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Original Research Article

Dermatoglyphic Patterns of Children with Special Educational Needs

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ABSTRACT

Background: The present study aimed at finding the finger and palmar dermatoglyphic patterns of students in special school and to discover whether significant dermatoglyphic features exist in students in special school.

Materials and methods: Finger and palm prints were taken from 100 students from Garden City Special School which served as the study group and 100 students from "In Him is Life School" which served as the control group. Analysis of quantitative and qualitative traits of dermatoglyphs (Total Finger Ridge Count, atd angle, pattern type, symmetry of palmprint and type of PIC) were performed. Descriptive statistics were used to determine the differences among the groups.

Results: Central pocket loop whorl (CPLW) which is an indicator in people with better academic performance was significantly lower (P<0.0001) in individuals in the special school (SS). The *atd* angle was significantly higher (P<0.0001) in both hands in SS than in CG. The current study revealed that the prevalence of symmetrical PIC was significantly lower (P=0.012) in the SS (39%) compared to CG (67%).

Conclusion: Students in special school have unique dermatoglyphic pattern. There were significant differences in certain types of dermatoglyphic pattern observed in students in special school compared to students in normal school. Further study is required to have a baseline data which can serve as a diagnostic tool for early detection of people who need special attention.

KEY WORDS: Dermatoglyphics, Patterns, Special, Educational, Needs.

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INTRODUCTION

Dermatoglyphics is the study of epidermal ridge patterns particularly in humans. The term dermatoglyphics was coined by [1].

Dermatoglyphic is derived from the Greek words 'derma' meaning skin and 'glyphics' meaning carvings [2]. It reflects the physical appearances of the palmar and plantar surfaces of all primates.

Certain phenotypic characters of an individual can change during life, but genotypic characters never change once they are formed. One such character mediated genetically is the epidermal ridge. Epidermal ridges are ridges on the epidermis of the skin of the palms of the hand and soles of the feet where sweat pores open and are demonstrable as palm/finger and foot prints [2].

Dermatoglyphics are useful structural features in the study of population differences because of the high unique characteristic of epidermal ridge formation [3]. The pattern of epidermal ridges is highly inheritable and demonstrates high degree of variation among individuals and tends to be permanent throughout postnatal life. Furthermore, dermatoglyphics are not subject to the diversity of extrinsic factors that may contribute to the appearance of many structural traits [3].

Special education (also known as special needs education or aided education) is the practice of educating students with special educational needs in a way that addresses their individual differences and needs [4]. Ideally, this process involves the individually planned and systematically monitored arrangement of teaching procedures, adapted equipment and m aterials, and accessible settings [4].

These interventions are designed to help learners with special needs achieve a higher level of personal self-sufficiency and success in school and their community, than may be available if the student were only given access to a typical classroom education.

In all, everyone should be treated equally. However, researches have shown that people with Learning Disabilities (LD) clearly represent a significant section of the society and LD has serious implications on access to quality education and provision of appropriate training to children with special needs [5].

The situation cannot easily be reversed because of challenges such as the lack of dependable data on children with special needs which include those with LD.

The successful response to intervention is to identify these children who are having difficulties in school very early. [6] has argued that early remediation can greatly reduce the number of children meeting diagnostic criteria for learning disabilities.

Recently, the knowledge of dermatoglyphic pattern in people with LD is of interest to researchers. However little information is available in this field of research in Ghana. Therefore, this study is carried out to identify the dermatoglyphics patterns of students in special school which might be important in the early detection of the condition and serve as a critical step before developing plans for appropriate provision of essential services (special schools and academic counselling).

MATERIALS AND METHODS

This study was conducted among the students of Garden City Special School, Asokore-Mampong, in the Ashanti region of Ghana. Individuals in the special school (SS) served as the study population whereas students of "In Him is Life" School served as the control group (CG). A total of 200 students participated in the current study. An informed consent and ethical approval were obtained from KNUST institutional research review board. This comprised 100 students each for the normal school and the special school. The study group consisted of students with various types of disability including Autism (AU), Down Syndrome (DS), Cerebral Palsy (CP) and Attention Deficit/Hyperactivity Disorder (ADHD).

