

Original Research

A comparative study of dermatoglyphic pattern in schizophrenic patients: A quantitative analysis

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ABSTRACT:

Dermatoglyphics has been used as an investigative tool for studying so many forensic aspects of the medico legal cases but now it is emerging as a diagnostic tool in number of clinical entities pertaining to genetics related to numerous medical disorders. This aspect is well used now to diagnose and screen the people at risk for the disease under study. The present study was thus conducted to delineate any such relationship exists between dermatoglyphics and schizophrenia. Here, dermatoglyphic patterns of 200 subjects were studied amongst which 100 were considered as controls and 100 were categorized as cases that were diagnosed cases of schizophrenia. The results of the current study concluded that the mean 'atd' angle and 'adt' angle both were more in right and left hands in case of cases as compared to controls with statistically significant difference. The observations also concluded that 'ab' ridge count was less in both right and left hand in case of cases as compared to controls with statistically significant p value. Also, the total finger ridge count 'TFRC' was more in cases as compared to controls. Hence it was concluded that quantitative assessment of dermatoglyphic patterns in schizophrenic patients can be considered as diagnostic tool.

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INTRODUCTION

Over the past so many years, dermatoglyphics has been a useful tool in understanding basic questions in biology, medicine, genetics, forensic & evolution. Dermatoglyphic analysis is now beginning to prove itself as an extremely useful tool for screening into many conditions with genetic basis. Cummins in 1926 first introduced the term "dermatoglyphics" which refers to the study of the naturally occurring patterns of the surface of the hands and feet ^[1]. Since then, the study of dermatoglyphics patterns has been used in various scientific studies to establish relationship of fingerprints as genetic markers. The basis of dermatoglyphics acting as genetic marker is that the chance of two persons having identical fingerprints is about one in 64 thousand millions^[2]. Contemporary dermatoglyphics research has shown a large number of behavioral abnormalities to be associated with typical dermatoglyphic characteristics. Mental retardation of unknown origin also shows significant

pattern of the palmar fields, particularly on the hypothenar, thenar and distally located axial triradii. Cummins (1926) was the first to demonstrate the existence of characteristic dermatoglyphic features associated with Down's syndrome ^[3]. Since then, several researchers claim the study of dermatoglyphics as an important diagnostic tool for some diseases especially the diseases with obscure etiology and mysterious pathogenesis. Significant investigations have also been carried out into the dermatoglyphic indicators of Down's syndrome, Trisomy 18, D trisomy, Cat cry syndrome, Turner's syndrome, Klinefelter's syndrome, Congenital heart disease, Leukemia, Cancer, Celiac disease, Intestinal disorders, Rubella, Rheumatoid arthritis, Bronchial asthma, Alzheimer's disease, Schizophrenia as well as other forms of mental illness^[4,5]. The morphology of the epidermal ridge is genetically determined. Dermatoglyphic patterns begin to develop in the 10th week of gestation and are completed by 24th week.

This time coincides with the critical phase of brain development. They both have common origin from the ectodermal germ layer. So, there may be existence of some biological and clinical correlation between the origin of brain and skin ridge patterns [6]. Hence, the epidermal ridges on finger, palms and soles can be considered as the blue print of activities that occurred during fetal life. They reflect the Neuroectodermal changes that were taking place in-utero as early as 12th week [7].

In 2013 there were estimated to be 23.6 million cases globally. Males are more often affected than females. About 20% of people do well, and a few recover completely. In 2013 an estimated 16,000 people worldwide died from behavior related to, or caused by, schizophrenia [8]. Henceforth, it is the need of the hour not only to diagnose and treat but also to prevent the psychiatric disorders like schizophrenia at a very early step. Application of dermatoglyphic pattern as a genetic marker, useful investigatory or screening procedure 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. The relevance of association of dermatoglyphics and schizophrenia is not to diagnose but to prevent by predicting the disease, not for defining an existing disease but to identify people with genetic predisposition. Hence the current study was planned to delineate if any robust association exists between fingerprint features as this can become a non-invasive and inexpensive marker for screening schizophrenia patients.

MATERIALS AND METHODS

The afore mentioned observational study was carried out in Postgraduate Department of Anatomy and in OPD block of Postgraduate Department of Psychiatry, Government Medical College, Jammu. The present study was designed to collect the dermatoglyphic fingerprints of the known cases of schizophrenia and compared with normal healthy subjects. This study consisted of 200 subjects, who were divided into two equal groups; 100 subjects in Group S (Schizophrenic Group) who were diagnosed cases of schizophrenia based on the diagnostic and statistical manual of mental disorders (DSM-IV) diagnostic criteria, attending OPD section of Department of Psychiatry, Government Medical College, Jammu and Group C (Control Group): which consisted of 100 normal persons, selected randomly from general population with no psychiatric disorders in them or in their family. All subjects gave informed consent. The socio demographic and clinical data and details of psychiatric history were obtained from the patient or from their medical records. Finger and palm prints were obtained by the ink and pad and the analysis of qualitative and quantitative

dermatoglyphic features was undertaken, with the aid of a magnifying glass.

