point (100, 0) of the grid is drawn on the distal and ulnar end of the palm (A). An example of X and Y coordinates in normal crease. T-DoT=(52+80+60)/(75+38+34)

Figure 2. This Diagram shows all six palmar crease which are indicated as Line A (Radial longitudinal line), Line B (Proximal transverse line), Line C (Distal transverse line), Line D (Middle longitudinal line), Line E (Ring finger crease), Line F (Little finger crease).

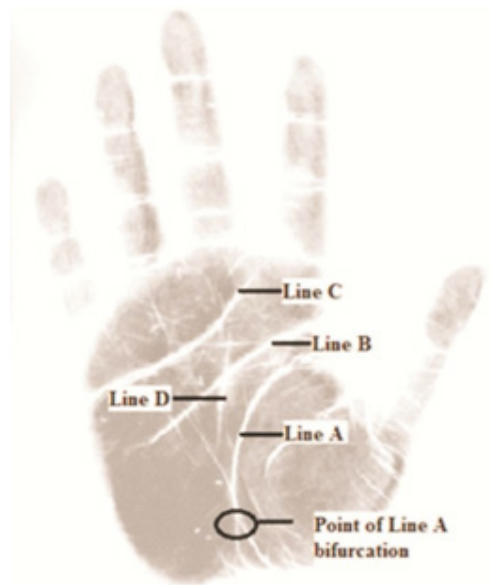

Figure 3. Lines A, B, C, and D with cascades alongside showing bifurcation of line a close to distal wrist crease.

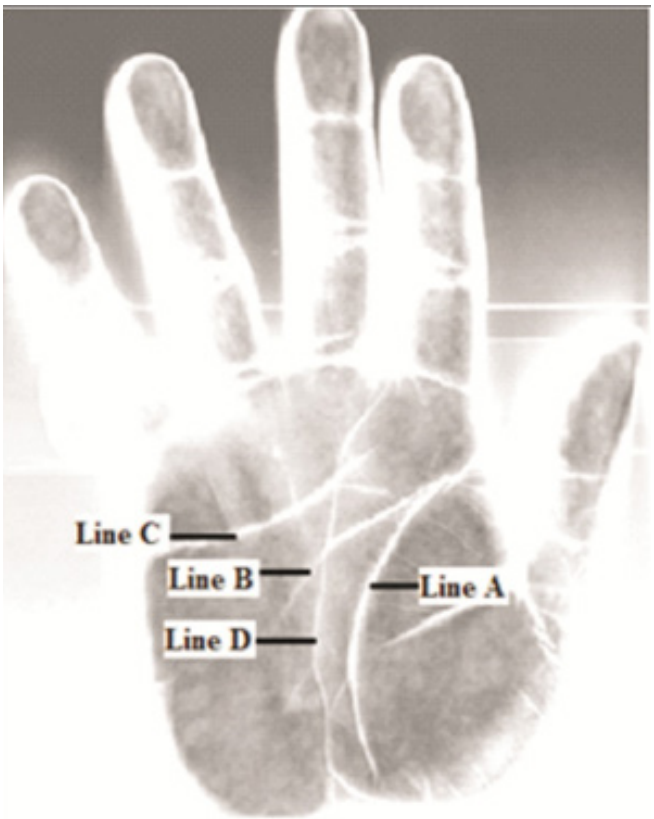

Figure 4. Lines A, B, C, D arranged in letter 'M'.

Figure 6. Extra line on the thenar eminence.

Figure 5. Palm showing Simian crease.

