

## A COMPARATIVE STUDY OF DERMATOGLYPHICS (FINGER TIP PATTERN) IN PATIENTS WITH MYOCARDIAL INFARCTION AND CONTROL GROUP.

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**BACKGROUND:** Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hand and fingers and plantar region of foot and toes. The myocardial infarction is almost always caused by coronary artery disease. Against the genetic background of dermatoglyphic patterns and coronary artery disease, the study was undertaken to determine the correlation between them. **AIMS** To do a comparative study of the dermatoglyphics (finger tip pattern) in patients with myocardial infarction and control group and to assess the usefulness of finger tip pattern in serving as a predictor for myocardial infarction. **SETTING AND DESIGN:** The study was done in 200 persons of age between 40 to 75 years . Out of them,100 were confirmed cases of CAD and 100 were normal healthy controls. **METHODS AND MATERIAL:** The finger and palmar prints of both hands were taken on white paper by Ink method and kores duplicating ink was used for taking the prints. **STATISTICAL ANALYSIS USED:** In statistical analysis SPSS software was used and Z test was used. The p value less than .001 and .05 was considered statistically significant.

**RESULTS AND CONCLUSIONS:** It was found that the total number of whorls are significantly higher in patients with myocardial infarction and total number of loops are significantly lower in patients with CAD. Such difference was significant only in right thumb, left thumb, right ring finger and left little finger. Similarly, loops were significantly less in right thumb, right index finger, right and left little finger. With regard to high incidence of MI, it can be concluded that the knowledge of dermatoglyphics in patients with MI can be utilized to find out genetic correlation. The existence of such relation might be important in the screening program for prevention of MI.

**KEYWORDS:** Dermatoglyphics patterns, myocardial infarction, coronary artery disease, loops, whorls, arches.

**INTRODUCTION:** Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hand and fingers and plantar region of foot and toes<sup>1</sup>. The term dermatoglyphics was coined by Cummins<sup>1</sup> and Midlo in 1926 and was derived from Greek words 'derma' means skin and 'glyphics' means carvings<sup>2</sup>. All studies of dermal ridge arrangement including genetic, anthropology and Egyptology are classified under dermatoglyphics. The

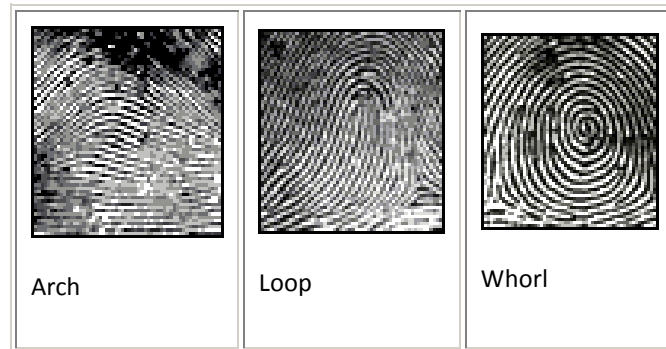
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dermatoglyphic patterns make their appearance as early as 12<sup>th</sup> to 13<sup>th</sup> week of gestation. Dermatoglyphics patterns have following features:

- ❖ They are unique
- ❖ They are permanent and once formed these patterns do not change throughout life except in the dimension in the proportion to the growth of an individual<sup>2</sup>.
- ❖ They are universal
- ❖ They are inimitable

They are classifiable. Generally finger prints are of three types that is whorl, loop, arch.



Development of dermatoglyphic pattern is under genetic control .this is evident from the clear resemblance of dermatoglyphics among related person. Dermatoglyphics as a diagnostic aid is now well established in a number of diseases, which have a strong hereditary basis, and is employed as a method of screening abnormal anaomalies<sup>3,4</sup> .

Myocardial Infarction is almost always caused by coronary artery disease (CAD). The most common cause of myocardial ischemia is atherosclerotic disease of an epicardial coronary artery or arteries sufficient to cause a regional reaction in myocardial blood flow and inadequate reperfusion of the myocardium supplied by the involved coronary arteries. Coronary artery is the leading cause of mortality and morbidity worldwide , with >4.5 million deaths occurring in the developing world. Despite a recent decline in developed countries both CAD mortality and the prevalence of CAD risk factors continue to rise in rapidly in developing world.<sup>5</sup> In the United States, diseases of the heart are the leading cause of death, causing a higher mortality than cancer. At least 250000 people die of a heart attack before they reach the hospital<sup>6</sup>

Ischemic heart disease (IHD) is likely to become the most common cause of death worldwide by 2020.<sup>6,7</sup>

The etiology of CAD is multifactorial with genetics playing an important role. The knowledge of dermatoglyphics in patients with CAD can be utilized to find out the genetic correlation. Thus, with regard to high incidence of CAD in the world, the existence of such relation might be important in screening program for prevention of myocardial infarction. Therefore, there is a scope of further research in this field. The present study is a step towards the same.

