

# Study of Fingertip Pattern in Diabetic Patients

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## ABSTRACT

**Aim:** To study and compare fingertip dermatoglyphic patterns in the diabetic patients with the control group and to find out, whether the specific dermatoglyphic trait exist in the patients of diabetes mellitus and whether it is significant.

**Materials and Methods:** The present study is undertaken with an aim to evaluate the dermatoglyphic features in diabetic patients. The study consists of 150 diabetic patients and 150 normal healthy individuals as controls. They were 75 males and 75 females in each group. Dermatoglyphic prints were taken by "Ink Method" described by Cummins and Midlo and further subjected to statistical analysis to find the variations in the dermatoglyphic features among diabetic patients and control groups.

**Results:** Loops are decreased in cases but not statistically significant. Loops are significantly decreased in diabetic females (P=0.032). Loops are increased in diabetic males but not statistically significant. Whorls are increased in diabetic patients but not statistically significant. Whorls are decreased in diabetic males but not statistically significant. Whorls are significantly increased in diabetic females (P=0.0482). Arches are decreased in diabetic patients but not statistically significant. Mean value of TFRC is neither increased nor decreased in diabetic patients. Mean value of AFRC is significantly increased in diabetic patients (P=0.05).

**Conclusion:** From the present study, it appears that there do exists a variations in the dermatoglyphic patterns in diabetic patients with an advantage of being simple and economical 'ink' method. As the specific features of dermatoglyphic patterns are present in diabetic patients, it can be use for mass screening program to segregate the predicted diabetic patients.

**Keywords:** Loop, whorl, arch, total finger ridge count, absolute finger ridge count

## INTRODUCTION

Dermatoglyphics deals with the scientific study of epidermal ridge patterns on the palmar and plantar aspect of finger tips, palms, soles and toes. The term 'Dermatoglyphics' was coined by Cummins and Midlo(1926)<sup>[7]</sup> and was derived from the Greek words 'derma' means skin and 'glyphics' means carvings (Penrose LS,1963)<sup>[15]</sup>. The skin on the palmar and plantar surfaces of man is not smooth. It is grooved by curious ridges, which form a variety of configurations. The ridge configurations have attracted the attention of laymen for millennia. From

cradle to grave until the body decomposes, the ridge pattern remain unchanged. The original ridge pattern(characteristics) does not disturbed unless the skin is damaged to a depth of about 1millimeter(Cummins and Midlo, 1943)<sup>[8]</sup>.The current state of medical dermatoglyphics is such that the diagnosis of some genetically transmitted diseases like diabetes mellitus, schizophrenia, hypertension and epilepsy can now be aided by dermatoglyphic analysis. Currently, several dermatoglyphic workers claim a very high degree of accuracy in their prognostic ability from the hand's

features. Nowadays study of dermatoglyphics has a great importance in Judicial and criminal researches. Similarly its study is related to some genetic diseases has an immense applications.

Diabetes Mellitus is a global disease and the worldwide prevalence of Diabetes Mellitus has risen dramatically over the past two decades from an estimated 30 million cases in 1985 to 177 million in 2000. Based on current trends, more than 300 million individuals will have diabetes by the year 2025<sup>[14]</sup>. Globally diabetes prevalence is similar in men and women but it is slightly higher in men above 60 years of age and in women at older ages. Although the prevalence of both type 1 and type 2 is increasing worldwide, the prevalence of type 2 Diabetes mellitus is rising much more rapidly because of increasing obesity and reduced physical activity with sedentary life as countries became more industrialised. Early diagnosis and treatment are essential in preventing long-term complications such as retinopathy, neuropathy and nephropathy. Most sufferers are asymptomatic and hence early diagnosis is a problem<sup>[1]</sup>.

Diabetes Mellitus is the silent killer of mankind and public health problem. Therefore investigators are looking for new methods for its early diagnosis and treatment. Even before that the early prediction of it may help to take some preventive measures. One of the etiology of diabetes mellitus is hereditary. In this study, we are trying to specify the dermatoglyphic characteristics to find out whether some specific trait exists in the Diabetes Mellitus patients. Dermatoglyphics is a growing discipline and its ease and ready applicability render it as a useful tool to the clinician. Dermatoglyphics may be effectively employed as a screening procedure in future and may help in the early detection of cases of Diabetes Mellitus.

## MATERIALS AND METHODS

The Present study was carried out in the Department of Anatomy, Chalmeda Anandrao Institute of Medical Sciences, Karimnagar from July 2010 to June 2012. The 150 Diabetic patients were taken, out of which 75 were males and 75 were females, their age group ranges from 30 to 70 years. Similarly equal number of controls in the same age group as that of diabetic patients were taken, out of which 75 were males and 75 were females.

The study population consists of all clinically diagnosed and confirmed by investigations as diabetic and they were from the Karimnagar and surrounding area.

