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Plantar Dermatoglyphics in Autism

R.S. Osaat[1], G.S. Oladipo[2], L.E. Oghenemawve[2], E.A. Osunwoke[2], P.N. Amadi[1], P.D. Victor[3]

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[1]Department of Anatomy, Faculty of Basic Medical Sciences, Madonna University, Nigeria
[2]Department of Anatomy, Faculty of Basic Medical Sciences, University of Port Harcourt
[3]Department of Anatomy, Faculty of Basic Medical Sciences, Rivers State University
rozysunna@yahoo.com, Gabriel.oladipo@uniport.edu.ng,
loveday.oghenemavwe@uniport.edu.ng, aeosunwoke@yahoo.com
,paulicity101@gmail.com,dakuro25@yahoo.com
Corresponding author: R.S. Osaat; E-mail: rozysunna@yahoo.com

ABSTRACT

Over the years, palmar dermatoglyphics were mostly studied by scientists as a diagnostic tool for most genetic diseases while plantar dermatoglyphics received little or no attention when compared to the palm. The study aimed at determining the plantar dermatolgyphics of autistic subjects in Nigeria. A total number of 200 subjects were recruited for the study. 100 autistic subject (82 males, 18 females) and 100 controls (65 males and 35 females) ranging between 5 to 35years. These subjects were selected from various special schools in Nigeria and from University of Port Harcourt Demonstration School. The dermatoglyphics patterns were determined using digital scanning method involving digital scanner (G3110 scanjet scanner with 4800x9600 dpi resolution). The data were analysed using chi-square test.The results revealed for both sexes, male and female, a significant difference between the patterns in zone II withproximal loop significantly higher in autistic subjects when compared to control subjects on the right foot ($p<0.05$). On the left foot of female autistic and control subjects, zones II and III showed significant difference with distal and proximal loops having higher percentage for autistic subjects when compared to control subject ($p<0.05$).The results showed that autistic subjects when compared to control subjects have higher percentages of whorls on zones I and III bilaterally though not statistically significant ($p>0.05$). In conclusion, plantar dermatoglyphics like palmar dermatoglyphics can aid diagnosis of autism and bring about early intervention of autistic patients in Nigeria.

***Keywords**: Plantar, Dermatoglyphics, Autism, Diagnosis, Nigeria,*

INTRODUCTION

Plantar dermatoglyphics is the study of foot-prints (Cummins and Midlo, 1943). Like palmar dermatoglyphics, plantar dermatoglyphics is also used as a means of personal identification. It has been in existence decades ago though interest in this area was not continuous throughout the twentieth century after the work of Wilder in 1902 (Bali, 1968; Verbov, 1970; Tewari&Bhasin, 1971. A lot of issues regarding research into this area, ranging from difficulty of getting the prints to the fact that people are always on footwears, and even if the individual is barefooted the impression rarely show ridge detail (Brown and Rutty, 2005). As such not so many researchers have interest of studying footprints (Bali, 1968; Verbov, 1970; Tewari&Bhasin, 1971). And as such it applications were limited in clinical use especially for diagnosis (Montgomery, 1927). Despite these challenges, research have shown that plantar dermatoglyphics was evidence in forensic investigations (Kathleen and Chris, 1987; Krishan, 2008) and in tribe and population study (Igbigbi and Msamati, 1999). Again in case where the individual does not have hands due to explosion the footprints can take the place of fingerprint. Therefore, there is need to study the plantar dermatoglyphics.

There are two methods of classifying the foot prints for easy study. One method by Cummins, and the other by Wilder (Montgomery, 1927). According to Cummins and Midlo, the sole was mapped into ten topographical zones (Cummins and Midlo, 1961). Zones I-V represented the distal plantar sole, and zones VI-X represented the proximal plantar sole (Igbigbi and Msamati, 2001).

Zone I is hallucal, zone II is second inter-digital , zone III is third inter-digital, zone IV is fourth inter-digital, zone V is hypothenar distal I, zone VI is hypothenar distal II, zone VII is hypothenar proximal, zone VIII is calcar (heel), zone IX is thenar proximal and zone X is thenar distal.