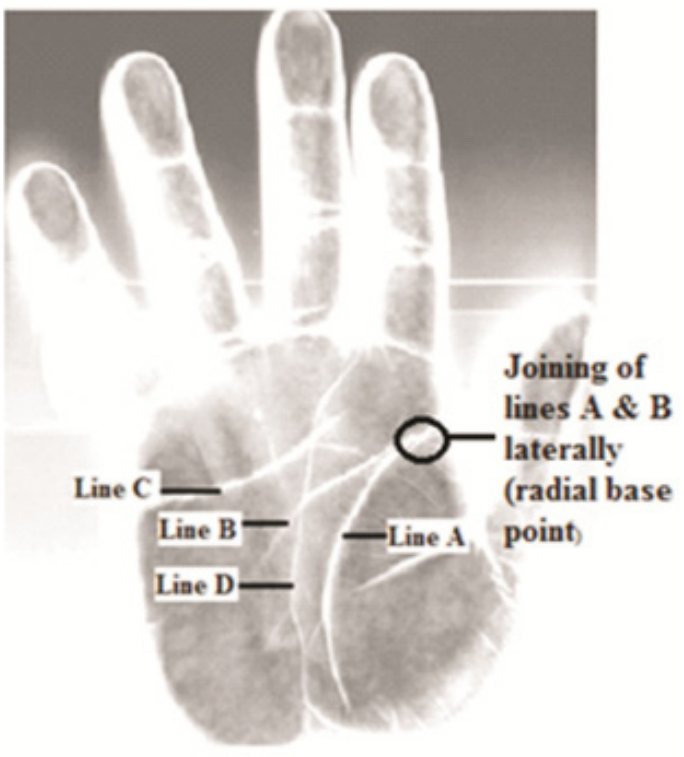

Figure 7. This illustration shows a palm having the. joining of line A & B laterally(radial base point).

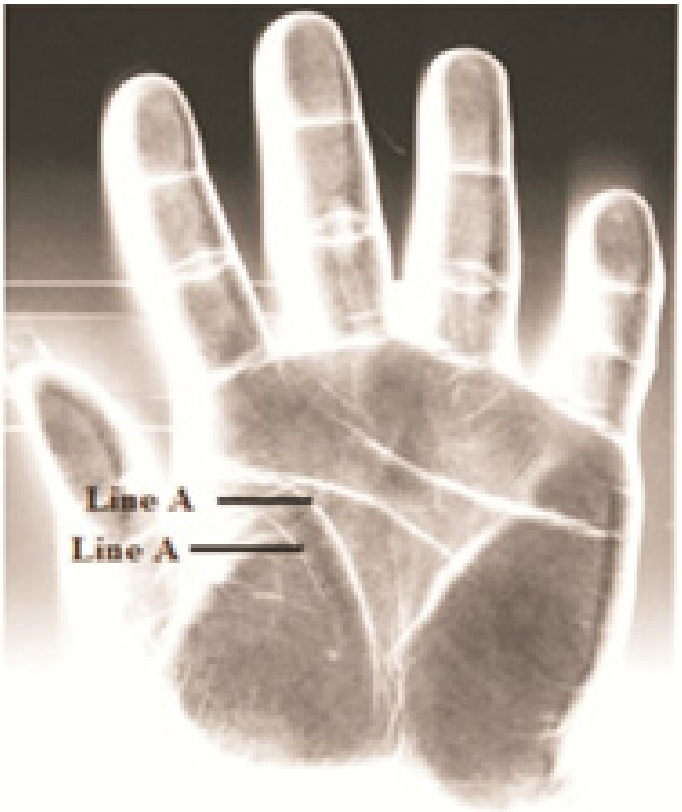

Figure 8. This diagram shows the palm having Palmer crease variant of double Line A.

