

Comparison of Dermatoglyphic Patterns in Bronchial Asthma Patients and Controls in Southern RajasthanKalpana Sharma¹, Vaishaly Kishore Bharambe², Komi Vyas³, Ram Prakash Saini⁴¹Ph.D. Scholar, Department of Anatomy, Pacific Institute of Medical Sciences, Sai Tirupati University, Udaipur, Rajasthan, India²Guide and Head of Department of Anatomy, Pacific Institute of Medical Sciences, Sai Tirupati University, Udaipur, Rajasthan, India³Assistant Professor, Department of Pathology, Pacific Institute of Medical Sciences, Sai Tirupati University, Udaipur, Rajasthan, India⁴Tutor, Department of Anatomy, Pacific Institute of Medical Sciences, Sai Tirupati University, Udaipur, Rajasthan, India

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Abstract**Introduction:** Dermatoglyphics is a science that deals with ridge patterns of volar aspect of hands and feet. It may be helpful indicator for screening of asthma in the mass population because both things are related to gene. The objective of the study was to compare the dermatoglyphic angles of palm in bronchial asthma patients and controls.**Method:** Prints were collected from both hands of 230 patients of bronchial asthma and 230 controls. In these prints angles of palm "atd", "tad", and "tda" were studied.**Result:** In present study there is significant increase in the mean value of 'atd' in both hands of patient ($p < 0.0001$). The mean value of 'atd' is 42.27 in right hand of patient and 40.26 in controls and the mean value of 'atd' is 43.76 in left hand of patient and 41 in controls. Mean value of 'atd' is more in right (42.08) and in left (43.14) hand of male patients as compared to right (40.15) and left (41.28) hand of male control. Mean value of 'atd' is more in right (43.37) and in left (43.68) hand of female patients as compared to right (40.52) and left (40.68) hand of female control.**Conclusion:** In the comparison to controls, patients' right and left hands showed a significant increase in the mean "atd" and "tad" and a decrease in the "tda". In comparison to male controls, male patients' right and left hands showed increase in the mean "atd" and "tad" and a decrease in the "tda". In the comparison of female controls, female patients' right and left hands showed not significant decrease in the "tad" angle, but decrease in the "tda" angle with significance.**Keywords:** Dermatoglyphics, Bronchial Asthma, Ridge Pattern.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Bronchial asthma, a chronic respiratory condition characterized by airway inflammation and reversible airflow obstruction, poses a significant public health burden globally. In recent years, researchers have increasingly explored the role of non-traditional factors, such as dermatoglyphic patterns, in understanding the etiology and manifestation of various diseases, including asthma.

Dermatoglyphics, the study of epidermal ridge patterns on the palms, fingers, and soles, have been recognized as potential markers of genetic predisposition and prenatal environmental influences. The investigation of "dermatoglyphics," an example design comprised of epidermal edges on the volar part of the hands and feet. The Tulane

College anatomist Harold Cummins previously utilized the expression "dermatoglyphics" in 1926.[1] Sir Galton Francis (1892) remembered the primary finger impression grouping for this book.[2]

People have harsh skin on their palmar and plantar surfaces. It is scored by inquisitive edges that, because of physical or topological power, form into a scope of plans as the dermal edges structure during the third intrauterine week.[3] In the third or fourth month of fetal turn of events, the Edges are conclusively recognized. Besides from an adjustment of size equivalent with a singular's development, when they structure, they are changeless and don't modify over the course of life.

Harm to the skin that infiltrates 1 mm might disturb the normal edge highlights.[4]

The cornified layer of epithelium and the dermal example decide the edge design. The development of cells in the lower zone of the epidermis known as dermal papillae makes the dermis discontinuously distend vertically as thickenings, and the actual dermis to multiply in the epidermal hollows. Following the development of epidermal edges, dermal papillae rises are apparent on the skin's surface.¹Since dermal edges and their organized examples are unaffected by maturing, improvement, or natural changes during the post pregnancy time frame, they might have the option to foresee specific acquired and obtained sicknesses with an innate influence.[5]

It is notable that bronchial asthma has an inherited establishment. In any case, the dermatoglyphics of "bronchial asthma" are deficiently appreciated.[6] Hereditary factors likewise assume a part in bronchial asthma. Information with respect to this connection is scant. Consequently, given the huge worldwide rate of bronchial asthma, the presence of such a connection might be essential for the screening program expected to forestall bronchial asthma. Assuming that an individual has a novel dermatoglyphic design and is in danger of creating bronchial asthma, early identification projects can evaluate that individual for counteraction by overseeing other gamble factors.

