



**ORIGINAL RESEARCH PAPER**

**Anatomy**

**ASSOCIATION OF PALMAR a-b RIDGE COUNT WITH  $\beta$ -THALASSEMIA MAJOR: AN ANALYTICAL STUDY AMONG SOUTHERN AND WESTERN POPULATION OF RAJASTHAN**

**KEY WORDS:** Dermatoglyphics, Hemoglobinopathies, Autosomal Recessive

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**ABSTRACT**

In previous studies a-b ridge count have been found to be unusual in  $\beta$ -thalassemia major patients. It was considered that  $\beta$ -thalassemia major patients would show higher degrees of changes in a-b ridge count compared to controls as in past studies. Therefore, present study was planned to study the association of a-b Ridge Count with  $\beta$ -thalassemia major patients in comparison to controls in Rajasthan population. A cross-sectional study was carried out in 400 study participants (200 diagnosed cases of  $\beta$ -thalassemia major & 200 controls) in Department of Anatomy, RNT Medical College, Udaipur, Rajasthan. Mean Left Hand a-b Ridge Count and Total a-b Ridge Count in total cases were also found significantly higher than controls. Mean Right Hand a-b Ridge Count, Mean Left Hand a-b Ridge Count and Total a-b Ridge Count in male cases were significantly higher than controls.

**INTRODUCTION**

The study of epidermal ridges on the volar aspect of the hands and feet which form a variety of pattern configuration called "dermatoglyphics". The word Dermatoglyphics was coined in 1926 by the anatomist Harold Cummins, of Tulane University<sup>1</sup>. The palmar and plantar surfaces of human hands and feet are clothed by skin which is different from skin of rest of the body. The skin of palms and soles is continuously corrugated with narrow ridges, without having hairs and sebaceous glands but sweat glands are abundant and relatively large in size<sup>2</sup>. Dermatoglyphics (derma, skin + glyphe, carve) is a collective name for all these integument features. Dermatoglyphic traits are formed under genetic control early in development but may be affected by environmental factors during first trimester of pregnancy. They however do not change significantly thereafter, thus maintaining stability not greatly affected by age. These patterns may represent the genetic makeup of an individual and therefore his/her predisposition to certain diseases<sup>3</sup>. In medical practice it can be an alternative tool for diagnosing hereditary diseases like diabetes, hypertension, schizophrenia as well as some haemoglobinopathies. Common disorder of hemoglobin synthesis in our country is  $\beta$ -thalassemia<sup>4</sup>. It is a single gene disorder with autosomal recessive pattern of inheritance. In homozygous state  $\beta$ -thalassemia is the most fatal form of the disease with high morbidity and mortality and is classified as  $\beta$ -thalassemia major<sup>5</sup> and the patients suffering from  $\beta$ -thalassemia major dependent on regular blood transfusion. Dermatoglyphics is very useful and easy method in various medical and genetically influenced diseases. In previous studies a-b ridge count have been found to be unusual in patients with  $\beta$ -thalassemia major<sup>6</sup>. It was considered that  $\beta$ -thalassemia major patients would show higher degrees of changes in a-b ridge count compared to controls as in past studies.

Therefore, present study was planned to study the association of a-b Ridge Count with  $\beta$ -thalassemia major patients in comparison to controls in Rajasthan population.

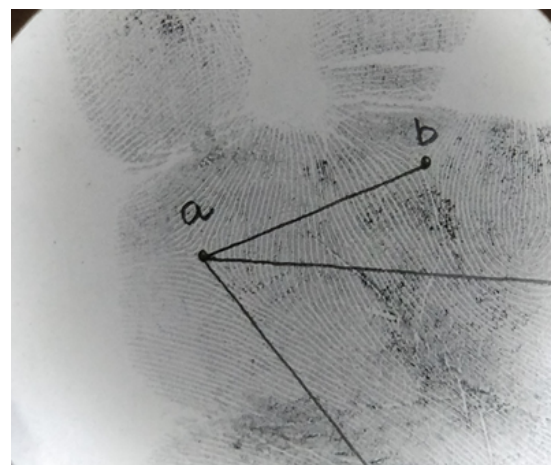
**MATERIAL AND METHODS**

This cross-sectional study was conducted in 400 study participants (200 cases & 200 controls) in the Department of Anatomy, RNT Medical College & attached hospitals, Udaipur, Rajasthan. 200 diagnosed cases of  $\beta$ -thalassemia major patients were randomly selected from wards of thalassaemia of MB Government hospital, Udaipur and Umaid hospital Jodhpur coming for blood transfusion and their age and sex matched 200 controls were selected from school going children & 1 year medical students residing in Rajasthan. After getting permission from concerned authorities, all the eligible study participants were approached by the Investigator herself, nature and purpose of the study was explained. After getting their informed and written consent, their socio-demographic data and detailed history was taken. A semi-

structured proforma of personal information was 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 those could also affect dermatoglyphic patterns were excluded from the study to avoid false results. Materials used for present study were white paper attached with Proforma both for right and left hands, Black duplicating ink, inking slab, roller, cotton balls, pressure pad, ruler, magnifying hand lens and pencil. In the present study, standard ink method by Cummins and Mildo, 1943 was used to take palmar prints<sup>7</sup>. After taking prints of palm the positions of digital triradius 'a' and digital triradius 'b' were identified with the help of magnifying hand lens with LED in both right and left hand. Then a-b interdigital ridge count (ABRC) was computed as the number of ridges that cross a line drawn between triradii a and b. The ABRC is a measurement of the second interdigital area of the hand. It was measured by counting the number of ridges between the triradius a at the base of the index finger, and the triradius b at the base of the middle finger. When digital triradii a and b were duplicated, then the triradius nearest to radial and ulnar border of palm were considered respectively. a-b Ridge count was done for both right and left hand. After that Total a-b ridge count (TABRC) was also determined by adding both the left and right hand a-b ridge counts.

