ORIGINAL RESEARCH PAPER

Volume-7 | Issue-7 | July-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ASSOCIATION OF 'atd' ANGLE WITH β- THALASSEMIA MAJOR: A CASE CONTROL STUDY AMONG NORTH-WESTERN INDIAN POPULATION

Anatomy

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ABSTRACT

Dermatoglyphics has been accepted as a simple and cost-effective method for determining various chromosomal, medical disorders and as well as hemoglobinopathies. β-thalassemia is a common disorder of hemoglobin synthesis in India. Keeping this in view, the present study was planned to study the association of 'atd' angles with β-thalassemia major cases in comparison to controls. A case control study was carried out in 400 study participants (200 cases & 200 controls) in department of Anatomy, R.N.T. Medical College & attached hospitals, Udaipur, Rajasthan. 'atd' angle of all study participants was measured. It was concluded that there was significant association of 'atd' angle found with β- thalassemia major. This dermatoglyphic parameter can be used as a diagnostic tool for the screening of β-thalassemia major.

KEYWORDS

Dermatoglyphics, Autosomal Recessive, Axial Triradius

INTRODUCTION

Ridges and creases of hands have been studied for fortune telling over thousands of years by palmists or chiromancers but now certain biological principles have contributed their application in medical sciences. "Dermatoglyphics" literally means skin carvings (derived from Greek word, "derma" means skin and "glyphe" means carve) the term is also used as a collective name for all the features of ridged skin. It is a scientific method of reading lines and ridges of finger, palm and sole. The term dermatoglyphics was first introduced in 1926 by Cummins and Mildo but further knowledge about dermatoglyphics was pioneered by Sir Francis Galton (1892)[1]. The epidermal ridge patterns on hands and soles are fully developed after birth and remain unchanged thereafter throughout life and are not affected by either the environmental or, age -related factors [2,3]. Since Dermatoglyphics may exhibit the genetic makeup of a person therefore it has been accepted as a simple and cost-effective method for determining various chromosomal and medical disorders like depression, schizophrenia, epilepsy, psoriasis, leprosy, Down's syndrome, diabetes, hypertension, coronary artery disease, bronchial asthma, pulmonary tuberculosis, carcinoma breast [4-6]. On examining a palm print, ridges can be seen running in different directions in the various areas. At the junction of three ridge systems, three ridges meet to form a triradiate pattern, generally termed triradius. There are four interdigital triradii, located at the base of the digits II, III, IV, and V except the thumb. These triradii are named as a, b, c, and d respectively.Other than the aforementioned, there exists triradius, the axial triradius (t) situated at or very near the proximal margin of the palm in the interval between the thenar and hypothenar eminences. Angle between line drawn from index finger triradius (a) and from little finger triradius (d) to the axial triradius (t) is known as atd angle and it is under genetic control. atd angle shows the extent of distal displacement of axial triradius. If the axial triradius is located more distally, it leads to an increase in the atd angle. This angle is used extensively in various dermatoglyphic studies. This was first introduced by Penrose[7].

Dermatoglyphics can be an alternative tool for diagnosing hereditary diseases like diabetes, hypertension, schizophrenia as well as some hemoglobinopathies. β -thalassemia is a common disorder of hemoglobin synthesis in India. [8]. It is a single gene disorder with autosomal recessive pattern of inheritance. In homozygous state β-thalassemia is the most severe form of the disease and is classified as β-thalassemia major [9]. Dermatoglyphics is very useful and easy method in the study of genetically influenced diseases. In previous studies atd angle have been found to be unusual in almost all the chromosomal disorders. It was considered that β-thalassemia major patients would exhibit higher degrees of changes in the values of atd angle compared to controls as in past studies.

Therefore, present study was planned to study the association of 'atd' angles with β-thalassemia major cases in comparison to controls.

MATERIAL AND METHODS

This cross-sectional study was carried out in 400 study participants (200 cases & 200 controls) in department of Anatomy, R.N.T. Medical College & attached hospitals, Udaipur, Rajasthan. 200 diagnosed cases of β- thalassemia major were randomly selected from Thalassemia ward of paediatric department of M.B. government hospital, Udaipur receiving regular blood transfusion and their age and sex matched 200 controls were selected from school going children & Undergraduate medical students of R.N.T. Medical College and Attached Hospitals,Udaipur. After getting permission from Institutional Ethical Committee, all the eligible study participants were approached by the Investigator herself, nature and purpose of the study was explained. After obtaining their informed and written consent, their socio-demographic data and detailed history was taken. Designed proforma of personal information were filled up for all study subjects. Subjects who were suffering from any of the diseases such as diabetes, bronchial asthma, pulmonary tuberculosis , sickle cell anemia and mental disorders like down syndrome, schizophrenia etc were excluded from the study to avoid false results because these diseases can also make changes in dermatoglyphic patterns. Materials used for present study were white paper attached with Proforma both for right and left hands, Black duplicating ink (Kore's), inking slab, roller, cotton balls, pressure pad, ruler, magnifying hand lens with LED, protractor, pencil and soap. In the present study, standard ink method by Cummins and Mildo, 1943 was used to take palmar prints.[10] After taking prints of palm the positions of digital triradii 'a', digital triradius 'd' and axial triradius 't' were identified with the help of magnifying hand lens with LED. Then atd angle was drawn by joining lines from digital triradius 'a' to axial triradius 't' and from digital triradius 'd' to axial triradius 't'. After that it was measured with the help of protractor bilaterally (in both palms). After entering values of atd angle in excel sheet it was subjected to statistical analysis. (Figure .1)

Statistical analysis

Shapiro–Wilk test was used to ensure normal distribution of data. Unpaired't' test was used to compare atd angles. 'p' value<0.05 was taken as significant. SPSS 22 version software was used for statistical calculations.