INCLUSION CRITERIA FOR CASES

- Diagnosed cases of schizophrenia as per diagnostic and statistical manual of mental disorders (DSM-IV) diagnostic criteria.

EXCLUSION CRITERIA FOR CASES

- Patients suffering from any chronic skin disease like: Eczema, Leprosy, Chronic dermatitis, etc.
- Patients having scars due to trauma on fingers.
- Patients having other psychiatric disorders
- Patients having other genetic or medical disorders like diabetes, chronic liver disease, malignancies and cardiovascular diseases.

EXCLUSION CRITERIA FOR CONTROLS

- Person with no hereditary or genetic disorders.
- Patients with no family history of any psychiatric disease.
- Patients with no history of any chronic skin disease e.g. Eczema, Leprosy, chronic dermatitis and Patients having scars due to trauma on fingers.

MATERIALS REQUIRED

Materials required for the study were: Fingerprint duplicating ink, Glass slab, Rubber roller, White bond paper, Spirit, Soap, Water, Towel, Magnifying hand lens, Protractor, Scale, Needle, Gloves, Sanitizer. After the finger and palm prints were obtained they were scrutinized for quantitative analysis of fingerprint patterns in cases and control groups.

OBSERVATIONS

The present observational study was carried out in Postgraduate Department of Anatomy Government Medical College, Jammu in collaboration with Department of Psychiatry, Government Medical College, Jammu. The study was aimed to collect the dermatoglyphic fingerprints of the known cases of schizophrenia and normal healthy subjects. A total of 200 subjects were taken for the study; out of which 100 were cases i.e. Schizophrenia patients (**Group S**) and 100 were considered Controls (**Group C**). After informing the patient about the procedure in detail, a informed written consent was taken from the attendants in case of schizophrenic cases and subject himself in case of controls and then the fingerprints or dermatoglyphic prints of both the hands were taken by ink method of both control and schizophrenic groups. The observations were recorded on bond paper of A4 size to get the quantitative dermatoglyphic features from the hand prints. The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens. The data was analyzed statistically and following observations were made in the present study:

'atd' ANGLE

Table-1 shows mean value of 'atd' angle in right hand in group S (43.64 ± 3.26) was higher in comparison to Group C (39.29 ± 2.18). This difference was statistically significant in right hand ($p < 0.05$) in Group S when compared to Group C. The mean value

of 'atd angle' in left hand in group S (43.29 ± 2.49) was higher in comparison to Group C (40.14 ± 2.44). This difference was statistically significant in left hand ($p < 0.05$) in Group S when compared to Group C.

Table 1: Showing mean 'atd' angle in right and left hands in Schizophrenic and Control groups.
'adt' angle:

Parameter	Group	Mean	S.D.	Significance		
				t-test	P Value	Result
'atd' Angle In Right Hand	S	43.64	3.26	11.7	<0.01	Significant
	C	39.29	2.18			
'atd' Angle In Left Hand	S	43.29	2.49	9.01	<0.01	Significant
	C	40.14	2.44			

The mean value of 'adt' angle in right hand in group S (81.35 ± 2.70) was higher in comparison to Group C (72.54 ± 3.42). This difference was statistically significant in right hand ($p < 0.05$) in Group S when compared to Group C. The mean value of 'adt angle' in left hand in group S (81.20 ± 2.35) was higher in comparison to Group C (72.67 ± 3.27). This difference was statistically significant in left hand ($p < 0.05$) in Group S when compared to Group C. (**Table-2**).

Table 2: Showing mean 'adt' angle in right and left hands in Schizophrenic and Control groups.
'ab' Ridge Count:

Parameter	Group (n=100)	Mean	S.D.	Significance		
				t-test	P- Value	Result
'adt'Angle In Right Hand	S	81.35	2.7	20.19	<0.01	Significant
	C	72.54	3.42			
'adt' Angle In Left Hand	S	81.2	2.35	21.13	<0.01	Significant
	C	72.67	3.27			

The mean 'ab ridge count' of right hand (38.7 ± 2.22) and left hand (39.38 ± 1.59) is lower in Group S when compared to mean 'ab ridge count' of right hand (43.11 ± 4.39) and left hand (42.64 ± 3.20) in Group C. These differences are statistically significant in right as well as in left hands ($p < 0.05$) (**Table 3**).