**STATISTICAL ANALYSIS**

Shapiro-Wilk test was used to ensure normal distribution of data. Unpaired 't' test was used to compare a-b Ridge Count (ABRC) and Total a-b Ridge count. 'p' value < 0.05 was taken as significant. SPSS 22 version software was used for statistical calculations.



**FIGURE NO.1: Showing a-b ridge count**

**RESULT AND DISCUSSION**

**TABLE-1: Comparison of a-b ridge Count between cases and controls w.r.t. hand**

Ridge Count	Group	N	Mean	SD	'p' Value*
Right Hand a-b Ridge Count	Case	200	34.68	5.16	0.113
	Control	200	33.87	5.04	
Left Hand a-b Ridge Count	Case	200	34.21	4.69	<b>0.018</b>
	Control	200	33.10	4.69	
Total a-b Ridge Count	Case	200	68.89	9.08	<b>0.037</b>
	Control	200	66.97	9.26	

**Table-2: Gender-wise comparison of a-b Ridge Count between cases and controls w.r.t. hand**

Ridge Count	Group	Mean± SD (male)	'p' Value*	Mean± SD (Female)	'p' Value*
Right Hand a-b Ridge Count	Case	35.32±4.94	<b>0.012</b>	33.95±5.34	0.732
	Control	33.48±5.28		34.19±4.84	
Left Hand a-b Ridge Count	Case	34.94±4.91	<b>0.001</b>	33.38±4.30	0.924
	Control	32.69±4.80		33.44±4.60	
Total a-b Ridge Count	Case	70.25±9.13	<b>0.003</b>	67.32±8.80	0.803
	Control	66.17±9.72		67.63±8.86	

**\*Unpaired 't' test**

Mean a-b Ridge Count was more in both right and left hand among cases than controls and this finding was well supported by study of and Das P et al (2014)<sup>6</sup> who also found more a-b ridge count in thalassaemic patients in both right and left hand than controls similarly Andani HR et al (2012)<sup>8</sup> also found higher a-b Ridge count in right hand of cases but mean left hand a-b Ridge count was found less in cases than controls which is contrary to present study and the reason could be due to methods used in ridge counting. When gender wise comparison was done it was found that male patients were having significantly more a-b Ridge Count in both right and left hand than controls Similar to the finding of present study male cases in study of Das P et al (2014)<sup>6</sup> were also having significantly more a-b ridge count in both right and left hand whereas in study of Dogramaci AC et al (2009)<sup>9</sup> male cases in their right hand were having less a-b ridge count than controls. This variation in the finding of Dogramaci AC et al (2009)<sup>9</sup> study conducted in Turkey may be due to difference in the racial characteristics of participants. In the present study female cases were having less a-b Ridge Count in both right and left hand than controls. The female cases in their right hand were having less a-b ridge count in the study of Dogramaci AC et al (2009)<sup>9</sup> as similar to present study. Contrary to the present study female cases were having more a-b Ridge Count in their right and left hand in the study of Das P et al (2014)<sup>6</sup> and this can again be due to difference in methodology used in ridge counting. **(Table-1-2)**

In this study Mean Total a-b Ridge Count was more among cases than controls and this finding was commensurate with study of Das P et al (2014)<sup>6</sup> who also found more Total a-b Ridge Count (TABRC) in cases than controls. Whereas in study of Basu D et al (2016)<sup>5</sup> thalassaemia cases were having less Total a-b Ridge Count than controls. This difference in the finding of Basu D et al (2016)<sup>5</sup> study may be due methodology used in ridge counting. When gender wise comparison was done between cases and controls it was found that in male cases mean TABRC was significantly more than controls while in female cases mean TABRC was found less than controls in present study similar to the findings of male cases in the study of Das P et al (2014)<sup>6</sup> were also having significantly more total a-b ridge count than controls. Contrary to the present study female cases were having more total a-b ridge count in the study of Das P et al (2014)<sup>6</sup> and this could be due to difference in methods used in ridge counting. **(Table-1-2)**

**CONCLUSION**

Mean Right Hand a-b Ridge Count, Mean Left Hand a-b Ridge Count and Total a-b Ridge Count in total cases were higher than controls. Mean Left Hand a-b Ridge Count and Total a-b Ridge Count in total cases were also found **significantly** higher than controls.

Mean Right Hand a-b Ridge Count, Mean Left Hand a-b Ridge Count and Total a-b Ridge Count in male cases were **significantly** higher than male controls while these were lower in female cases than female controls.

**LIMITATIONS**

Scarcity of literature was limitation for discussion of findings.

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