International Journal of Recent Trends in Science And Technology, ISSN 2277-2812 E-ISSN 2249-8109, Volume 7, Issue 1, 2013 pp 31-35

Dermatoglyphic Studies in Female Schizophrenics

Sunil M. Kolekar[1], Sunita U. Sawant[2*], P. Jyothi[3]

[1]Associate Professor, Department of Physiology

{[2]Associate Professor, [3]Lecturer of Genetics} Department of Anatomy

Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, INDIA.

[*]Corresponding Address:

sawantsunita@yahoo.co.in

Research Article

Abstract: **Objective:** To compare the fingerprint and palm print patterns between female patients with schizophrenia and normal controls. **Study design:** Cross-sectional study. **Material and Methods:** Fifty females with schizophrenia from 16 to 60 years of age and an equal number of age matched normal controls were selected. The fingerprints and palm prints were obtained using standard Ink method. **Results:** The arches are significantly less in schizophrenic females as compared to their controls ($p<0.05$). There is higher percentage of frequency of presence of patterns in Th/I_1 and hypothenar areas of right hand in schizophrenic females; of which the difference in frequency of Th/I_1 area is statistically significant ($p<0.05$) and low percentage of frequency of presence of patterns in I_2, I_3 and I_4 areas of left hand in schizophrenic females as compared to that of controls; of which, I_4 area shows highly significant less presence of patterns in schizophrenic females ($p<0.01$). There is significant increase in occurrence of ridge dissociation in schizophrenic females for both hands as compared with that of controls ($p<0.001$). Mean 'atd' angle is higher in both palms of schizophrenic females as compared to that of controls (left hand - ($p<0.05$). Mean 'a-b' ridge count in the left hand and mean 'b-c' ridge count in right hand are lower in schizophrenic females ($p<0.05$) compared to their controls. **Conclusion:** Dermatoglyphic patterns can differentiate the patients and control groups when they are studied in association with clinical features of schizophrenia.

Keywords: Dermatoglyphics, Schizophrenia, Fingerprint patterns, Finger ridge count, 'atd' angle, Ridge dissociation

Introduction

Dermatoglyphic traits are formed between the 11 and 24 week of fetal development and remain thereafter. The fine ridge patterns of the fingers, palms and soles have intrigued man since primitive times. There is evidence that finger-prints were used for identification more than 2000 years ago[(1)]. The presence of finger-prints on ancient pottery, tiles and tablets showed that the ancient potters were aware of the patterns on the fingertips[(2)]. In 1926, Cummins and Midlo coined the word 'Dermatoglyphics' for the scientific study of ridge patterns. A monograph on epidermal ridges was published by Cummins and Midlo in 1943 and 1961. This monograph was provided interesting information on the historical development of the scientific study of the epidermal ridges, how to record and analyze the epidermal ridge configurations[(3)]. The clinical significance of the dermatoglyphics in certain developmental and chromosomal defects has been searched with encouraging results by many workers. Dermatoglyphics can provide easy, inexpensive way of investigation and hence can be used as screening device and a diagnostic tool on the basis of clinical background. Poll[(4)] was the first investigator to study comprehensively the finger patterns of patients with schizophrenia. He analyzed 232 male and 545 female schizophrenics in Berlin and compared them with normal subjects. Dermatoglyphic studies of schizophrenics support the usefulness of these morphological traits in detecting a biologic and genetic background in schizophrenia and suggest heterogeneity in its etiology, although the evidence is still controversial[(5)]. Schizophrenia is hypothesized to be the results an interaction between specific genetic factors and non-specific insults during embryonic development [(6)]. Since both the ridges and the brain are derived from the ectoderm, it seems reasonable to use unusual dermatoglyphic patterns to characterize disturbances to brain development. Preliminary experimental results have successfully demonstrated the association between dermatoglyphics and cerebral structural measures in patients with schizophrenia[(7)]. Significant dermatoglyphic differences are found among the patients suffering schizophrenia with or without a positive family history of the disease, suggesting a strong "genetic loading" in familial cases of schizophrenia. In this study, dermatoglyphic traits in female schizophrenics are compared with normal controls and the findings with those of the previous workers.

