

A COMPARATIVE STUDY OF DERMATOGLYPHIC PATTERNS OF POLYDACTYLY PATIENTS AND NORMAL NIGERIAN INDIVIDUALS

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ABSTRACT

The study was carried out to document characteristic dermatoglyphic patterns in subjects with polydactyly in South Southern Nigeria. Digital and palmar dermatoglyphic analysis of 20 subjects with polydactyly and 20 normal subjects was done. (15 males and 5 females). Dermatoglyphic features such as the digital patterns, ATD angle, DAT angle, A-B ridge count and digital ridge count on the hands were assessed. The result demonstrated that 44% of the digital patterns in the polydactyly subjects were ulnar loop as against 58.34% in the normal. The polydactyly subjects had significantly greater DAT angle than the normal subjects. ($P < 0.05$). The palmar DAT angles was significantly higher in the female (polydactyly and normal) ($P < 0.05$) while that of the male polydactyly and male normal subjects were not significant ($P > 0.05$). The mean A-B ridge counts in polydactyly subjects were significantly higher than in the normal group. It was observed that there was no mean significant difference between the digital ridge counts and ATD angles ($P > 0.05$) in both hands. The digital ridge count had significant difference in both polydactyly and normal ($P < 0.05$). Also the ADT angles showed that polydactyly had higher mean significance compare to the normal. The female polydactyly left palm is significant ($P < .05$). The genotype and blood group of polydactyly patients showed high significant ($P < 0.05$). The result demonstrated that dermatoglyphic patterns and values could be used as a noninvasive anatomical marker of polydactyly. However, further studies are needed to confirm these findings for Nigerians, possibly using a larger population.

Key words: Dermatoglyphic, Polydactyly, South-southern Nigerians.

INTRODUCTION

Polydactyly or polydactylism also known as hyperdactyly is a congenital physical anomaly in humans having supernumerary fingers or toes. Polydactyly refers to extra digits - in the hand,

extra fingers or thumbs. It is sometimes called sexdactyly, hexadactyly, or hexadactylism¹⁻⁵. Polydactyly is one of the most common variations on the basic growth pattern of the hand.

Polydactyly can occur by itself, or more commonly, as one feature of a syndrome of congenital anomalies. It is associated with autosomal dominant mutations in single genes, i.e. it is not a multifactorial trait. Mutation in a variety of genes can give rise to polydactyly. Typically the mutated gene is involved in developmental patterning, and a syndrome of congenital anomalies results, of which polydactyly is one feature.^{6,7}

Dermatoglyphic pattern is positively correlated in some disease conditions both genetically determined and none genetically related. Such conditions include those associated with organic mental retardation.^{4,8,9-14} A number of studies have indicated dermatoglyphic correlation in large number of genetic disorders which include diabetes mellitus,^{14,8} schizophrenia⁶, congenital heart disease¹⁰, Androgenetic alopecia¹¹ and Down Syndrome⁴. However, there is no documented work concerning dermatoglyphics in polydactyly patients of Nigerian origin. The objective of this study was therefore to establish the dermatoglyphic patterns and parameter values of polydactyly patients for use in Nigeria, particularly in the South-southern region of the country from which the subjects for the study were selected.

MATERIALS AND METHODS

A total of 40 subjects, 20 polydactyly (P) and 20 normal controls (N), were randomly selected for the study. Both the polydactyly subjects and normal controls comprised 15 males and 5 females, all between the age 18-28 years from South-Southern Nigeria. The members of the control group were either of the AA or AS genotype while that of the polydactyly was AA. Palmar and digital prints of both hands were collected from the subjects using a standard method. The subjects were required to wash their hands with soap and water and dry them with a hand towel to avoid dirt from interfering with the ink prints. The stamp pad was soaked with

endorsing ink. Ensuring that the ink was thoroughly spread on the pad, the fingers were placed on it one after the other and then transferred to the duplicating paper and rolled gently and slowly from side to side in order to obtain clear complete print. To obtain palmar prints, subjects had their hands extended at the wrist with fingers fully abducted and were asked to make impressions by placing their palms on the duplicating paper, starting with the proximal part of the paper, applying little pressure. Palmar angles were measured as shown in figure 1. The genotype was also obtained.

The Genotype was gotten with the aid of the genotyping machine and the blood grouping was carried out too with the aid of Anti A, B, O, and D. The mixing was done on a white tile. The blood of the subject was gotten (just a little was dropped on the tile) and the various antiseras were added and mixed thoroughly to check the kind of group (A, B, AB, O) the blood belong to, the blood part that cause agglutination is said to be the wrong blood group while the one that does not agglutinate is the right blood group. It must be noted that the anti D was use to check the Rhesus factor, if it is negative (-ve) there will be no agglutination while if it is positive (+ve). And the remaining part of the blood that was not use for the blood typing was use in genotyping (AA, AS, SS, AC).