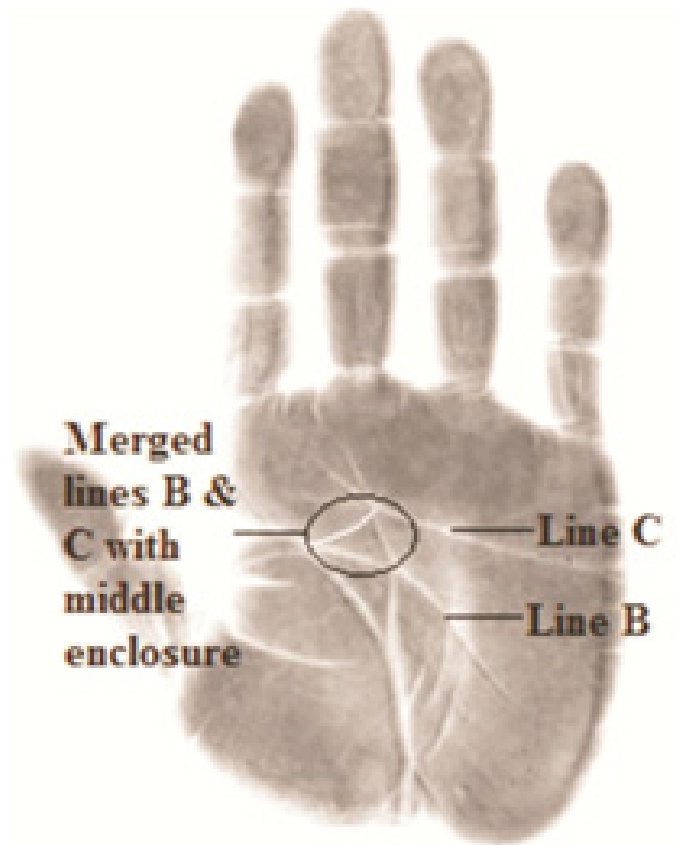

Figure 9. This illustration shows a palm having the a middle enclosure formed by the merging of line B & Line C.

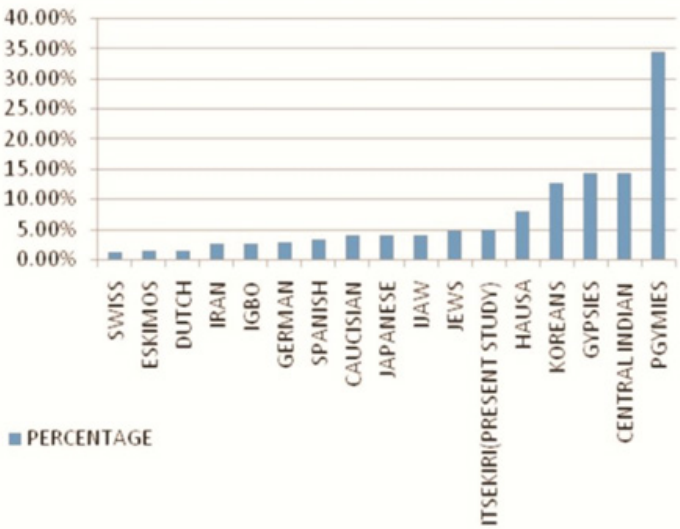

Figure 10. Comparison of simian crease in the study and other population.

The major creases termed the radial longitudinal crease (RLC), proximal transverse crease (PTC) and distal transverse crease (DTC) were identified based on their source of origin from the radial part of the palm and were classified as Lines A, B and C. Lines D, E, F and G were interpreted as middle longitudinal, ring finger, little finger and ulnar longitudinal creases respectively. Other variants were translated as Lines H, I, J, K, L, M, N and O which were transcribed as Extra creases located on the thenar eminence, Numerous Criss-Crossing, Double A/B and M creases. Lines L, M, N, O were the simian creases, Proximal Bifurcation of the RLC (Line A), Merged PTC and DTC(Line B and C) with a central enclosure and Joined RTC and PTC (Line A and B) laterally (Figs. 1-9). We also compared compared simian crease in the studied population and other population (Fig 10)

Quantitative analysis was obtained from the total degree of transversality of the creases (T-DOT) with the aid of AutoCAD version 21. The T-DOT method was adopted from Dar and Schmidt and Park *et al.*[3,13] It was defined by Dar and Schmidt as the proportion of the transverse to longitudinal distance of a crease.

Data were represented in frequencies and tables to illustrate palmar creases and Chi-square test was used to compare non-parametric variables. A paired T test compared between right and left palms while unpaired T test compared between two independent groups. Statistical evaluation was done using SPSS Version 23.0 software. Significance was accepted at $p<0.05$.