Material and Methods

Patients were taken from Kripamai Nursing Home, Miraj, India. All these patients were diagnosed as schizophrenics by Dr. V.B. Debsikdar (Consulting psychiatrist) and Dr. M.B. Debsikdar (M.D. Medicine). Indoor patients were included for the study. Fifty female patients of schizophrenia in the age group of 16-60 years were taken for the present study. As control, prints of 50 normal females from the same age group were used.

The method used for obtaining finger and palm prints in the present study was standard method (Ink method described by Cummins and Midlo[8]). The quality of each print was immediately examined by using a magnifying hand lens and care was taken to include all essential details.

The finger and palm prints were then analyzed for qualitative as well as quantitative features.

1) Qualitative analysis:
   a) Finger-tip patterns (Figure 1)
   b) Thenar, Hypothenar, interdigital patterns i.e. Th/I1, I2, I3, I4 patterns (Figure 2)
   c) Ridge dissociation
2) Quantitative analysis (Figure 3):
   a) Finger ridge count
   b) 'atd' angle
   c) Ridge count of digital areas including 'a-b', 'b-c' and 'c-d' ridge counts.

Statistical analysis

Mean and Standard deviation (S.D.) were calculated from the data. The data obtained was subjected to various statistical tests of significance viz. Chi-square test and Z-test to find out differences between the patient and the control group. Differences were considered statistically significant when 'p' value was less than 0.05.

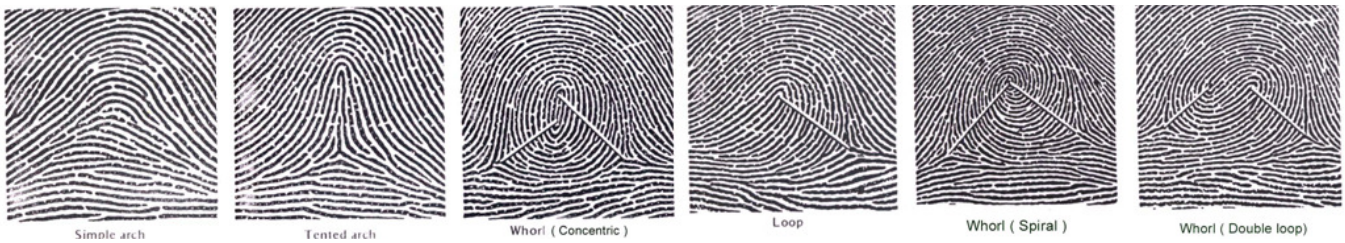

Figure 1: *Finger-tip patterns*

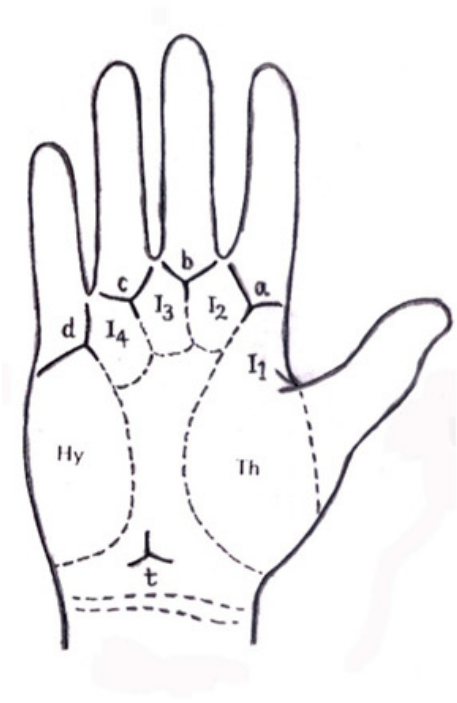

Figure 2: *Thenar, Hypothenar, interdigital patterns i.e. Th/I1, I2, I3, I4 patterns*