Understanding any detectable differences in dermatoglyphic patterns between asthma patients and controls could offer valuable insights into the genetic and environmental determinants of asthma in this Southern Rajasthan. Moreover, such findings may contribute to the development of novel diagnostic approaches or personalized interventions for asthma management.

By bridging the fields of dermatoglyphics and respiratory health, this study seeks to contribute to a deeper understanding of the complex interplay between genetic predisposition, environmental factors, and the pathogenesis of bronchial asthma. In this manner, the target of study was finished to figure out a particular dermatoglyphic boundaries point in the patients with bronchial asthma.

Materials and Methods

The study was conducted at the Pacific Institute of Medical Sciences (PIMS) from June 2021 to March 2023. The study was conducted after getting ethical clearance from Institutional Human Ethics Committee (IHEC).

Participant size

Considering the prevalence of bronchial asthma of 0.96 %, the required sample size came out to be 230 [7]. Dermatoglyphic prints were obtained from 460

clinically diagnosed bronchial asthma patients and 230 controls. Subjects of 5 years to 50 years of age of both sexes were included for the study.

Inclusion and Exclusion Criteria

Cases who were diagnosed as Bronchial asthma were consulted in the OPD and diagnosed by the physician at the Pacific Institute of Medical Sciences in Umarda, Udaipur, throughout the study period from June 2021 to March 2023 were included. The control group consisted of Udaipur residents, medical students, paramedical workers, hospital employees, and their children; these individuals did not exhibit any asthmatic symptoms or respiratory issues.

Individuals under five years old, those with additional co-morbidities, those with immunological disorders and co-occurring, uncontrolled severe asthma, and those with long-term respiratory conditions other than asthma are excluded from the study. Individuals with malformed fingers and palms, wounds, illnesses, or burn scars on either hand were not considered as cases. Those Patients who were not willing to participate are also excluded.

Material

Camel duplicating ink, sturdy 8½" x 11" plain white paper, a convenient roller, an inking glass slab, a round bottle, a magnifying lens, a scale, a biological pointed essential needle, and a protractor were the materials needed to take fingerprints.

The dermatoglyphic print (angles) taken were studied under the following heading:

1. Case & control
2. Male case & control
3. Female case & control

Data Collection Procedure

Using the Indian Ink method, the equipment were cleaned both before and after the prints were taken (Cumins and Midlow, 1961). After being convinced of the procedure and the justification for taking their prints, the person granted their informed consent. In an orderly proforma, general information such as name, age, sex, residence address, and family history were gathered and recorded.

Before getting the prints, the participants' hands were washed with soap and water. Using a roller, a little dab of printer ink was applied to the inking slab, spreading it out into a thin layer. The Indian Ink method, established by Cumins and Midlow in 1961, was employed for fingerprint collection.(6) Prior to and after each fingerprinting session, all equipment underwent thorough cleaning. Informed consent was obtained from participants after explaining the procedures. General data, including name, age, sex, residential address, and family

history, was collected and recorded in an organized proforma. Before fingerprinting, participants' hands were washed using soap and water. A minute amount of duplicating ink was dispensed from the roller onto a thin film, facilitating direct ink application onto the fingers. During the fingerprinting process, anatomical adjustments were made to minimize discomfort. The thumb was positioned with the ulnar edge facing downward and rolled towards the body, while the other digits were placed with the radial edge facing downward and rolled away from the body. Subsequently, the obtained prints were scrutinized under different criteria using a magnifying lens and recorded in the proforma for further analysis.

Palmar Pattern Configuration [8,10]

The fingertip patterns display three fundamental dermatoglyphic landmarks, which are as follows: [8]

1. **Triradius:** This is an outcome of three ridge systems coming together to make an angle of about 120° with one another.
2. **Core:** The core of the design is located about in the middle. The form of the core might vary. A straight, rod-like ridge or a set of two or more of these parallel ridges typically serve as the representation of the core in a loop pattern. The core of a whorl can take the form of a circle or an ellipse at the center of the design, or it can appear as a dot or a small ridge that is curved or straight.
3. **Radiants:** Ridges that surround the pattern region and radiate outward from the triradius are known as radiators. The "skeletal" framework of the pattern is made up of these ridges.

