

Study of Palmar Angles as a Dermatoglyphic Feature in Bronchial Asthma

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Abstract

Dermatoglyphics is the branch of science that deals with the study of ridge patterns on fingertips, palm, soles, and toes. These patterns can serve as a noninvasive, cost-effective tool that can be used for the prediction of bronchial asthma.

Objective: The present study was undertaken to study 'atd,' 'adt,' and 'dat' angles in bronchial asthma patients in comparison with controls. **Materials & methods:** palm prints were taken from 250 clinically diagnosed asthma patients from our hospital. Those prints were compared with 250 controls amongst the medical students and staff from the same hospital. Palmar prints were taken by standard ink method. From the palm print, the angles were measured and compared.

Result: angles taken were analyzed between the patients, and the control group of individuals showed the statistical difference. **Conclusion:** we conclude that there is a genetic influence on the dermatoglyphic pattern, which can serve as a non-invasive, anatomical marker, and a predictor tool to determine the individuals with bronchial asthma.

Keywords: atd, dat, adt, Dermatoglyphics, fingertips.

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INTRODUCTION

Asthma is a chronic respiratory disease resulting from a combination of genetic and environmental factors. It is defined as a chronic inflammatory disorder of the conducting airways and is characterized by airway hyperresponsiveness, which leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or early morning [1]. As genetic factors influence it, the dermatoglyphic pattern may have a correlation, which could be of help in predicting the occurrence of bronchial asthma among the family members of the patients suffering from the disease [2].

Dermatoglyphics deals with the study of skin ridge patterns on the fingers, toes, palms of hands, and soles of feet. Evidence suggesting that certain features of dermal ridges are genetically determined has been compiled during the last century. Sir Francis Galton [15] was the first person who gave evidence favorably, implying that pattern type has a genetic basis. Wilder [16] suggested that a dominant inheritance of the thenar or first interdigital patterns.

Epidermal ridges are formed between the 3rd to 4th month of fetal development and once formed remain permanent and never changes throughout the life, unless the skin is damaged to the depth of 1mm. These patterns are genetically determined and are influenced by environmental factors. Dermatoglyphics can be used as a diagnostic aid for many diseases and for screening abnormal anomalies, which have a strong hereditary basis. The importance of dermatoglyphics is to prognosis and not to diagnosis those people with a genetic predisposition to the development of certain diseases like bronchial asthma. Bronchial asthma is one of the most widely studied respiratory diseases, and its genetic basis has been well established.

The most commonly measured dermatoglyphic traits include fingerprint pattern, measurement of ridge counts between triradii, points formed by the convergence of three patterns of ridges and the measurements of angles like atd, dat and adt angle that exists between the 'a,' 'd' and 't' triradii in the palm. Only a few studies have shown links between dermatoglyphic patterns that help in predicting the

occurrence of bronchial asthma [3]. Hence this study was taken to assess the correlation between dermatoglyphic pattern and bronchial asthma.

MATERIALS AND METHODS

Source of Data

The study was conducted on all the clinically diagnosed bronchial asthma patients, who attended the OPD of MES Medical College and Hospital, Perinthalmanna, during the study period from 2014 December to 2017 December. Matched controls were selected from among the medical students, staff members, and their children of the hospital with no symptom of any respiratory diseases.

Sample Size

Dermatoglyphic prints were obtained from 250 bronchial asthma patients and 250 controls. Subjects of 6 years to 60 years of age of both sexes were included for the study. Among them, 133 adults, 44 teenagers, and 73 belongs to childhood.

Inclusion Criteria

Clinically diagnosed bronchial asthma patients attended the outpatient department of MES Medical College, Perinthalmanna.

Exclusion Criteria

Patients with chronic respiratory diseases other than asthma. Those with deformed fingers and palm, injuries, and infections like burning, the scar of burn on either hand were excluded.

METHODOLOGY

An Institutional Ethical Committee approval was obtained. The purpose, procedure, and importance of the study were explained to all patients, and their consent was taken. The materials used for taking fingerprints were rollers, printer’s ink, glass sheet, Performa sheet, magnifying lens, protractor, scale, spirit, and soap solution.