Table 3: Showing mean ab ridge count in right and left hands in Schizophrenic and Control group.
Total Finger Ridge Count (TFRC):

Parameter	Group	Mean	S.D.	Significance		
				t-test	P Value	Result
Mean ab Ridge Count In Right Hand	S	38.7	2.22	-8.94	<0.01	Significant
	C	43.11	4.39			
Mean ab Ridge Count In Left Hand	S	39.38	1.59	-9.11	<0.01	Significant
	C	42.64	3.2			

Table-4 shows that the mean value of TFRC in both hands of Group S (136.67 ± 4.9) is higher when compared to Group C (124.3 ± 9.4).

Table 4: Total Finger Ridge Count (TFRC) in both Hands in Schizophrenia and Control Groups.

Variable	Group	Mean	S.D.	Significance		
				t value	P- value	Result
Mean TFRC In Both Hands	S	136.67	4.9	11.57	<0.001	S
	C	124.3	9.4			

DISCUSSION

The primary aim of the study was to compare the finger and palm prints of schizophrenia patients with those of the normal population. The results of afore mentioned study revealed that there are some significant differences in dermatoglyphics of patients with schizophrenia and normal population. The findings of this study are discussed under following heads:

'atd' angles: In the present study, the value of 'atd' angle of both the palms was higher in schizophrenia patients as compared to control group. These differences were statistically significant in right as well as in left hand. These findings are very much similar to that of the results documented by various studies of the past^[9,10&11] who also concluded that 'atd' angles in schizophrenia patients were higher as compared to control group. Latiff AA et al., and Jan N

et al., also supported the results of afore mentioned study by concluding in their comparative study significant higher 'atd' angle in schizophrenia patients as compared to controls^[12& 13]. The 'atd' angle parameter in present study is in contrast to study performed by Sengupta S and Bhuyan SD (1995) who found lower mean 'atd' angle in schizophrenics as compared to controls^[14]. Norovsambuu O et al., (2021) and Bandlamudi S et al., (2015) did not find any significant difference in the schizophrenic group and control group^[15 & 16].

'adt' angle: In the present study, the value of 'adt' angle of both the palms was higher in schizophrenia patients as compared to control group. These differences were statistically significant in right as well as in left hand. These findings are very much similar to that of Jan N et al. (2018) and Bandlamudi S et al. (2015) in their comparative study also found higher 'adt' angle in schizophrenia patients as compared to controls^[13 & 16].

'ab' ridge count: In the present study, the mean 'a-b' ridge count of right and left hands were lower in schizophrenia patient when compared to controls. The results of the present study are in agreement with the results of past literature^[9, 12, 13 & 15]. This concluding finding was supported by the evidence derived from Golembos-Smith et al., (2012), Bramon E et al., (2005) and Latiff AKA et al., (2019) whose study on 'ab' ridge count in schizophrenia patients confirmed the presence of 'ab' ridge count reduction in schizophrenia patients^[17, 18 & 19]. The results of this study also correlate with the results of Sengupta S and Bhuyan SD (1995), Fearon P et al., (2001), Karmakar B and Malhotra KC (1979), who also observed reduction in a-b ridge count in schizophrenia patients^[14, 20 & 21]. However, the results pertaining to 'ab' ridge count of present study were not in accordance with Arunpongpaissal S et al., (2011) who found no significant differences in 'ab' ridge count in schizophrenia patients when compared to controls^[22].

TOTAL FINGER RIDGE COUNT (TFRC)

In this study, mean TFRC of both hands was significantly higher in patients of schizophrenia when compared to controls. These differences are statistically significant in male as well as female schizophrenics when compared to mean TFRC of male and female controls. These conclusions were supported by Jan N et al., (2018) and Bandlamudi S et al., (2015) who in their comparative study also found significantly higher TFRC in schizophrenia patients as compared to controls^[13 & 16]. But few investigators concluded their results in contrast to the results of present study by summarizing that the mean Total Finger Ridge Count (TFRC) in male and female Schizophrenics was lower as compared to controls^[9, 12 & 19]. However, Sunita U et al., (2013), were not able to find any significant difference in TFRC in schizophrenia patients when compared to controls^[11].

CONCLUSION

The results of the present study it appears that a relationship between the varied expression of the dermatoglyphic patterns and Schizophrenia does exist; and when combined with clinical features, the use of dermatoglyphics can be used as a reliable genetic marker in the screening of high risk people for the early detection in Schizophrenia. But it has its own limitations when used alone in an individual case. Henceforth, it is recommended that further study in a large population cohort shall be conducted which will add more validity to study findings.

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