Table: 1 Distribution of the study participants according to their age

Parameter	Group	N	Mean	SD	'p' Value*
Age	Case	200	9.80	4.56	0.296
	Control	200	10.28	4.61	

*Unpaired 't' test

Table: 2 Distribution of the study participants according to their sex

Sex	Case		Control		Total	
	No.	%	No.	%	No.	%
Male	107	53.50	90	45.00	197	49.25
Female	93	46.50	110	55.00	203	50.75
Total	200	100.00	200	100.00	400	100.00

Chi-square = 2.561 with 1 degree of freedom; P = 0.110

Table: 3 Comparison of atd angle (◦) between cases and controls

atd Angle	Group	N	Mean (◦)	SD (◦)	'p' Value*
Right Hand	Case	200	44.37	6.36	<0.001
	Control	200	41.04	6.51	
Left Hand	Case	200	44.38	6.57	<0.001
	Control	200	41.81	6.82	

*Unpaired 't' test

Table: 4 Comparison of atd angle (◦) between male cases and male controls

atd angle	Group	N	Mean (◦)	SD (◦)	'p' Value*
Right Hand	Case	107	44.05	6.12	0.016
	Control	90	41.72	7.30	
Left Hand	Case	107	44.35	6.35	0.002
	Control	90	41.48	6.59	

*Unpaired 't' test,

Table: 5 Comparison of atd angle (◦) between female cases and female controls

atd angle	Group	N	Mean (◦)	SD (◦)	'p' Value*
Right Hand	Case	93	44.74	6.63	<0.001
	Control	110	40.48	5.77	
Left Hand	Case	93	44.42	6.85	0.017
	Control	110	42.07	7.03	

*Unpaired 't' test

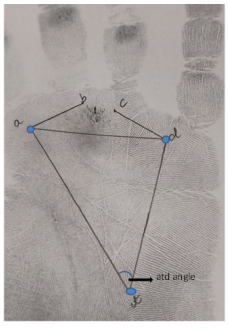

Figure .1 Showing atd angle in right palm

Table 6: Comparison of atd angle (°) in both sexes of Cases and Controls of present study with the previous studies

Author	Year	Sample size	Sex	Side	Mean±SD atd angle in cases	Mean±SD atd angle in controls	P value*
Andani RH et al	2012	100 cases 100 controls	Male	right	-	-	-
				left	-	-	-
			female	right	-	-	-
				left	-	-	-
			Male + female	right	48.78±6.73	38.11±5.54	-
				left	44.31±6.73	39.74±6.14	-
Biswas S et al	2013	30 cases 60 controls	male	right	44.41±4.19	46.09±6.53	1.23
				left			
			female	right	43.75±5.59	43.75±3.2	0.21
				left			
			Male+ female	right	-	-	-
				left	-	-	-
Basu D et al	2016	50 cases 50 controls	male	right	-	-	-
				left	-	-	-
			female	right	-	-	-
				left	-	-	-
			Male+ female	right	-	-	-
				left	44.93±1.02	42.22±5.38	-
Present study	2018	200 cases 200 controls	male	right	44.05±6.12	41.72±7.30	0.016
				left	44.35±6.35	41.48±6.59	0.002
			female	Right	44.74±6.63	40.48±5.77	<0.001
				left	44.42±6.85	42.07±7.03	0.017
			Male + female	right	44.37±6.36	41.04±6.51	<0.001
				left	44.38±6.57	41.81±6.82	<0.001

RESULTS AND DISCUSSION:

Case group and control group were found comparable. Mean age of cases and controls was 9.8 years and 10.28 years respectively and was not statistically significant ('p' Value=0.296). (Table 1) There were 46.50% and 55.0% females among cases and controls respectively ('p' value= 0.110). (Table 2)

Mean atd angle (◦) was significantly higher in right hand of cases (44.37) than controls (41.04) similar results were found when comparison of Mean atd angle (◦) was done for left hand.(Table 3) Similarly, Basu D et al also found significantly higher values of left hand atd angle (◦) in cases of their study. [9] (Table 6) This finding of present study was in accordance with Dallapiccola B et al, Mutalimova AB et al, Andani RH et al and Bhalla AK et al, who also observed significantly higher values of mean atd angle in cases.[10-13]

In present study it was found that Mean atd angle (◦) was significantly higher in right hand of male cases (44.05) than male controls (41.72) similar results were found when comparison of Mean atd angle (◦) was done for left hand. (Table 4) However, Biswas S et al did not observe higher values of mean atd angle in male cases[14] (Table 6). Their study comprised of 30 cases and 60 controls while in present study there were 200 cases and 200 controls this may be possible reason for this difference.

Mean atd angle (◦) was significantly higher in right hand of female cases (44.74) than female controls (40.48) similar results were found when comparison of Mean atd angle (◦) was done for left hand. (Table 5) However, Biswas S et al did not observe higher values of mean atd angle in female cases. [14] (Table 6) Their study comprised of 30 cases and 60 controls while in present study there were 200 cases and 200 controls this may be possible reason for this difference.

CONCLUSION

There was significant association of 'atd' angle found with β-thalassemia major as the mean 'atd' angle (◦) was wider in cases in comparison to controls, which indicates distal displacement of axial tri-radius in β-thalassemia major patients. This parameter can be used as a diagnostic tool for the screening of β-thalassemia major.

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