

# Palmar Dermatoglyphic Patterns In Normal And Congenital Heart Diseased Children

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## ABSTRACT

**Objective:** To evaluate and compare the finger and palmar dermatoglyphic patterns in children with congenital heart diseases with that of the normal healthy children.

**Study Design:** Case control study

**Place and Duration of Study:** Department of Anatomy, Liaquat University of Medical and Health Sciences Jamshoro from 1<sup>st</sup> January 2020 to 31<sup>st</sup> December 2020.

**Methodology:** One hundred children with both male and female congenital cardiac diseases. Dermatoglyphic palm and finger patterns were investigated.

**Results:** Ventricular septal defects (VSD) are the most common congenital heart condition in both males (50%) and females (34.8%), followed by atrial septal defects (ASD) in both males (20.4%) and females (20.4%) (39.1%). The majority of loops are located in both the cases and controls groups, followed by whorls, and then arches. With a p-value of 0.001, the rise in whorls in congenital heart diseases is statistically important. When the cases were compared to the controls, the Whorls (p 0.001) and loops (p 0.001) were found to be statistically important, indicating that the Whorls are more common in congenital heart disorders than the controls.

**Conclusion:** Congenital cardiac illnesses are linked to anomalous dermatoglyphic patterns. In congenital children with heart disease, there is an increase in Whorls and a reduction in the number of arches.

**Keywords:** Dermatoglyphics, Congenital heart disease, Children

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## INTRODUCTION

Since the dawn of time, humans have been fascinated by the fine ridge patterns found on the fingertips, palms, and soles. Curious ridges groove the skin on the palmar and plantar surfaces, forming some configurations. Papillary ridges can only be seen on the palms and soles of the hands, as well as flexor surface areas where they are formed by small arrays separated by narrow furrows, in parallel or curved form. The epidermal ridges lead to a standard arrangement of dermal papillae interlocking to hold the two layers together closely. This is a way of life constant and distinct to the individual, thus serving as a tool to identify.<sup>1</sup> Dermatoglyphics is currently being used to describe, compare, and forecast the incidence of biomedical events.<sup>2</sup> Arches (60-65 percent), loops (30-35 percent), and whorls (40-50 percent) are the three basic types of fingerprints (5 percent). A person's ten fingers may all have the same pattern, but different patterns frequently appear on different digits.<sup>3</sup>

Development of epidermal ridge patterns occurs at the 6th to 19th week of gestation. Genetic factors alone are not responsible for the development of dermatoglyphic patterns. It is also the result of the interaction between individual genes and the intrauterine environment as a result, any prenatal insult during this crucial time of embryogenesis/organ system development should affect dermatoglyphic patterns.<sup>4</sup> Congenital heart defects are a diverse group of disorders with well-understood etiologies, as well as the significance of genetic and environmental

causes. There is a hereditary susceptibility to these defects, but no Mendelian inheritance pattern has been established.<sup>5</sup> In any mode of inheritance, somatic features like dermatoglyphics are shown in earlier trials showing the combination of dermatoglyphic patterns.<sup>6-13</sup>

In this study, finger dermatoglyphic differences in congenital heart disorders are studied and compared. The goal of this study is to identify the significant dermatoglyphic characteristics criteria that apply to CHD patients and can be utilised as a confirmation test in the diagnosis of CHD.

## MATERIALS AND METHODS

This case control research was carried out in the department of Anatomy, Liaquat University of Medical and Health Sciences Jamshoro from January 2020 to December 2020. Hospital case controls were taken out. In the study, children were enrolled with echo-cardiography verified congenital heart disorders (cyanotic and acyanotic). The study eliminated children who had dubious congenital cardiac disorders, acquired heart conditions and hand deformations. Dermatoglyphs are explored with both males and females in 100 infants with congenital cardiac disease. A comprehensive history of consanguinities, birth order, drug admission during the prenatal period, and family history of congenital cardiovascular diseases were taken for all congenital cardiac disease children included in the study. Electrocardiogram, chest XRay was taken.

