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C-Line Termination of Autistic Subjects in Nigeria

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ABSTRACT
C-line termination patterns have been found to be of great importance in population studies. However, recent studies also revealed its usefulness in the diagnosis of some genetic diseases. This study aimed at evaluating the C-line termination patterns of autistic subjects in Nigeria as compared with the control group. Digital scanning method was used. 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. Autistic subjects were selected from special schools in Nigeria while the control subjects were selected from University of Port Harcourt Demonstration Secondary School. Chi-square statistical tool was used to test the data. The result revealed that absent termination (AT), proximal termination (PT) and radial termination (RT) have higher percentage frequencies in autistic subjects when compared with the control subjects for both sexes bilaterally while control subjects have the highest percentage frequency of ulnar termination, (Right autism: AT-8%, PT-9%, RT-47%, UT-36%; right control: AT-6%, PT-5%, RT-41%, UT-48%) and (left autism: AT-16%, PT-9%, RT-29%, UT-46%; left control: AT-15%, PT-5%, RT-23%, UT-57%). However, there was no significant difference in the distribution of the c-line patterns between autistic and control subjects for both sexes on both hands ($p>0.05$). Both the male and female of autistic and control subjects showed no significant differences when compared ($p>0.05$). The results of this study suggest that C-line patterns are population specific. For Nigerians, it might not be a good dermatoglyphic screening tool for diagnosis of autism. However, further studies with greater sample size are recommended.

Keywords: C-line termination, Dermatoglyphics, Autism, diagnosis, Nigeria

INTRODUCTION
Autism is a neuro-developmental disorder associated with social and communication impairments that is, the inability to relate normally, to form normal social relationships or to communicate normally[1]. It is also characterized by repetitive behavior, ie sticking to a particular type of play of behaviour like watching one particular programme on TV etc. The onset of autism varies. Some shows signs from birth while for others symptoms appear more suddenly after some months of normal life. It is five times more in males than in females, cuts across all boundaries. It knows no racial, ethnic or social boundaries. Autism is increasing yearly upto 17-20% which might be as a result of lack of information on the disease[2]. Though there is no actual cure for it, the 2006 autism act called for research into the possible causes of autism especially environmental causes, and creating education for autism, organizing programs which can bring about early diagnosis and detection, intervention as well as treatment for autism[3].

Dermatoglyphics which is one of the physical anthropological tools used previously for the identification of individual is recently useful for the early detection/diagnosis of diseases[4], especially those with genetic basis. Fingerprint derives its usefulness from the fact that the ridges on the fingers and palm are slightly different from individual and no two persons have exactly the same print patterns[5]. These ridges as well as the print patterns are constant throughout the life of an individual which makes an individual unique and special from the other person(s)[6,7]. It has been reported that no monozygotic twins have the same fingerprint pattern and ridges[5,8].

Development of dermatoglyphics and brain seems to be interlinked[9]. The brain and skin develop from the same ectoderm, at about 13th week of intrauterine life and complete its formation at about the 21st week of intrauterine life. At this period of development, various organs also develop alongside, so that ridge pattern can be affected by certain abnormalities of early development. 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.[10,11,12,13].

Today medical dermatoglyphics applies dermatoglyphics in the diagnosis of some diseases with high level of accuracy[14]. Some researchers have reported certain level of correlations between dermatoglyphics and some disorders especially those with genetic origin such as autism[15,16,17] and Down's syndrome[18,19,20,21,16], mental retardation[22], Schizophrenia[23], and Diabetes Mellitus[24,25], due to the fact that genetic and uterine environmental

events influence dermal pattern formation and so genetic anomalies in the process leave markers in the ridge pattern.

The Palmar C mainline is the ridge that begins as the proximal radiant from tri-radius c, and it lies at the base of the ring fingers[26]. Its study is of great value or importance in the study of ethnic variation. It shows polymorphism with regards to direction and as well as degree of transversality[27,28,26]. And so, it is very good tool for population genetics study,[27,29,30]. In addition C-line termination has been shown to have value in the investigations of some genetic diseases e.g. Down syndrome[31]. But it was found to have no correlation with Klinefelter's syndrome[32]. Hence, this study aimed at evaluating the c-line patterns of autistic subjects in Nigeria.

