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Comparison of Axial Triradius Angle in Palms between Schizophrenic Patients and Healthy Controls

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ABSTRACT

Introduction: *Dermatoglyphics is the branch of medical science that is concerned with the study of dermal ridges present on fingers, palms, toes and the soles of human. This study was conducted to measure a dermatoglyphic trait axial triradius angle in schizophrenic patients. Difference of axial triradius angles in between schizophrenic male and female were also calculated.* ***Methods:*** *This cross-sectional comparative study was conducted in Department of Anatomy at Rajshahi Medical College, Rajshahi, Bangladesh from January, 2017 to January, 2018. A total number of 400 subjects were enrolled for this study. Among them, 200 were schizophrenic patients and 200 were healthy controls. Their palm prints were taken and ATD angles were observed.* ***Results:*** *The axial triradius angles were wider in healthy controls than schizophrenic patients. Sex variation showed axial triradius angles wider among schizophrenic females.* ***Conclusion:*** *The findings showed differences in dermatoglyphic trait, axial triradius angle between schizophrenic patients and healthy controls. So, this study may provide us important documents in the prediction of schizophrenia.*

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INTRODUCTION

Dermatoglyphics is a Greek word; "derma" means skin and "glyphic" means to curve.[1] The meaning of dermatoglyphics is "skin curving". The skin ridge patterns are formed on finger, palm, sole and toes.[2] The analysis of skin ridge patterns by studying prints of them is known as dermatoglyphics.[3]

The scientific study of Dermatoglyphics is credited to a Czech physiologist and biologist, Joannes Evangelista purkinjee in 1823.[4] The word "Dermatoglyphics" was first utilized in medical research by an anatomist named Harold Cummins in 1926.[5]

Axial triradius (ATD) angle is an important dermatoglyphic trait. The ATD angle is formed by drawing lines between the triradii below the index and little digits and the most proximal triradius on the hypothenar region of the palm. Depending upon the proximity to the lower

margin of the palm it is designated as t, t' and t".[6] The value of angle <45º corresponds to t, values intermediate 45º-56º is t' and >56º is t" (Figure 1).[7]

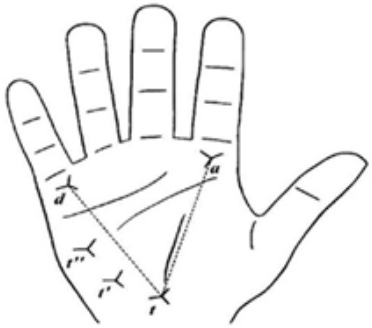

Figure 1: Axial triradius angle

Schizophrenia is a clinical syndrome of variable, but profoundly disruptive, psychopathology that involves cognition, emotion, perception and other aspects of behaviour. The expression of this manifestation varies across patients but the illness is always severe and is usually long lasting. Schizophrenia is equally prevalent in men and women. The incidence and prevalence rates are roughly equal worldwide which is about 1%.[8]

The brain and skin ridges are developed during same gestational period, between 11th to 24th weeks of gestation.[9] Both of them have originated from the ectodermal germ layer.[10] So, there may have some biological and clinical values associated between them.[11] The types of ridge pattern develops in palm are genetically determined. Any mental anomalies in embryo will effect on development of ridge pattern.[12] An interesting thing is that the movement of hand in uterus do not influence later on development of palmer creases.[13]

In the modern world, dermatoglyphics and its traits has some important role in medical research. Specific dermatoglyphic traits presenceis an accompanying feature of various groups of disease such as chromosomal aberrations, sickle cell disease, psoriasis, cancer, epilepsy, congenital heart disease, lupus erythematodes, mental disorder.[14] There are some exceptional conditions also in which there is absence of fingerprints termed as adermatoglyphia. The conditions are in cases of leprosy, patients being treated with anticancer drugs, ectodermal dysplasia etc. X-ray, grievous injuries can cause harm to the skin prints.[15]

In the present study, schizophrenic patients were undertaken as a mental disorder. So, this comparative study was aimed to find out the differences of ATD angles on the palms of hand in male and female schizophrenic patients.