The dermatoglyphic pattern taken were studied under the following category:

- 1). Case & control
- 2). Male & female
- 3). Childhood, Teenage & Adult

Both the hands washed with soap and water. The humidity is removed with a towel. The ink is placed on the glass slab and spread with the roller into even thin film and place the palm over it, so that ink spread uniformly on the palm. After inking, the palm was placed onto the proper area of an A4 paper from

the wrist to the tip of the fingers, with minimum pressure applied on the dorsum of the hand. Then the hand was rolled ulnar wards, without disturbing the print. Keep the fingers apart from each other while taking the impression.

With the aid of the magnifying lens, mark the ‘a’ ‘t’ and ‘d’ points. Now with the aid of a protractor, scale, and a pencil, join the ‘a’ and ‘d’ point with the ‘t’ point. Then measure the angle forming between these lines. The triradius was designated as t and t’ or t’’, depending upon the proximal to the lower margin of the palm. When two ‘a’ or two ‘d’ triradii were encountered, the more radial and more ulnar triradius respectively were used to determine the angle. When more than one triradii was encountered in a single print, only the most proximal triradius was used. Measured atd, adt, and dat angles of both right and left palm of bronchial asthma patients and controls were taken and compared.

Care should be taken in using the angles as the dermatoglyphic parameter [4]. The angle tends to decrease with the age as the palm grows much more in length than breadth [5]. It was partially corrected by introducing the classification by age. It is also affected by the amount of spreading of fingers. It can also be affected by the pressure exerted while taking the palm print. This angle can be measured reliably by taking the reading by one individual or multiple readers [6]. Current study was done to find out the association of ‘atd’ adt and ‘dat’ angles in bronchial asthma patients with controls.

STATISTICAL ANALYSIS

The data were entered into Microsoft Excel XP software program. Statistical analysis was done by SPSS 25th version. The values obtained were statistically analyzed with independent T-test for correlating the angle with bronchial asthma among the study population. P<0.05 was considered significant.

RESULT

The atd, dat, and adt angles were calculated from the palm print of 250 bronchial asthma patients and 250 controls. They were tabulated, compared, and analyzed statistically.

Table-1 shows the comparison of atd, dat, and adt angles in case and control. Increase in the value of the mean ‘atd’ angle and decrease in ‘adt’ angle in the right and left hands of bronchial asthma patients compared to controls, which is highly significant (Figure-1).

Table-1: Comparison of ‘atd’, ‘dat’ & ‘adt’ angles in case & controls

Side	Angle	Case/Control	Mean	Std. Deviation	P value
Right	atd	case	42.52	5.421	<0.001**
		control	40.43	3.854	

Left	dat	case	57.48	4.323	0.117
		control	56.76	5.923	
	adt	case	79.92	5.28	<0.001 **
		control	82.65	5.497	
	atd	case	43.81	5.007	<0.001 **
		control	40.84	4.801	
	dat	case	57.13	3.923	0.236
		control	56.62	5.575	
	adt	case	79.24	5.189	<0.001 **
		control	82.37	5.572	

Data expressed as mean & SD. **P-value <0.001 was considered as statistically significant

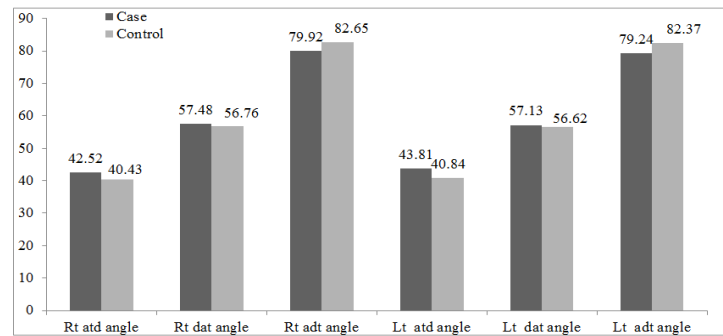


Fig-1: Comparison of 'atd', 'dat' & 'adt' angles in case & controls
Data expressed as Mean & SD. ** P value <0.001 was considered as statistically significant.

Table-2 shows the comparison of atd, dat, and adt angles in case and control, in relation to gender. In the female, there is an increase in the mean value of atd angle and decrease in adt angle in the right and left hand of bronchial asthma patients compared to the

controls (Figure-2). In the male, the mean value of atd of the left palm and dat angle of both palm were significant in case. However, the mean value of adt angle of the right and left hand is more in control when compared to bronchial asthma patients (Figure-3).