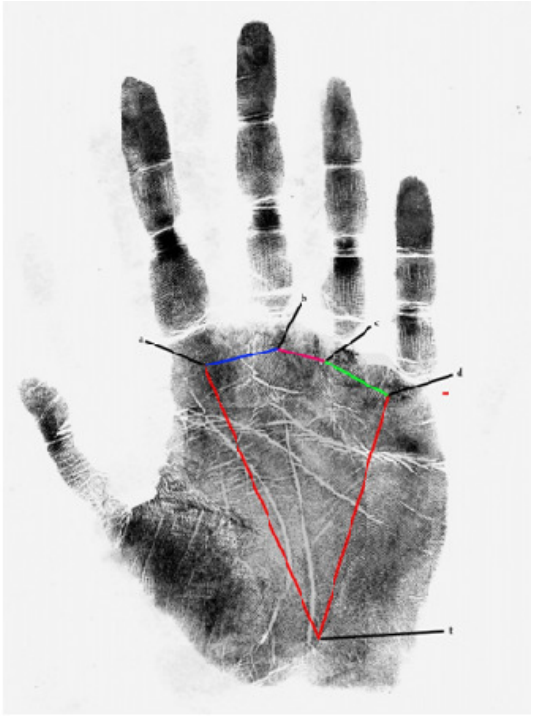

Figure 3: *'atd' angle, 'a-b', 'b-c' and 'c-d' ridge counts*

Results

In present work 50 female schizophrenic patients of the age group between 16 to 60 yrs were studied. For such traits observations were compared with normal female controls in identical number and age group.

Table 1: Percentage frequency of fingerprint patterns in schizophrenic and normal Females

Pattern	Female Patients		Normal Females		χ^2	p value
	No.	%	No.	%		
Whorls	189	37.8	186	37.2	8.24	<0.05
U. loops	282	56.4	271	54.2		
R. loops	10	2	5	1		
Arches	19	3.8	38	7.6		

df=3 df - Degree of freedom, χ^2 - Chi-square test

Table 1 shows the difference in the frequency of pattern distribution in control and schizophrenic females is statistically significant ($p<0.05$). The significance of difference between proportions is mainly due to the difference in the frequency of arches, which is significant ($p<0.05$). The arches are significantly less in schizophrenic females as compared to their controls.

Table 2: Digitwise frequency of fingerprint patterns among schizophrenic and normal females

Digit	Subject	Whorls		Ulnar loops		Radial loops		Arches	
		R	L	R	L	R	L	R	L
1	Patients	22	20	28	29	0	0	0	1
	Normal	20	22	28	24	0	0	2	4
2	Patients	22	23	24	16	1	7	3	4
	Normal	18	21	26	17	1	4	5	8
3	Patients	10	13	37	33	0	0	3	4
	Normal	8	14	38	31	0	0	4	5
4	Patients	27	30	22	18	0	1	1	1
	Normal	28	30	20	16	0	0	2	4
5	Patients	9	12	40	36	0	1	1	1
	Normal	10	15	39	32	0	0	1	3

df= 1 R- Right, L- Left, 1- Thumb, 2- Index finger, 3- Middle finger, 4- Ring finger, 5- Little finger

Table 2 shows:
R1- There is increase in whorls and decrease in arches in schizophrenic females.
R2- There is increase of whorls, but decrease in ulnar loops and arches in schizophrenic females.
R3- There is increase of whorls, but decrease in ulnar loops and arches in schizophrenic females.
R4- There is increase in ulnar loops, but decrease in whorls and arches in schizophrenic females.
R5- There is increase in ulnar loops but decrease in whorls in schizophrenic females.
L1- There is increase in ulnar loops but decrease in whorls and arches in schizophrenic females.
L2- There is increase of whorls, radial loops but decrease in ulnar loops and arches in schizophrenic females.
L3- There is increase in ulnar loops, but decrease in whorls and arches in schizophrenic females.
L4- There is increase in ulnar and radial loops but decrease in arches in schizophrenic females.
L5- There is increase in ulnar and radial loops but decrease in whorls and arches in schizophrenic females.
All above differences are not statistically significant ($p>0.05$).