## AIMS:

- To do a comparative study of the dermatoglyphics (finger tip pattern) in patients with myocardial infarction and control group.

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- To assess the usefulness of finger tip pattern in serving as a predictor for myocardial infarction

**MATERIAL AND METHODS:** The present study was carried out in the Department Of Anatomy, MGM Medical College Indore Madhya-Pradesh The study was conducted on 200 subjects out of these 100 were confirmed cases of myocardial infarction having coronary artery disease. The total number of controls was 100 and having no clinically proven CAD. The age group selected for cases and controls were between 40-75 years. The confirmed cases of MI were taken from the Division of Intensive Coronary Care Unit of the Department of Medicine, M.Y. Hospital and M.G.M. Medical College, Indore. The controls were taken from attendant of patients. The individuals with history/ family history of hypertension , diabetes , or any cardiac problem , mental illness , congenital abnormality were excluded from control and baseline ECG , serum TGS and serum cholesterol was done for the controls. The patient and control group were explained about the purpose of study and written consent was taken from them.

The ink method as described by Cummins and Midlo was used for the study for taking the fingerprints.<sup>8</sup>

It required ink pad, kores duplicating ink, roller, proforma for taking fingerprints, magnifying lens, soap and cardboard.

The hands were thoroughly washed with soap before taking prints and well dried. Then requisite amount of ink was placed on ink pad and evenly distributed with the help of roller. Then each finger of both hands was rolled with medial side to laterally on the pad or cardboard and then placed on paper with one lateral edge and then rolled over in opposite direction. Fingerprints were recorded carefully and analyzed for pattern type. Percentage of whorl, loop and arches were compared into two groups.

**STATISTICS:** For each subject 10 fingerprints were taken. Overall 1000 fingerprints for cases and 1000 fingerprints for control group was obtained for analysis.

In statistical analysis SPSS software was used and large sample test Z test was used. For the comparison of percentage of different finger prints taken Z test was used for difference of proportion. For calculation of mean age Z test for difference of means was calculated.

**RESULTS:** In this study 200 persons were selected according to criteria given in the material and methods. Out of 200 persons, 100 cases who were known cases of CAD were treated as Study Group and 100 were Healthy Controls.

The total number of fingerprints pattern recorded was 2000, out of these 1000 were for cases and 1000 were for controls.

The age group selected for both cases and controls was between 40 to 75 years. Out of 100 cases, 84 were males and 16 were females.

The mean age of cases and controls for male and female is as follows:

Total male cases	: 84
Mean age	: 52.33 ± 9.08.
Total number of females cases	: 16
Mean age	: 59.25±7.16

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Mean age of total no. of cases	:	53.44±9.10
Total number of controls was	:	100
		74 were males and 26 were females
Total number of male controls	:	74
Mean age of male	:	57.70±7.95
Total number of female controls	:	26
Mean age of female controls	:	50.32±8.33
Mean age of total no. of controls	:	51.57 ± 7.99.

Fingerprints patterns of both cases and controls were analyzed by using Z test. The percentage of total number of different types of finger prints, comparison of fingerprint patterns between case and control in individual digit and comparison of different types of fingertip patterns in control and MI patients.

Table No. 1 shows comparison of total number of different types of fingerprints in cases (MI patients) and controls.

It is observed that total numbers of whorls in patients with myocardial infarction were 39.6% and total number of whorls in control is 25.4. The P value < 0.001, it means that total number of whorls was significantly higher in patients with myocardial infarction as compared to control group.

While there was less number of loops (51.8%) in patients with myocardial infarction as compared to control group (68.0%). The P value < 0.001, means that total number of loops is significantly lower in the patients with myocardial infarction.

**Table No. 1: Comparison of the total number of finger prints between patients and control group**

Type of finger prints	Cases (%)	Controls (%)	P value	Significance
Whorls	39.6	25.4	< 0.001	Significant
Loops	51.8	68.0	< 0.001	Significant
Arches	8.6	6.6	> 0.001	Not significant

Since there was significant difference in total number of loops and whorls in the two groups, they were further compared in individual digit.

