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Dermatoglyphics: A Diagnostic Tool for Autism

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ABSTRACT

Dermatoglyphics, a well-established method for personal identification over some decades can also be used in the diagnosis of varieties of genetic diseases. The aim of this research was to evaluate the dermatoglyphics of the palm of autistic subjects for diagnostic purpose. The study recruited 100 autistic subjects and 100 controls subjects selected from various special schools in Nigeria and University of Port Harcourt environs respectively. Data were analysed using chi square statistical tool. The traits evaluated include: hypothenar pattern and thenar pattern. The results revealed significant difference between the distribution of hypothenar pattern of both sexes, and of male subjects between autistic and control subjects ($p<0.05$) on both right and left palms. Autistic male subjects have significantly higher percentage frequencies of arches when compared to male controls, (89%Right, 68% left) autism, (95% R, 72% L) controls ($p<0.05$). The difference in the distribution of thenar pattern was significant between autistic and control subjects of both sexes on the right palm ($p<0.05$), and between male autistic and male controls on the right palm ($p<0.05$). In conclusion, the result revealed significant difference in the dermatoglyphic hypothenar and thenar patterns between autistic and control subjects. The study, therefore recommends dermatoglyphics as a tool in diagnosing autism in Nigeria.

Keywords: Hypothenar, Thenar, Dermatoglyphics, Autism, Nigeria.

INTRODUCTION

Dermatoglyphics is the study of the epidermal ridges of the skin found on the surface of the fingers, palms of the hands and soles of the feet[1]. Fingerprint plays its outstanding roles of individuality and uniqueness for proper identification and does not change throughout life[1]. As a matter of fact, its science is based on two major facts which are: The ridges are slightly different for the fingers and no two persons have exactly similar print patterns[2] and the ridges are permanent throughout life thereby providing mark of individuality[3]. Dermatoglyphics is one of the physical anthropological features that can be used for identification of persons and more recently for the early detection/diagnosis of diseases[4]. It has been reported that no two monozygotic twins have the same fingerprint pattern and ridges[2,5] thereby making fingerprint an important tool in medical science.

Development of dermatoglyphics and brain seems to be interlinked[6]. The brain and skin develop from the same ectoderm. At about 13th week of intrauterine life dermal ridges begin to form and complete its formation at about the 21st week of intrauterine life. At this period of development, various organs also develop alongside, especially neuronal development, so that ridge pattern can be affected by certain abnormalities of early development[7]. It is on this ground that dermatoglyphics is correlated with genetic abnormalities, mental illnesses and chromosomal disorders such as down syndrome, autism, diabetes, schizophrenia, etc.[8,9,10,11]. Today medical dermatoglyphics applies dermatoglyphics in the diagnosis of so many diseases with 80% to 90% accuracy[12]. Infact the diagnosis of these disorders can now be done on the basis of dermatoglyphics analysis alone[13].

The thenar and first inter-digital areas are closely related and they are always referred to as one area which is labeled thenar/first inter-digital (th/I) area. In this area, there are most cases no pattern but the ridges follow a mild curve around the base of the thumb. However, in certain clinical conditions, patterns are seen on the thenar/Ist inter-digital area with unusual incidence e.g. Down's syndrome, trisomy eighteen (18). Therefore the presence of pattern on this area is a dermatoglyphic feature that is highly special to some conditions[14]. Incidence of thenar/I patterns decreased in females with increasing number of X chromosome[14].

Hypothenar area is located on the ulnar side of the palm opposite the thenar/Ist interdigital area. This area is presented with three true patterns which include, whorls, loops and tented arches[15]. Also present in this

area are simple arches, open fields and vestiges which are not true patterns. Unlike the digit or fingertips, the maximum number of tri-radius in the hypothenar is three instead of two seen in the fingertips.

The aim of this research was to evaluate the thenar and hypothenar dermatoglyphic patterns of the palm for the purpose of diagnosing autistic patient in Nigeria.

