

Comparative Study of Dermatoglyphic Patterns of Schizophrenic Patients with Control Population

REKHA HIREMATH, ASHWINI NUCHHI, ANJALI GOSAVI, ANAND MUGADLIMATH

ABSTRACT

Introduction: Dermatoglyphics is the study of epidermal ridges and their configurations on the fingers, palms and soles. They can be considered as the blueprint of the activities that occurred during fetal life. They reflect the neurectodermal changes that were taking place in-utero as early as 12th week. Application of dermatoglyphic pattern as a genetic marker in schizophrenia has attracted the attention of many researchers in the world. Various studies have been conducted to prove the direct link between ridges on epidermis and schizophrenia using different features to characterize the configuration of ridges.

Aim: To study and compare dermatoglyphic patterns of schizophrenic patients with control population.

Materials and Methods: The study was conducted on 100 schizophrenics and 100 controls. The palms of the control and study groups were inked and pressed on plain paper. The obtained palm prints were studied namely finger print patterns and palmar pattern (a-bridge count, interdigital patterns), Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), and mean 'atd' angle.

Results: TFRC and a-b ridge count was decreased in schizophrenics (117.01 with SD of 31.5) when compared to controls (117.18 with SD of 35.6), though the difference was statistically not significant ($p=0.972$). Mean ab-RC in right hand of schizophrenics was lower (29.69) with SD of 6.7 as compared to control group which was having ab-RC of 35.72 with SD of 6.2. This difference was statistically highly significant ($p<0.001$). Mean ab-RC in left hand of schizophrenics was lower (30.32) with SD of 6.2 as compared to control group which was having ab-RC of 35.94 with SD of 5.9. This difference was statistically highly significant ($p<0.001$). Frequency of occurrence of patterns in interdigital areas in schizophrenia was compared with control group- more patterns seen in I3 and I4 areas, but data was statistically significant only at I2.

Conclusion: Therefore, this study demonstrated that certain dermatoglyphic patterns (ab-RC) are associated with schizophrenia and potential utility of these dermatoglyphic patterns in identifying individuals at high risk for schizophrenia may be considered in future studies.

Keywords: A-b ridge count, Absolute finger ridge count, Finger print pattern, Total finger ridge count

INTRODUCTION

Dermatoglyphics is the study of the epidermal ridges of the skin covering the digits, palms of the hands, and soles of the feet [1]. In the recent past a number of investigators have focused their attention in finding out an association of morphological and genetic characters with a number of human pathological conditions. Dermatoglyphic patterns being determined by polygenic inheritance are increasingly being used as in scientific studies. It has been demonstrated by many that dermatoglyphic analyses are of aid in the diagnosis, nosology and understanding the genetics of many human pathogenic abnormalities. A number of researchers have studied that

dermatoglyphics correlates with mental and behavioral traits, after Galton's pioneering work on fingerprints [2].

Using dermatoglyphics as a genetic marker in schizophrenia is not totally new but many investigators have already worked throughout the world on same subject. Many authors in different time period have tried to substantiate the direct link between dermatoglyphic patterns and schizophrenia using different features [3].

Hence, this study was undertaken to find statistically significant differences between schizophrenic patients and normal individuals on the basis of dermatoglyphic parameters.

MATERIALS AND METHODS

The qualitative study was conducted at BLDE Medical College Bijapur, India, for a period of 1.5 years from November 2011 to April 2013. Consecutive 100 patients of schizophrenia diagnosed clinically in the age group of 15-70 years in both sexes and 100 non psychiatric people of same age group in both sexes as control.

Patients were those attending outpatient and inpatient Department of Psychiatry of the institute. Finger and palm prints of 100 normal people for control in the age group of 15-70 years were obtained from medical students and staff of BLDE Medical College Bijapur. Study was comprised of finger print patterns (whorls, radial loops, ulnar loops and arches) and palmar pattern (ab ridge count, interdigital patterns). The quantitative study also includes TFRC, AFRC and mean 'atd' angle.

Inclusion criteria: Diagnosed cases of schizophrenia as per criteria laid down by Diagnostic and Statistical Manual of Mental Disorders, published by American Psychiatric Association (DSM-IV criteria) [4], diagnosed by consultant psychiatrist.

Exclusion criteria: infected hand, deep burns of fingers and palms leading to scars, any deformities of fingers and palm.

Determination of sample size: Mean value of schizophrenia being 82.2 and SD being 10.2 and considering 95% confidence limits, ± 2 margin of error, the required sample size was 100.

Sample formula:

$$N=(1.96)^2S^2/d^2,$$

Where: S=standard deviation=10.2; d=Margin of error= ± 2 .