Results

Qualitative analysis of Palmar creases and their variants

Table 1 shows that Line A was present in 100% of the right palms while Line C was observed on all the left palms (100%) of the population studied. We observed that 1.67% of Urhobos had Line E and F on their right palms while Line G was observed in 3.33% of Itsekiris.

Table 1. Distribution of Palmer Crease among the Urhobo and Itsekiri Ethnic Groups

Palmer Crease	Percentage Frequency			
Milton	Right Palms		Left Palms	
	Urhobo	Itsekiri	Urhobo	Itsekiri
Line A	60(100%)	60(100%)	60(100%)	60(100%)
Line B	60(100%)	60(100%)	59(98.33%)	59(98.33%)
Line C	60(100%)	60(100%)	60(100%)	60(100%)
Line D	34(56.6%)	48(80%)	31(51.67%)	43(71.67%)
Line E	1(1.67%)	0	0	0
Line F	1(1.67%)	0	4(6.67%)	0
Line G	0	2(3.33%)	0	0

Line F was seen only on the left palms of 6.67% of Urhobos.

We observed that lines D and J were seen on the right palms of 56.60%; 8.33% of Urhobos and 80%;20% of Itsekiris and on the left palms of 51.67%; 13.33% of Urhobos and 71.67%; 23.33% of Itsekiris (Tables 1 and 2). Further analysis revealed lines M and I on the right palms of 50%; 13.33% Urhobos and 38.33%; 11.67% Itsekiris while they were observed on the left palms of 30%; 28.33% Urhobos and 21.67%; 3.33% Itsekiris (Table 2). The table also presented Line L on 3.33% right palms and 1.67% left palms of the Itsekiris. Line H was more frequently seen on the right (10%) and left (5%) palms of Itsekiri and Urhobos correspondingly, while line K was more prevalent on the right palms of Urhobos (30%) as compared to the left palms of Itsekiri (31.67%) (Table 2).

Findings from Table 3 shows that among the Urhobos, 25% of males and 66.7% of females had line D at p< 0.05 while Table 4 depicts that among the Itsekiris, 70% of males and 48.3% of females had line O at p<0.05. Significant gender differences were observed in the distribution of line D (p=0.006) and line O (p=0.016) among the Urhobo and Itsekiri ethnic group respectively.

Quantitative analysis of Palmar creases and their variants

Findings from this study showed that the mean T-DOT of the right palms of the Urhobos was 2.14±1.50 while those of the Itsekiris was calculated as 1.99±0.45 (Table 5). Further analysis showed that the left palms of the Urhobos had a mean T-DOT of1.78±0.35 while those of the Itsekiris had a mean of 1.71±0.31 (Table 5). However the ethnic differences were not statistically significant on both palms (p=0.480, 0.220).

Table 6 shows that the Urhobo males had a tranversality of 1.99±0.32 and 1.80±0.30 on their right and left palms respectively. The study further showed that the females had a transversality of 2.28 ± 2.11 on their right palms and that of 1.77 ± 0.41 on their left palms. There was no significant gender differences in the mean T-DOT of the palmer creases among the Urhobos bilaterally (p=0.848,0.988).

Among the Itsekiris, the calculated mean transversality of the right and left palms were 2.08 ± 0.51 and 1.83±0.39 respectively in males and 1.90±0.39 and 1.59±0.15 respectively in their female counterparts (Table 7). Male participants with a simian crease from this same ethnic had a transversality of 2.67±0.06 on their right palms compared with 2.36±0.00 seen on their left palms. Among the Itsekiris, significant gender differences was observed in the mean T-DOT of the normal palmar creases of the left hand (p=0.002) (Table 7).