Also, Montgomery (1927) combined the method of Wilder's and his own method to have a very simple method. On the ball of the foot there are five pattern bearing areas. One is proximal to the great toe (the hallucal). Three others lie laterally to the hallucal below the small toes and together form the plantar areas. And the fifth, or hypothenar distal, is located on the lateral edge of the sole proximal to the fourth plantar area. Below the ball of the foot is the centre of the foot (Chatterjee, 1953). The hypothenar distal and proximal and thenar proximal and distal (areas VI,

VII, IX and X, according to Cummins and Midlo) are found here. Zone eight also called the calcar or heel is located at the heel (Chatterjee, 1953).

In the thenar distal (hallucal) and 1st plantar area, the following patterns are seen:

1. Upright loop opening distally (L^d) (Montgomery, 1927; Siemens, 1954)
2. Inverted loop opening proximally (L^p) (Montgomery, 1927)
3. Tibial loop opening tibially (L^t) (Siemens, 1954)
4. Fibular loop opening fibularly (L^f) (Siemens, 1954).
5. Whorl: it is of three types. Concentric whorl (W), Spiral whorl (W^s) and Seamed whorl (W^{sm}) (Siemens, 1954).
6. Open fields (O): these are succession of parallel ridges, straight or but gently curved. They form no pattern (Cummins and Midlo, 1942, Siemens, 1954).
7. Arches open proximally (A^p), tibially (A^t) and distally (A^d) (Siemens, 1954).

Second, third and fourth inter-digital areas show elongated whorls (W)); loops distal (L^d);loop proximal (L^p) - fibularly (L^{pf}) and tibially (L^{pt}); Vestiges (V), Small vestiges (v), open fields (O) and multiplications (M). Proximal tri-radii are indicated as y, subordinate to a loop or whorl e.g. $L^{pt}y$ (Siemens, 1954; Igbigbi and Msamati, 2001; Sharma *et al.*, 2007).

The hypothenar distal and proximal contains principally loops (L) which open usually tibially but sometimes fibularly (L^t/L^f) (Montgomery, 1927; Siemens, 1954), rarely a whorl or an arch (Siemens 1954), Multiplications or vestiges may also be present.

The calcar area is formulated in dual fibio-tibial order. Tibial vestiges and open fields are common in the calcar,thenar proximal and distal because they have low pattern intensity. That is to say that there are extremely very rare true calcar patterns (Siemens, 1954).

The Federal Bureau of Investigation system (FBI's) is particularly interested in the ball area of the foot which is directly below the large toe (hallucal area). The area has three true patterns, arch, loop and whorl. The arch pattern is designated by letter 'O' Loop is designated as 'L' and whorl as 'W' (Hutchins, 2002). However, lack of these true patterns indicate disease state, and are found in about 50% of Down syndrome patients (Jones, 2022).

Footprint is as important, no less valuable, where available than identification by fingerprint (Brown & Rutty, 2005; Krishan & Kanchan, 2016). It can as well be used for determination of sex and stature (Krishan *et al.*,2012; Kanchan *etal.*, 2012). Kanchan *et al*. (2012) worked on the ridge density of the footprint of South Indian subjects. They defined four areas which include,

medial area of the great toe, the ball of the great toe, the ball of the 5th toe below the triradius point, and the central prominent part of the heel. The results showed that the mean frequency of the ridge density was significantly higher in females than in males in all the studied areas of footprints. Sexual dimorphism was observed in the study.

Autism is a neuro-developmental disorder which is associated with social and communication impairments (Caronna, 2008), that is, the inability to relate normally, to form normal social relationships or to communicate normally (Manning *et al.*, 2001). It is also characterized by repetitive behavior, ie sticking to a particular type of play or behaviour like watching one particular programme on TV etc. The term "Autism" was first coined by Kanner in 1982 who single handedly did a lot of work on Autism. Autism is associated with stigma, fear and frustration (Okey, 2007). Autism is increasing yearly upto 17-20% which might be as a result of lack of information on the disease (Agbonkhese, 2015).

Dermatoglyphics, like every other method can serve as a means of diagnosing genetic diseases early. It is an easy method which everyone can use even parents, not expensive and very simple. Like the fingerprint, footprint can also be used to make clinical decision especially with regards to autism. In view of this, this study seeks to determine plantar dermatoglyphic features specific to autistic subjects and the comparison between male and female autistic subjects in Nigeria. This can aid early diagnosis as well as early intervention.