Bilateral images of the fingers and palms of each participants were captured using HP Scanjet digital scanner, Scanjet G3110 (Hewlett Packard, USA) connected to a laptop computer. Participant hands were clean, dried and gently placed on the scanner with the pads of all five fingers touching the surface of the scanner. The pollices were separately scanned due to it apposition with the other digits

Fingerprints were enlarged with Microsoft Window Photo Viewer, examined and classified into the pattern system (Arch, plain whorl, double loop whorl, central pocket loop whorl, radial loop and ulna loop) adopted by USA Federal Bureau of Investigations (FBI) to obtain quantitative data for analysis. Finger ridge count of each finger was counted to obtain the total finger ridge count for both hands. The palm print of each participant was also examined. The symmetry between the two palm prints was determined and recorded. The prints were then classified according to the PIC model of palm print classification.

The analysis of prints included identification of patterns, ridge counts, palmar creases and *atd* angles on the palm. The data obtained was entered into Microsoft Excel 2010 and

statistically analysed with SPSS and Graph Pad Prism 5.

Qualitative and quantitative analysis was employed in studying the prints obtained. Qualitative studies were done by studying the pattern configuration on fingertips and categorization of palmar creases as well as its symmetry. Quantitative analysis was done by ridge counting and measuring the atd angle in the palm. Separate analysis was done for the right and left hand.

RESULTS

Fingerprint Patterns Observed: The mean percentage frequency of UL was the highest pattern predominant the index finger of both special school (66.00 ± 0.57) and control group (66.00 ± 0.57). This was not statistically significant (P = 1.000) between the groups. Contrary, the mean percentage frequency of RL was significantly higher (p = 0.0019) in special school (10.00 ± 0.57) than in control group (3.00 ± 0.57). Similarly, ARs were significantly higher (p = 0.0039) in the special school (9.00 ± 0.57) than in control group (3.00 ± 0.57).

The middle finger presented significantly lower (p < 0.0001) CPLW proportion in special school (3.00 ± 0.57) as against the control group (18.00 ± 0.57). Similarly, the mean percentage frequency of RL was significantly higher (p = 0.0022) in special school (5.00 ± 0.57) than in control group (0.33 ± 0.33). The mean percentage frequency of CPLW was significantly lower (p < 0.0001) in special school (3.00 ± 0.57) compared to control group (18.00 ± 0.57) on the middle finger. Contrary, the mean percentage frequency of UL was not significantly different (p = 0.2879) when special school (76.00 ± 0.57) was compared to control group (77.00 ± 0.33).

On the ring finger, the mean percentage frequency of PW was significantly higher (p = 0.0006) in special school (15.00 ± 0.57) than in control group (7.00 ± 0.33). Similarly, the mean percentage frequency of RL was statistically significantly higher (p < 0.0001) in special school (12.00 ± 0.57) compared to the control group (0.33 ± 0.33). Contrary, the difference in mean percentage of UL was not significantly different (P = 0.0705) when compared between special school (48.00 ± 0.57) and control group (50.00 ± 0.57). The mean percentage frequency of AR was significantly higher (p < 0.0001) in special school (15.00 ± 0.57) compared to the control group (0.33 ± 0.57).

On the little finger, the mean percentage frequency of CPLW in special school (3.00 ± 0.57) was significantly lower (p = 0.0036) than in the control group (8.00 ± 0.57). In contrast, no statistically significant difference in mean percentage frequency of RL (p = 0.0668) was found between when the special school (2.00 ± 0.57) and the control group (0.33 ± 0.33). Similarly, mean percentage frequencies of ARs were not statistically significantly different (p = 0.2879) in special school (3.00 ± 0.57) and the control group (4.00 ± 0.57). Also, mean percentage frequency of UL was not significantly different (p = 0.0705) when special school (81.00 ± 0.57) was compared to control group (83.00 ± 0.33). Similarly, mean percentage frequency of PW was significantly higher (p = 0.0018) in special school (9.00 ± 0.57) compared to the control group (3.00 ± 0.57).