Ethical clearance letter was obtained from institutional ethical committee before the start of study and consent taken from participants/guardians after explaining the procedure in brief.

Source of data: The material for the study was clinically diagnosed cases of schizophrenia (100) as per DSM [4] criteria in the age group of 15-70 years.

The modified Purvis Smith method [4] was applied. Patients were asked to wash both their hands with soap and water so as to remove any oil or dirt. Black duplicating ink was smeared on both hands and prints were taken by rolling the hands from wrist creases to finger tips on the roller covered on a bond paper of A4 size.

Fingerprints: The distal phalanges of study subject's right

hand were inked over the tile by firm pressure on the dorsum, starting from little finger. Similar method followed on left hand. Rolled finger prints were recorded after applying uniform pressure on white bond paper as following order (ulnar to radial side).

Palm prints: Palms were inked as explained above. The hand was horizontally and the rod was gradually rolled on the table. Complete palm impression, obtained over paper. Thus one set of finger prints and palm prints was obtained from each subject.

The prints obtained were immediately examined with hand-lens and care was taken to include all essential details.

STATISTICAL ANALYSIS

Data was charted on a excel sheet and analyzed using SPSS software and data was charted on a excel sheet and analyzed using SPSS software and appropriate statistical method was used.

RESULTS

Loops were most frequently occurring patterns in schizophrenics and controls. Incidence of whorls remained same in both groups (37.6%) with decreased incidence of ulnar loops (55.8% V/s. 56.2%). Increased incidence of radial loops (1.6% V/s. 1.2%) and arches (5% V/s. 4.4%) was seen in male schizophrenic patients as compared with controls. It can also be appreciated that the difference was statistically non significant ($p=0.968$) [Table/Fig-1-3].

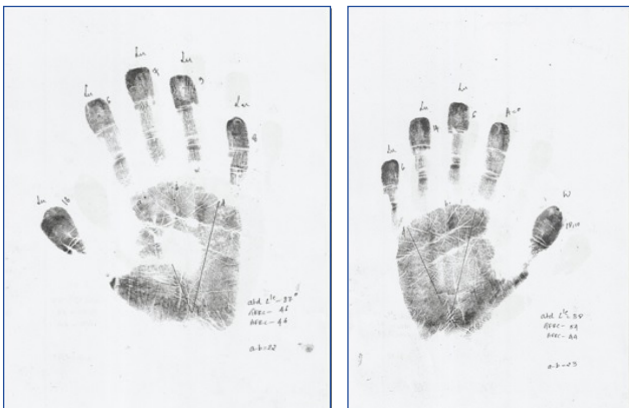
Loops were most frequently occurring patterns in both the schizophrenics and controls. Increased incidence of loops (58.8% V/s. 54.6%), and arches (7% V/s. 5.4%) and decreased incidence of whorls (37.8% V/s. 32.6%) and radial loops (1.6% V/s. 2.2%) was seen in female schizophrenic patients as compared with controls. It can also be appreciated that the difference was statistically non significant ($p=0.240$) [Table/Fig-4-6].

Loops were the most frequently occurring patterns in both the schizophrenics and controls. In schizophrenic patients as compared with control there was increased incidence of whorls (37.7% V/s. 35.1%), and radial loops (2% V/s. 1.6%) and decreased incidence of loops (55.4% V/s. 57.3%) and arches (6% V/s. 4.2%). It can also be appreciated that the difference was statistically non significant ($p=0.42$) [Table/Fig-7].

The mean AFRC in schizophrenics was lower (151.9) with SD

Male Right + Left	Whorl		Loop-Ulnar		Loop-Radial		Arch		Statistics
	n	%	n	%	n	%	n	%	
Schizophrenics (100)	188	37.6	279	55.8	8	1.6	25	5	$\chi^2= 0.257$
Controls (100)	188	37.6	281	56.2	9	1.2	22	4.4	d(f)= 3 p= 0.968

[Table/Fig-1]: Comparison of fingerprint patterns in schizophrenic males and control males.



[Table/Fig-2]: Right hand of schizophrenic male.
[Table/Fig-3]: Schizophrenic male- left hand.

