

# Dermatoglyphics: A Study of Finger Tip Patterns in CAD Patients of North India and Its Genetic Disposition

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## ABSTRACT

**Introduction:** Dermatoglyphics is the scientific study of skin creases and lines thus forming an important part of the surface anatomy. The development of this pattern occurs at much earlier embryonic stage. This is the same period when most of the organs and systems develop including cardiovascular system. Hence in this study we evaluated the dermatoglyphics in the patients of coronary artery disease as compared to the controls.

**Materials and Methods:** The present study was conducted on 50 patients with confirmed diagnosis of coronary artery disease who visited the outpatient and inpatient department of Cardiology at Government Medical College Jammu. 50 subjects were taken as controls and it was seen that they do not suffer from any relevant disease and are not on any relevant medication.

**Result:** The results showed that percentage of ulnar loops were more among the people of Jammu Region who were taken as controls and the percentage of whorls dominated in patients of Coronary artery disease.

**Conclusion:** Dermatoglyphics in Coronary artery disease showed significant variation as compare to normal. Presence of above dermatoglyphic features will help us to predict that these individuals may be susceptible for Coronary artery disease. It warrants further research in the same direction.

**Key Words:** Dermatoglyphics, Coronary artery disease, Pattern, Loops, Arches, Whorls.

## INTRODUCTION

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hand including fingers and plantar region of foot including toes. The word dermatoglyphics comes from two Greek words (derma-skin and glyphe-carve). It gives the impression that something has been carved out of the skin. Characteristically hair does not grow from these areas. The term Dermatoglyphics was coined by Cummins H & Midlo C, 1926. [1,2] In humans and animals, dermatoglyphics are present on fingers, palms, toes and soles. This helps shed light

on a critical period of embryogenesis, when the architecture of major organ system is developing.

Dermatoglyphics have been extensively used to characterize and differentiate human population hence are highly suitable for studying population variations. Dermatoglyphic features due to its permanency, genetic influence as well as number of easily observable and measurable characters may be considered one of the most suitable parameters for population variability. [3-5]

The knowledge of dermatoglyphics can be globally utilized for the prevention

and screening of major causes of mortality in the present day scenario like coronary artery disease.

Coronary artery disease is defined as impairment of heart function due to inadequate blood flow to the heart compared to its needs, caused by obstructive changes in the circulation to the heart. It is the cause of 25%-30% deaths in most industrialized countries. [6-8]

Taking into consideration genetic predisposition of dermatoglyphics and Coronary artery disease, present study is carried out to find out the correlation between them, so that dermatoglyphics can prove to be a helpful tool in the diagnosis of predisposition towards the disease at an earlier age.

#### Aims and objectives:

1. To analyze the prevalent pattern of Dermatoglyphics in population of Jammu Division of North India.
2. To determine prevalent Dermatoglyphic parameters in patients of Coronary artery disease.

#### MATERIALS AND METHODS

1. The present study was conducted on 50 patients with confirmed diagnosis of Coronary artery disease who visited the outpatient and inpatient department of Cardiology at Government Medical College, Jammu.
2. 50 subjects were taken as controls and it was seen that they do not suffer from any related disease.

#### The materials used for the study were:

Kores printer ink, clean glass slab, Bond paper, Rubber roller, Magnifying lens, Soap, Cotton swabs, Scale, Pointer. After taking informed consent from the subjects, they were asked to wash their hands with soap and water so as to remove any oil or dirt. Standard Indian ink method was used for taking impressions with Kores duplicating ink. A small drop of duplicating ink was squeezed out on a glass slab and spread on it evenly by rolling the roller over the ink on the slab so that a thin layer was formed. Fingertip of both the hands were

impregnated with ink, one by one, by placing the finger on its edge on the slab and then rolling it over gently to the other edge by applying continuous correct pressure. After the fingers were inked, rolled impressions were taken on A4 sheet of bond paper one by one. Rolled fingerprints were taken because they show the full pattern area. The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens, scale and ridge counting was done with the help of sharp needle. The qualitative parameters observed were the types of patterns of individual digit or finger i.e. loop, arch, whorl and composite.