### *Method of Dermatoglyphic Printing*

Patients were informed about the procedure in detail and their consent was obtained to conduct the study.

Dermatoglyphic prints were taken by the "INK METHOD" as described by Cummins (1936)<sup>[6]</sup> and Cummins and Midlo(1943)<sup>[8]</sup>.

### *Materials Required*

- 1) Black Duplicating ink(Kores)
- 2) Ink pad
- 3) Printing cards (White 'Map Litho' paper with a glazed surface on one side)
- 4) Rubber roller
- 5) Magnifying hand lens
- 6) Cotton puffs
- 7) Scale and Pencil Pen
- 8) Protractor- To measure atd angle
- 10) Needle with a sharp point, for ridge counting.

### *Steps in the Printing Method*

- 1) At one time a group of 10 to 15 patients were collected, then the subjects were asked to clean their hands with soap and water. They were also asked to dry their hands but to leave some moisture.
- 2) The requisite amount of ink daub was placed on the glass slab. It was uniformly spread by the rubber roller to get a thin even ink film on the glass slab.
- 3) The thin film of ink was applied on the palm by passing the inked rubber roller uniformly over the palm and digits taking care that the hollow of the palm and the flexor creases of the wrist were uniformly inked.
- 4) The palm was examined for the uniformity of the ink, and if found otherwise ink was also applied to the hollow of the palm with the help of cotton puffs.
- 5) Left hand of the subject was then placed on the sheet of paper (kept over the pressure pad) from proximal to distal end. The palm was gently pressed between intermetacarpal grooves at the root of fingers, and on the dorsal side corresponding to thenar and hypothenar regions. The palm was then lifted from the paper in reverse order, from the distal to proximal end. The fingers were also printed below the palmar print by rolled fingerprint method. The tip of the fingers were rolled from the radial to ulnar side to include all the patterns.
- 6) The same procedure was repeated for right hand on separate paper.

- 7) The printed sheets were coded with name, age and sex for case group(DM) and control group.
- 8) The prints were then subjected for detail dermatoglyphic analysis with the help of magnifying hand lens and ridge counting was done with the help of a sharp needle. The details were noted on the same paper with the pencil pen.

In the prepared proforma essential informations were recorded. The data included age, sex, address, family history and other medical history of importance. The finger prints were analysed qualitatively and quantitatively. The qualitative analysis include fingertip patterns and the quantitative analysis include total finger ridge count, absolute finger ridge count.