Provisional diagnosis of heart disease congenital was made and echocardiography was subsequently confirmed. The control group comprised of 100 healthy youngsters, both men and women, clinically screened for any additional congenital abnormalities or cardiac disorders. The dermatology of fingers was investigated and data was meticulously documented. The ridge patterns on the fingertip distal phalanges are commonly divided into groups. 14 The second arch. 3. 26. Whorl Arch: the craters travel with a gently distally bent sweep that lends the name to the pattern type, from one side to the other. The single or simple arch consists of cranks passing distally across the finger. No triad is present. Tented arch is placed within or close to the digit midaxis. The distal, erect radiant is connected to the abrupt elevation of the curvilinear ridges which make up the tent and give the design its name. LOOP: Only one triradius is available for it. The ridge course around only one extremity of the pattern generating the head of the loop, instead of running in complete tracks as in whorl, from the other end the sketches flow towards the edge of the digit. The end of the pattern can be seen as open. The loop is termed the Ulnar loop and the loop opens to the Radical loop and is called the radial loop. WHORL: the Whorl is considered as a primordial pattern of design simplified by loops and arches. Most of the ridges circuit the centre of the design area. The whorl is bounded by the type lines completely and continuously. These lines of type are radiants from the two triadia. The pattern area is the zone surrounded by the type lines. The lines are regarded as the pattern skeleton. The nearby transverse and the distal is the distal transverse system to the pattern region.

The data was entered and analyzed in SPSS version 20.0. Student 't' tests have been used to detect the importance of continuous research variables between two groups. The importance of categorical scale research parameters between two or more groups was accurately tested. P value <0.05 was considered as significant level.

**RESULTS**

It is observed that males and females are equal in number both in congenital heart disease and control groups (Table 1) VSD is the majority in the congenital cardiac group of both men (50%) and women (34.8%), followed by ASD in both men (20.4%) and women (39.1 percent ) [Table 2]. The case and control group show that most are loops with humps and then the arches. In both case and control. A statistically significant rise in whorls in congenital cardiac disorders, with a value of p<0.001 (Table 3). The Whorls (p <0.001) and the loops (p <0.001) are discovered to be statistically important compared with controls. This suggests that Whorlae are more commonly observed than in controlling in the context of congenital cardiac disease.

When comparing various finger patterns between acyanotic and cyanotic heart conditions, no statistical relevance has been identified. In comparison to male congenital children the loops and whorls from the table below are statistically significant. Arches have not been meaningful. The loops and whorls in the table above are notable in comparison with female congenital heart disease children in normal female children. Arches have not been meaningful (Table 4). The atd angle right and left of the above table was much higher than that of normal children,

the a-b ridge count of right and left and full-finger ridge count of children who have congenital heart disease. In children with congenital cardiac disease, the axial triradius is distally situated.

Table 1: Gender wise distribution of the children (n = 100)

Gender	No.	%
Male	54	54.0
Female	46	46.0

Table 2: Diagnosis of congenital heart diseases according to the gender distribution (n = 100)

Diagnosis	Total	Male	Female
VSD	43(43%)	27(50%)	16(34.8%)
ASD	29(29%)	11(20.4%)	18(39.1%)
TOF	14(14%)	7(13%)	7(15.2%)
PDA	4(4%)	3(5.6%)	1(2.2%)
TGV	4(4%)	1(1.9%)	3(6.5%)
DORV	2(2%)	1(1.9%)	1(2.2%)
AS	3(3%)	3(5.6%)	-
ALCAPA	1(1%)	1(1.9%)	-
Total	100 (100%)	54 (100%)	46 (100%)

Table 3: Comparison of finger pattern analysis in CHD cases and Normal children (n = 100)

Finger pattern	Normal		CHD		P value
	No.	%	No.	%	
Loops	682	68.2	537	53.7	<0.001**
Arches	60	6.0	48	4.8	0.241
Whorls	258	25.8	415	41.5	<0.001**
Total	1000	100.0	1000	100.0	-

Table 4: Comparison of mean changes values of finger pattern analysis in CHD cases and Normal children (n = 100)

Finger pattern	Normal	CHD	P value
Over all pattern			
Loops	6.82±2.37	5.35±2.92	<0.001**
Ulnar loops	6.44±2.36	5.08±2.84	<0.001**
Radial Loops	0.38±0.75	0.27±0.57	0.243
Arches	0.60±1.10	0.48±1.04	0.429
Whorls	2.58±2.43	4.14±3.23	<0.001**
Finger pattern (Male)			
Loops	5.20±2.80	5.95±3.35	0.306
Ulnar loops	4.91±2.72	5.75±3.26	0.240
Radial Loops	0.29±0.59	0.20±0.41	0.539
Arches	0.44±0.94	0.65±1.39	0.416
Whorls	4.33±3.13	3.40±3.59	0.254
Finger pattern (Female)			
Loops	7.26±2.08	5.07±3.15	<0.001**
Ulnar loops	6.65±2.20	4.85±3.07	<0.002**
Radial Loops	0.61±0.95	0.22±0.52	<0.016*
Arches	0.76±1.25	0.59±1.22	0.502
Whorls	1.98±1.96	4.30±3.55	<0.001**

