



DERMAL AB-RIDGE COUNT: POSSIBLE MARKER FOR AUTISM

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ABSTRACT

Dermatoglyphics as the study of epidermal ridges has been well known for personal identification and recently for the diagnosis of various genetic disorders. The study aimed at evaluating the AB- ridge count (ABRC) of autistic subjects and its use as a possible marker for the diagnosis of autism in Nigeria. A total of 200 subjects were recruited for the study comprising 100 autistic subjects (males = 82, females= 18) and 100 control subjects (males= 65, females = 35). Autistic subjects were selected from special schools in Nigeria while the control subjects were selected from University of Port Harcourt Demonstration Secondary School and its neighbourhood. The data was analysed using Mann-Whitney U test. Results revealed that mean rank of ABRC of autistic subjects and control subjects for both sexes on the right hand was 85.65 and 115.36 respectively. The difference was significant, ($p < 0.05$). The left hand was not significant though lower than controls. While mean rank of ABRC for male autistic and male control subjects on the right hand was 59.17 and 83.58 respectively. The difference was significant ($p < 0.05$) on the right hand but not significant on the left hand. The female autistic subjects were not significantly different from the female control subjects bilaterally, ($p > 0.05$). The results revealed a strong association of ABRC with autism. It suggests dermatoglyphic ab-ridge count can be used as a possible diagnostic marker for the early diagnosis of autism in Nigeria.

KEYWORDS: ABRC, Dermatoglyphics, Diagnosis, Autism, Nigeria.

INTRODUCTION

The skin is the membranous protective covering of the body. It consists of two layers derived from two different germ layers. They are the ectoderm and mesoderm. The epidermis is the superficial layer which is derived from surface ectoderm while the dermis is the deep layer derived from mesoderm.^[1] At about the 10th week of intrauterine life the epidermal ridges begin to form and are permanently established at about the 17th week of intrauterine life. On the surface of the palms of the hands and the soles of the feet, the epidermal ridges produce grooves.^[2] Characteristic patterns are formed on the tips of fingers and toes which are genetically determined.^[3] This is the basis for examining fingerprints in criminal investigations and for medical genetics.

Dermatoglyphics is the scientific study of epidermal ridges of skin (both fingerprints and footprints).^[1] Its science is based on two major facts: first, the ridges are slightly different for different fingers and no two persons, not even the monozygotic twins, show exactly similar fingerprint patterns, and secondly, the ridges are permanent throughout life.^[4] The permanency of fingerprint patterns as studied by Galton in 1892 has been the bedrock of genetics in dermatoglyphics.

Dermatoglyphics has formed part of the research into human genetics.^[5] In that regard some scientists such as Sarah Holt & Penrose have made so many important contributions on quantitative genetics of dermatoglyphics in normal population.

During the early month of fetal development when the ridges are in the process of formation, certain disturbances of fetal growth during this period, which could be either under genetic control or influenced by environmental factors are able to modify the ridge configurations, because once a pattern is established it can never be altered except increase in size.^[6,7,8] Today, dermatoglyphics has so many applications. It can be applied in psychiatry, twin diagnosis, forensic and anthropology studies, maternal disputed paternity, personal identification as well as medical/disease diagnosis and population studies.^[9,10]

The term "Autism" was first coined by Kanner in 1982 who single handedly did a lot of work on Autism. Autism is a neuro-developmental disorder characterized by social and communication impairments.^[11,12] It is also characterized by repetitive behaviour, ie sticking to a

particular type of play of behaviour like watching one particular programme on TV etc.

Located proximal to the base of digits II to V are the tri-radius which are labeled abc& d. Ridges between tri-radius 'a' and 'b' are called a-b ridge count. Ridges between 'b' and 'c' are called b-c ridge count and between 'c' and 'd' are called c-d- ridge count. The counting is done along a straight line connecting the tri-radial point to the point of core. The ABRC is said to be the more satisfactory palmar ridge count because it is genetically controlled.^[13] However, more recently research reveals palmar ridge count, as a useful tool in diagnosing autism.^[14] Hence, the study aimed at evaluating the dermatoglyphic ab- ridge count as a possible diagnostic marker of autistic subjects in Nigeria.