On the index finger, the mean percentage frequency of UL was the highest pattern prevalent in the index finger of both special school (61.00 ± 0.57) and control group (61.00 ± 0.57). This was not statistically significant (p = 1.000) between the groups. Contrary, the mean percentage frequency of RL was significantly higher (p = 0.0006) in special school (9.00 ± 0.57) than in control group (1.00 ± 0.57). Similarly, the mean percentage frequency AR was significantly higher (p = 0.0036)) in the special school (9.67 ± 0.57) than in control group (4.00 ± 0.57). Contrary, the mean percentage frequency of CPLW was significantly lower (p < 0.0001)) in the special school (4.00 ± 0.57) than in control group (26.00 ± 0.57).

The middle finger presented significantly lower (P < 0.0001) CPLW prevalence in special school (6.00 ± 0.57) as against the control group (20.00 ± 0.57). Similarly, mean percentage frequency of RL was significantly higher (P = 0.0161) in special school (3.00 ± 0.57) than in control

Table 1: Student t-test analysis of fingerprint pattern between special school and normal school students in the right hand.

		UL	RL	PW	DLW	CPLW	AR	
		mean% ± *SE*	mean% ± *SE*	mean% ± *SE*	mean% ± *SE*	mean% ± *SE*	mean% ± *SE*	%
Thumb	SS	61.00 ± 0.57	1.00 ± 0.57	9.00 ± 0.57	11.00 ± 0.57	4.00 ± 0.57	14.00 ± 0.57	100
	CG	59.00 ± 0.57	0.33 ± 0.33	1.00 ± 0.57	10.00 ± 0.57	24.00 ± 0.57	5.67 ± 0.57	100
	P-value	**0.0705**	**0.3739**	**0.0006*** **	**0.02879**	**< 0.0001*** **	**0.0002*** **	
Index	SS	66.00 ± 0.57	10.00 ± 0.57	6.00 ± 0.57	3.00 ± 0.57	6.00 ± 0.57	9.00 ± 0.57	100
	CG	66.00 ± 0.57	3.00 ± 0.57	1.000 ± 0.57	5.00 ± 0.57	22.00 ± 0.57	3.00 ± 0.57	100
	P-value	**1**	**0.0019****	**0.0036****	**0.0705**	**< 0.0001*** **	**0.0039****	
Middle	SS	76.00 ± 0.57	5.00 ± 0.57	8.00 ± 0.57	1.00 ± 0.57	3.00 ± 0.57	7.00 ± 0.57	100
	CG	77.00 ± 0.57	0.33 ± 0.33	0.33 ± 0.33	1.00 ± 0.57	18.00 ± 0.57	4.00 ± 0.57	100
	P-value	**0.2879**	**0.0022***	**0.0003*** **	**1**	**< 0.0001*** **	**0.0213***	
Ring	SS	48.00 ± 0.57	12.00 ± 0.57	15.00 ± 0.57	4.00 ± 0.57	6.00 ± 0.57	15.00 ± 0.57	100
	CG	50.00 ± 0.57	0.33 ± 0.33	7.00 ± 0.57	2.00 ± 0.57	37.67 ± 0.33	3.33 ± 0.33	100
	P-value	**0.0705**	**< 0.0001*** **	**0.0006*** **	**0.0705**	**< 0.0001*** **	**< 0.0001*** **	
Little	SS	81.00 ± 0.57	2.00 ± 0.57	9.00 ± 0.57	2.00 ± 0.57	3.00 ± 0.57	3.00 ± 0.57	100
	CG	83.00 ± 0.57	0.33 ± 0.33	3.00 ± 0.57	1.67 ± 0.33	8.00 ± 0.57	4.00 ± 0.57	100
	P-value	**0.0705**	**0.0668**	**0.0018****	**0.2879**	**0.0036****	**0.2879**	

Data is presented as mean%±standard error (SE). Group comparisons were made using t-test. AR- arch; RL-radial loop; Ulnar loop-UL; PW-plain whorl; CPL-central pocket loop; DLW- double loop whorl; SS-special school; CG-control group. * P < 0.05, ** P < 0.001 and *** P < 0.0001.