MATERIALS AND METHODS

This research was carried out in some selected cities in Nigeria such as Lagos, Abuja and Port Harcourt. These cities were selected based on the awareness of the people as regards the disorder. They have good numbers of both government and private special/inclusive schools. The cities are strategically located within the country. This study comprised both male and female autistic subjects in Nigeria. The age ranged between 5 to 35 years. The sample size for this study was 100 subjects (82male and 18 females) for autism and 100 subjects (65males and 35 females) for control. The sampling technique used for this research was convenience sampling technique. This is as a result of the difficulty in getting the children due to fear of stigmatization. The subjects included for research must be autistic subjects living in Nigeria who volunteered through their parents or institutional authorities to participate in the study, with no form of trauma or anomaly in their feet and fall within the age bracket.Thereafter, an informed consent

which contains details of the research work was issued out and clarifications given were necessary before the commencement of work.

The dermatoglyphic patterns were collected and determined using the scanning method precisely High-resolution digital scanner. The method involved using a digital scanner (Hewlett-Packard (hp) G3110 Scanjet Scanner with 4800x9600 dpi resolution) connected to a laptop to identify and classify dermatoglyphics. The scanner and laptop were both electrically powered using any electrical source.

The subjects' feet and soles were thoroughly washed with water and soap and dried with clean towel to remove dirt. Each subject was asked or assisted to place the washed soles on the scanner and accordingly the soles were scanned. The scanned images were saved in a folder and named appropriately using a tag number to help in the easy identification of the scan images.

The data obtained from this study were subjected to test using SPSS (Statistical Package for Social Science). Variables were presented as numbers and frequencies (%). Chi-square was used to test for association. All statistical testing was done at 95% confidence level with p-value less than 0.05($p< 0.05$) taken to be significant.

RESULTS

Table 1 showed percentage frequency and the test of association of the right foot patterns in autistic and normal subjects of both sexes. The result revealed that, in the hallucal area, autistic subjects have more of distal loop (15%) than normal subjects (6%) and more of proximal loop than normal subjects. Whorl was seen to be increased in the hallucal area of normal (73%) than autistic (64%) subjects. However, the differences were not statistically significant. In the second interdigital area (zone II), on the right foot the distribution of patterns was statistically significantly between autism and control subjects ($p<0.05$). Particularly, proximal loop was higher for autism than control while distal loop was higher for control than autistic subjects ($p<0.05$). Other areas were not statistically significant. For the big toe, autistic subjects have higher percentage of fibular loop 69% and whorl 6% than normal subjects which has fibular loop 62% and whorl 5%. These differences were not significant $p>0.05$. On the left foot of autistic subjects and normal subjects (table 2), none of the plantar areas was significantly different between autistic and normal subjects ($p>0.05$) including the big toe.

Table 3 showed that zones II was statistically different between male autistic and male normal subjects on the right foot. While on the left foot (table 4), none of the areas understudy was

significantly different ($p<0.05$). In table 5, the right foot of the female autistic subjects and normal subjects was significant different in the second interdigital area (zone II) ($p<0.05$) while other zones were not statistically significant ($p>0.05$). On the left foot, table 6, zones II and III showed significant difference ($P<0.05$).

Table 1: Right foot patterns in Autistic and Normal Subjects of both sexes

Right Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X^2	df	P-value
I	AU FOOT	15 (15.0)	2 (2.0)	14 (14.0)	0 (0.0)	-	64 (64.0)	5 (5.0)	-	7.54	5	0.18
	NO FOOT	6 (6.0)	0 (0.0)	14 (14.0)	1 (1.0)	-	73 (73.0)	6 (6.0)	-			
II	AU FOOT	0 (0.0)	54 (54.0)	-	-	-	0 (0.0)	46 (46.0)	-	100.64	3	**0.00****
	NO FOOT	44 (44.0)	0 (0.0)	-	-	-	2 (2.0)	54 (54.0)	-			
III	AU FOOT	42 (42.0)	6 (6.0)	-	-	-	26 (26.0)	26 (26.0)	-	0.39	3	0.94
	NO FOOT	46 (46.0)	6 (6.0)	-	-	-	23 (23.0)	25 (25.0)	-			
IV	AU FOOT	19 (19.0)	11 (11.0)	-	-	-	0 (0.0)	70 (70.0)	-	2.20	3	0.53
	NO FOOT	14 (14.0)	9 (9.0)	-	-	-	1 (1.0)	76 (76.0)	-			
Big Toe	AU FOOT	-	-	-	69 (69.0)	25 (25.0)	6 (6.0)	-	-	1.57	2	0.46
	NO FOOT	-	-	-	62 (62.0)	33 (33.0)	5 (5.0)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