#### The quantitative parameters observed were:

1. The ridge counts of individual fingers of both right and left hands.
2. Total finger ridge count. For finger ridge counting, the basic dermatoglyphic landmarks were considered i.e. triradius and core. A triradius is formed by confluence of three ridge systems and core is the approximate centre of the pattern.

#### RESULTS

In present study all the data obtained from both Coronary artery disease group and controls were analysed qualitatively and quantitatively then depicted in the form of tables and graphs as under.

**Table 1: Distribution of Pattern types in Control Group (n=50) in the right, left and both hands.**

Pattern Type	Right Hand Digits (n=50*5=250)		Left Hand Digits (n=50*5=250)		Both Hand Digits (n=50*10=500)	
	No.	%age	No.	%age	No.	%age
Arches	21	8.40	27	10.80	48	9.60
Radial Loops	60	24.0	36	14.4	96	19.20
Ulnar Loops	100	40.0	142	56.8	242	48.4
Whorls	67	26.8	45	18.0	112	22.40
Composite	2	0.80	0	0	2	0.40
Total	250	100	250	100	500	100

In the frequency distribution of pattern in Control group, ulnar loops (100; 40.0%) had the highest occurrence in the right hand digits, followed by whorls (67; 26.8%). Similarly, in the left hand digits, ulnar loops (142; 56.8%) had the highest

occurrence followed by whorls (45; 18.0%). Taking average of ten fingers, overall 24.2 (48.4%) had ulnar loops, 11.2 (22.40%) had whorls, 9.6 (19.20%) had radial loops, 4.8 (9.60%) had arches and 0.02 (0.40%) subjects had composite type of pattern among control group.

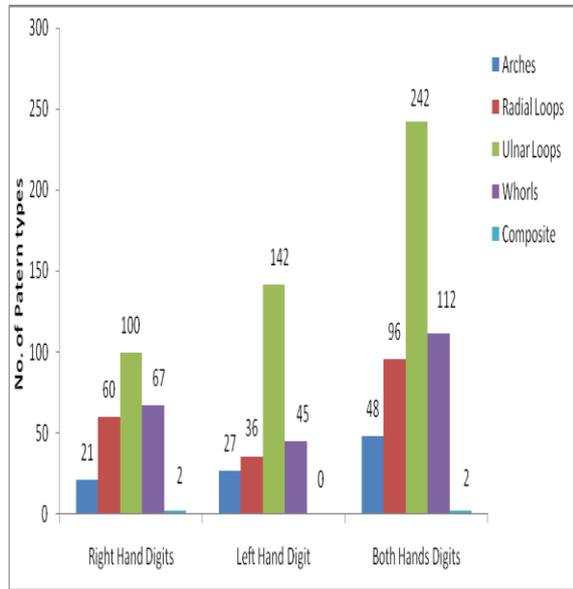


Fig 1. Bar Chart Showing distribution of Pattern types in Control group in the right, left and both hands.

Table 2: Distribution of Pattern types in Coronary Artery Disease Group (n=50) in right, left and both hands

Pattern Type	Right Hand Digits (n=50*5=250)		Left Hand Digits (n=50*5=250)		Both Hand Digits (n=50*10=500)	
	No.	%age	No.	%age	No.	%age
Arches	12	4.80	7	2.80	19	3.80
Radial Loops	29	11.60	39	15.60	68	13.6
Ulnar Loops	41	16.4	47	18.80	88	17.6
Whorls	168	67.2	153	61.20	321	64.20
Composite	0	0	4	1.6	4	0.80
Total	250	100	250	100	500	100

In the frequency distribution of pattern in Coronary artery disease group, whorls (168; 67.2%) had the highest occurrence in the right hand digits followed by ulnar loops (41; 16.4%). Similarly, in the left hand whorls (153; 61.20%) had the highest occurrence, followed by ulnar loops (47; 18.80%). Overall whorls (321; 64.20%) had the highest occurrence followed by ulnar loops (88; 17.6%) while composite pattern had least (4; 0.80%) occurrence. Taking average of ten fingers, Overall 32.1 (64.20%) had whorls, 8.8 (17.6%) had ulnar loops, 1.9 (3.80%) had arches and 0.4 (0.80%) subjects had composite type of pattern among Coronary artery disease group.