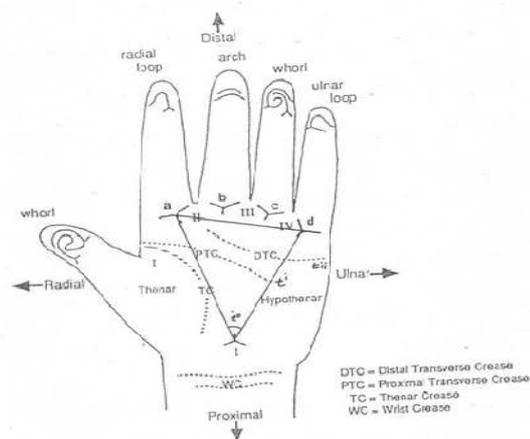


Figure 1. Measurement of ATD angle, DAT angle and digital patterns

RESULTS

This study was carried out on 20 normal healthy persons and 20 polydactyly individuals, all from South-southern Nigeria. The results are shown in tables 1-9. t-tests confirmed significant differences between polydactyly individuals and the normal subjects in the frequencies of digital patterns on all the right and left hand digits. (p<0.05).

Table1. Percent frequency of digital patterns in both polydactyly (P) and normal control group (N)

Pattern	Polydactyly (P) P= 20			Normal (control group) N= 20		
	Male	Female	Average	Male	Female	Average
ARCH	8.67%	14%	11.34%	4.67%	12%	8.34%
WHORL	29.35%	54%	41.68%	34.00%	28.00%	31.00%
ULNAR LOOP	62.00%	26%	44.00%	56.67%	60.00%	58.34%
RADIAL LOOP	0.67%	6%	3.34%	4.67%	0.00%	2.34%

Table2. Percent frequency of digital patterns for each digit of both hands in female polydactyly (P) and female normal control group (N) P > 0.05

Right hand digits		P=5				N=5					
		RI		RII		RIII		RIV		RV	
Patterns		P	N	P	N	P	N	P	N	P	N
Arch		40.00	40.00	0.00	20.00	0.00	20.00	0.00	0.00	0.00	0.00
Whorl		40.00	60.00	40.00	40.00	60.00	20.00	60.00	40.00	40.00	0.00
Ulnar Loop		20.00	00.00	20.00	40.00	20.00	60.00	40.00	60.00	60.00	100.00
Radial Loop		20.00	0.00	20.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00

Left hand digits		P=5				N=5					
		LI		LII		LIII		LIV		LV	
Patterns		P	N	P	N	P	N	P	N	P	N
Arch		40.00	20.00	0.00	0.00	20.00	20.00	20.00	0.00	20.00	0.00
Whorl		40.00	20.00	40.00	40.00	80.00	20.00	60.00	20.00	80.00	20.00
Ulnar Loop		20.00	60.00	60.00	60.00	00.00	60.00	20.00	80.00	0.00	80.00
Radial Loop		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3. Percent frequency of digital patterns for each digit of both hands in male polydactyly (P) and male normals "N" (control group) P > 0.05 N=NORMAL P=POLYDACTYL

Right hand digits		P=15				N=15					
		RI		RII		RIII		RIV		RV	
Patterns		P	N	P	N	P	N	P	N	P	N
Arch		6.67	0.00	6.67	6.67	6.67	13.33	6.67	6.67	6.67	0.00
Whorl		46.67	66.67	26.67	33.33	26.67	33.33	46.67	40.00	20.0	20.00
Ulnar Loop		46.67	20.00	66.67	40.00	73.33	53.33	46.67	53.33	73.3	80.00
Radial Loop		0.00	13.33	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00

Left hand digits		P=15				N=15					
		LI		LII		LIII		LIV		LV	
Patterns		P	N	P	N	P	N	P	N	P	N
Arch		13.33	6.67	26.67	13.33	6.67	0.00	0.00	0.00	6.67	0.00
Whorl		33.33	53.33	33.33	26.67	26.67	26.67	26.67	26.67	6.67	20.00
Ulnar Loop		53.34	40.00	33.33	53.33	66.67	73.33	73.33	73.33	86.66	80.00
Radial Loop		0.00	0.00	6.67	6.67	0.00	0.00	0.00	0.00	0.00	0.00

Table 4. Mean, Standard deviation (S.D) and Standard errors (S.E) of *palmar ATD angles* in male and female and polydactyly group.

	Mean ± S.E N=NORMAL		Mean ± S.E P=POLYDACTYL	
	Right Palm	Left Palm	Right Palm	Left Palm
Male	38.87 ± 1.30	39.13 ± 1.70	43.13 ± 0.73	44.60 ± 0.59
Female	47.20 ± 4.13	47.80 ± 3.80	44.60 ± 0.78	41.20 ± 1.96

Sample size for male normals = 15; Sample size for Male Polydactyly = 15; Sample size for Female normals = 5; Sample size for female Polydactyly=5. P > 0.05 but for female normal P < 0.05

Table 5. Mean, Standard deviation (S.D) and Standard errors (S.E) of *palmar DAT angles* in male and female and polydactyly group.

Sample size for normal male = 15; Sample size for Male Polydactyly = 15; Sample size for normal female = 5; Sample size for female Polydactyly=5.