MATERIALS AND METHODS

A descriptive survey design with a convenience sampling technique was used. Sample size was determined using prevalence rates of 0.7%[16] since the actual population of the group was not known. Sample size of 100 (82 males and 18 females) autistic subjects and 100 (65 males and 35 females) control subjects were used. Digital scanning method was used which involved a digital scanner (hp G3110 Scanjet Scanner with 4800x9600 dpi resolution) and a laptop. The subjects' palms (both right and left palms) were thoroughly washed, dried and scanned. The data were analysed using Chi square. All statistical testing was done at 95% confidence level with p-value less than

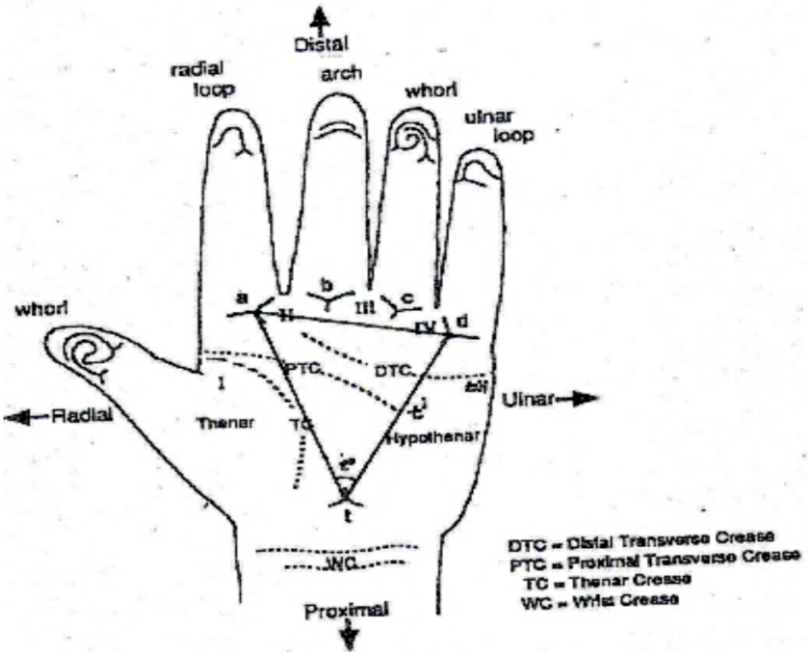
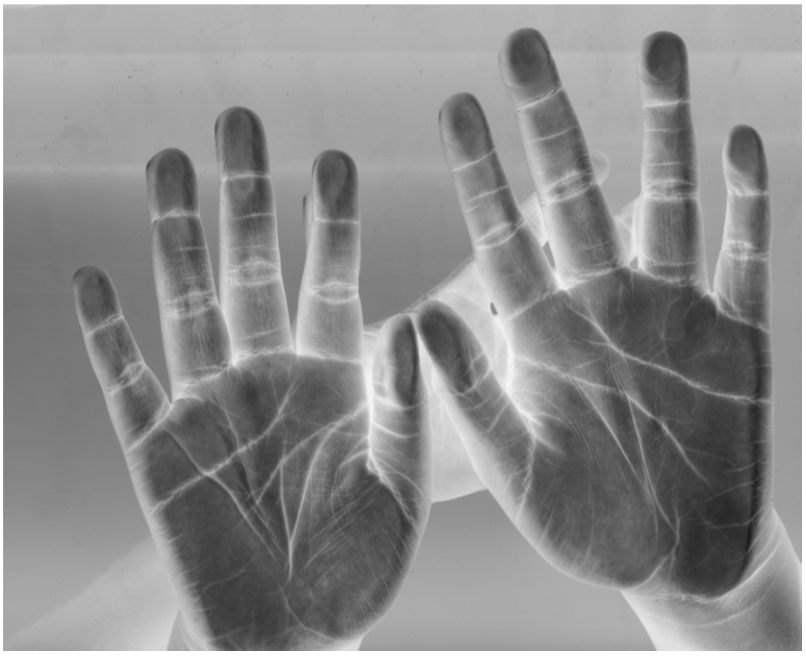