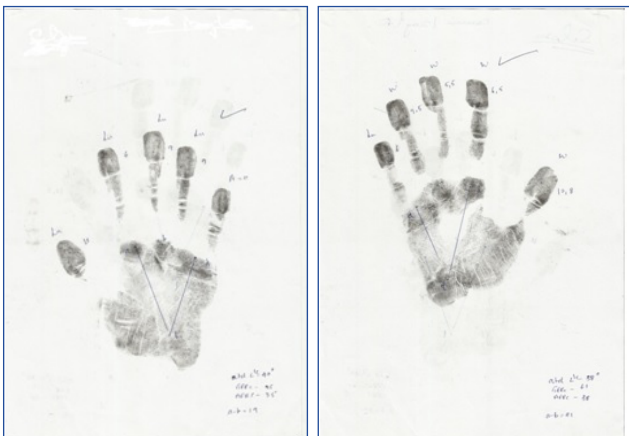
statistically not significant ($p=0.972$). The ab-RC in right hand of schizophrenics was lower (29.69) with SD of 6.7. This difference was statistically highly significant ($p<0.001$). Mean ab-RC in left hand of schizophrenics was lower (30.32) with SD of 6.2 as compared to control group. This difference was statistically highly significant ($p<0.001$).

Mean atd angle on right hand in schizophrenics was higher (40.09) with SD of 4.5 as compared to control group. This difference is statistically not significant ($p=0.152$). Mean atd angle on left hand in schizophrenics was higher (40.75) with SD of 5.2 as compared to control group. This difference was statistically not significant ($p=0.095$) [Table/Fig-8].

Frequency of interdigital patterns in schizophrenia and controls, it can be noted that in schizophrenia highest number

Female Right + Left	Whorl		Loop-Ulnar		Loop-Radial		Arch		Statistics
	n	%	n	%	n	%	n	%	
Schizophrenics (100)	189	37.8	294	58.8	8	1.6	35	7	$\chi^2=4.20$
Controls (100)	163	32.6	273	54.6	11	2.2	27	5.4	d(f)=3 $p=0.240$

[Table/Fig-4]: Comparison of fingerprint patterns in female schizophrenics and controls.



[Table/Fig-5]: Right hand schizophrenic female patients.
[Table/Fig-6]: Left hand schizophrenic female patients.

Feature	Group (n=100)	Mean	SD	t-value	Sig. (2-tailed)
Absolute Finger Ridge Count	Schizophrenics	151.91	48.764	-0.335	0.738
	Controls	154.75	69.381		
Total Finger Ridge Count	Schizophrenics	117.01	31.504	0.036	0.972
	Controls	117.18	35.692		
Right-ab Ridge Count	Schizophrenics	29.69	6.761	-6.550	<0.001
	Controls	35.72	6.249		
L- ab Ridge Count	Schizophrenics	30.32	6.268	-6.473	<0.001
	Controls	35.94	5.976		
Right-atd	Schizophrenics	40.09	4.515	1.440	0.152
	Controls	39.11	5.095		
Left-atd	Schizophrenics	40.75	5.273	1.680	0.095
	Controls	39.50	5.252		

[Table/Fig-8]: Comparison of quantitative dermatoglyphic features in schizophrenics and controls.

of patterns were seen I3 and I4 areas (32.5% and 30%) and in controls its I4 and I3 (37% and 33%). Statistically significant difference was found only in I2 area ($p=0.002$) [Table/Fig-9].

DISCUSSION

Poll analyzed the prints of German schizophrenic patients comprising 232 males and 545 females and compared them with a sample of the normal general population of the

Patterns	Schizophrenics (Male+Female)	Controls (Male+Female)	χ^2	p-value
Whorl	377 (37.7)	351 (35.1)	$\chi^2=2.8$, d(f)=3	p=0.42
Loop-Ulnar	554 (55.4)	573 (57.3)		
Loop-Radial	20 (2)	16 (1.6)		
Arch	49 (4.9)	60 (6)		

[Table/Fig-7]: Comparison of fingerprint patterns in schizophrenics and controls.

of 48.76 as compared to control group. This difference was statistically not significant ($p=0.738$).

Mean TFRC in schizophrenics was lower (117.01) with S.D. of 31.5 as compared to control group. This difference was

Interdigital Pattern	Schizophrenics n (%)	Controls n (%)	χ^2	Degree of Freedom	p-value
TH /I1	4 (2)	1 (0.5)	1.846	1	0.174
I2	9 (4.5)	0 (0)	9.424	1	0.002
I3	65 (32.5)	74 (37)	1.911	1	0.167
I4	60 (30)	66 (33)	.772	1	0.380
HYT	21 (10.5)	17 (8.7)	.520	1	0.471

[Table/Fig-9]: Comparison of frequency of patterns in interdigital areas, hypothenar areas in schizophrenics and controls.

respective sex, in his study he found lower incidence of whorls in the male schizophrenics than in control males, while in female schizophrenics the incidence was higher than in the control females. He also noted slight increase in arches in male schizophrenics than in control males [6]. In present study incidence of whorls in male schizophrenics and control was same [Table/Fig-1] but in female schizophrenics the whorls were increased [Table/Fig-4].