MATERIALS AND METHOD

This study comprised both male and female autistic subjects in Nigeria. There was no age consideration since dermatoglyphics is permanent throughout life and doesn't change with age. Though there was no documented statistical record on the population of autistic subjects in Nigeria, however Bakare[33] 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 were not many and are difficult to come by due to fear of stigmatization associated with this disorder. The subjects who met the inclusion criteria and granted consent were selected from various special schools in some selected cities in Nigeria– Lagos, Abuja and Port Harcourt. These cities were selected because of their awareness as regards the disorder, and they are strategically located within the country. Information needed for the selection of the subjects was obtained directly from the occupational therapists, care-givers or teachers supported by the researcher 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 neigbhourhood. Information needed for the selection of the subjects was obtained directly from the occupational therapists, care-givers or teachers which were supported by the physical observations of the researcher. An informed consent which contains details of the research work was issued out and clarifications given were 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 an 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 scanner and laptop were both electrically powered using any electrical source. The palms were scanned and saved appropriately. Palmar C-line has about four (4) likely terminating patterns which include:

- Ulnar termination: Here C-line terminates on the ulnar (little finger) border of the palm, precisely at position 3,4,5',5",6 or 7 [31,26].
- Radial termination: Termination occurs on the radial (thumb) side of the palm, precisely at position 9,10,11,12, or 13 [31,26].
- Proximal termination: Termination occurs on the base of the little or ring finger or the inter-digital area between these fingers, precisely at position 8 or X, x, [31,26].
- Absent termination: The c-tri-radius and by extension the C-line are missing or not present at all [28,34,31].

The data obtained from this study were subjected to test using SPSS (Statistical Package for Social Science IBM ® Version 23 New York). Chi square was used for the analysis. 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 the distribution of the right and left C-line termination (CLT) pattern and test of association in autistic and normal subjects of both sexes. C-line termination was not significantly different in both groups bilaterally $p>0.05$. Autistic subjects have the highest radial termination on the right and left hands than the normal subjects. While ulnar termination was more in normal subjects than autistic subjects (both sexes) on both hands. Autistic subjects also have higher percentage of absent and proximal terminations when compared to the normal subjects.

Table 2 showed the distribution of the right and left C-line termination (CLT) pattern and test of association in male autistic and normal subjects. C-line termination was not significantly different in both groups $p>0.05$. Autistic subjects have the highest radial termination on the right and left hands than the normal subjects. While ulnar termination was more in normal subjects than autistic subjects (both sexes) on both hands. Autistic male subjects have higher percentage frequency of proximal termination when compared to normal subjects bilaterally. However, absent termination showed the difference unilaterally.

Table 3 showed the distribution of the right and left C-line termination (CLT) and test of association in female autistic and normal subjects. C-line termination was not

significantly different in both groups p>0.05. Autistic female subjects have the highest radial termination on the right hand than the female normal subjects, the reverse was seen in the left hand. Ulnar termination was higher in female normal subjects than autistic female subjects. Autistic female subjects have higher percentage of absent termination when compared to the normal female subjects bilaterally. However proximal termination was absent in the right autistic female subjects and low in the left normal female subjects.

Table 1: Distribution of the right and left C- Line termination (CLT) pattern and test of association in autistic and normal subjects of both sexes

Group	CLT (%)				Chi-Square analysis		
	AT	PT	RT	UT	X^2	Df	P-value
Right							
AU Subjects	8 (8.0)	9 (9.0)	47 (47.0)	36 (36.0)	3.55	3	0.31
NO Subjects	6 (6.0)	5 (5.0)	41 (41.0)	48 (48.0)			
Left							
AU Subjects	16 (16.0)	9 (9.0)	29 (29.0)	46 (46.0)	3.04	3	0.39
NO Subjects	15 (15.0)	5 (5.0)	23 (23.0)	57 (57.0)			

Note: AU-Autism, NO-normal, AT-Absent termination, PT-Proximal termination, RT-Radial termination, UT-Ulnar termination, df-degree of freedom, **-significant

Table 2: Distribution of the right and left C-Line termination (CLT) pattern and test of association in males of autistic and normal subjects

Group	**CLT (%)**				**Chi-Square analysis**		
	AT	**PT**	**RT**	**UT**	X^2	**Df**	**P-value**
Right							
AU FINGER	5 (6.7)	9 (12.0)	34 (45.3)	27 (36.0)	5.26	3	0.15
NORMAL FINGER	5 (7.7)	2 (3.1)	26 (40.0)	32 (49.2)			
Left							
AU FINGER	11 (14.7)	7 (9.3)	25 (33.3)	32 (42.7)	1.97	3	0.58
NORMAL FINGER	9 (13.8)	4 (6.2)	17 (26.2)	35 (53.8)			