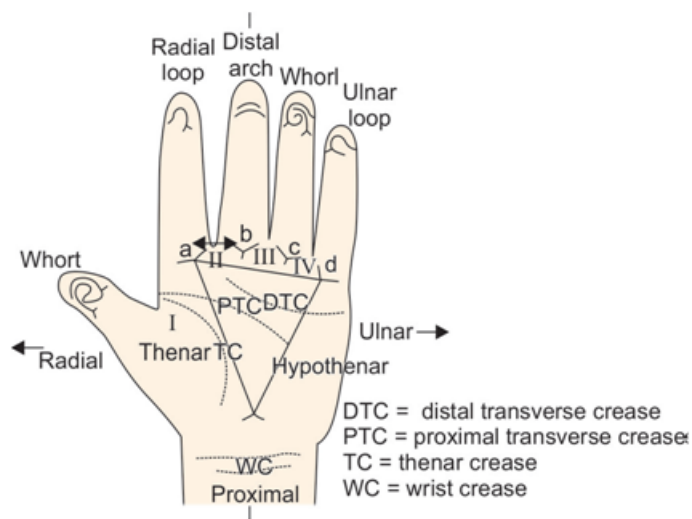


Figure 1: Anatomical region on the palm for dermatoglyphics [9]

To perform comparable dermatoglyphic analysis across multiple subjects, the palm has been segmented into multiple anatomically defined regions.

It consists of hypothenar area, first, second, third, and fourth interdigital areas, as well as thenar areas.

atd angle

Lines drawn from the axial triradius (t) to the digital triradius (d) and from the digital triradius (a) to the triradius (t) produce this angle. The atd angle increases as "t" moves farther away from the distal transverse crease.[10]

Statistical Analysis

The data was entered in excel sheet and analysed by using SPSS Version 20 software. Student t-tests will be used to determine the significance of the mean ± SD difference between the two groups.

Result

The palm prints of 230 individuals with bronchial asthma and 230 controls were used to compute the "atd", "tad", and "tda" angles.

A. Comparison among case and control

In comparison to controls, bronchial asthma patients' right and left hands showed a highly significant increase in the mean "atd" angle and "tad" and a decrease in the "tda" angle.

Table 1: Comparison of angles among right hand of case and control

Angles	Right				p value
	Case(230)		Control(230)		
	Mean	Sd	Mean	Sd	
Atd	42.27	3.4	40.26	3.97	< 0.0001
tad	58.01	3.12	56.53	3.77	< 0.0001
tda	79.71	4.15	83.21	5.11	< 0.0001

The comparison of the “atd”, “tad”, and “tda” angles of right hand in the case and control is displayed in Table 1. Mean value of ‘atd’ angle is more in right (42.27) hand of bronchial asthma patients as compared to right (40.26) hand of control. Like this ‘tad’ also have higher mean value more in right (58.01) hand of bronchial asthma patients as compared to right (56.53) hand of control.(Figure 2)

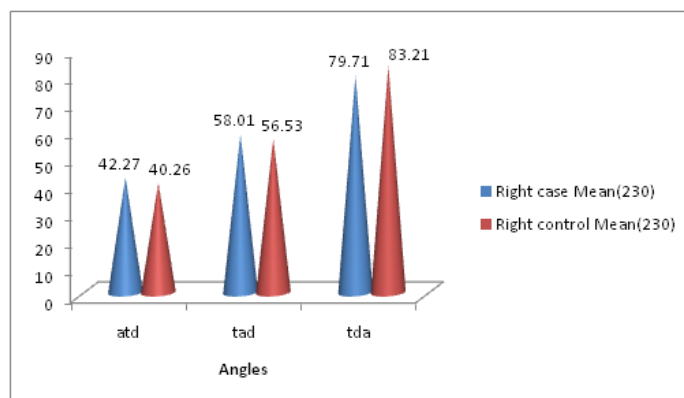


Figure 2: Comparison of angles among right hand of case and control

Table 2: Comparison of angles among left hand of case and control

Angles	Left				p value
	Case(230)		Control(230)		
	Mean	Sd	Mean	Sd	
atd	43.76	2.93	41	3.49	< 0.0001
tad	57.6	3.19	56.61	3.86	0.0029
tda	78.63	3.98	82.39	5.16	<0.0001

The comparison of the “atd”, “tad”, and “tda” angles of left hand in the case and control is displayed in Table 2. Mean value of ‘atd’ angle is more in left (43.76) hand of bronchial asthma patients as compared to left (41) hand of control. Like this ‘tad’ also have higher mean value more in left (57.6) hand of bronchial asthma patients as compared to left (56.61) hand of control.(Figure 3)