Table 2. Distribution of Variants Palmer Flexion Creases among the Urhobo and Itsekiri Ethnic Group

Variants Palmer Flexion Creases	Percentage Frequency			
	Right Palms		Left Palms	
	Urhobo	Itsekiri	Urhobo	Itsekiri
Line H	4(6.67%)	6(10.0%)	3(5.00%)	2(3.33%)
Line I	8(13.33%)	7(11.67%)	17(28.33%)	2(3.33%)
Line J	5(8.33%)	12(20.0%)	8(13.33%)	14(23.33)
Line K	18(30.00%)	14(23.33%)	18(30.00%)	19(31.67%)
Line L	0	2(3.33%)	0	1(1.67%)
Line M	30(50.0%)	23(38.33%)	18(30.0%)	13(21.67%)
Line N	1(1.67%)	0	1(1.67%)	1(1.67%)
Line O	32(53.33%)	32(53.33%)	40(66.67%)	39(65.0%)

Table 3. Gender comparison of Palmer Crease among Urhobo ethnic group

Urhobo				
Palmar Crease Pattern	**Category**	**Male**	**Female**	**P-value**
A	Present	60(100.0%)	60(100.0%)	1
	Absent	-	-	
B	Present	59(98.3%)	60(100.0%)	0.315
	Absent	1(1.70%)	-	
C	Present	60(100.0%)	60(100.0%)	1
	Absent	-	-	
D	Present	25 (41.70%)	40(66.7%)	0.006*
	Absent	35(68.30%)	20(33.3%)	
E	Present	1(1.70%)	-	0.315
	Absent	59(98.3%)	60(100.0%)	
F	Present	2(3.30%)	3(5.00%)	0.648
	Absent	58(96.70%)	57(95.00%)	
G	Present	-	-	1
	Absent	60(100.0%)	60(100.0%)	
H	Present	6(10.00%)	1(1.70%)	0.051
	Absent	54(90.00%)	59(98.30%)	
I	Present	10(16.70%)	15(25.00%)	0.261
	Absent	50(83.30%)	45(75.00%)	
J	Present	4(6.70%)	9(15.00%)	0.142
	Absent	56(93.30%)	51(85.00%)	
K	Present	14(23.30%)	22(36.70%)	0.111
	Absent	46(76.70%)	38(63.30%)	
L	Present	-	-	1
	Absent	60(100.0%)	60(100.0%)	
M	Present	22(36.70%)	26(43.30%)	0.456
	Absent	38(63.30%)	34(56.70%)	
N	Present	-	1(1.70%)	0.315
	Absent	60(100.0%)	59(98.3%)	
O	Present	34(56.70%)	38(63.30%)	0.456
	Absent	26(43.30%)	22(36.70%)	

Table 4. Comparison of Palmer Crease among the Itsekiri Tribe

ITSEKIRI				
Palmar Crease Pattern	**Category**	**Male**	**Female**	**P-value**
A	Present	60(100.0%)	60(100.0%)	1
	Absent	-	-	
B	Present	59(98.30%)	60(100.0%)	0.315
	Absent	1(1.70%)	-	
C	Present	60(100.0%)	60(100.0%)	1
	Absent	-	-	
D	Present	50(83.30%)	41(68.3%)	0.055
	Absent	10(16.70%)	19(31.70%)	
E	Present	-	-	1
	Absent	60(100.0%)	60(100.0%)	
F	Present	-	-	1
	Absent	60(100.0%)	60(100.0%)	
G	Present	2(3.30%)	-	0.154
	Absent	58(96.7%)	60(100.0%)	
H	Present	4(6.70%)	4(6.70%)	1
	Absent	56(93.30%)	56(93.30%)	
I	Present	4(6.70%)	5(8.30%)	0.729
	Absent	56(93.3%)	55(91.7%)	
J	Present	9(15.00%)	17(28.3%)	0.076
	Absent	51(85.00%)	43(71.7%)	
K	Present	20(33.30%)	13(21.70%)	0.152
	Absent	40(66.70%)	47(78.30%)	
L	Present	3(5.0%)	-	0.079
	Absent	57(95.00%)	60(100.0%)	
M	Present	17(28.30%)	19(31.7%)	0.690
	Absent	43(71.70%)	41(68.30%)	
N	Present	1(1.70%)	-	0.315
	Absent	59(98.30%)	60(100.0%)	
O	Present	42(70.00%)	29(48.30%)	0.016*
	Absent	18(30.00%)	31(51.70%)	