MATERIALS AND METHODS

This study comprised both male and female autistic subjects in Nigeria. Though there was no documented statistical record on the population of autistic subjects in Nigeria, however Bakare *et al.*^[15] reported prevalence rate of 0.7% for autism in Nigeria. The sampling technique used for this research was the convenience sampling technique since the children in question are not many and are difficult to locate due to fear of stigmatization associated with this disorder. The subjects who met the inclusion criteria were selected. Information needed for the selection of the subjects were obtained directly from the occupational therapists, care-givers or teachers and supported by the researcher's physical observations.

One hundred (100) autistic subjects (82 males and 18 females) and one hundred (100) control subjects (65 males and 35 females) were recruited for the study. Age

of autistic subjects was matched with the control subjects. Autistic subjects were selected from special schools in Nigeria while the control subjects were selected from University of Port Harcourt Demonstration Secondary School and the neighbourhood. An informed consent which contains details of the research work was issued out and clarifications given where necessary before the commencement of work. Ethical approval was also gotten from the Research Ethics Committee, University of Port Harcourt before the start of the study.

The subjects included for the research work 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 palms and feet.

The method involves using a digital scanner (Hewlett-Packard (hp) G3110 Scanjet Scanner with 9600x4800 dpi resolution) connected to a laptop to identify and classify dermatoglyphics. The palms were scanned and saved appropriately. For abRC the counting were done along a straight line between 'a' tri-radius and 'b' tri-radius points using autocad program (version 2010). The program was used to count ridges with limited errors after a line was drawn between two triradii 'a' and 'b'.

The data obtained from this study were subjected to test using SPSS software (Statistical Package for Social Science Version 23). For clarity, tables were used to present results. Mann-Whitney U test was used to test for association. Mann-Whitney U test analysis was used since it is a non-parametric alternative test to the independent t-test. All statistical testing were done at 95% confidence level with p-value less than 0.05 ($p < 0.05$) taken to be significant.

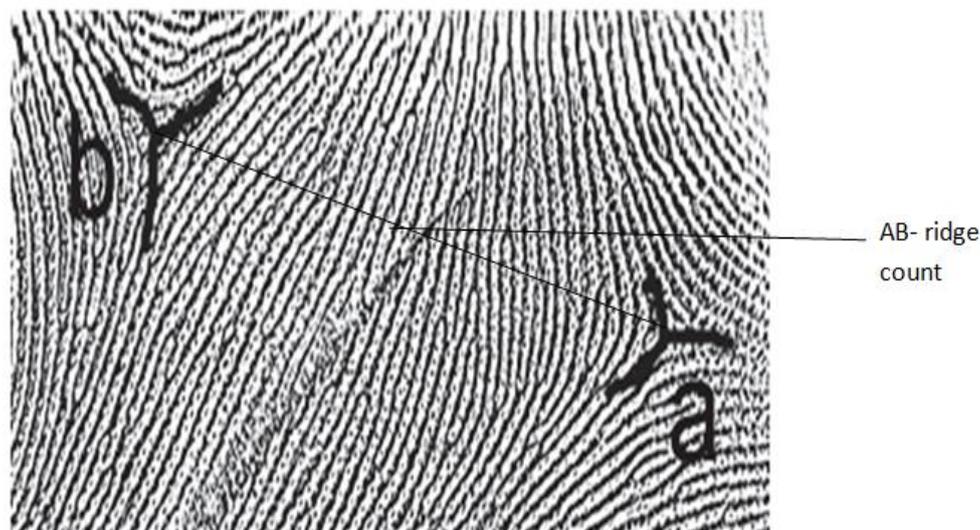


Figure 1: AB- ridge count.^[16]

RESULTS

As shown in table 1, Mann-Whitney U test was used to test for differences between ABRC of autistic subjects

and that of normal subjects on the right and left hands of both sexes. The results on the right hand showed that the mean rank of ABRC of autistic subjects was significantly

different from those of normal subjects ($p < 0.05$), while on the left hand no significant difference was observed between the groups ($p > 0.05$). As shown in table 2, the results on the right hand showed that ABRC of autistic male subjects were significantly different from those of male normal subjects ($p < 0.05$), while on the left hand,

ABRC was not significantly different in both groups ($p > 0.05$). As shown in table 3, the results on the right and left hands of female autistic and normal subjects showed no statistically significant difference in both groups ($p > 0.05$).