Table 2: Student t-test analysis of fingerprint pattern between special school and normal school in the left hand.

		UL	RL	PW	DLW	CPLW	AR	
		Mean% ± *SE*	Mean% ± *SE*	Mean% ± *SE*	Mean% ± *SE*	Mean% ± *SE*	Mean% ± *SE*	Total
Thumb	**SS**	73.00 ± 0.57	2.00 ± 0.57	10.00 ± 0.57	6.00 ± 0.57	4.00 ± 0.57	5.00 ± 0.57	100
	CG	71.00 ± 0.57	0.33 ± 0.33	3.00 ± 0.57	7.00 ± 0.57	14.00 ± 0.57	4.67 ± 0.33	100
	P-value	**0.0705**	**0.0668**	**0.0010****	**0.2879**	**0.0003*** **	**0.2879**	
Index	**SS**	61.00 ± 0.57	9.00 ± 0.57	13.00 ± 0.57	3.33 ± 0.57	4.00 ± 0.57	9.67 ± 0.33	100
	CG	61.00 ± 0.57	1.00 ± 0.57	6.000 ± 0.57	2.00 ± 0.57	26.00 ± 0.57	4.00 ± 0.57	100
	P-value	**1**	**0.0006*** **	**0.0010****	**0.2879**	**< 0.0001*** **	**0.0036****	
Middle	**SS**	74.67 ± 0.33	3.00 ± 0.57	9.00 ± 0.33	0.33 ± 0.33	6.00 ± 0.57	7.00 ± 0.57	100
	CG	74.00 ± 0.57	0.33 ± 0.33	1.00 ± 0.57	1.00 ± 0.88	20.00 ± 0.57	3.67 ± 0.33	100
	Pvalue	**0.6433**	**0.0161***	**0.0010****	**0.3739**	**< 0.0001*** **	**0.0075****	
Ring	**SS**	55.00 ± 0.57	7.00 ± 0.57	14.00 ± 0.57	3.33 ± 0.33	9.67 ± 0.33	11.00 ± 0.57	100
	CG	56.67 ± 0.33	0.33 ± 0.33	4.00 ± 0.33	0.33 ± 0.33	33.67 ± 0.33	5.00 ± 0.57	100
	P-value	**0.0668**	**0.0006*** **	**0.0003*** **	**0.0031****	**< 0.0001**	**0.0018****	
Little	**SS**	79.00 ± 0.57	1.00 ± 0.57	8.00 ± 0.57	2.00 ± 0.57	4.00 ± 0.57	6.00 ± 0.57	100
	CG	80.67 ± 0.33	0.33 ± 0.33	4.00 ± 0.57	2.00 ± 0.57	10.00 ± 0.57	3.00 ± 0.57	100
	P-value	**0.2879**	**0.3739**	**0.0080****	**1**	**0.0018****	**0.0213**	

Table 3: Student t test analysis of *atd* angle between special school and normal school in both hands.

	STATUS	N	Mean ± SD	P value
Right	**SS**	100	44.87 ± 2.91	0.0001***
	CONTROL GROUP	100	41.27 ± 4.06	
Left	**SS**	100	44.58 ± 5.12	0.0001***
	CONTROL GROUP	100	41.52 ± 4.76	

Data is presented as mean ± standard deviation (SD). Group comparisons were made using t-test.; SS-special school; CONTROL GROUP -control group. * P < 0.05, ** P < 0.001 and *** P < 0.0001.

group (0.33 ± 0.33). AR was significantly higher (P = 0.0075) in special school (7.00 ± 0.57) compared to control group (3.67 ± 0.33) on the middle finger.

