

## Comparison of Digital and Palmar Dermatoglyphic Patterns in Diabetic and Non- Diabetic individuals

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**Abstract:** 74 type II diabetes mellitus patients (37 males and 37 females), were compared with 74 controls, non- diabetics. Significant dermatoglyphic changes were noted between diabetics and non- diabetics. Whorls were the predominant digital pattern noted in both hands of male as well as female diabetics. This was seconded by presence of ulnar loops. There was no significant difference in the atd angle between the two study groups. Further studies in larger populations, comparing different ethnicities may be done to find out the value of dermatoglyphic findings as markers in the prediction of diabetes and many other diseases.

**Keywords:** Dermatoglyphics, Diabetes mellitus type II, whorls

### I. Introduction

The term 'Dermatoglyphics' was coined by Cummins and Mildo in 1926 and is composed of "derma" meaning 'skin' and "glyphics" meaning 'curves'. It indicates the study of the epidermal ridge configuration on the fingers and toes of palms and soles. Epidermal ridges are formed early in the intra uterine life and remain unchanged thereafter. They may be affected by environmental and genetic factors in utero [1]. They are also called as the 'poor man's karyotype' since they represent the genetic makeup of an individual. Epidermal ridge patterns show significant findings in patients of diseases with a strong or partial genetic background [2]. A very well-known example of dermatoglyphic finding is the presence of Simian crease in patients of Down's syndrome which has a strong genetic background. It has been clearly established that conditions like diabetes and hypertension have a partial genetic background, which is why there may be some distinct findings in the said conditions. Diabetes mellitus type II is a disease on the rise in developing country like ours [2]. It is a disease which causes multiple organ damage with time. It requires extensive care and drug management [3]. Diabetes also gives rise to dire complications if not under control. Since it is a condition with a partial genetic background, one can assume that there might be certain dermatoglyphic findings specific to diabetic patients. Digital finger patterns include various types like loops (ulnar or radial), whorl and arch. Loops have an open end, depending on which they are classified into radial or ulnar. Loops and whorls have a core (centre) whereas arches have no core. Arches have ridges which rise at the centre. The 'atd' angle is formed by connecting triradii in the palm; triradius 'a' and triradius 'd' are located at the base of the index finger and the little finger respectively. The 't' triradius is located distal to the palmar crease. The atd angle is calculated by joining these and measuring all 3 angles i.e. atd, tda, dat angles. The corrected atd angle is then calculated using a trigonometric formula [1, 4].

$\{\tan(\text{corrected angle} / 2)\} = \sin(\text{atd angle}) / \{2 \times \sin(\text{dat angle}) \times \sin(\text{tda angle})\}$

The atd angle is also called as the palm angle [1].

### II. Objective

The present study aims to compare the predominant digital pattern and the 'atd' angle in patients with diabetes mellitus type II and non- diabetic individuals.

### III. Materials And Methods

Ethical clearance was obtained from the institutional ethical committee and proper etiquette was adhered to during the surgery. The study was conducted over a period of three months from January 2014 to March 2014 with a total study population of 148 in- patients who gave their consent to participate in the study and were admitted to the hospital for various complaints. Out of these, 74 patients were suffering from type II diabetes mellitus and the remaining 74 were non diabetic patients admitted for various other reasons. Equal gender distribution (37 males and 37 females) was maintained in both the groups.

The parameters studied were:

- 1) The digital pattern- ulnar loop/ radial loop/ whorl/ arch
- 2) The corrected atd angle

The inclusion criteria for patients in the diabetic group:-

- 1) Age above 45 years
- 2) Blood sugar level: Fasting – 126 mg/dl; Post prandial: 200mg/dl (2 hours after breakfast)
- 3) Known diabetics on medication even with normal blood sugar values
- 4) Absence of any genetic disorder

The inclusion criteria for patients in the non-diabetic group:-

- 1) Age above 45 years
- 2) Normal blood sugar levels
- 3) No family history of diabetes mellitus

The data collecting tools included a stamp pad; a pre organized printed proforma with distinct allocation for recording the finger and palmar prints. A magnifying glass, protractor, scale and scientific calculator were used to measure the parameters, viz. predominant digital pattern and the atd angle. Data analysis was done using tables in Microsoft Excel 2010 and SPSS (software version 11.5). Percentages and mean values were calculated for the parameters measured in both the groups.