Table-2: Comparison of 'atd,' 'dat' & 'adt' angles in case & control with gender

Sex	Side	Angle	Case/Control	Mean	Std. deviation	P value	
Female	Right	atd	case	43.22	5.377	<0.001 **	
			control	40.37	4.028		
		dat	case	56.97	4.464	0.98	
			control	56.99	5.828		
	Left	adt	case	79.81	5.241	<0.001 **	
			control	82.5	5.615		
		atd	case	44.51	4.985	<0.001 **	
			control	40.53	4.949		
	Male	Right	atd	case	41.71	5.383	0.051
				control	40.5	3.643	
dat			case	58.08	4.093	0.019*	
			control	56.47	6.053		
Left		adt	case	80.04	5.344	<0.001 **	
			control	82.85	5.365		
		atd	case	43	4.929	0.006*	
			control	41.23	4.6		
dat	case	57.69	3.909	0.029*			
	control	56.28	5.664				
adt	case	79.45	4.717	<0.001 **			
	control	82.3	5.443				

Data expressed as mean & SD. **P-value <0.001 was considered statistically significant

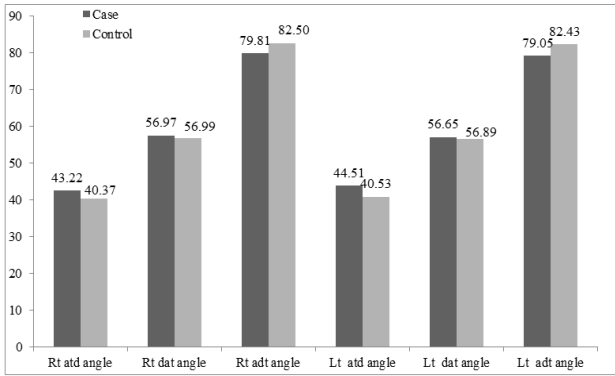


Fig-2: Comparison of 'atd,' 'dat' & 'adt' angles in case & control in Females

Data expressed as Mean & SD. ** P-value <0.001 was considered statistically significant.

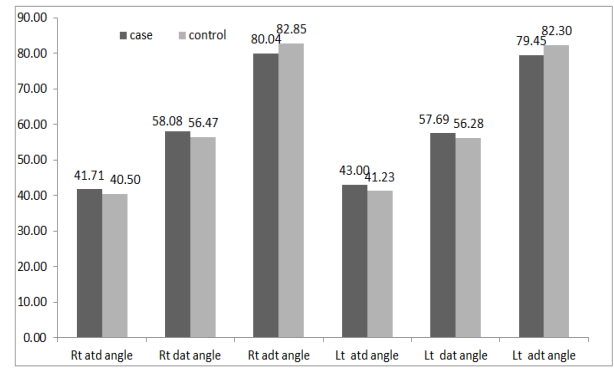


Fig-3: Comparison of 'atd,' 'dat' & 'adt' angles in case & control in Males

Data expressed as Mean & SD. ** P-value <0.001 was considered statistically significant.

Table-3: Comparison of 'atd,' 'dat' & 'adt' angles in case & controls with group

Group	Side	Angle	Case/Control	Mean	Std. Deviation	P value
Adult	Right	atd	case	44.53	5.037	<0.001**
			control	41.4	3.702	
		dat	case	56.26	3.915	0.302
			control	55.68	4.85	
		adt	case	79.23	4.693	<0.001**
			control	82.87	4.438	
	Left	atd	case	44.86	5.257	<0.001**
			control	41.49	4.385	
		dat	case	56.55	4.349	0.384
			control	55.9	7.263	
		adt	case	78.58	5.545	<0.001**
			control	82.4	5.871	
Children	Right	atd	case	38.78	5.056	0.265
			control	39.66	4.224	
		dat	case	60.9	3.457	<0.001**
			control	55.54	3.343	
		adt	case	80	6.749	<0.001**
			control	84.59	3.604	
	Left	atd	case	42.68	4.675	0.094
			control	41.19	5.829	
		dat	case	59.26	2.298	<0.001**
			control	56.85	4.012	
		adt	case	78.74	4.705	0.001**
			control	81.93	6.577	
Teenage	Right	atd	case	42.61	3.636	<0.001**
			control	39.53	3.343	
		dat	case	55.52	3.56	0.001**
			control	59.89	8.224	
		adt	case	81.86	3.488	0.197
			control	80.27	7.601	
	Left	atd	case	42.52	4.061	<0.001**
			control	39.32	4.001	
		dat	case	55.36	3.207	<0.001**
			control	57.65	2.657	
		adt	case	82.05	3.827	0.304
			control	82.79	3.601	