Table 3: Frequency distribution of patterns in thenar, hypothenar and interdigital areas of right hand of schizophrenic and normal females

Palmar area	Subject	Presence of pattern	%	Absence of pattern	%	χ^2	P value
Th/I_1	Female patients	4	8	46	92	4.167	<0.05
	Normal females	0	0	50	100		
I_2	Female patients	2	4	48	96	0	-
	Normal females	2	4	48	96		
I_3	Female patients	19	38	31	62	0	-
	Normal females	19	38	31	62		
I_4	Female patients	20	40	30	60	2.564	>0.05
	Normal females	28	56	22	44		
Hypo	Female patients	14	28	36	72	0.48	>0.05
	Normal females	11	22	39	78		

df=1, Th/I_1- thenar/first interdigital area, I_2, I_3,
I_4- Second, third and fourth interdigital areas,
Hypo- hypothenar area.

Higher percentage of frequency of presence of patterns in Th/I_1 and hypothenar areas of right hand is seen in schizophrenic females; of which the difference in frequency of Th/I_1 area is statistically significant ($p<0.05$). While there is decrease in I_4 areas of right hand in schizophrenic females as compared to that of controls. But this difference is not statistically significant ($p>0.05$) as shown in Table 3.

Table 4: Frequency distribution of patterns in thenar, hypothenar and interdigital areas of left hand of schizophrenic females and normal females

Palmar area	Subject	Presence of pattern	%	Absence of pattern	%	χ^2	p value
Th/I_1	Female patients	3	6	47	94	0.211	>0.05
	Normal females	2	4	48	96		
I_2	Female patients	1	2	49	98	0.344	>0.05
	Normal females	2	4	48	96		
I_3	Female patients	8	16	42	84	0.071	>0.05
	Normal females	9	18	41	82		
I_4	Female patients	24	48	26	52	7.689	<0.01
	Normal females	31	62	19	38		
Hypo	Female patients	10	20	40	80	0.065	>0.05
	Normal females	9	18	41	82		

df=1

Table 4 shows low percentage of frequency of presence of patterns in I_2, I_3 and I_4 areas of left hand in schizophrenic females as compared to that of controls; of which, I_4 area shows highly significant less presence of patterns in schizophrenic females ($p<0.01$). There is increase in frequency of presence of patterns in Th/I_1 and hypothenar area of left hand of schizophrenic females as compared with their controls. But these differences are not statistically significant ($p>0.05$).

Table 5: Ridge Dissociation in schizophrenic and normal females

Subject	Right	Left	χ^2	p value
Patients	5	13	3.154	<0.001
Normal	3	1		

df=1

Table 5 shows that there is increase in occurrence of ridge dissociation in schizophrenic females for both hands as compared with that of controls. This difference is statistically significant ($p<0.001$).

Table 6: Mean Finger ridge count in schizophrenic and normal Females

Finger	Patients		Normal		Z value	p value
	Mean	S.D.	Mean	S.D.		
R1	15.96	4.553	14.56	5.894	1.329	>0.05
R2	11.58	5.541	11.08	5.907	0.436	>0.05
R3	11.26	5.19	10.96	4.819	0.299	>0.05
R4	13.32	5.644	13.54	6.109	0.187	>0.05
R5	10.52	4.437	10.74	4.936	0.234	>0.05
L1	14.66	5.169	14.46	6.485	0.17	>0.05
L2	10.96	5.447	10.6	6.481	0.301	>0.05
L3	10.84	5.527	12.78	5.987	1.68	>0.05
L4	13.9	5.433	13.48	6.747	0.343	>0.05
L5	11.52	4.55	11.58	5.466	0.059	>0.05

There is decrease in mean ridge counts for fingers R4, R5, L3, L5 and increase in mean ridge counts for fingers R1, R2, R3, L1, L2, L4 in schizophrenic females as compared with their controls (Table 6). But these differences are not statistically significant ($p>0.05$).

Table 7: Mean 'atd' angle (in degree) in schizophrenic and normal Females

Hand	Female Patients		Normal Females		Z value	p value
	Mean	S.D.	Mean	S.D.		
Right	44.66	8.62	42.28	3.654	1.798	>0.05
Left	45.56	7.025	42.9	5.441	2.117	<0.05

Table 7 shows higher mean 'atd' angle in both palms of schizophrenic females as compared to that of controls. But the differences are statistically significant only for left hand ($p<0.05$).