Note: AU-Autism, NO-normal, AT-Absent termination, PT-Proximal termination, RT-Radial termination, UT-Ulnar termination, df-degree of freedom, **-significant

Table 3: Distribution of the right and left C-line termination (CLT) and test of association in female of autistic and normal subjects

Group	**CLT (%)**				**Chi-Square analysis**		
	AT	**PT**	**RT**	**UT**	X^2	**Df**	**P-value**
Right							
AU FINGER	3 (12.0)		13 (52.0)	9 (36.0)	4.56	3	0.21
NORMAL FINGER	1 (2.9)	3 (8.6)	15 (42.9)	16 (45.7)			
Left							
AU FINGER	5 (20.0)	2 (8.0)	4 (16.0)	14 (56.0)	0.96	3	0.81
NORMAL FINGER	6 (17.1)	1 (2.9)	6 (17.1)	22 (62.9)			

Note: AU-Autism, NO-normal, AT-Absent termination, PT-Proximal termination, RT-Radial termination, UT-Ulnar termination, df-degree of freedom, **-significant

DISCUSSIONS

Autism is one of the fastest growing genetic disease world-wide. Since the brain and the skin are formed about the same period of intrauterine life, dermatoglyphics might reveal some association with autism. Infact studies revealed that dermatoglyphics can be a good tool in preventive medicine[9]. Though studies reveal relationship of some dermatoglyphics features and autism[17], but the c –line patterns of autism especially in Nigeria has not actually been studied. The present study deals with the bilateral and bisexual differences exhibited between autistic subjects and the control subjects in Nigeria.

The study of c-line termination is of great importance in population studies as well as anthropological studies[26]. Previously it has strong bilateral, racial and population differences whereby different populations can be sorted out using c-line termination [35,36]. However recently, c-line pattern have be used in the diagnosis of disorders especially those with genetic origin[31]. Among the four main lines of dermatoglyphic patterns of the palm, c-line is noted to show true polymorphism in terms of direction[26,27].

In the present study, c-line termination patterns between autistic and normal subjects of both sexes show no significant correlation on both hands, though high percentage was seen in the radial, proximal and absent terminations of autistic subjects than normal subjects. On the other hand, ulnar termination was high in normal subjects when compared to autistic subjects, more in the left hand than in the right hand. Dastidar[37] revealed a significant difference in the distribution of c-line termination and type 2 diabetes mellitus (T2DM) patients and controls. Sant *et al.*[38] reported decreased ulnar termination in diabetes mellitus in both sexes that was statistically significant. Plato *et al.*[31] who revisited the dermatoglyphics of Down syndrome reported an increased radial termination and a decreased ulnar termination for Down syndrome than controls. Bryant *et al.*[34] and Sharma *et al.*[21] also reported a higher frequency of radial termination on Down syndrome than control subjects. Ambade *et al.*[26] reported increase frequency of radial and absent terminations on the left palm of coronary artery disease (CAD) than controls of both sexes. They also reported a significant decrease frequency of radial termination and increase frequency of absent termination of c-line on the right hand of both sexes when compared to controls. In a study on Klinefelter's syndrome[32], ulnar termination was more frequent than radial termination when compared to controls. A comparative study of the Ogonis and Ijaws in Nigeria by Jaja and Igbigbi[28] revealed no radial termination in the two groups, while ulnar and proximal terminations were observed among the Ogonis and Ijaws respectively. A close look at that demonstrated association of radial termination to disorder while ulnar termination to normal condition.

In the present study, autistic subjects have a high percentage of proximal and absent terminations when compared to the control group of both sexes bilaterally. Male autistic subjects have more of radial termination than ulnar termination. Likewise the female autistic subjects have an increased percentage of radial termination than ulnar termination. Sant *et al*.[38] reported similar finding of an increased radial termination of the female autistic subjects. However, Ambade *et al.*[26] reported increase frequency of ulnar termination in females on the right hand in Coronary Artery Disease. There was absence of proximal termination on the right hand of the female autistic subjects in the present study. However, these differences show no statistically significant different between autistic subjects and control subjects. This could be as a result of smaller sample size used and high sample and more extensive study is recommended to confirm this study.

CONCLUSION

From the result of the present study, it implies dermatoglyphic pattern of c-line termination population specific. None of the C-line distribution pattern was significantly different between the experimental and control groups. This suggests that in this part of the world dermatoglyphic pattern of c-line termination might not be a very good parameter in screening autistic population for early intervention. However, further studies are recommended.

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