Data expressed as mean & SD. **P-value <0.001 was considered statistically significant

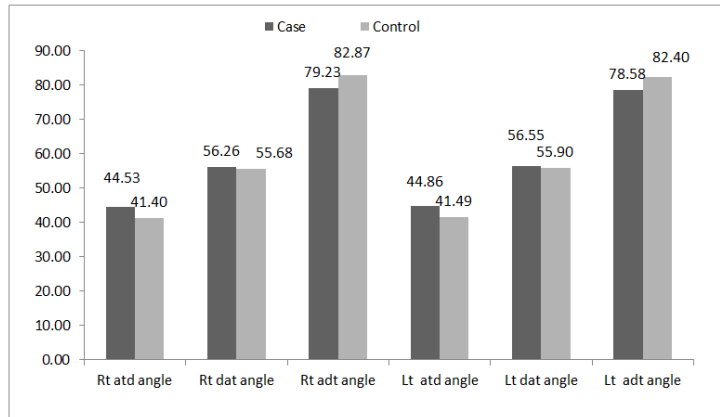


Fig-4: Comparison of ‘atd,’ ‘dat’ & ‘adt’ angles in case & controls in Adults
Data expressed as Mean & SD. ** P-value <0.001 was considered statistically significant.

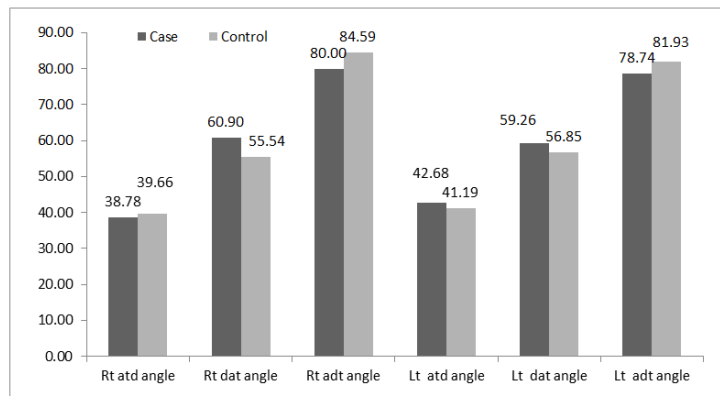


Fig-5: Comparison of ‘atd,’ ‘dat’ & ‘adt’ angles in case & controls in Children
Data expressed as Mean & SD. ** P-value <0.001 was considered statistically significant.

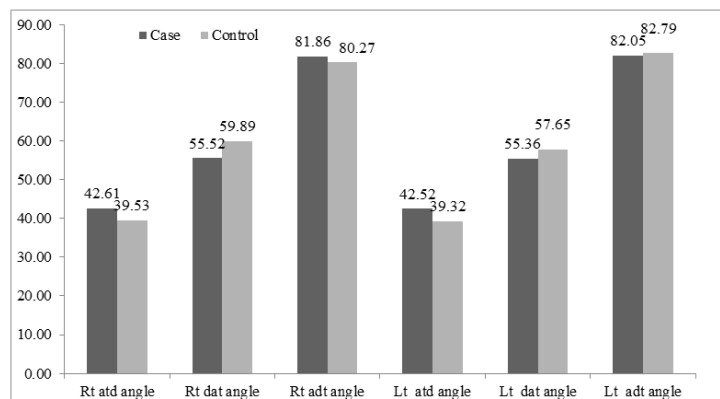


Fig-6: Comparison of ‘atd,’ ‘dat’ & ‘adt’ angles in case & controls in Teenage
Data expressed as Mean & SD. ** P-value <0.001 was considered statistically significant.

Table-3 shows atd, dat, and adt angles in case and controls with age grouping. In group adult, there is an increase in the value of mean ‘atd’ angle in the right and left hands of bronchial asthma patients than controls, which is statistically significant. However, the value of mean ‘adt’ angle in the right and left hands is more in controls than the bronchial patients, which is also statistically significant (Figure-4). In group childhood, there is an increase in the value of mean ‘dat’ angle and decrease in ‘adt’ angle in the right and left hand of bronchial asthma patients when compared with the controls, which is statistically significant

(Figure-5). In group teenage, there is an increase in the value of mean ‘atd’ and decrease in ‘dat’ angle in the right and left hands of bronchial asthma patients with control, which is also statistically significant (Figure-6).