Table 5. Quantitative analysis of T-DOT in the studied population

	Cases	Urhobo Right Palm	Iteskiri Right Palm	T-test	P-value	Cases	Urhobo Left Palm	Iteskiri Left palm	T-test	P-value
Normal Crease	58	2.14±1.50	1.99±0.45	0.708	0.480	59	1.78±0.35	1.71±0.31	1.233	0.220
Simian Crease	2	-	2.67±0.06	59.222	-	1	-	2.36±0.00	-	-

Table 6. Quantitative analysis of T-DOT of gender among the Urhobos'

	Urhobo									
	Cases	Male Right Palm	Female Right Palm	T-test	P-value	Cases	Male Left Palm	Female Left palm	T-test	P-value
Normal Crease	30	1.99±0.32	2.28±2.11	-0.194	0.848	30	1.80±0.30	1.77±0.41	0.015	0.988

Table 7. Quantitative analysis of T-DOT of gender among the Itsekiri's

	Iteskiri									
	Cases	Male Right Palm	Female Right Palm	T-test	P-value	Cases	Male Left Palm	Female Left palm	T-test	P-value
Normal Crease	28	2.08±0.51	1.90±0.39	1.549	0.127	29	1.83±0.39	1.59±0.15	3.233	0.002*
Simian Crease	2	2.67±0.06	-			1	2.36±0.00	-		

Discussion

This study has shown that Line A was seen on all right and left palms among the Urhobos and the Itsekiris. This is similar to the findings of Adetona *et al.* who showed that the Yoruba, Igbo and Hausa people of Nigeria had Line A on their right and left palms[1]. Furthermore, Borrifice's study of palmar crease in a Nigerian population also reported findings consistent with our study.[18] This shows that majority of Nigerians have Line A on both palms. Nevertheless, we cannot conclude if it can be found among all Nigerians since some ethnic groups have not yet been studied. We therefore recommend further studies to be carried out on other ethnic groups in Nigeria to corroborate this findings, considering the fact that Africans are genetically diverse people.

The above findings are rarely seen among the Indians as demonstrated by Bali and Chaube that line A, also referred to as triple radial base crease (TRBC) was the least palmar crease.[19] This shows that there are racial differences in palmer creases and this is in keeping with Mekbeb and Park *et al.* who showed inequality of this crease among the Ethiopians and Koreans.[3,20] In addition to racial differences, palmar creases vary across geographical regions and ethnic groups. Besides, their expression is heavily influenced by age and sex.[9] This validates their use in identification by physical and forensic anthropologists.

Furthermore, the study showed that Line C was found on all the left palms of the Urhobos and Itsekiris contrary to reports from other studies carried out among the Yoruba, Igbo and Hausa ethnic groups in Nigeria which showed variation of this crease on the left palms.[1] This line can therefore be used to identify an Urhobo or Itsekiri person from Delta State.

The reduction in frequency of line D to O among the subjects was consistent with the study of Adetona *et al.*[1] Apart from the major creases, line D was more common among the variants in accordance with the findings of Okoro and Uloneme.[20] We also found out that Lines D and J were more prevalent among the Itsekiris while Lines M and I were more frequent among the Urhobos. Lines E and F were found only among the Urhobos while Lines G and L were found only among the Itsekiris. This implies that when Lines E and F are seen on a Nigerian, there is a probability that such a person is likely from the Urhobo ethnic group while Lines G and L may define an Itsekiri person. Concerning pattern asymmetry, Line H was frequently observed on the right palms of the Itsekiris compared to its predominance on the left palms of the Urhobos while line K was observed more on the right palms of the Urhobos as compared to the left palms of the Itsekiris.