Table 2: Left foot patterns in Autistic and Normal Subjects of both sexes

Left Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X^2	df	P-value
I	AU FOOT	13 (13.0)	-	7 (7.0)	-	-	70 (70.0)	9 (9.0)	1 (1.0)	5.07	4	0.28
	NO FOOT	6 (6.0)	-	12 (12.0)	-	-	74 (74.0)	8 (8.0)	0 (0.0)			
II	AU FOOT	2 (2.0)	61 (61.0)	-	-	-	0 (0.0)	37 (37.0)	-	7.97	3	0.05
	NO FOOT	1 (1.0)	43 (43.0)	-	-	-	1 (1.0)	55 (55.0)	-			
III	AU FOOT	41 (41.0)	13 (13.0)	-	-	-	21 (21.0)	25 (25.0)	-	3.29	3	0.35
	NO FOOT	40 (40.0)	6 (6.0)	-	-	-	26 (26.0)	28 (28.0)	-			
IV	AU FOOT	10 (10.0)	13 (13.0)	-	-	-	0 (0.0)	77 (77.0)	-	3.47	3	0.32
	NO FOOT	14 (14.0)	7 (7.0)	-	-	-	1 (1.0)	78 (78.0)	-			
Big Toe	AU FOOT	-	-	-	67 (67.0)	26 (26.0)	7 (7.0)	-	-	0.10	2	0.95
	NO FOOT	-	-	-	65 (65.0)	28 (28.0)	7 (7.0)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

Table 3: Distribution of the right foot and test of association in males of autistic and normal subjects

Right Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X^2	Df	P-value
I	AU FOOT	11 (14.7)	2 (2.7)	9 (12.0)	-	-	48 (64.0)	5 (6.7)	-	6.903	5	0.228
	NO FOOT	3 (4.6)	-	9 (13.8)	1 (1.5)	-	47 (72.3)	5 (7.7)	-			
II	AU FOOT	-	43 (57.3)	-	-	-	-	32 (42.7)	-	77.747	3	**0.000****
	NO FOOT	34 (53.2)	-	-	-	-	1 (1.5)	30 (46.2)	-			
III	AU FOOT	32 (42.7)	2 (2.7)	-	-	-	21 (28.0)	20 (26.7)	-	1.984	3	0.576
	NO FOOT	28 (43.1)	5 (7.7)	-	-	-	17 (26.2)	15 (23.1)	-			
IV	AU FOOT	13 (17.3)	7 (9.3)	-	-	-	-	55 (73.3)	-	1.293	3	0.731
	NO FOOT	12 (18.5)	5 (7.7)	-	-	-	1 (1.5)	47 (72.3)	-			
Big Toe	AU FOOT	-	-	-	47 (62.7)	22 (29.3)	6 (8.0)	-	-	0.191	2	0.909
	NO FOOT	-	-	-	41 (63.1)	20 (30.8)	4 (6.2)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

Table 4: Distribution of the left foot and test of association in males of autistic and normal subjects