Table 5: Comparison of mean changes values of Dermatoglyphic parameters analysis in CHD cases and Normal children (n = 100)

Dermatoglyphic parameters	Normal	CHD	P value
atd RT	38.04±2.68	47.00±5.55	<0.001**
atd LT	38.37±2.81	47.22±5.69	<0.001**
TFRC	121.27±23.31	167.01±36.55	<0.001**
a-b RC,RT	33.07±3.89	37.21±4.87	<0.001**
a-b RC,LT	33.61±3.65	37.98±4.52	<0.001**
Dermatoglyphic parameters (Male)			
atd RT	37.98±2.56	47.74±5.43	<0.001**
atd LT	38.07±2.93	47.58±4.77	<0.001**
TFRC	115.37±19.03	166.50±33.84	<0.001**
a-b RC,RT	32.00±3.79	36.94±4.30	<0.001**
a-b RC,LT	32.46±3.24	37.94±4.79	<0.001**
Dermatoglyphic arameters(Female)			
atd RT	38.11±2.84	46.12±5.62	<0.001**
atd LT	38.72±2.66	46.78±6.63	<0.001**
TFRC	128.20±26.04	167.61±39.86	<0.001**
a-b RC,RT	34.33±3.65	37.52±5.48	<0.001**
a-b RC,LT	34.96±3.68	38.02±4.25	<0.001**

There was a significant increase in the atd angle in the right and left, in the a-b-corner on the right side and the overall finger ridge counts in men's congenital cardiac diseases in children in compared to ordinary male children. The atd angle in the left and right arms and the a-b ridge counts of the right and left arms were dramatically raised as against normal female children, and the total finger ridge count in female congenital hearts was significantly increased (Table 5). The atd angle at right and left, the a-b ridge count at right and left and the overall finger ridge count for acyanotic congenital heart conditions children compared to cyanotic congenital heart illness children are not significant changes.

## DISCUSSION

It was well-known that modified dermo-glyphic patterns were associated to multiple congenital disorders including congenital heart disease. In the present study attempted to compare with other studies to examine dermatoglyphic patterns of congenital heart disorders in infants.

This study indicated that the numbers of Whorls and Arche were increased in congenital heart illness patients in accordance with findings by Mutalik et al<sup>9</sup>, Magotra et al<sup>10</sup>, Singh et al<sup>11</sup>. Comparison in congenital cardiac conditions of finger print patterns.

Further investigation of finger patterns showed that whorls of both boys and females of the congenital heart disease group were increased and distinct from Khalil et al<sup>13</sup> study. The majority of the study showed no statistical meaning between the male and female congenital cardiovascular groups.

In this study, the 'atd' angle was enhanced in patients with congenital heart disease in both right and left palms by distal placement of triadum in comparison to normal children, in which many studies previously carried out such as Hale et al<sup>6</sup>, Sanchez Cascos et al<sup>2</sup>, Burghat Collard et al<sup>8</sup> and Singh et al.<sup>11</sup>

The TFRC study in congenital cardiovascular disorders is raised in comparison to Singh et al<sup>11</sup>, but TFRC was lowered in all congenital cardiovascular diseases in Khalil et al.<sup>13</sup>

A-b ridge count is shown to have increased in children with congestive heart disease statistically significant in this study, both right- and left-hand. In the Alter M et al<sup>4</sup> study, and Khalil et al<sup>13</sup> study, it has been discovered that the a-b ridge count is not statistically significant.

Simian crease and Sydney line: In our study there was no major change in cases in Simian crease and

Sydney line compared to controls in accordance with study of Nair et al<sup>11</sup> and Khalil et al.<sup>13</sup>

## CONCLUSION

Congenital heart disease is associated with irregular patterns of the dermatoglyph. In congenital children with heart disease an increasing number of whorls and a reduced number of arches are seen. The above patterns will help to diagnose congenital heart disorders in kids as a diagnostic aid. They can also help to differentiate congenital and acquired heart disease from functional. To assess the importance of this dermatoglyphic parameter as a diagnostic tool in children's congenital heart disease, a large sample study is needed.

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