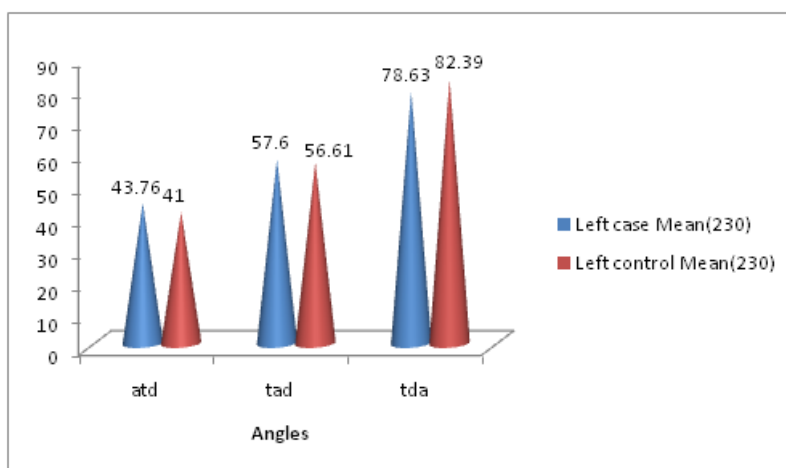


Figure 3: Comparison of angles among left hand of case and control

B. Comparison of angles among male case and control

In comparison to male controls, male bronchial asthma patients' right and left hands showed a highly significant increase in the mean "atd" angle and “tad” and a decrease in the "tda" angle.

Table 3: Comparison of angles among right hand of male case and male control

Angles	Right				p value
	Male case(115)		Male control(115)		
	Mean	Sd	Mean	Sd	
atd	42.08	2.73	40.15	4.17	< 0.0001
tad	58.19	2.77	56.08	4.55	< 0.0001
tda	79.73	3.98	83.77	5.76	< 0.0001

The comparison of the “atd”, “tad”, and “tda” angles of right hand in the male case and male control is displayed in Table 3. Mean value of ‘atd’ angle is more in right (42.08) hand of male bronchial asthma patients as compared to right (40.15) hand of male control. Like this ‘tad’ also have higher mean value more in right (58.19) hand of male bronchial asthma patients as compared to right (56.08) hand of male control.

Table 4: Comparison of angles among left hand of male case and male control

Angles	Left				p value
	Male case(115)		Male control(115)		
	Mean	Sd	Mean	Sd	
atd	43.14	2.566	41.28	3.247	< 0.0001
tad	57.84	2.232	56.02	4.412	< 0.0001
tda	79.02	3.275	82.7	5.522	< 0.0001

The comparison of the “atd”, “tad”, and “tda” angles of left hand in the male case and male control is displayed in Table 4.

Mean value of ‘atd’ angle is more in left (43.14) hand of male bronchial asthma patients as compared to left (41.28) hand of male control. Like this ‘tad’ also have higher mean value more in left (57.84)

hand of male bronchial asthma patients as compared to left (56.02) hand of male control.

C. Comparison of angles among female case and control

In comparison to female controls, female bronchial asthma patients' right and left hands showed a highly significant increase in the mean "atd" angle.

Table 5: Comparison of angles among right hand of female case and female control

Angles	Right				p value
	Female case(115)		Female control(115)		
	Mean	Sd	Mean	Sd	
atd	43.37	3.812937	40.52	3.636182	< 0.0001
tad	57.08	3.161255	57.23	2.91584	0.7084
tda	79.55	4.701977	82.25	4.200469	< 0.0001

The comparison of the “atd”, “tad”, and “tda” angles of right hand in the female case and female control is displayed in Table 5. Mean value of ‘atd’ angle is more in right (43.37) hand of female bronchial asthma patients as compared to right (40.52) hand of female control. Like this ‘tad’ also have lower mean value in right (57.08) hand of female bronchial asthma patients as compared to right (57.23) hand of female control.

Table 6: Comparison of angles among left hand of female case and female control

Angles	Left				p value
	Female case(115)		Female control(115)		
	Mean	Sd	Mean	Sd	
atd	44.68	3.262521	40.68	3.662201	< 0.0001
tad	56.88	3.903586	57.1	3.151078	0.64
tda	78.44	4.763752	82.22	4.700269	< 0.0001

The comparison of the “atd”, “tad”, and “tda” angles of left hand in the female case and female control is displayed in Table 6. Mean value of ‘atd’ angle is more in left (43.68) hand of female bronchial asthma patients as compared to left (40.68) hand of female control. Like this ‘tad’ also have lower mean value in left (57.23) hand of female bronchial asthma patients as compared to left (57.1) hand of female

control. In the comparison of female controls, female bronchial asthma patients' right and left hands showed not significance decrease in the “tad” angle, but decrease in the "tda" angle with extremely significance.