METHODS

This cross-sectional comparative study was carried out in the Department of Anatomy at Rajshahi Medical College, Rajshahi in between January, 2017 to January, 2018. The research protocol was reviewed and approved by the Institutional Review Board (IRB) of Rajshahi Medical College, Rajshahi. Two groups of people within the age of 15-40 years were purposively selected. One group was comprised of 200 individuals of healthy controland another group of 200 schizophrenic patients. Selection of schizophrenic patients were performed by a qualified psychiatrist. Persons having a history of drug or alcohol abuse, an identifiable neurological disorder (e.g. Seizure, multiple sclerosis, etc.), head injury, any signs of mental retardation, psoriasis and permanent scar on any of the either hand were excluded. Informed written consent was taken from each study subject before data collection. The prints of palms were taken by ink and pad method. All the subjects were asked to wash their palmer aspects of hand clearly with soap and water. After drying by soft towel, the palms were placed on the ink pad. Then their palms of both hands were placed on white papers and impressions were taken. Firstly, the axial triradius (ATD) angles were noticed by magnifying glass. Then, lines drawn by joining the points and angles were examined (Figure 2). The ATD angles of right and left hand were analyzed according to the subject and sex.

Figure 2: Examination of palm prints to reveal Axial triradius angle

After data collection, processing and analysis were done. Observations and results were noted carefully. The results were presented in the forms of tables with necessary interpretation and inference. Collected data were analyzed by using computer based on SPSS software version-16. The test of significance was conducted by using the Chi square test (χ^2) and independent '*t*' test. A *p* value ≤0.5 was considered statistically significant.

RESULTS

ATD angles of right hand in schizophrenic patients was <45° in 91% (182) cases and in case of left hand it was <45° in 88.5% (177) cases (Table I).

Table I: Axial triradius angles of schizophrenic patients (n-200)

Degree of angle	Right hand		Left hand	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<45	182	91.0	177	88.5
45-56	18	9.0	22	11.0
>56	00	0.0	1	0.5

Right hand: Mean angle = (39.28±4.18°); Range: (30°-54°); Left hand: Mean angle = (39.61±5.25°); Range: (22°-69°)

ATD angles of both hands in healthy controls were <45° in 71.0% (142) subjects (Table II).

Table II: Axial triradius angles in healthy controls (n-200)

Degree of angle	Right hand		Left hand	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<45	142	71.0	142	71.0
45-56	52	26.0	47	23.5
>56	6	3.0	11	5.5

Right hand: Mean angle = (43.00±6.60°); Range: (33°-85°); Left hand: Mean angle = (43.35±7.32°); Range: (32°-84°)

In the right hand, ATD angles were significantly narrow (<45°) in schizophrenic patients than healthy controls. The mean degree of ATD angle was also significantly (*p*<0.001) different between two groups (Table III).

Table III: Comparison of ATD angles of right hand between schizophrenic patients and healthy controls

Degree of ATD angle	Group		*p* value
	Schizophrenia (n-200)	Healthy controls (n-200)	
<45	182 (91.0)	142 (71.0)	<0.001*
45-56	18 (9.0)	52 (26.0)	
>56	0 (0.0)	6 (3.0)	
Mean degree of ATD angle	39.3±4.17	43.0±6.6	<0.001**

Figure in the parenthesis denote corresponding %
*Data were analyzed using Chi square Test (χ^2);
** Unpaired t-test was done to analysis the data.

In case of left hand, the majority (177, 88.5%) of schizophrenic patients had the ATD angle <45º than healthy individual whereas the angle between (45-56)º and >56º was more prevalent in healthy controls. The mean degree of ATD angle was significantly (*p*<0.001) different between two groups (Table IV).

Table IV: Comparison of ATD angles of left hand between schizophrenic patients and healthy controls

Degree of ATD angle	Group		*p* value
	Schizophrenia (n-200)	Healthy controls (n-200)	
<45	177 (88.5)	142 (71.0)	<0.001*
45-56	22 (11.0)	47 (23.5)	
>56	1 (0.5)	11 (5.5)	
Mean degree of ATD angle	39.6±5.2	43.3±7.3	<0.001**

Figure in the parenthesis denote corresponding %; *Data were analyzed using Chi square Test (χ^2)
** Unpaired t-test was done to analysis the data.

Although the ATD angle <45º was more in schizophrenic males than that of females and the angle between (45-56)º were more in schizophrenic females but above variations were not statistically significant. The mean degree of ATD angle was not significantly different between the groups (Table V).

Table V: Comparison of ATD angle of right hand between schizophrenic male and female

Degree of ATD angle	Group		*p* value
	Schizophrenic male (n-100)	Schizophrenic female (n-100)	
<45	94 (94.0)	88 (88.0)	0.216*
45-56	6 (6.0)	12 (12.0)	
>56	0 (0.0)	6 (3.0)	
Mean degree of ATD angle	38.8±3.8	39.7±4.4	0.15**

Figure in the parenthesis denote corresponding %;*Data were analyzed using Chi square Test (χ^2)
** Unpaired t-test was done to analysis the data.