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**Table No. 2(a) and 2(b) shows comparison of percentage of whorls in individual digit in two groups.**

**Table No. 2(a) Comparison of Percentage of Whorls in Each Digit in Two Groups of Right Hand**

Group	Right hand				
	Thumb	Index finger	Middle finger	Ring finger	Little finger
<b>Whorls</b>					
Cases	48	42	28	64	42
Controls	22	26	26	38	20
P value	< 0.001	> 0.001	> 0.001	< 0.001	< 0.001
Significance	Significant	Not significant	Not significant	Significant	Significant

**Table No. 2(b) Comparison of Percentage of Whorls in Each Digit in Two Groups of Left Hand**

Group	Left Hand				
	Thumb	Index finger	Middle finger	Ring finger	Little finger
<b>Whorls</b>					
Cases	38	32	22	50	38
Controls	20	34	18	32	18
P value	< 0.001	> 0.001	> 0.001	> 0.001	< 0.001
Significance	Significant	Not significant	Not significant	Not significant	Significant

**WHORLS:** All the digits in patients shows higher percentage of whorls. For the right hand, the difference being significant statistically in right thumb, right ring finger and right little finger, there value in cases were 48%, 64% and 42% respectively for cases and 22%, 38% and 20% respectively for the control group, which is statistically highly significant ( $P < 0.001$ ).

For the left hand, the difference being significant in left thumb and little finger, there values for cases were 38% and 38% respectively and for control group, they were 20% and 18% respectively. It was statistically highly significant ( $P < 0.001$ ).

P value is  $< 0.001$  which shows that whorls were significantly higher in patients of myocardial infarction as compared to controls.

Table No. 3(a) and 3(b) shows comparison of percentage of loops in individual digit in two groups.

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**Table No. 3(a) Comparison of Percentage of Loops in Each Digit in Two Groups of Right Hand**

Group	Right hand				
	Thumb	Index finger	Middle finger	Ring finger	Little finger
<b>Loops</b>					
Cases	42	40	72	34	48
Controls	78	62	72	46	72
P value	< 0.001	< 0.001	> 0.001	> 0.001	< 0.001
Significance	Significant	Significant	Not significant	Not significant	Significant

**Table No. 3(b) Comparison of Percentage of Loops in Each Digit in Two Groups of Left Hand**

Group	Left Hand				
	Thumb	Index finger	Middle finger	Ring finger	Little finger
<b>Loops</b>					
Cases	60	56	68	54	44
Controls	72	54	78	62	84
P value	> 0.001	> 0.001	> 0.001	> 0.001	< 0.001
Significance	Not significant	Not significant	Not significant	Not significant	Significant

**LOOPS:** The percentage of loops were significantly lower in right thumb, right index finger and right little finger, they were for the cases were 42%, 40% and 48% respectively and for control group, they were 78%, 62% and 72% respectively. It was statistically highly significant ( $P < 0.001$ ).

For the left hand, loops were significantly lower in the left little finger, their values for the cases were 44% and for control group it was 84% respectively. It was statistically highly significant ( $P < 0.001$ ).

P value is  $< 0.001$  which shows that loops were significantly lower in patients of myocardial infarction as compared to controls.

Table No. 4 shows comparison of different types of finger tips in controls and CAD patients.

**Table No. 4 Percentage of Persons Showing Different Finger Tip Patterns**

Finger tip pattern	Cases (%) (n=100)	Controls (%) (n=100)	P value	Significance
Whorls	90	60	< 0.001	Significant
Loops	94	98	> 0.05	Not significant
Arches	22	20	> 0.05	Not significant

It shows that significantly more number of CAD patients shows presence of whorl in one or more finger as compared to control. It was 90% in cases and 60% in control ( $p$  value  $< 0.001$ ).

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The difference in incidence of loops and arches was not statistically significant.

**DISCUSSION AND CONCLUSIONS:** The present study recorded the finger print pattern of all 10 fingers of 200 persons of age group 40-75 years.

It was found that the total number of whorls is significantly higher in patients with MI and total number of loops are significantly lower in patients with CAD.

The observations of the present study are supported by observation found in earlier studies. Rashad & Mi<sup>9</sup> in 1975 also reported significantly higher frequency of whorl in myocardial infarction patients. In 1978, Rashad et al<sup>10</sup> also reported significantly higher frequency of whorls and less number of loops in his patients and they also found higher absolute ridge count in patients with myocardial infarction.

In 1981 Anderson et al<sup>11</sup> also noted decrease in loop pattern and increase in whorl pattern in myocardial infarction but not statistically significant difference when compared with controls as in our study it is statistically significant.

Rao<sup>12</sup> in 1995 reported that person who have predominant whorls in fingerprints have higher incidence of widespread arterial and venous thrombosis.