Palmer crease variants such as lines B, D, F, I, J, K, N and O were predominant among the Urhobo females

while lines W, H and M were common among the males. Lines D, G, K, L, M, N and O were frequently observed among the Itsekiri males while lines B, I and J were common among the females. Sexual dimorphism was evidenced by significantly higher numbers of lines D and O among the Urhobo females and Itsekiri males respectively (p=0.006; 0.016) This is in concordance with reports by Boroffice and Mekbeb whose studies demonstrated sexual dimorphism in palmer creases.[18,20]

Quantitative analysis using the T-DOT has been regarded as a prospective diagnostic tool and an additional parameter in investigating congenital disorders .[13] In the current study, the T-DOT of all the right palms was higher than those of the left palms. These findings were contrary to reports by Park *et al.* who documented higher T-DOT of the left palms than the right palms among the Koreans.[3] This discrepancy could be explained by the already established anthropological disparity among individuals.[4] However, this study observed a significantly higher T-DOT on the left palms of the Itsekiri males than their female counterparts (p= 0.002). From the study, the simian crease showed a significantly higher T-DOT than the normal creases (p= 0.000) and this was in accordance with the findings of Dar and Schmidt who documented a significantly higher T-DOT in normal individuals with simian creases than those with normal creases. These scholars also found out that Down's syndrome subjects with simian crease had a significantly higher T-DOT than normal individuals with or without the simian crease. The differences in T-DOT was attributed to the well-developed thenar creases in normal individuals compared to subjects with Down's syndrome. These findings were also consistent with the study of Park *et al.*[3] The present study further revealed that Nigerian males from the Urhobo and Itsekiri tribes have a lower T-DOT than their American and Korean counterparts while the T-DOT of the right palm in the Urhobo females was higher than that of Korean females and lower than that of American females.[3,9] This is a clear indication of racial differences in T-DOT.

Simian crease from this study was observed among normal Itsekiri males only. This supports the opinion of some authors who conveyed that an abnormal crease may not necessarily infer a congenital disorder.[4,21-22] In support of this, the presence of a simian crease has also been documented among normal intelligent individuals.[21-22] The current study revealed a 5.00% prevalence of the simian crease among the Itsekiris and this was higher than those of the Ijaws (4.10%) and Igbos (2.62%) but was lower than those of the Hausas (8.00%) of Nigeria[4,23-24]. In comparison with reports from other countries, the prevalence of simian crease in our population was higher than the Caucasians, Dutch, Jews, Swiss, Eskimos, Spanish, Japanese, Germans and Iranians (4.00%, 1.50%, 4.6%, 1.20%,1.30%, 3.40%, 4.00%,2.8% and 2.5% respectively).[22-25]On the other hand, our finding was lower than those of the Korean, Central India, Gypsy and the Pygmy populations (11.20%; 12.60%, 14.40%, 14.30% and 34.70% respectively). Our comparison of results from the different populations reveal that the Swiss have the lowest prevalence (1.20%) of simian crease while the Pygmies recorded the highest frequency (34.70%). Therefore, it is evident that ethno-historic features and geographical location influence the pattern of palmar creases.

Conclusion

All the palmar creases and their variants were observed as classified by Milton and Cummins and Adetona *et al.*[1,5-6] Comparison with reports from other populations revealed variations among several ethnic and racial groups suggesting that creases are influenced by ethnicity, race as well as geographical location. The simian crease was present among normal healthy Itsekiris suggesting that the presence of simian crease alone may not be a definite indicator for some genetic conditions such as Down's syndrome. We consequently recommend additional parameters such as T-DOT in diagnostic medicine.