Table 8: Mean 'a-b', 'b-c' and 'c-d' ridge counts in schizophrenic and normal Females

Ridge counts	Hand	Female Patients	Normal Females	Z value	p value
		Mean (S.D)	Mean (S.D)		
'a-b' ridge count	Right	34.88 (5.102)	36.52 (4.700)	1.672	>0.05
	Left	35.62 (4.130)	37.66 (4.397)	2.391	<0.05
'b-c' ridge count	Right	23.51 (5.324)	25.45 (4.006)	2.059	<0.05
	Left	25.31 (5.838)	26.44 (3.924)	1.136	>0.05
'c-d' ridge count	Right	31.91 (4.680)	33 (4.869)	1.141	>0.05
	Left	33.36 (5.470)	32.58 (4.872)	0.753	>0.05

From above Table 8, schizophrenic females show lower mean 'a-b' ridge count as compared to that of controls in both hands but the difference is not statistically significant ($p>0.05$) except for the left hand of the schizophrenic females which is statistically significant ($p<05$). Mean 'b-c' ridge count is lower in schizophrenic females in their both right and left hands as compared to that of controls. But the difference is statistically significant only for right hand as compared to their controls ($p<0.05$). Schizophrenic females show increased mean 'c-d' ridge count in their left hand and decreased mean 'c-d' ridge count in their right hand as compared with that of controls. But these differences are not statistically significant ($p>0.05$).

Discussion

The present study consists of 50 female patients having schizophrenia and 50 healthy female controls of same age group. The prints were obtained by the ink method and analyzed to find variations in dermatoglyphic features among patients and controls. The findings of the present study are compared with other studies of dermatoglyphics in schizophrenia.

Finger Tip Patterns :

Arches: Frequency of arches has decreased significantly ($p<0.05$) in schizophrenic females (3.8%) as compared to normal females (7.6%). This finding coincides with Beckman and Noring[9], Mellor[10].

Loops: Frequency of loops is found to have increased in schizophrenic females (58.4%) as compared to normal females (55.2%). This finding does not match with Singh S.[11].

Whorls: There is slight increase in whorls in schizophrenic females (37.8%) as compared to normal females (37.2%).

Palmar patterns: The study of palmar patterns in schizophrenic females shows increased in frequency of patterns in the right Th/I_1 area as compared with that of normal females. This difference is statistically significant ($p<0.05$). This finding coincides with Singh S.[11]who also found significant rise in Th/I_1 patterns in schizophrenic females. The present study shows significant decrease in frequency of patterns in the left I_4 area ($p<0.01$) of schizophrenic females as compared with that of normal females. This finding is similar to Rothhammer F.[12] and Polednak [13].

Ridge dissociation: Ridge dissociation is a phenomenon in which ridges become broken into small fragments. The process may involve whole pattern or a part of pattern. Ridge dissociation is not common in the general population.

In the present study there is highly significant rise in ridge dissociation in case of schizophrenic females ($p<0.001$) as compared to their respective controls. This finding is in agreement with many of the workers. Raphael and Raphael[14] (1962) found 18% of schizophrenics showing ridge dissociation. Beckman and Noring[9] found 10% schizophrenic females (normal 0%) with dissociation. Singh S.[11] (1967) observed that 9% of schizophrenic females showed dissociation compared to 2.9% of normal females.

Finger ridge count: In the present study there is no significant difference between schizophrenics and controls in the mean finger ridge count for all fingers. Fananas L.[15] found significant differences for finger ridge count between schizophrenics and controls for fingers R1, L1 and L2 for both males and females. Furthermore, Fananas L. found statistical differences for fingers R2 and L4 in males and for L3 in females. In all his findings values for schizophrenics were lower than those of normal. However, Singh S.[11] found all values were higher for schizophrenics than those for controls.

'atd' angle: Female schizophrenics show increase in 'atd' angle in their both hands with significant difference in left hand ($p<0.05$). These finding are very much similar to that of Mellor C.S.[10]. Mellor found significant ($p<0.001$) increase in 'atd' angle of female schizophrenics. Singh S.[11] also found increase in 'atd' angles of female schizophrenics except in the left hand of schizophrenic females; but the differences were not significant.