Discussion

Recently, a lot of research has been done to determine the relationship between morphological and genetic traits and several illnesses with the aid of certain research projects. Polygenic inheritance determines dermatoglyphics, one of the aforementioned tools that is widely employed in scientific research. Numerous professionals have shown that dermatoglyphic analysis is a valuable tool for diagnosing and comprehending the hereditary makeup of numerous illnesses.

1. Comparison of 'atd' angle among case and control

The present study mean value of "atd" angle is increased in both hands with significant increase in Bronchial Asthma patients ($p < 0.001$). The similar finding were shown in the study by Deepa TK et al., that the value of the mean 'atd' angle in the right and left hands of bronchial asthma patients compared to controls were increased. [11] The study done by Sahana BN et al, revealed that mean value of 'atd' angle in the right hand of case was 40.34 was higher than the right hand of control (40.01) and mean value of 'atd' angle in the left hand of case was 40.35 was higher than the left hand of control (40.13). [12] A similar result of an increase in atd angle was observed in the study of Sreenivasulu K et al. [13] Another study by Mahajan AA et al that mean of 'atd' angle was higher in case of bronchial asthma patient (40.12) when compared to control (39.83). [14] While in contrast the study done by Pakhale SV et al., showed the decrease in the value of 'atd' in the right and left hand of male bronchial asthma patient when compared with controls. [15]

2. Comparison of 'adt' angle among case and control

The current study shown that mean value of "adt" angle is increased in right ($p < 0.001$) and left ($= 0.0029$) hands with significant increases in Bronchial Asthma patients.

While in contrast the study done by Deepa TK *et al.*, revealed significant decreases in the value of the mean 'adt' angle in the right ($p < 0.001$) and left ($p < 0.001$) hands of bronchial asthma patients compared to controls. In the study of Monteseirin FJ et al found that statistically significant value for lower 'adt' angle in right hand in patients. [16]

3. Comparison of 'atd' 'tda' 'tad' angle among male case and control

The current study showed that the mean value of 'tda' angle of the right and left hand is more in control when compared to male bronchial asthma patients. The Study of Deepa TK et al, revealed similar result that the mean value of 'atd' of the left palm and 'tad' angle of both palm were

increased. [11] Similar findings were found in the study of Pakhale SV et al, in male patients' left hands had a higher mean "atd" angle than controls' hands. [15]

The present study found that mean "atd" angle in the right hands of male patients was higher than controls. While in contrast the study by Pakhale SV et al, observed that the mean "atd" angle in the right hands of male patients was lower than in controls. [15]

4. Comparison of 'atd' 'tda' 'tad' angle among female case and control

The present study found that the mean value of the "atd" angle increase and the mean value of the 'tda' angle decrease in the left and right hands when compared the controls to the female bronchial asthma patients. Similar findings were observed in the study done by Deepa TK et al., [11] The study of Pakhale SV et al, revealed same finding that there were increases in value of mean 'atd' angle in left hands of female patients than controls. [15]

The current study done by Pakhale SV et al, found that there was increase in value of mean 'atd' angle in right hands of female patients than controls. While in contrast the study done by Pakhale SV et al, there was decrease in value of mean 'atd' angle in right hands of female patients than controls. [15]

Conclusion

Dermatoglyphic patterns would help the physician to make a more thorough examination than usual to find out any hidden abnormality. Therefore, it can be a useful and affordable tool for initial research into a variety of diseases that may have a genetic basis. In contrast to controls, the current study reveals a correlation between dermatoglyphic angles in patients with bronchial asthma.

In the present study, there is significant increase in the mean value of 'atd' angle in both hands of Bronchial Asthma patients ($p < 0.001$). The mean value of 'atd' angle is 42.27 in right hand of bronchial asthma patient and 40.26 in controls and the mean value of 'atd' angle is 43.76 in left hand of bronchial asthma patient and 41 in controls. So in the comparison to controls, bronchial asthma patients' right and left hands showed a highly significant increase in the mean "atd" angle and "tad" and a decrease in the "tda" angle.

In comparison to male controls, male bronchial asthma patients' right and left hands showed a highly significant increase in the mean "atd" angle and "tad" and a decrease in the "tda" angle. In the comparison of female controls, female bronchial asthma patients' right and left hands showed not significant decrease in the "tad" angle, but decrease in the "tda" angle with extremely significance

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