	Mean ± S.E N=NORMAL		Mean ± S.E P=POLYDACTYL	
	Right Palm	Left Palm	Right Palm	Left Palm
Male	58.07 ± 1.49	59.20 ± 1.46	62.50 ± 0.84	59.80 ± 0.90
Female	57.60 ± 3.24	56.00 ± 4.43	64.60 ± 2.17	64.80 ± 3.61

P > 0.05 but for female (normal and polydactyly) P < 0.05

Table 6. Mean, Standard deviation (S.D) and Standard errors (S.E) of *palmar ADT-angles* in male and female and polydactyly group.

	Mean ± S.E N=NORMAL		Mean ± S.E P=POLYDACTYL	
	Right Palm	Left Palm	Right Palm	Left Palm
Male	80.87 ± 1.13	81.67 ± 1.29	73.00 ± 0.83	74.93 ± 1.18
Female	75.20 ± 1.07	76.20 ± 1.75	70.80 ± 1.66	74.00 ± 2.79

Table 7. Mean, Standard deviation (S.D) and Standard errors (S.E) of *palmar A-B ridge count* in male and female and polydactyly group.

	Mean ± S.E N=NORMAL		Mean ± S.E P=POLYDACTYL	
	Right Palm	Left Palm	Right Palm	Left Palm
Male	33.40 ± 1.07	31.73 ± 1.55	33.20 ± 1.00	33.47 ± 1.36
Female	62.40 ± 9.40	38.80 ± 1.86	36.00 ± 1.80	39.20 ± 1.69

For male normals = 15; Sample size for Male Polydactyly = 15; Sample size for Female normals = 5; Sample size for Female Polydactyly. **P > 0.05** but for **female right palm (normal) P < 0.05**

Table 8: Mean, Standard deviation (S.D) and Standard errors (S.E) of *digital ridge count* in male and female and polydactyly group.

	Mean ± S.E N=NORMAL		Mean ± S.E P=POLYDACTYL	
	Right Palm	Left Palm	Right Palm	Left Palm
Male	67.40 ± 4.02	70.13 ± 3.18	66.80 ± 4.04	70.67 ± 3.26
Female	62.40 ± 10.49	72.00 ± 11.88	64.00 ± 9.65	70.20 ± 11.18

P < 0.05

male normals = 15; Sample size for Male Polydactyly = 15; Sample size for Female normals = 5; Sample size for Female Polydactyly.

Table 9: Genotype and blood group table in males and females.

	Genotype	Blood group
Normal	2 AS, 18 AA,	18 O ⁺ , 2A ⁺ ,
Polydactyly	20 AA	19 O ⁺ , 1 A ⁺

P < 0.05

DISCUSSION

A number of studies have indicated dermatoglyphic correlation in large number of genetic disorders which include diabetes mellitus^{14,8}, schizophrenia⁶, congenital heart disease¹⁰, Androgenic alopecia¹¹ and Down Syndrome⁴. The variable implicated with dermatoglyphics correlation include: digital pattern, ATD angle, DAT angle digital ridge count and palmer crease pattern^{13,4,12,14}.

Most of the authors agree that ulnar loop has the highest percentage followed by whorl, arch and radial loop among the normal individuals. Oladipo and Akanigha¹¹ have however reported that whorl had the highest percentage among Alopecians. My observation in this respect is partly in agreement with those of most authors and partly in agreement with that of Oladipo and Akanigha¹¹ as the whorl and ulnar loop has the highest percentage in the digit of male and female polydactyly patients respectively. Similarly it also has the highest percentage in Rii, Riii, Riv, Li, Lii, Liii, and Liv of the normal female subjects.

The mean ATD angles of polydactyly patients in the present study average 47.50 and 39.00 for females and males respectively. However, these were not significantly ($p < 0.05$) greater than those of the normal subjects 42.90 and 43.87 of females and males respectively. In addition, the obtained average ATD angles in this study is greater than the average ATD angle of 41.8⁰ reported for average Nigerians by Oladipo and Akanigha¹¹. Normal ATD angle was equally put at 45⁰. An Average value that is far from these values is considered abnormal statistical analysis of the observed dermatoglyphics parameters; digital patterns, and palmer crease in polydactyly patients and control (normal) groups concluded that no significant difference exist between the two groups for all dermatoglyphic parameters studied.

There were no Sidney and Simian creases in the both subjects. Thus, digital ridge count is the best parameter for assessing people with polydactyly

but A-B ridge count and ADT angles and DAT angles are also good parameters for the assessment of individuals with polydactyly.

Furthermore, in this study, both experimental and control groups were selected at random from south southern, Nigeria, with no sex or tribe matching between experimental and control subjects.

Dermatoglyphics have also been shown to have ethnic and racial variations^{11,15,16,17,18}. It is possible then that an ethnicity sensitive sample would yield a different result.

However, field studies using sample frame across geographic and sociocultural groups with bigger and ethnicity sensitive samples may give opportunity for more definitive deductions.

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