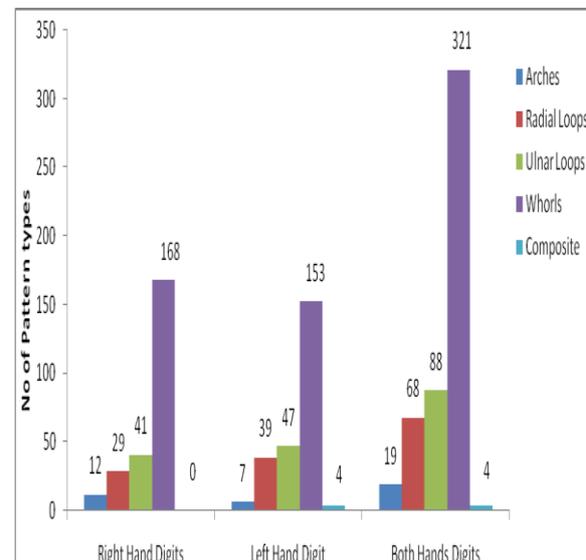


Fig 2: Bar Chart showing distribution of pattern types in Coronary artery disease group in the right, left and both hands.

Table 3: Relationship of dermatoglyphic patterns in Control group and Coronary artery disease group.

Pattern Type	Control Group (n=50*10=500)		Coronary Artery Disease Group (n=50*10=500)		Statistical Inference
	No.	%age	No.	% age	
Arches	48	9.60	19	3.80	t=2.390074; p=0.027991; Significant
Radial Loops	96	19.20	68	13.60	t=2.183436; p=0.042486; Significant
Ulnar Loops	242	48.40	88	17.60	t=6.632566; p=0.000003; Highly Significant
Whorls	112	22.40	321	64.20	t=7.99846; p=0.0000000; Highly Significant
Composite	2	0.40	4	0.80	t=0.670829; p=0.510852; Not Significant
Total	500	100	500	100	

➤ Relationship of arches in Control group and Coronary artery disease group was statistically significant (p=0.027991)

due to few number of arches in Coronary artery disease group.

➤ Relationship of radial loops in Control group and Coronary artery disease group

was statistically significant ( $p=0.042483$ ) due to few number of radial loops in Coronary artery disease group.

- Relationship of ulnar loops in Control group and Coronary artery disease group was statistically highly significant ( $p=0.000003$ ) due to few number of ulnar loops in Coronary artery disease group.
- Relationship of whorls in Control group and Coronary artery disease group was statistically highly significant ( $p=0.000000$ ) due to more number of whorls in Coronary artery disease group.
- Relationship of composite pattern in Control group and Coronary artery disease group was statistically not significant ( $p=0.510852$ ).

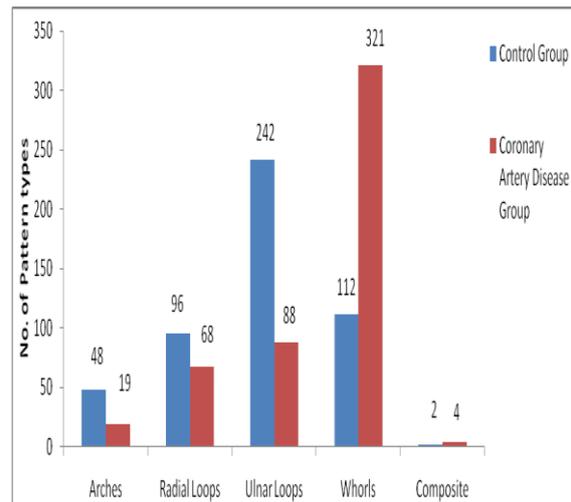


Fig 3: Bar chart showing relationship of dermatoglyphic patterns in Control group and Coronary artery disease group

Table4: Relationship of total finger ridge count (TFRC) in Control group and Coronary artery disease group.