Figure 1: Palm showing thenar and hypothenar areas[17]



RESULTS

Table 1: Distribution of the right and left thenar (Th/I) patterns and test of association in autistic (AU) and Controls of both sexes, male and female subjects

	Group	TH/I_1				Chi-Square analysis		
		A	L	V	W	X^2	Df	P-value
Both sexes	Right							
	AU	80 (80.0)	-	20 (20.0)	-	9.85	2	0.01**
	Control	90 (90.0)	3 (3.0)	7 (7.0)	-			
	Left							
	AU	77 (77.0)	-	23 (23.0)	-	6.62	3	0.09
	Control	76 (76.0)	5(5.0)	18 (18.0)	1 (1.0)			
males	Right							
	AU	60 (80.0)		15 (20.0)		6.35	2	0.04**
	Control	58 (89.2)	2 (3.1)	5 (7.7)				
	Left							
	AU	55 (73.3)		20 (26.7)		5.66	3	0.13
	Control	49 (75.4)	3 (4.6)	12 (18.5)	1 (1.5)			
Females	Right							
	AU	20 (80.0)		5 (20.0)		3.49	2	0.18
	Control	32 (91.4)	1 (2.9)	2 (5.7)				
	Left							
	AU	22 (88.0)		3 (12.0)		1.90	2	0.39
	Control	27 (77.1)	2(5.7)	6 (17.1)				

*Note: A- Arch, L- loop, V- Vestiges, W- whorl, AU- Autism, ** - significant difference*

Table 2: Distribution of the right and left Hypothenar (HPT) patterns and test of association in autistic (AU) and controls of both sexes, male and female subjects

	Group	HPT (%)					Chi-Square analysis		
		A	Double loop	RL	UL	W	X^2	Df	P-value
Both sexes									
	Right								
	AU	89 (89.0)	1 (1.0)	7 (7.0)	2 (2.0)	1 (1.0)	18.44	4	0.00**
	Control	68 (68.0)	1 (1.0)	30 (30.0)	1 (1.0)	-			
	Left								
	AU	95 (95.0)	-	2 (2.0)	3 (3.0)	-	23.96	3	0.00**
	Control	72 (72.0)	1 (1.0)	25 (25.0)	2 (2.0)	-			
males									
	Right								
	AU	69 (92.0)		4 (5.3)	2 (2.7)		17.41	3	0.00**
	Control	43 (66.2)	1 (1.5)	20 (30.8)	1 (1.5)				
	Left								
	AU	72 (96.0)		1 (1.3)	2 (2.7)		19.20	3	0.00**
	Control	47 (72.3)	1 (1.5)	16 (24.6)	1 (1.5)				
females	Right								
	AU	20 (80.0)	1 (4.0)	3 (12.0)		1 (4.0)	4.79	3	0.19
	Control	25 (71.4)		10 (28.6)					
	Left								
	AU	23 (92.0)		1 (4.0)	1 (4.0)		4.95	2	0.08
	Control	25 (71.4)		9 (25.7)	1 (2.9)				

*Note: A- Arch, RL- Radial loop, UL – Ulnar loop, W- whorl, AU- Autism, ** - significant difference*

DISCUSSION

Hypothenar patterns had been reported to be one of the important dermatoglyphic features that can be used to diagnose some genetic disorders like Down's syndrome[18,19,15].

The presence of hypothenar ulnar loop was significantly increased in autism than control subjects of both sexes, while control subjects have significantly higher hypothenar radial loop than autistic subjects. The result was in line with Plato *et al.*[19] who revisited the palmar dermatoglyphics of Down's syndrome. Recently, Sharma *et al*[20] reported significant difference for congenital deaf subjects and controls bilaterally. The male autistic subjects were significantly different from the control male subjects. However, the female showed no statistically significant difference, sexual dimorphism observed.