Left Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X2	Df	P-value
I	AU FOOT	10 (13.3)	-	4 (5.3)	-	-	52 (69.3)	8 (10.7)	1 (1.3)	5.864	4	0.210
	NO FOOT	3 (4.6)	-	8 (12.3)	-	-	48 (73.8)	6 (9.2)	-			
II	AU FOOT	-	45 (60.0)	-	-	-		30 (40.0)	-	2.558	2	0.278
	NO FOOT	1 (1.5)	32 (49.2)	-	-	-		32 (49.2)	-			
III	AU FOOT	31 (41.3)	6 (8.0)	-	-	-	16 (21.3)	22 (29.3)	-	1.113	3	0.774
	NO FOOT	29 (44.6)	4 (6.2)	-	-	-	17 (26.2)	15 (23.1)	-			
IV	AU FOOT	6 (8.0)	10 (13.3)	-	-	-	0	59 (78.7)	-	4.577	3	0.206
	NO FOOT	11 (16.9)	5 (7.7)	-	-	-	1 (1.5)	48 (73.8)	-			
Big Toe	AU FOOT	-	-	-	46 (61.3)	23 (30.7)	6 (8.0)	-	-	0.169	2	0.919
	NO FOOT	-	-	-	42 (64.6)	18 (27.7)	5 (7.7)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

Table 5: Distribution of the right foot and test of association in females of autistic and normal subjects

Right Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X2	df	P-value
I	AU FOOT	4 (16.0)	-	5 (20.0)	-	-	16 (64.0)	-	-	1.91	3	0.591
	NO FOOT	3 (8.6)	-	5 (14.3)	-	-	26 (74.3)	1 (2.9)	-			
II	AU FOOT	-	11 (44.0)	-	-	-	-	14 (56.0)	-	23.621	3	**0.000****
	NO FOOT	10 (28.6)	-	-	-	-	1 (2.9)	24 (68.6)	-			
III	AU FOOT	10 (40.0)	4 (16.0)	-	-	-	5 (20.0)	6 (24.0)	-	3.610	3	0.307
	NO FOOT	18 (51.4)	1 (2.9)	-	-	-	6 (17.1)	10 (28.6)	-			
IV	AU FOOT	6 (24.0)	4 (16.0)	-	-	-	-	15 (60.0)	-	4.925	2	0.085
	NO FOOT	2 (5.7)	4 (11.4)	-	-	-	-	29 (82.9)	-			
Big Toe	AU FOOT	-	-	-	22 (88.0)	3 (12.0)	-	-	-	5.767	2	0.056
	NO FOOT	-	-	-	21 (60.0)	13 (37.1)	1 (2.9)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

Table 6: Distribution of the left foot and test of association in female of autistic and normal subjects

Left Foot	Group	Ld (%)	Lp (%)	Lt (%)	Lf (%)	A (%)	W (%)	O (%)	V (%)	Chi-square analysis		
										X2	df	P-value
I	AU FOOT	3 (12.0)	-	3 (12.0)	-	-	18 (72.0)	1 (4.0)	-	0.272	3	0.965
	NO FOOT	3 (8.6)	-	4 (11.4)	-	-	26 (74.3)	2 (5.7)	-			
II	AU FOOT	2 (8.0)	16 (64.0)	-	-	-	-	7 (28.0)	-	11.101	3	**0.011****
	NO FOOT	-	11 (31.4)	-	-	-	1 (2.9)	23 (65.7)	-			
III	AU FOOT	10 (40.0)	7 (28.0)	-	-	-	5 (20.0)	3 (12.0)	-	8.796	3	**0.032****
	NO FOOT	11 (31.4)	2 (5.7)	-	-	-	9 (25.7)	13 (37.1)	-			
IV	AU FOOT	4 (16.0)	3 (12.0)	-	-	-	-	18 (72.0)	-	1.724	2	0.422
	NO FOOT	3 (8.6)	2 (5.7)	-	-	-	-	30 (85.7)	-			
Big Toe	AU FOOT				21 (84.0)	3 (12.0)	1 (4.0)	-	-	2.599	2	0.273
	NO FOOT				23 (65.7)	10 (28.6)	2 (5.7)	-	-			

Note: AU-Autism, NO-normal, Ld- distal loop, Lp- proximal loop, Lt- tibial loop, Lf- fibular loop, A- Arch, W- whorl, O- Open field, V- vestiges, df-degree of freedom, **-significant,

DISCUSSIONS

In the present study, whorls were seen especially on zones I & III for autism. This is similar to the work of Igbigbi *et al.* (2001) who reported whorls on zone I for hypertensive patients, Diabetes with hypertension had whorls on zones I, III & IV, while diabetes alone had whorls on zones I, II, & III. For control subjects whorls were found in zones I – IV in the present study, this was in line with the work of Igbigbi and Didia (1999) on the Urhobos of Nigeria. However, Igbigbi and Msamati (2001) observed whorl on zones I, III & IV of Zimbabwean subjects indicating racial and ethnic differences.