DISCUSSION

The study of ridged skin on fingers, palm, sole, and toes is termed as dermatoglyphics. It comes from two Greek words (derma – skin, and glyph – carving). The ridges and creases on the palm, fingers soles and toes have a great significance in determining the

characteristics of human beings because of their permanence, variability, and unchangeability.

Earlier, dermatoglyphics has been regarded by geneticists and anthropologists as a useful tool in the analysis of the relationship in the population. It got the attention of medical researchers when it was found that many patients with chromosomal aberrations had unusual ridge formation. By the advancement of human genetics, dermal pattern indices, together with clinical features, are being employed for the diagnosis of many inherited diseases.

Differentiation of dermal ridges takes place in the 3rd and 4th month of fetal life and become completed by the end of 4th month. Generally, it remains unchanged until the death, except in cases of serious injuries that scar the dermis. Because of this reason, it has become one of the most important parameters in defining the characteristic features of the patient. It has to turn out to be a valuable tool in the medical field for screening many genetic disorders.

The dermatoglyphic palmar pattern has been associated with numerous medical disorders [4]. Geometric value of the angles in asthma patients has been studied. Sandeep *et al.*, there is a decrease in the mean atd in the right hand of the female bronchial asthma patients. It also shows a decrease in the value in the right and left hand of male bronchial asthma patient when compared with controls [7] On the contrary, our study shows an increase in the value of mean atd in the right and left hand of male, shows no significant value, but in female, it is significant. A similar result of an increased atd angle was observed in the study of Sreenivasulu *et al.*, [8]. No significant difference in the value of atd angle when compared bronchial asthma with controls in Amrut *et al.*, [9]. There exists a statistically significant value for lower 'tda' angle in right hand [10]. The presence of the whorl pattern on both thumbs was a constant feature in all asthma patients. In all digits, the frequency of arches was reduced in bronchial asthma patients when compared to controls, which was statistically significant was observed by Gupta M [11]. Normal atd angle ranges from 30 to 65 degree, in the case of mental retardation revealed a range of <30 to <65 degrees Vashit *et al.*, [12]. 'dat' angle of both hands was higher in patients with multiple sclerosis compared with healthy controls. The atd angle of the right hand of the patients was lower than the controls Vedat Sabanciogullari *et al.*, [13].

In the case of hypertension, the mean value of atd angle was more in the right hand and less on the left hand of male patient than that of the controls [14].

In dermatoglyphics, much work was done to find out an association between the morphological and genetic characters in many diseases. Many authors have

demonstrated that it is an important aid in the diagnosis and understanding of many genetic diseases. In this study, atd, dat & adt angles were studied and found to be statistically significant. When compared with case and control group, bronchial asthma case shows an increased 'atd' angle, and control shows an increased 'adt' angle in both right and left hand. When compared to sex, female bronchial asthma patients show an increased 'atd' angle while the male controls show an increased 'adt' angle in both right and left hands. Increased value of mean 'atd' angle is found in the right and left hand of adult and teenage bronchial asthma patients as compared to controls. However, the childhood group shows an increased value of mean 'dat' angle in bronchial asthma patients compared to controls.

Since asthma is a genetically transmitted disease, there would be some correlation between bronchial asthma and dermatoglyphics that would be of statistical significance in the bronchial asthma patients as compared to the controls.

CONCLUSION

Dermatoglyphic patterns play a significant role in the diagnosis of various genetic disorders. It has also been observed in some diseases which may be influenced directly or indirectly by genetic inheritance. The present study shows an association between dermatoglyphic angles in bronchial asthma patients when compared with controls.

In palm print, any deviation from the regular pattern will be strongly indicative of particular anomaly. Although no dermatoglyphic patterns can be studied alone in making a diagnosis, several patterns, when combined can be used to establish or to find an uncertain diagnosis or disorder that might be identified only later otherwise be ignored. Dermatoglyphic patterns would help the physician to make a more thorough examination than usual to find out any hidden abnormality. So it can be a handy and cost-effective tool for preliminary investigations for various disease with a suspected genetic base.

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