Pons in his study on schizophrenics observed no statistically significant difference in the frequency of finger print patterns between patients and controls [7]. In present study also, the difference was statistically not significant [Table/Fig-7].

Mellor CS in his study included 232 male and 253 female schizophrenics [8]. He found that whorls and loops were increased and percentage of arches was decreased in schizophrenic females as compared to control females and the percentage of whorls, loops and arches was almost equal in schizophrenics and control males. This study is in total agreement with findings of present study [Table/Fig-1,4].

Varma SL et al., studied dermatoglyphic patterns in 250 schizophrenics and 90 controls [9]. The frequency of loops in the patient group was lower than in the control group. The frequency of arches in the patients and control groups was similar. This finding was not statistically significant. These findings are similar to our observations in the present study [Table/Fig-7].

In the present study [Table/Fig-8] of 100 schizophrenics and 100 controls there is decrease in the mean values of AFRC in schizophrenics (151.91) in comparison to the control group (154.75) which was not statistically significant. There is decrease in TFRC in schizophrenics (117.01) as compared to controls (117.18); the values are statistically not significant. Similar findings were observed by other researchers [10-12].

In a study by Srinivas Murthy R et al., the observations in 120 schizophrenics and 120 controls were, there was decrease in the TFRC in schizophrenics (141.38) in comparison to the control group (148.04), which was not statistically significant [13].

In a similar study by Jhingan HP et al., in male catatonic schizophrenics TFRC was lower [14]. The observations of these two studies are comparable to the observations of present study [Table/Fig-8].

Kemali D et al., in their study of 219 Italian schizophrenic males and 105 controls observed that total finger count was reduced in schizophrenics than in controls [15]. This finding is similar to present study [Table/Fig-8].

In the present study [Table/Fig-9] when frequency of occurrence of patterns in interdigital areas in schizophrenia was compared with control group the patterns were as follows- Thenar + I1=2% vs 0.5%, I2=4.5% vs 0%, I-3=32.5% vs 33%, I4=30% vs 33%, and Hypothenar = 10.5% vs 8.7%. The comparative data was significant only at I2 (p=0.002).

Vishwanathan CP et al., observed an increase in I3 pattern which was significant in schizophrenic males (50.59) when compared to normal males (38.67) [16]. Pons J et al., but reported an increased frequency of patterns in third interdigital area (I3) in schizophrenics as compared to controls [7].

Mellor CS et al., in his study of 232 male and 253 female British schizophrenics in the age group of 16 to 60 years interpreted increased frequency of patterns in third interdigital area in schizophrenics as compared to controls [8].

Srinivas N et al., in their study compared handprints of 30 schizophrenics with same number matched controls [17]. They noted significant increase in the loop pattern in the third interdigital area of the schizophrenic patients as compared to controls. Observations of all the four studies described above are similar to results of present study [Table/Fig-9].

Jhingan HP et al., observed fewer patterns in I3 palmar area [14]. Frequency of patterns in the thenar/I1 palmar area in schizophrenics was eight as compared to 13 controls. In I2 palmar area, patients had a total of nine patterns whereas controls had eight. Number of patterns in I-4 palmar area of patients was 61 as compared to 55 of controls.

Murthy compared the dermatoglyphics of 240 (120 males and female each) schizophrenics with the same number of controls [13]. According to the above study, palmar patterns were different in schizophrenics and normal. Frequency of patterns in second and third interdigital area was to be significantly lower in schizophrenics than in normal.

Polednak AP et al., in his study compared finger prints of 40 schizophrenic males with 105 control males and he found reduced percentage of patterns in third interdigital area of schizophrenics as compared to controls [18]. Observations of all the studies described above are contrary to observations of present study [Table/Fig-9].

LIMITATION

The study sample was small consisting of 100 cases and

controls each and we did not go in to the details of specific types of schizophrenic patients.

CONCLUSION

From our study we conclude following points-there is decrease in TFRC in schizophrenics (117.01) as compared to controls, which was statistically non-significant. Mean a-b ridge count in the right hand and in the left hand of schizophrenics was decreased when compared to controls, statistically significant. The atd angle is decreased in schizophrenic patients when compared to controls, statistically not significant.

Frequency of occurrence of patterns in interdigital areas in schizophrenia was compared with control group- more patterns seen in I3 and I4 areas, but data was statistically significant only at I2. This finding is unique from our study which needs further study for future use as a possible genetic screening method.

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