For autistic subject more hypothenar whorl was seen on the right hand of both sexes. Control subjects showed no hypothenar whorl. The presence of hypothenar whorl though not statistically significant in autistic female subjects indicates dermatoglyphic distortions and implies deviation from normal. Mensvoort[15] linked hypothenar whorl to Down's syndrome subjects and other medical disorders. Therefore the presence of hypothenar whorl on the palms of an individual could indicate risk of autism, owing to its absence in the control subjects – a dermatoglyphic feature.

Unlike the excess patterns seen in the hypothenar area, there was paucity of patterns in thenar/I_1 area. Among autistic subjects no true patterns were seen while few loops and whorls were seen on the control subjects only compared to autistic subjects. Vestiges and arches were in abundance and were significant on the right hand in autistic subjects. Plato *et al.*[19] observed similar findings for Down's syndrome. This means that thenar pattern cannot actually serve good dermatoglyphic feature for the screening of autistic subjects since no statistically significant difference was observed especially for the true patterns. Sharma *et al*.[20] observed a high percentage frequency of thenar/I_1 for deaf subjects as against controls though the difference was not statistically significant.

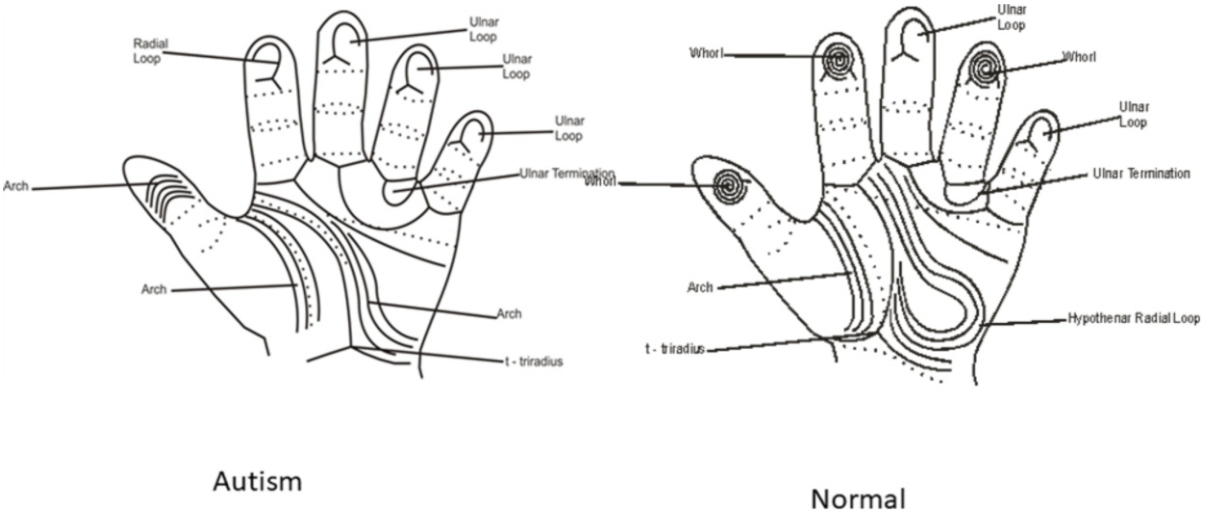


Figure 3: Diagnostic map of autistic and normal subjects

CONCLUSION

Conclusively, significant difference was observed between dermatoglyphic hypothenar patterns of autistic and control subjects on both sexes and on male subjects. Dermatoglyphic thenar patterns showed significant difference between autistic and control subjects especially for arches and vestiges. Thus from these results dermatoglyphic hypothenar and thenar patterns can serve as an adjunct method in screening Autism to aid early detection and bring about early intervention. The study recommends dermatoglyphic as a diagnostic tool in the early screening of autistic patients in Nigeria.

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