On the ring finger, mean percentage frequency of PW was significantly higher (P = 0.0003) in special school (14.00 ± 0.57) than in control group (4.00 ± 0.57). Similarly, RL was statistically significantly (P = 0.0006) in special school (7.00 ± 0.57) compared to the control group (0.33 ± 0.33). Contrary, the mean percentage frequency of UL was not significant (P = 0.0668) when compared between special school (55.00 ± 0.57) and control group (56.67 ± 0.33). AR were significantly higher (P = 0.0018) in special school (11.00 ± 0.57) compared to the control group (5.00 ± 0.57).

On the little finger, the mean percentage frequency CPLW in special school (4.00 ± 0.57)

***ATD* ANGLE:** For the right hand, the *atd* angle was significantly higher (p < 0.0001) in special school (44.87 ± 2.91)^0 compared to control group (41.27 ± 4.06)^0 (Table 4). Similarly, the *atd* angle for the left hand was significantly higher (p < 0.0001) in special school (44.58 ± 5.12)^0 compared to control group (41.52 ± 4.76)^0.

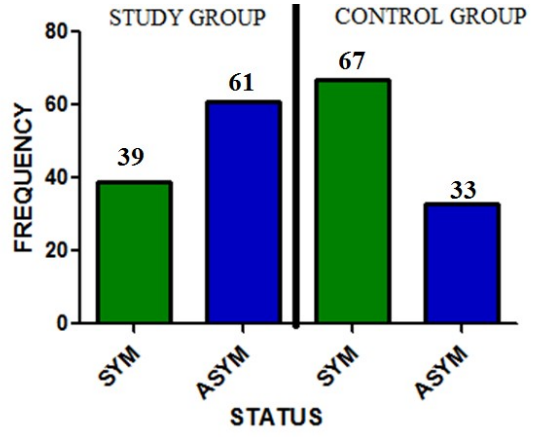

Fig. 1: A bar chart comparing the proportion of PIC symmetry among Normal School and Special School participants; SYM-symmetrical, ASYM- Asymmetrical.

PIC PATTERN: Two patterns were observed, symmetrical and asymmetrical. An individual with symmetrical PIC pattern has the same PIC types in the right as well as the left palms. In the present study, the proportion of symmetrical PIC pattern was significantly lower (p < 0.0001) in the special school (39%) compared to control group (67%) (p = 0.012). The remaining (61%) of the SS participants had asymmetrical PIC pattern (implying that the PIC types in the right palm were different from that of the left palm) as against (33%) of the control group (Figure 1).

TYPES OF PIC PATTERNS

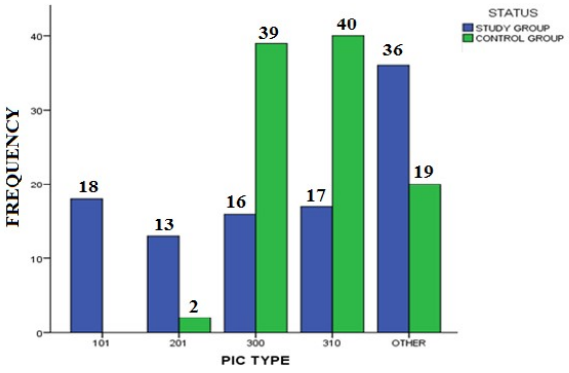

Fig. 2: A bar chart comparing the proportion of PIC type among special and normal school participants.