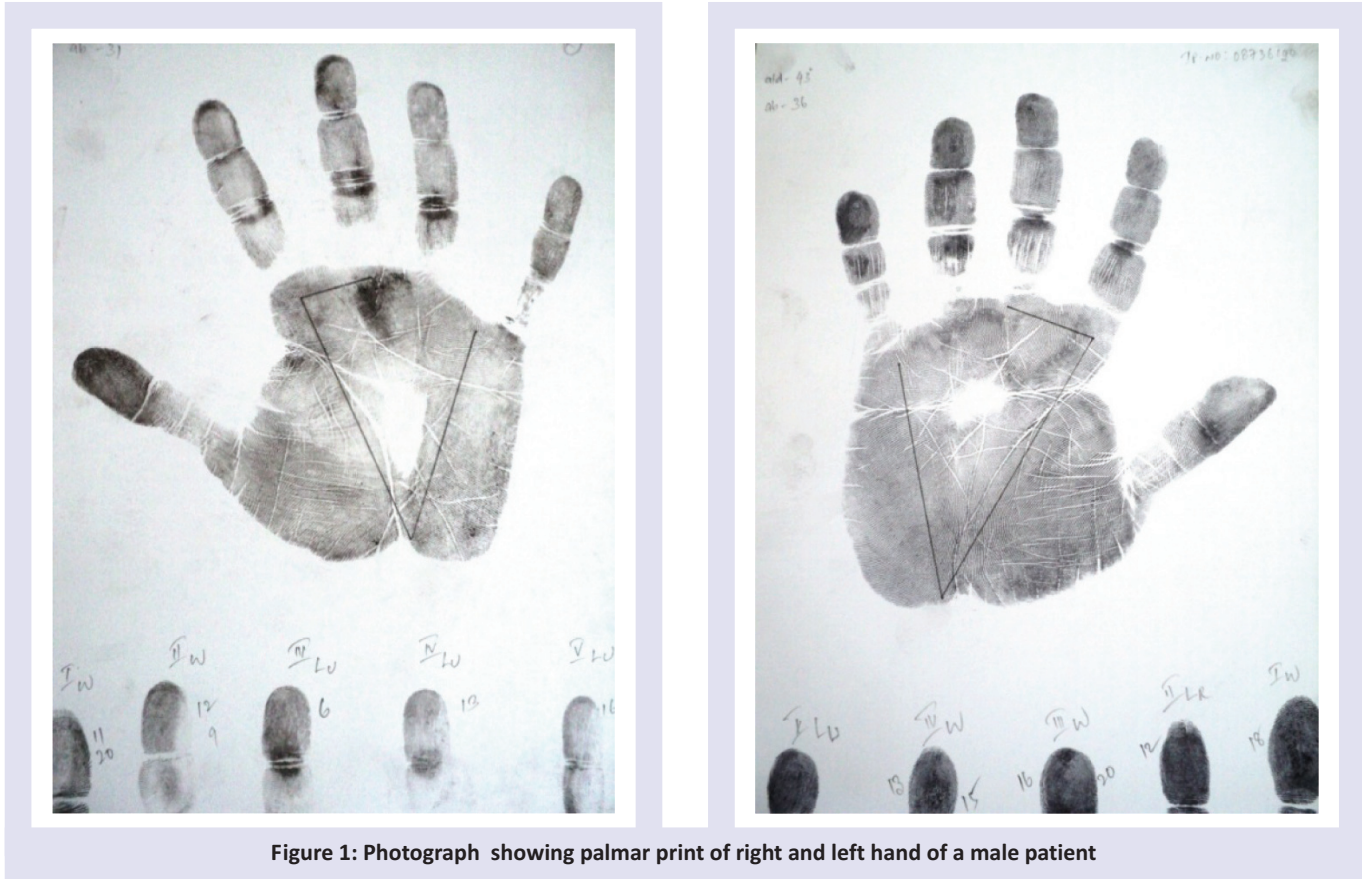


Figure 1: Photograph showing palmar print of right and left hand of a male patient

## RESULTS

The dermatoglyphic patterns on right and left hands of 150 diabetic patients are analysed according to sex and pattern and are subjected to statistical tests to evaluate

significant pattern of identifiable difference between the diabetic patients and the controls.

In our study, out of 150 cases studied, number of males were 75 and females were 75.

Table 1 : Shows the statistical comparison of different finger tip pattern between case and control in males.

Finger tip pattern	Male				X <sup>2</sup>	P Value	Remark
	Cases		Control				
	No.	%	No.	%			
Loop	436	58.1	404	53.9	2.771	0.0960	NS
Whorl	296	39.5	322	42.9	1.86	0.1728	NS
Arch	18	2.4	24	3.2	1.881	0.3477	NS

In diabetic males, there is an increase in the frequency of loop pattern and decrease in the frequency of both whorl and arch patterns as compared to control males but it is not statistically significant.

**Table 2 : Shows the statistical comparison of different finger tip pattern between cases and control in females.**

Finger tip pattern	Female				X <sup>2</sup>	P Value	Remark
	Cases		Control				
	No.	%	No.	%			
Loop	414	55.2	455	60.7	4.592	0.032	S
Whorl	302	40.3	265	35.3	3.882	0.0482	S
Arch	34	4.5	30	4	0.2611	0.6093	NS

The decrease frequency of loop pattern and an increase frequency of whorl pattern in diabetic females found to be statistically significant.

There is an increase in the frequency of arch pattern but it is not statistically significant.

**Table 3 : Shows the statistical comparison of different finger tip pattern between cases and controls.**

Finger tip pattern	Female				X <sup>2</sup>	P Value	Remark
	Cases		Control				
	No.	%	No.	%			
Loop	850	56.6	859	57.3	0.1101	0.7400	NS
Whorl	598	39.9	587	39.1	0.1688	0.6812	NS
Arch	52	3.5	54	3.6	0.0391	0.8432	NS

There is decrease in the frequency of both loop and arch patterns and an increase in the frequency of whorl pattern as compared to controls but it is not statistically significant.

**Table 4 : Shows the statistical comparison of Total finger ridge count (TFRC) between cases and controls.**

Group	Mean	SD	SE	F value	P value	Remark
Case	117.65	32.964	2.691	0.993	0.320	NS
Control	117.30	30.366	2.479			

**Table 5 : Shows the statistical comparison of Absolute finger ridge count(AFRC) between cases and controls.**

Group	Mean	SD	SE	F value	P value	Remark
Case	156.88	64.123	5.236	3.778	0.05	S
Control	154.27	56.457	4.610			

The mean value of AFRC is increased and found to be statistically significant in cases as compared to controls respectively.

## DISCUSSION

Dermatoglyphics as a diagnostic tool is well established in a number of diseases which have strong hereditary basis. Diabetes Mellitus being the hereditary basis, certain dermatoglyphic variation is to be expected in it.

The present study was carried out in the department of Anatomy, CAIMS, Karimnagar. The study consists of 150 diabetic patients and equal numbers of normal healthy individual were included as controls for comparison. The prints were obtained by 'ink method' on the map litho paper and analysed to find out the variations in dermatoglyphic features among the diabetic patients and the controls.