Bhatt<sup>13</sup> in 1996 presented data showing significant higher incidence of whorl and lower incidence of loops in patients with MI.

In 1994 Kaseem & Mokhtar<sup>14</sup> reported significant association in finger tip pattern, ridge count, and palm pattern in patient with CAD and control group.

In 1998 Mishra et al<sup>15</sup> reported the significant increase in whorls in patient with coronary heart disease.

In 2000, Dhall et al<sup>16</sup> reported increased incidence of whorl and less number of loops in patients with MS as compared to control group. In 2002, Jalali & Hajian-Tilaki<sup>17</sup> reported that significant decrease in loops and increase number of arch type of finger tip pattern in patient with MI ( $P < .000$ )<sup>1</sup> while in the presents study not statistically significant difference in arches when compared with controls ( $P > .001$ ).

In 2012 Chimne & Ksheersagar<sup>18</sup> reported significant decreased loops and increased whorls in CAD patients ( $P < .001$ ).

So observations of present study add support to these earlier observations. It is apparent that there do exists a relation between dermatoglyphic patterns and CAD.

The conclusion derived from present study is that CAD is most important cause of mortality and morbidity in the world. CAD causes more death and disability and incurs greater economic cost than any other illness in developing world. With the urbanization in the developing world, the prevalence of risk factor for CAD is increasing in these regions, especially India. With regard to high incidence of MI, the knowledge of dermatoglyphics in patients with MI can be utilized to find out genetic correlation.

The existence of such relation might be important in the screening programme for prevention of MI. If an individual with special patterns of dermatoglyphics is susceptible to MI, he/she can be screened for prevention by controlling other risk factors in early detection programme.

So, with the help of fingerprint pattern it might be helpful for screening of persons for CAD in rural areas where there are lack of diagnostic facilities.

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## REFERENCES:

1. Harold Cummins and Charles Midlo. Palmar and plantar epidermal configurations (Dermatoglyphics) in European Americans. *Am J Phys Anthropol* 1926; 9 :471-502.
2. Penros LS. Finger prints,palms and chromosomes. *Nature* 1963; 197: 933-938.
3. Sir Francis Galton. Fingerprints. London: MacMillan & Co. New York 1892; 5 : 77-81.
4. Schaumann B , Alter M. Dermatoglyphics in Medical Disorders. Springer-Verlag New York 1976, 187-189.
5. Okrainec K, Banerjee DK, Eiseberg MJ. Coronary Artery Disease in developing world. *Amer.Heart J.*;2004;148:7-15.
6. Andrew PS,Braunwald E. Harrison's Textbook of Internal Medicine. 16thed. United States of America : Mc Graw Hill Publication; 2005.
7. Kumar V,Abbas AK,Fausto N, Robbins and Cotran Pathologic Basis Of Disease.2007, 7THed, Saunders Elsevier Publication, Philadelphia, Indian Reprint, pp:571-87.
8. Cummins H, Midlo C, Finger Prints, Palms and Soles. An Introduction To Dermatoglyphics. New York ;Dovar pub.INC;1961.
9. Rashad MN, Mi MP. Dermatoglyphics traits in patients with cardiovascular disorders. *Amer J Physl Anthropol* 1975;42(2):281-83.
10. Rashad MN, Mi MP, Rhoads G. Dermatoglyphic studies of myocardial infarction patients *Hum Hered* 1978; 28:16.
11. Anderson MW, Haug PJ, Critchfield G. Dermatoglyphic features of myocardial infarction patients. *Amer J Physl Anthropol* 1981; 55(4):523-27.
12. Rao UR. Anticardiolipin antibodies. *Medicine Update APICON* 1995;17-19.
13. Bhatt SH. New signs of myocardial infarction. *Medicine Update* 1996; Sept : 411-416
14. Kaseem NS, Mokhtar MM, Elbel- Bessy MF. Genetic markers in coronary heart diseas. *J Egypt Public health Asso.* 1994; (5-6):359-78.
15. Misra S, Dhiman SR , Kaur K . Finger Dermatoglyphics and Coronary Heart Disease. *Man in India* 1998; 78(1-2): 127-33.
16. Dhall U, Rathee S,Dhall A. Utility of finger prints in myocardial infarction patients. *J Anat Soc India* 2000; 49(2):153-54.
17. Jalili F, Hajian-Tilaki KO. A comparative study of dermatoglyphic pattern in patients with myocardial infarction and control group. *Acta Medica Iranica* 2002; 40(3):187-91.
18. Chimne DH,Ksheersagar DD. Dermatoglyphic patterns in angiographically proven coronary artery disease. *J Anat Soc India* 2012; 61(2) :262-68.