References

1. Adetona MO, Oladapo OO, Akinyemi, JO. Palmar Flexion Creases Variants among Nigerians. Afr J Biomed Res.2012; 15: 93–96.
2. Narendra KG, Rekha G, Kavita P. Predominance of simian and sydney lines in mental retarded (2015). Int. J. Analy. Pharm. Biomed. Sci. 2015; 4(8): 7-10.
3. Park JS, Shin DS, Jung W, Chung MS. Improved analysis of palm creases. Anat Cell B. 2010;43(2):169–177.
4. Alhaji MM, James T, Uduak E, MurdakaiT .Palmar creases and handedness in Hausas of Northern Nigeria: a cross-sectional study. Asian J of Biol. Med. Sci. 2015. Vol.1 (2): 6-13
5. Milton A. Variation in Palmar creases. Amer J Dis Child.1970; 120: 424-431
6. Cummins H. The skin and breasts. Morris' Human Anatomy, ed New York, McGraw-Hill Book Co. Inc.1966; pp 113-114.
7. Rignell A. Simian crease incidence and the correlation with thenar and hypothenar pattern types in Swedish patients with trisomy 21 (Down's syndrome). Am J Phys Anthropol.1987; 72:277-86.12.
8. Sabry MA, Ismail EA, Alal-Torki RL, Farah S, Al Obenbergerova SL, Bastaki L. Unusual traits associated with Robinow syndrome. Med Genet.1997; 34(9):736-40.
9. Dar H, Schmidt R, Nitowsky HM. Palmar crease variants and their clinical significance: a study of newborns at risk. Pediatr Res.1977; 11: 103-108
10. Johnson CF, Opitz E. The single palm crease and its clinical significance in a child development clinic: observations and correlations. Clinical Pediatrics. 1971;10:392–403.
11. Dar H, Carney J, Winter ST. Dermatoglyphics and the Simian Crease in infants of low birth weight. ActaPoediatrica Scand. 1971;60:479–481.
12. Lopuszanska M, Jankowska EA. Dermatoglyphic morphology in some diseases. Pol MerkurLekarski. 2001;11(63):282–286

13. Dar H, Schmidt R. Topographic approach for analysis of palm crease variants. J Med Genet.1976; 13: 310-313
14. Ekeh P. Studies in Urhobo culture. Buffalo: Urhobo Historical Society. 2005; p.2
15. NaingL,Winn T, Rusli BN. Practical Issues in Calculating the Sample Size for Prevalence Studies . Arch. Orofac. ScI. 2006; 1: 9-14.
16 Jaiyeoba-Ojigho EJ, Odokuma IE, Igbigbi PS. Comparative Study of Fingerprint Patterns of Two Ethnic Groups: A Nigerian Study. J of College Med. Sci.-Nepal.2019; 15(4), 270-275.
17. Oghenemavwe EL, Osaat RS. An improvise easy digital method for palmar dermatoglyphics. Bio. &Bioeng. 2015; 1(3): 85–59.
18. Boroffice RA. Palmar Creases in a Sample of the Nigerian Population. J. Hum. Evolu. 1981;10, 273-275
19. Bali RS, Chaube R. On the formulation of palmar creases. Zeit. fur Morpho. und Anthro. 1971; 63:121-130
20. Mekbeb A. Prevalence of the Different Types of Palmar Creases Among Medical and Dental Students in Addis Ababa, Ethiopia. Ethiop J Health Sci. 2019; 29(3):391.
21. Hernandez M. Palmar creases in Spaniards. AnthropolAnz 1985; 43:187-90.19.
22. Lestrange, MT. de. The transverse crease in Europe:Index and comparative study of different samples cited inthe literature. Amer. J.Phys. Anthro. 1960; 35, p.2005-232
23. OyinboC,Fawehinmi H. Prevelance of Simian and Sydney Creases in the Ijaws of South South Nigeria. The Int. J.of Biol. Anthropo. 2008;3(2):85-91
24. Izuchukwu SE, Okwudili OU, Pukoha UU. Prevalence of palmar flexion crease variants prevalence and its relationship to gender among secondary school students of Igbo origin in Anambra State ,Nigeria. Int.J of Med. Sci.Appl. Bios.2018; 3(2): 27-34
25. Sharma DK, SharmaV. Prevalences of Simian, Sydney and Suwon Creases and their Association with Each Other, Body Sides, Handedness, Sex and Anomalies /Diseases /Syndromes in a Population of Central India. Inter. J. of Mor. 2011; 29(3):1069-1075.

Received: June 2, 2021
Accepted: September 28, 2021

Corresponding author
Jaiyeoba-Ojigho Jennifer Efe
E-mail: efemenadelsu@gmail.com