### *Qualitative analysis of finger tip pattern*

#### *Loops*

In the present study, the percentage of loops found to be decreased in both sexes in patients as compared to the control group.

In diabetic males, there is an increase in the frequency of loop pattern as compared to control males but it is not statistically significant. But in diabetic females the decrease frequency of loop pattern found to be statistically significant ( $P=0.032$ ) as compared to control females.

The decrease frequency of loop pattern in the diabetic patients in our study are in agreement with Bets LV et al (1994)<sup>[5]</sup>, Sarthak Sengupta and Jina Boruah (1996)<sup>[20]</sup> who reported the decrease frequency of loop in diabetic patients. WHORL:

Julian L. Verbov (1973)<sup>[11]</sup> found decrease frequency of whorl, whereas Sant SM et al (1980)<sup>[19]</sup>, Li Yanhua Wu Shoushan Han et al (1990)<sup>[12]</sup>, Shariatzadeh S.M.A et al (2002)<sup>[21]</sup>, Hossein Rezaei Nezhad and Nasser Mahdavi Shah (2010)<sup>[10]</sup> and Sarthak Sengupta and Jina Boruah (1996)<sup>[20]</sup> reported an increase frequency of whorl pattern in diabetic patients.

In our present study, the percentage of whorl is increased in cases when compared to controls. Though there is

decrease in the frequency of whorl in diabetic males as compared to control males but it is not statistically significant whereas in diabetic females, the increase frequency of whorl pattern found to be statistically significant ( $P=0.0482$ ) as compared to the control females.

The present study finding (increase frequency of whorl pattern in diabetic patients) coincides with the findings of the above workers except Julian L. Verbov (1973)<sup>[11]</sup> who reported the decrease frequency of whorl pattern in diabetic patients.

The decrease frequency of whorl in male diabetic patients of our present study coincides with Roopa Ravindranath et al (1995)<sup>[18]</sup> who reported decrease frequency of whorl pattern in male diabetic patients.

#### *Arch*

In the present study, the percentage of arch pattern found to be decreased in cases as compared to the controls. In diabetic males, the frequency of arch pattern is decreased but it is increased in the diabetic females as compared to control groups but it is not statistically significant.

Julian L. Verbov (1973)<sup>[11]</sup>, Sant SM et al (1980)<sup>[19]</sup>, and M Pramila Padmini et al (2011)<sup>[16]</sup> observed increase frequency of arches in diabetic females. Thus, the finding of increase frequency of arch pattern in diabetic females in the present study coincides with the findings of above workers.

### *Quantitative analysis of finger tip pattern*

#### *Total Finger Ridge Count(TFRC)*

In our present study, the mean value of TFRC is not found to be statistically significant between the cases and the controls.

Thus, the finding of our present study does not coincide with Barta L et al (1978)<sup>[3]</sup>, A.L Udoaka and K Lawyer-Egbe (2009)<sup>[23]</sup> and M Pramila Padmini et al (2011)<sup>[16]</sup> who observed high TFRC value in diabetic patients.

#### *Absolute Finger Ridge Count(AFRC)*

In our present study, the mean value of AFRC found to be increased which is statistically significant ( $P=0.05$ ) in

diabetic patients as compared to the controls.

M Pramila Padmini et al (2011)<sup>[16]</sup> observed high incidence of AFRC values in diabetic patients. The finding of increase AFRC in diabetic patients of our present study coincides with the findings of above worker.

## CONCLUSION

The present study is undertaken with an aim to evaluate the dermatoglyphic features in diabetic patients. The study consists of 150 diabetic patients and 150 normal healthy individuals as controls. They were 75 males and 75 females in each group.

Dermatoglyphic prints were taken by "Ink Method" described by Cummins and Midlo(1943)<sup>[8]</sup> and further subjected to statistical analysis to find the variations in the dermatoglyphic features among diabetic patients and control groups. From the present study, it is concluded that:

1. There is decrease in loops in diabetic patients but significant only in diabetic females.
2. There is an increase in whorls in diabetic patients but significant only in diabetic females.
3. No significant increase in arches in diabetic patients.
4. No significant difference found in the mean value of TFRC between diabetic patients and the controls.
5. There is significant increase in the mean value of AFRC in diabetic patients.

Thus from the present study, it appears that there do exists a variations in the dermatoglyphic patterns in diabetic patients with an advantage of being simple and economical 'ink' method. Moreover, the materials required for the dermatoglyphic procedure are easily available and portable. As the specific features of dermatoglyphic patterns are present in diabetic patients, it can be use for mass screening program to segregate the predicted diabetic patients.

## CONFLICT OF INTEREST

The authors declared no conflict of interest.

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