The result on zone II for right foot of both sexes, male and female was seen to be significantly different between autistic and control subjects in the present study. However Whorl was practically absent on zone II of both sexes, males and females of autistic subjects but was present on the zone II of control subjects. This imply that the absent of whorl on zone II can serve as dermatoglyphic feature that can aid in the diagnosis of autism. On zone IV there was the absence of whorl on autism.

Moreso, in zone II of the right foot of both sexes, male subjects, and female subjects, distal loop was seen in control subjects but was absent in autistic subjects and proximal loop was seen in autistic subjects but absent in control subjects – a significant association. This may be a distinguishing feature. This result was similar to the work of Kathleen and Chris (1987) who reported distal loop as the most common pattern found on the plantar hallucal area of America Caucasians. Proximal loop was strikingly high in zone II of autistic subjects than the control subjects. Oghenemavwe and Tagar (2017) reported proximal loop to be more on zone II for Down's syndrome than control subjects which was in line with the present study. This means that the presence of proximal loop on zone II of autistic subject (present study) and Down syndrome subjects (previous study) is an indication of the presence of disorder. And it can be used to distinguished autism or Down syndrome from control subjects.

On the left foot of female subjects, the distribution of patterns was seen to be significant on zone II and zone III. In zone III distal loop was significantly higher in autistic than control subjects which according to Soltan and Clearwater (1965) could serve an important dermatoglyphic feature in diagnosis of autism. Though was in contrast to Bryant *et al.* (1970) who reported insignificant difference in zone III between Down's syndrome and control groups.

In the present study hallucal-area open field was seen to be strikingly very high in control subjects than autistic subjects and the differences were significant on zone II of both sexes, males and female subjects. This is also in contrast with the study of Hsu *et al.* (1971) who reported over 90% of plantar hallucal patterns of patients than the control. Very few patients lacked an arch/open field on both feet in this study. This means the study of Bryant on Chinese was similar to the present study on Nigerians. A study done in the middle 19th century also reported higher percentage of tibial arch (open field/arch) (Soltan& Clearwater, 1965).

In the big toe there were no significant differences between the distribution of all the patterns studied on both sexes, males subjects and female subjects between autistic and controls.This is in contrast to the work of Igbigbi *et al.* (2001) who reported a significantly higher frequency of loops in diabetes than diabetes with hypertension and those with hypertension alone. Also, the work was contrary to the work of Igbigbi and Msamati (1999) who reported significantly higher loops on the big toe of male Malawi population than the female Malawi population

From the results of the study it showed that autism had a strong genetic basis but the foot patterns are less hereditary-control than the ridge patterns of the hands (Villar & Epstein, 2005; Ahmed-Popova *et al.,* 2014). The differences in the sexes and in the right and left feet may be considered as a sign of impaired neurodevelopment that took place during the formation of papillary ridges (Ahmed-Popova *et al.,* 2014). Though research on autism supports the role of genetic factors in the etiology of autism (Geschwind, 2008); there is no particular model of genetic transmission or identifiable major gene that present the cause of autism (Geshwind, 2008). This means that autism is affected by both genetic and environmental factors.

CONCLUSIONS

The results showed that autistic subjects as compared with the control subjects had higher proximal loop on zone II of the right foot of both sexes, males and females, absence of whorl on zone II on the right foot of both sexes, males, and females, presence of whorl on zones I and III, higher distal loop on zone II of females bilaterally and zone III on left foot of female subjects Gender differences were observed between male autistic and male controls, it was also observed that differences between autistic subjects and control subjects seem to be more on the right foot than the left foot.Thus from these results dermatoglyphics can serve as an adjunct method for the screening of Autism in Nigeria to aid early detection and bring about early intervention, and so recommended.

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AUTHORS' CONTRIBUTION

The first author designed the work, wrote the first manuscript, the third and fourth managed the statistical analysis, the second managed the literature review. All the authors read and approved the final manuscript for submission.

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