Table 1: Mann-Whitney U test comparing the Right and left AB Ridge count of Autistic and Normal Subjects of both sexes.

Right hand	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	P-value
ABRC	AU Subjects	100	85.65	8564.50	3514.50	8564.50	-3.64	0.00**
	NO Subjects	100	115.36	11535.50				
Left hand								
ABRC	AU Subjects	100	94.63	9463.00	4413.00	9463.00	-1.44	0.15
	NO Subjects	100	106.37	10637.00				

Note: AU-Autism, NO-normal, df-degree of freedom, **-significant, z score, ABRC- AB ridge count.

Table 2: Mann-Whitney U test comparing the Right and left AB Ridge count of Autistic and Normal Subjects of male subjects.

Right hand	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	P-value
ABRC	AU FINGER	75	59.17	4437.50	1587.50	4437.50	-3.56	0.00**
	NORMAL FINGER	65	83.58	5432.50				
Left hand								
ABRC	AU FINGER	75	66.86	5014.50	2164.50	5014.50	-1.14	0.25
	NORMAL FINGER	65	74.70	4855.50				

Note: AU-Autism, NO-normal, df-degree of freedom, **-significant, z score, ABRC- AB ridge count.

Table 3: Mann-Whitney U test comparing the Right and left AB Ridge count of Autistic and Normal Subjects of female subjects.

Right hand	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	P-value
ABRC	AU FINGER	25	27.60	690.00	365.00	690.00	-1.09	0.28
	NORMAL FINGER	35	32.57	1140.00				
Left hand								
ABRC	AU FINGER	25	28.68	717.00	392.00	717.00	-0.68	0.49
	NORMAL FINGER	35	31.80	1113.00				

Note: AU-Autism, NO-normal, df-degree of freedom, **-significant, z score, ABRC- AB ridge count.

DISCUSSION

ABRC has been shown to be genetically controlled and happened to be the most satisfactory dermal ridge count and highly correlated with disorders.^[5,17] Research on twins indicates greater environmental influence on ABRC than finger ridge count.^[5] ABRC was found to be significantly different between patients especially Down's syndrome and controls.^[18] In the present study, ABRC of autistic subjects were observed to be significantly lower on the right hand while the left hand also had a decreased ABRC but not significant between autistic and normal subjects of both sexes. This finding was in line with Sanyaolu *et al.*^[17] who also reported significantly lower ABRC for autistic children than controls. Millicic *et al.*^[19] observed a significant difference in the ABRC of autistic and control subjects and between the mothers and their sons as compared with their fathers and their daughters. This implies that, the parents of autistic subjects could also carry certain

genetic modifications showed in dermatoglyphics. The present study suggests genetic factors in the etiology of autism. Ozyurt *et al.*^[20] observed a significantly lower ABRC for schizophrenia. In polydactyly patients, ABRC was significantly higher than normal subjects.^[21] The male autistic subjects have a significantly lower ABRC on the right hand when compared to the male normal subjects. The result was in consonance with the works of Arrieta *et al.*^[22], Millicic *et al.*^[19] and Stosljevic and Adamovic.^[23] The female autistic subjects showed an insignificantly lower ABRC when compared to controls on both hands. Sanyaolu *et al.*^[17] also reported an insignificantly lower ABRC for female autistic subjects than the female controls. The results of this study observed sexual dimorphism. It also showed that the male autistic subjects are more influenced by environmental factors than do female subjects since the female autistic had no significant difference when compared to female normal subjects. The male are more

susceptible to environmental prenatal stress than their female counterparts. ABRC is said to be more influenced by environmental factors than genetic factors and only reduced ABRC could be associated with early environmental insults such as obstetric complications.^[24,25,26,27,20]

CONCLUSION

The findings of this study are in line with other works, it suggests dermatoglyphic AB-ridge count a possible diagnostic marker for the early diagnosis of autism in Nigeria.

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