There was a significantly higher (p < 0.0001) PIC type 101 in special school (18%) compared to control group (0%). Similarly, PIC type 201 was significantly higher (p = 0.0002) in special school (13%) than in control group (2%). PIC type 300 was significantly lower (p < 0.0001) in special school (16%) than in control group (39%). Similarly, there was a significantly lower (p < 0.0001) PIC type 310 in SS (17%) compared to control group (40%). The 'other' PIC type was significantly higher (p < 0.0001) in special school (36%) compared to (19%) in control group. (Figure 2)

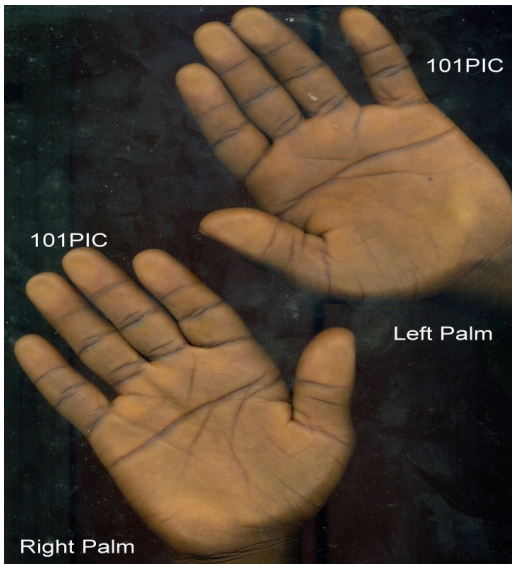

Fig. 3: A photograph showing 101 – 101 symmetrical PIC in special school (X 0.5)

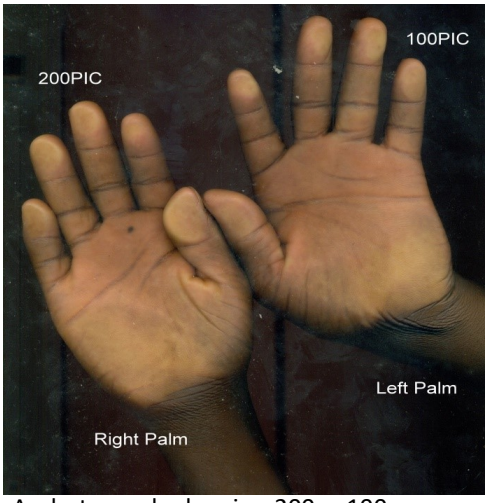

Fig. 4: A photograph showing 200 – 100 asymmetrical PIC in special school (X 0.5).

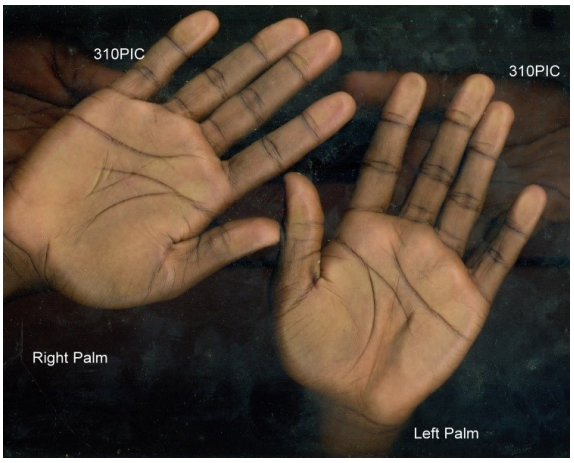

Fig. 5: A photograph showing 310 – 310 symmetrical PIC in control group (X 0.5)

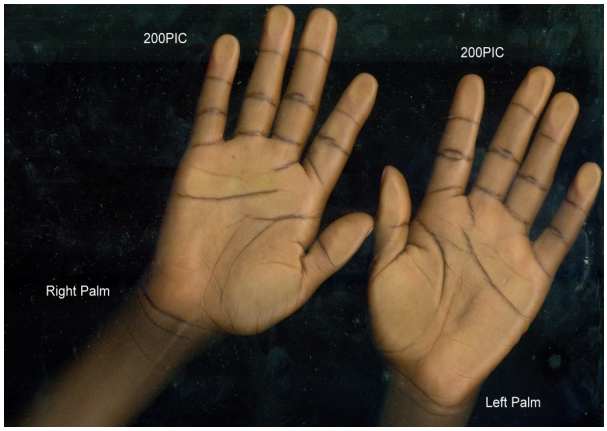

Fig. 6: A photograph showing 200 – 200 symmetrical PIC in control group (X 0.5)