Parameter	Control Group Mean $\pm$ SD	Coronary Artery Disease Group Mean $\pm$ SD	Statistical Inference
TFRC	108.6000 $\pm$ 20.5573	139.6800 $\pm$ 20.95129	t=7.98723; p=0.000000; Highly Significant

- Relationship of mean total finger ridge count in Control group and Coronary artery disease group was statistically highly significant ( $p=0.000000$ ).

## DISCUSSION

The scientific study of papillary ridges of the hands and feet is credited as the beginning with the work of Purkinje in 1823. Since then scientists are searching to find its relation to identity of an individual and relation of susceptibility to killer diseases. [9] Dermatoglyphics as a diagnostic tool is now well established in number of diseases which have strong hereditary basis. Myocardial infarction is multifactorial in origin reflecting a complex interaction between multitude of genetic factors and environmental factors, so certain dermatoglyphic variation is to be expected in it.

The present study was carried out to analyze the prevalent pattern of dermatoglyphics in coronary artery disease and control groups in the population of Jammu Division of North India. Dermatoglyphic markers taken into consideration in the present study were

finger tip ridge pattern and total finger ridge count. The results of the study revealed that in population of Jammu region the frequency of fingertip patterns of both hands was ulnar loops (48.4%) > whorls (25%) > radial loops (19.20%) > arches (9.60%) > composite (0.40%).

Manara et al, 2011 [10] studied digital and palmar dermatoglyphics in 30 patients of coronary artery disease and 30 controls. In finger dermatoglyphics coronary artery disease patients showed higher frequencies of whorl patterns but lower frequencies of ulnar loop, radial loop and arch patterns than controls. The mean total finger ridge count of coronary artery disease patients was lower than the controls.

This study is in partial agreement with the observations of the present study. In the present study coronary artery disease patients also exhibited increase in frequency of whorls and lower frequencies of ulnar loop, radial loop and arch patterns but the

mean total finger ridge count was increased in patients of coronary artery disease.

A similar study was done by Kumar N et al, 2012 [11] on 60 patients with ischemic heart disease and 60 controls. All the patients with ischemic heart disease exhibited an increase in frequency of whorls, ulnar loops, radial loops and a decrease in frequency of arches. The present study also agrees with the above study in significantly higher frequency of whorls and lower frequency of arches in ischemic heart disease as compared to controls.

Rekha P & Senthil Kumar, 2012 [12] studied dermatoglyphic patterns among 75 myocardial infarcted subjects and equal number of healthy subjects. The results indicated that there is a significant relation between the tented arch type of fingerprint and the risk of myocardial infarction. The present study is in contrast to the above study in having significantly higher frequency of whorls and lower frequency of arches in patients of myocardial infarction as compared to controls.

The results of present study are in consonance with a study conducted by Salunkhe and Mudiraj, [13] who observed that there was a significant increase in the percentage of whorls and decrease in percentage of loops and arches in coronary artery disease patients as compared to controls, as we also observed higher percentage of whorls (48.20) and lower percentage of ulnar loops (34.20%), radial loops (13.60%) as compared to control group.

## CONCLUSION

The knowledge of dermatoglyphic pattern in patients with coronary artery disease is an interesting matter and little information is available about this relation. Dermatoglyphic features due to its permanency, genetic influence may be considered as one of the most suitable parameters for population variability. The present study used dermatoglyphic markers such as fingertip ridge pattern and total finger ridge count to analyze the prevalent

pattern of dermatoglyphics among the population of Jammu Division. The results showed that percentage of ulnar loops were more among the people of Jammu Region and the percentage of whorls dominated in patients of Coronary artery disease. The characteristic digital dermatoglyphic patterns such as increased total finger ridge count and high incidence of whorl pattern are associated with Coronary artery disease. These features can be used in early detection of Coronary artery disease in the society. This will definitely have an impact on reducing mortality and morbidity from these diseases.

## ACKNOWLEDGEMENT

The author is indebted to the cooperation all the patients and the persons who acted as controls and took voluntarily part in the study.

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How to cite this article: Patloo AA, Khan MA, Bashir N. Dermatoglyphics: a study of finger tip patterns in CAD patients of north india and its genetic disposition. Int J Health Sci Res. 2017; 7(12):52-57.

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