#### IV. Results

The results are depicted using tables. They are as follows:

**Table 1:** Incidence (average of all 10 fingers) of digital pattern in diabetic and non- diabetic group with equal gender distribution (n=74 in each group)

Group / Digital pattern	Whorl	Ulnar loop	Arch	Radial loop
Diabetic male	48.2 %	43.5 %	7.5 %	0.8 %
Non- diabetic male	24.1 %	72.2 %	3.0 %	0.7 %
Diabetic female	43.7 %	37.9 %	15.2 %	3.2 %
Non- diabetic female	20.0 %	78.4 %	1.2 %	0.4 %

The P value was < 0.05, indicating that the difference in the digital pattern between the diabetic and non- diabetic group is statistically significant. The whorl pattern was more commonly found in diabetics than in non- diabetics i.e. 48.2% in diabetic males as compared to 24.1% in non- diabetic males and 43.7% in diabetic females as compared to 20.0% in non- diabetic females. Ulnar loops were the predominant digital pattern in non- diabetic males as well as females. In the diabetic population, ulnar loops were seen only second to the whorl pattern. Arches and radial loops were most common in the hands of the diabetic females at 15.2% and 3.2% respectively. The only digital pattern that was found to be statistically insignificant was the presence of radial loop in diabetic and non- diabetic males at 0.8% and 0.7% respectively. The second parameter studied was the atd angle, which was measured and calculated using a formula mentioned above.

**Table 2:** Corrected atd angle (average of both hands) in diabetic and non- diabetic group with equal gender distribution (n=74 in each group)

Value/ Group	Atd angle in diabetic group (degrees)	Atd angle in non- diabetic group (degrees)
Mean value	47.2	44.5
Maximum value	80.4	78.2
Minimum value	34.2	25.3

The P value is > 0.05, indicating that the difference in the corrected atd angle between the diabetic and non- diabetic group is not statistically significant.

#### V. Discussion

Dermatoglyphics is the study of the epidermal ridge configuration on fingers and toes of palms and soles. As mentioned earlier, it represents the genetic makeup of an individual and is easily recordable. The procedure of recording epidermal ridge configurations is simple, non-invasive and inexpensive. Diabetes Mellitus Type II is a disease with an established genetic background and hence it is safe to assume that there might be significant dermatoglyphic findings in such cases. Various dermatoglyphic studies are being carried out related to diseases like diabetes and hypertension, cancerous conditions of the breast, prostate, thyroid and other structures, infectious conditions like tuberculosis and leprosy, autoimmune conditions like psoriasis, Hashimoto's thyroiditis and rheumatoid arthritis <sup>[1, 5, 6]</sup>. Once characteristic dermatoglyphic findings of a particular disease are noted, they can be used as markers to predict the disease in general population and can also be used as a screening tool.

In a study by Burute P et al. conducted in Maharashtra, India, it was noted that there was a significantly higher frequency of arches and lower frequency of whorls in female diabetics than controls. It was also noted

that there was an increase in the frequency of ulnar loops in both males and females of the diabetic group however; the difference was not statistically significant<sup>[2]</sup>.

In another study by Eberechi et al. conducted in Nigeria, Africa, it was observed that the diabetic subjects had significantly higher frequency of ulnar loops. The atd angle was higher in the left hands of diabetic patients and was statistically significant<sup>[3]</sup>.

In a study by Sant et al. it was noted that the frequency of whorls was increased and frequency of ulnar loop was decreased in both hands of male and female diabetic patients and both findings were significant<sup>[7]</sup>.

In a study by Sengupta S et al. it was found that there was an increased frequency of whorls in male diabetics<sup>[8]</sup>.

Ravindranath et al. recorded that there was a statistically significant increase in the frequency of ulnar loops in both males and females especially on the left hand of female diabetic patients<sup>[9]</sup>.

In the present study there was increases frequency of whorl pattern in both sexes and decreased frequency of ulnar loops in both males and females. There was no statistical significance between the atd angles in the diabetic and non- diabetic group. The findings of the present study are comparable to those of Sant et al. and Sengupta et al.

## **VI. Conclusion**

The study was conducted in a small population comprised of patients hailing from the rural areas in and around Villupuram. Dermatoglyphic studies related to diabetes have to be conducted in larger populations and in different ethnicities to clearly enunciate the characteristic dermatoglyphic findings of diabetes mellitus type II. The same can also be said for various other diseases too.

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