DISCUSSION

Fingerprint Pattern: In current study, the UL was the most frequently observed fingerprint pattern in both groups. In the study group, the highest prevalence of UL was 81.00 ± 0.57 and the lowest prevalence was 48.00 ± 0.57 on the right little and ring fingers, respectively. Similarly, on the left hand, the highest prevalence (79.00 ± 0.57) was recorded on the little finger and the lowest prevalence (55.00 ± 0.57) on the ring finger.

The findings of the current study correlate with the findings of a study carried out by Soman, M. A., et al. 2015 [7] to determine fingerprint patterns of intellectually disabled children. The study was to determine the incidence of all four fingerprint patterns (Ulnar Loop, Radial Loop, Whorls and Arches). The study revealed that UL had the highest incidence in the intellectually disabled group and in the control group [7]. This was closely followed by the whorl pattern.

Kiran, K., et al 2010 study used dermatoglyphics to predict mental retardation, over 50 mentally challenged children was compared to 50 healthy children. The study revealed significant differences in the fingerprint patterns of the mentally challenged children compared to the control group. The mentally challenged children showed an increase in UL and a corresponding marked decrease in whorls and AR. The findings of the study correlate with the findings [8].

The CPLW was most prevalent in the control group than in the study group. For example, on the right index finger, CPLW was significantly higher ($p < 0.0001$) in the control group (22.00 ± 0.57) than in the SS (6.00 ± 0.57). Similarly, on the right ring finger, CPLW was significantly higher ($p < 0.0001$) in the control group (37.67 ± 0.33) than in the SS (6.00 ± 0.57). On the left hand, CPLW was significantly higher ($p < 0.0001$) in the control group (26.00 ± 0.57) than in the SS (4.00 ± 0.57) on the index finger (Tables 1 and 2). Similarly, on the left ring finger, CPLW was significantly higher ($p < 0.0001$) in the control group (33.67 ± 0.33) than in the SS (9.67 ± 0.33).

In a study by Offei, E. B., et 2014 [9], students with CPLW located on the ring and middle fingers performed better academically than those with other fingerprints ($p < 0.0001$). The finding of the significant increased frequency of CPLW in control group in the present study coincides with the finding of above study.

In the current study, RL pattern was least incidence in control group in all the fingers. For instance, on the left index finger, RL was

significantly lower (0.0006) in control group (1.00 ± 0.57) than in SS (9.00 ± 0.57). Similarly, on the right index, RL was significantly lower (p = 0.0019) in control group (3.00 ± 0.57) than in SS (10.00 ± 0.57).

The findings of the current study correlate with the findings carried out by Soman, M. A., 2015 et al. [7]. The study revealed that RL had the least frequency among the control group.

AR were more prevalent in the SS than in the control group in the current study. For instance, on the left index finger, AR were significantly higher (0.0036) in SS (9.67 ± 0.33) than in control group (4.00 ± 0.57). Similarly, on the right index, AR were significantly higher (0.0039) in SS (9.00 ± 0.57) than in control group (3.00 ± 0.57). [10] found in his study that there is an increase in AR in children with LD, particularly boys, than in healthy controls. The finding of the significant increased frequency of AR in persons with LD in the present study coincides with that of above study.

Rosa, A., et al. in 2000 investigated the dermatoglyphic traits in children with idiopathic intellectual disability. In the study, more RL and AR were found in intellectually disabled compared to control group. The findings of the current study correlate with the findings carried out by [11]. Comparison was also made between the various types of disability which includes AU, DS, CP and ADHD. For all the various types of disability, the incidence of UL was highest in all groups. However, DS persons had the highest incidence of UL among the groups. For example, on the right middle finger, Anova test was significant (p = 0.0002) among the groups for UL. DS persons had the highest incidence with 22.00 ± 1.00 and AU persons had the lowest incidence with 15.00 ± 1.00. Similarly, on the left middle finger, Anova test was significant (p < 0.0001) among the groups for UL. DS persons had the highest incidence with 23.00 ± 1.00 and AU persons had the lowest incidence with 15.00 ± 1.00.