'a-b' ridge count: Mean 'a-b' ridge count is significantly lower in left hand of schizophrenic females than their controls ($p<0.05$). This finding is similar to that of Singh

S.[11]. Rothhammer F.[12] found lower values of mean 'a-b' ridge count for schizophrenic males and females than in controls; but the differences were not significant.

'b-c' ridge count: Schizophrenic females studied presently show low values of mean 'b-c' ridge counts in both hands as compared to that of controls. But the difference is statistically significant ($p<0.05$) only for right hand of schizophrenic females.

'c-d' ridge count: In the present study it is found that there is no significant difference in mean 'c-d' ridge count in schizophrenic females as compared to normal females.

Conclusion

Dermatoglyphic patterns are recognized by genetic factors. It has been proved that genetic factors are responsible for schizophrenia, so there is scope for the study of relationship between schizophrenia and dermatoglyphic patterns. Dermatoglyphic patterns can differentiate the patients and control groups when they are studied in association with clinical features of schizophrenia. Many more studies are essential using schizophrenic people of different ethnic background to know whether the dermatoglyphic findings are universally observed in schizophrenic persons despite of different social and community variations.

Acknowledgement

Authors are very thankful to Dr. Debsikdar V.B. (MD, psychiatry) and Dr. Debsikdar M.B. (MD, Medicine) for kindly allowing us to get the finger prints of schizophrenic patients in Kripamayee Nursing Institute, Miraj, India. Authors are also thankful to Dr. R.B. Vaidya, Professor of Anatomy, Sangli for his valuable guidance.

Conflict of Interest: None

References

1. Achs R. and Harper R. Current developments, an evaluation: Dermatoglyphics. American J. of Obstr. And Gynaec. 1968; 101, 1006-1023.
2. Lambourne G. The fingerprint story. Publisher Harrcep Ltd., London 1984.
3. Schaumann B. and Alter M. Dermatoglyphics in Medical disorders. Spinger-Verlag, New York, Heidelberg, Berlin 1976.
4. Poll H. Dactygraphische Geschlechsunterschiede der Schizophrenen Mschr. Psychiat. Neurol 1935; 91, 65-7.
5. Plato C.C., Gerruto R. M. and Fox K.M. Application of dermatoglyphics to the study of late onset disorders of known and unknown etiologies. Colleg. Anthropol. 1987; 11, 2, 397-405.
6. Avila M. T., Sherr J., Valentine L. E., Blaxton T. A. and Thaker G. K. Neurodevelopmental interactions conferring risk for schizophrenia: a study of dermatoglophic markers in patients and relatives. *Schizophr. Bull.* 2003; 29, 3, 595–605.
7. Van J. Os, Woodruff P. W. R., Fananas L., Ahmad F., Shuriquie N., Howard R. and Murray R. M. Association between cerebral structural abnormalities and dermatoglyphic ridge counts in schizophrenia. *Compr. Psych.* 2000; 41, 380–384.
8. Cummins H. & Midlo C. Finger prints, palms and soles. An Introduction to Dermatoglyphics. New York: 1961, Dover Publication.
9. Bechman L. and Norring A. Finger and palm prints in schizophrenia. Acta genet. Basel, 1963; 13: 170-177.
10. Mellor C.S. Dermatoglyphics in schizophrenia. Brit. J. Psychiat., 1968; 114, 1387-1397.
11. Singh S. Dermatoglyphics in schizophrenia. Acta genet., Basel 1967; 17, 348-356.
12. Rothhammer F., Pereira G., Camousseght A. and Benado M. Dermatoglyphics in schizophrenic patients. Human Heredity 1971; 21, 198-202.
13. Polednak Anthony P. Dermatoglyphics of Negro male schizophrenics. Brit. J. Psychiat., 1972; 120, 397- 8.
14. Raphael T and Raphael L.G. Fingerprints in schizophrenia. J. American Medical Association 1962; 180, 215.
15. Fananas L., Moral P. and Bertranpetit. Dermatoglyphics in schizophrenia: study of Family History Subgroups. Human Biology 1990; 62, 3, 421-427.

*Address for correspondence:
Dr. Sunita U Sawant
Associate professor of Anatomy
ASRAM Medical College, ELURU-534005
West Godavari Dist., Andhra Pradesh, India
Email: sawantsunita@yahoo.co.in