The ATD angle between (45-56)ºwere more in schizophrenic females than males and the angle <45º were more in schizophrenic male. Two groups were also significantly (*p*<0.001) heterogeneous in terms of Mean degree of ATD angle (Table VI).

Table VI: Comparison of ATD angle of left hand between schizophrenic male and female

Degree of ATD angle	Group		*p* value
	Schizophrenic male (n-100)	Schizophrenic female (n-100)	
<45	95 (95.0)	82 (82.0)	0.014*
45-56	5 (5.0)	17 (17.0)	
>56	0 (0.0)	1 (1.0)	
Mean degree of ATD angle	38.3±4.5	40.8±5.6	0.001**

Figure in the parenthesis denote corresponding %; *Data were analyzed using Chi square Test (χ^2)
** Unpaired *t*-test was done to analysis the data

DISCUSSION

In this study, axial triradius (ATD) angle was distributed and compared according to the frequency of their common types and their mean. In the present study, frequency of the ATD angle of schizophrenic patient's right and left hand was distributed in Table I. In the right hand of schizophrenic patient ATD angle was <45° in more than 90% cases but in left hand it was 88.5%. Mean angle was 39.28±4.18° in right hand and 39.61±5.25° in left hand. The healthy control's ATD angle was <45° in more than 70% cases both in right and left hand. Their mean angle was 43.00±6.60° in right hand and 43.35±7.32° in left hand.

ATD angles were significantly (p<0.001) narrow (<45º) in right hand of schizophrenic patients than healthy controls. In case of left hand, the majority of schizophrenic patients had the ATD angle <45º than healthy individual whereas the angle between (45-56)º and >56º was more prevalent in healthy controls.

When we compared about the measurement of ATD angles, common type of both hands between schizophrenic patient and the healthy control group it was found that in right and left hand most of the schizophrenic patient's ATD angles was t (<45°). ATD angle t' (45-56)° was more frequent in both the hands of healthy controls. These difference was statistically significant (p<0.001) for t (<45°) type.

Mellor[16] conducted a quantitative study, where he calculated the ATD angle which has no similarities with the findings of the present study. His result showed that the mean ATD angle was more in schizophrenic cases, but in the present study mean ATD angle was more in normal male and female.

In right hand, Type t ATD angle (<45°) was more common in schizophrenic male than schizophrenic female but variations of angle were not significant. In the left hand type t (<45°) was more common in schizophrenic male that is significant (p<0.014). Type t' (45-56)° was more frequent in schizophrenic female. In both the hand t" (>56°) was absent in schizophrenic male. In comparison to their mean value schizophrenic female has higher mean value than schizophrenic male in both hand and the differences was significant in their left hand (p<0.001).

Kudalkar et al.[17] conducted a study where they compared ATD angles with their mean of both hands in between schizophrenic and control group and found significant differences. Their study has few similarities with the present study. In both hand they found that mean ATD angle was lower in schizophrenic male but higher in schizophrenic female. The present study result also showed that, female schizophrenic patient has higher mean ATD angle than male schizophrenic patient in both hands.

Sengupta et al.[18] had done a study in India, where they found marked differences in ATD angle compared between case and control group. Their observation showed that the frequency of type t (<45°) was dominant in male controls that was not similar to the present study findings. But in case group t' (45-56)° was highest in male and t" (>56°) was common in female. These findings have similarities with the present study.

Singh[19] found increase ATD angles in schizophrenic males and right hand of schizophrenic

females. But the differences were not statistically significant. Present study showed increase ATD angles in healthy controls significantly.

Bhusaraddi et al.[20] found slight increase of ATD angles in schizophrenic males only and the difference was not significant. But present study showed an increase of ATD angles in healthy controls and the difference was statistically significant.

Bulgir et al.[21] found wider ATD angles in schizophrenic males and schizophrenic females than healthy controls. The differences were statistically significant only in females. But the findings have no similarities with the present study. The present study result showed significant increase of ATD angles in healthy control group.

The variations of the results which were observed between the different studies might be due to variations in sample size, genetic factor and environmental factor.

CONCLUSION

Axial triradius angles were more in healthy controls than schizophrenia. Sex variation of axial triradius angles in schizophrenia showed that it was more among the schizophrenic females. Dermatoglyphic trait, ATD angle has its own limitation when used alone but combined with other clinical features it would play an important role in the diagnosis of schizophrenia.