***ATD* ANGLE:** The *atd* angle for the right hand was significantly higher (p < 0.0001) in SS (44.87 ± 2.91)^0 compared to CONTROL GROUP (41.27 ± 4.06)$^{0.}$ Similarly, the *atd* angle for left hand was significantly higher (p < 0.0001) in SS (44.58 ± 5.12)^0 compared to CONTROL GROUP (41.52 ± 4.76)^0 (p = 0.0001). Between the four clinical sub groups in the SS, DS individuals had the highest *atd* angle on the right (48.28) and left (52.24). This was followed by ADHD patients with 45.04 *atd* angle on the right and 44.48 on the left hand. AU had the least *atd* angle on both hands with 42.64 on the right and 44.48 on the left. The One-way Anova test revealed that the means *atd* angles were significantly different in both hands between the sub-groups in the SS (p < 0.0001).

In a comparative study by study carried out by Jameela, T. P. 2006 [12], DS persons had the highest *atd* angle than the other disability groups. DS recorded 53.58 and 48.39 *atd* angle on the left and right respectively of male DS persons. In female DS persons, the *atd* angle was 52.34 and 50.39 for the left and right hand respectively. Autistic persons had the lowest *atd* angle among the disability groups. AU recorded 42.60 and 42.64 *atd* angle on the left and right respectively of male AU persons. In female AU persons, the *atd* angle was 44.10 and 39.78 for the left and right hand respectively.

Symmetrical and asymmetrical pic pattern of palmprints: In the current study, the prevalence of symmetrical PIC pattern of palm prints was significantly lower (p < 0.0001) in the SS (39%) compared to control group (67%) (p = 0.012). The remaining (61%) of the SS were asymmetrical PIC as against (33%) of the control group. From the current study, a huge percentage of individuals with asymmetrical PIC were recorded in the SS group.

In a study by Offei, E. B., et 2014 [9], it was reported that there was significant difference between the mean academic performances of students with symmetrical palms and those with asymmetrical palms. The study concluded that individuals with symmetrical PIC in the palms will perform better academically than those with asymmetrical PIC in the palm.

In a study of 276 children with a variety of disorders, and 150 healthy children, Johnson et al [13] found a higher incidence of congenital abnormalities (52% to 30%) and borderline retardation or lower IQ (52% to 33%)

in individuals with single palmar crease, also known as the Simian Line cases. Thus, a high incidence of mental retardation in individuals with simian crease with $p < 0.01$.

Rajangam, S., et al in 1995 reported in his study that among abnormal dermatoglyphic which include simian crease, Sydney line occurred more frequently in the individuals with DS. [9] reported that none of the students in the normal population displayed PIC 101, 201 and 211 palmar creases. The study concluded that PIC 101, 201 and 211 characterizes individuals with learning difficulties.

The present study also conforms to the above mentioned report. In the present study, there was a significant higher ($p < 0.0001$) PIC type 101 in SS (18%) compared to control group (0%). Similarly, PIC type 201 was significantly higher ($p = 0.0002$) in SS (13%) than in control group (2%). PIC type 300 was significantly lower ($p < 0.0001$) in SS (16%) than in control group (39%).

CONCLUSION

A comparison was made to find if there were any dermatoglyphic differences among the various disability groups. The study showed several differences between the various disability groups and the control group.

The current study has demonstrated that students in a special school have:

1. An increased radial loop on the index, middle and ring fingers.

2. An increased arch and plain whorl on all the fingers.

3. A decreased central pocket loop whorl on all the fingers.

4. An increased *atd* angle on both palms.

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Conflicts of Interests: **None**

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