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REFERENCES

1. Cummins H, Midlow C. Palmar and planter epidermal ridge configurations (dermatoglyphics) in Europeans-Americans. Am J Phys Anthropol. 1926; 9(4): 471-502. DOI:10.1002/ajpa.1330090422.
2. Sawant SU, Kolekar SM, Jyothi P. Dermatoglyphics in male patients with Schizophrenia. IJRTSAT. 2013; 6(2): 109-114.
3. Bannister LH. Integumental system. In: Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, et al, editors. Gray's Anatomy. 38th ed. London: Edinburgh Churchill Livingstone; 1995. p. 380.
4. Ahmed W, Bose BK, Rimi KR, Khan AH. Dermatoglyphics of Patients Suffering from Pulmonary Tuberculosis. Dinajpur Med Col J. 2014; 7(2): 80-82.
5. Verbov J. Clinical significance and genetics of epidermal ridges-A review of dermatoglyphics. J Invest Dermatol. 1970; 54(4): 261-271. DOI: 10.1111/1523-1747.ep12258550.
6. Malvalwala J. The utility of the angle atd in dermatoglyphics. Am J Phys Anthropol. 1963; 21(1): 77-80. DOI:10.1002/ajpa.1330210110.
7. Penrose, LS. The distal triradius ton the hands of parents and sibs of mongol imbeciles.Ann Hum Genet. 1954; 19(1): 10-38. DOI:10.1111/j.1469-1809.1954.tb01260.x.
8. Sadock BJ, Sadock VA, editors. Synopsis of Psychiatry. 10th ed. Philadelphia, USA: Lippincott-Raven Publishers; 2007. p. 467.
9. Babler WJ. Embryonic development of epidermal ridges and their configurations. Birth Defects Orig Artic Ser. 1991; 27(2): 95-112. PMID: 1786361.
10. Rakic P. Specification of cerebral cortical areas. Science. 1988; 241(4862): 170-176. DOI:10.1126/science.3291116.
11. Preus M, Fraser FC. Dermatoglyphics and Syndromes. Amer J Dis Child. 1972; 124(6): 933-943. DOI:10.1001/archpedi.1972.02110180135022.
12. Moore KL, Persaud TVN, editors. The developing human clinical oriented embryology in the integumentary system. 8th ed. Philadelphia, USA: Saunder Elsevier; 2009. p. 440.
13. Achs R, Harper RG, Siegel M. Unusual dermatoglyphic findings associated with rubella embryopathy. N Engl J Med. 1966; 274(3): 148-150. DOI:10.1056/NEJM196601202740307.

14. Papova FA, Mantarkov M, Fusova A, Antanasov T, Akabaliev V, Sivkov S. Comparative Dermatoglyphic Study Of Fingerprint Patterns In Patients With Schizophrenia And Healthy Controls. Scr Sci Med. 2013; 45(1): 92-96. DOI:http://dx.doi. org/10.14748/ssm. v45i0.847.

15. Sarfraz N. Adermatoglyphia: Barriers to Biometric Identification and the Need for a Standardized Alternation. Cureus. 2019; 11 (2): 1-9. DOI:10.7759/cureus.4040.

16. Mellor CS. Dermatoglyphics in Schizophrenia: Part I: Qualitative Aspects. Br J Psychiat. 1968; 114(516): 1387-1397. DOI:10.1192/bjp. 114. 516.1387.

17. Kudalkar UN, Madhale NR. Dermatoglyphic patterns in schizophrenia. J Evid Based Med Healthc. 2016; 3(8): 231-234. DOI:10.18410/ jebmh/2016/55.

18. Sengupta S, Bhuyan SD. Palmar dermatoglyphics in schizophrenia. Indian J Psychiatry. 1995; 37(2): 86-90. PMID: 21743721; PMCID: PMC2971472.

19. Singh S. Dermatoglyphics in schizophrenia. Hum Hered. 1967; 17(4): 348-356. DOI: 10.1159/000152084.

20. Bhusaraddi PS, Havaldar PP, Rangasubhe P, Shaheb SH. The Study on Correlation of Dermatoglyphics and Schizophrenia. Int J Anat Res. 2019; 7(3.3): 6961-6965. DOI:10. 16965/ijar.2019.267.

21. Balgir RS, Murthy RS, Wig NN. Genetic loading in schizophrenia: a dermatoglyphic study. Isr J Med Sci. 1993; 29(5): 265-268. PMID: 831 4683