# Type II Diabetes Detection Using Finger Prints

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***Abstract-*** *Dermatoglyphic pattern refers to the configuration of physically occurring ridge on certain body parts specifically palms, finger, soles and toes. The fingerprints of both hands are not the unique. They do not vary among size or character throughout a person's life, apart from cases of serious injury that wound the dermis. Dermatoglyphics which are allied with hereditary abnormality are valuable in diagnose of these disorders at birth or soon after. Diabetes Mellitus is the silent killer of manhood and public health problem. The main intent was to classify patterns of dermal ridges on the fingertips and palms of both diabetic patient and the normal individual. From the observation of earlier researcher, if there is increase in number of whorls, decrease in number of loops and arches in type II diabetes mellitus patients compared with normal individual. There are significant differences in diabetic patients in various dermatoglyphic features when compared to normal. Therefore it is possible to identify the risk in population with the help of dermatoglyphic pattern. Therefore, Dermatoglyphics is extensively useful for the early identification of type II diabetes mellitus mainly in a heap selection of a population as a further diagnostic tool. Hence, it may be effectively employed as a screening process in prospect and may help in the early revealing of diabetes mellitus.*

***Keywords***- Dermatoglyphic, Diabetes mellitus, whorls, loops, arches

## I. INTRODUCTION

Dermatoglyphics is the study of the forms of the ridged skin of the digits, palms and soles. It is formed during the thirteenth week of the developing embryo and remain unchanged throughout the life. There stays a connection between dermatoglyphics and some diseases, similar schizophrenia, Down's syndrome, Alzheimer, Multiple sclerosis, diabetes, congenital spinal cord anomalies. Diabetes Mellitus is a non-communicable disease and major public health problem. Among all types of Diabetes Mellitus, Non-Insulin Dependent Diabetes Mellitus (NIDDM) is leading in India. NIDDM results from a contact between genetic and environmental factors. Family history is a strong danger factor and it specifies genetic predisposition. Diabetes has a strong hereditary background. Offspring of two diabetic parents have an 80% lifespan risk of diabetes (Kenny et al., 1995). The atypical patterns of the epidermal ridges serve as a diagnostic tool in a number of diseases that have a strong hereditary background. Dermatoglyphic examination is absolutely cost effective and requires no hospitalization, and it can help in predicting the phenotype of a possible future illness. The present study was undertaken to determine the reliability of dermatoglyphic as a predictive diagnostic tool for diabetes.

Dermatoglyphics offers following major advantages.

1) The epidermal ridge patterns on the hand and sole are entirely developed at birth and therefore, remain unchanged for life.

   Subjects with undiagnosed Type 2 diabetes are at superior risk of developing coronary artery disease and stroke. Therefore it is significant to screen for diabetes in a cost efficient manner in subjects who demonstrate major risk factors for diabetes.

2) Scanning of the ridge patterns or recordings these permanent imitations can be accomplished rapidly, inexpensively and without any strain to the patient.

Finally, the relevance of dermatoglyphics is not to diagnose, but it is preventive by predicting a disease. Similarly it is not for defining an existing disease, but for identifications of people with the genetic Predisposition to develop certain diseases.

## II. MATERIALS AND METHODS

To collect the finger prints, using finger print scanner. Patients were asked to wash their both hands with soap water. The palm print were taken by the digital camera with high resolution. The fingertip pattern recognized and counted for each hand, the results were recorded, snapped and compared the data with non-diabetics population of similar age group. Using finger print scanner to take the finger prints and finger print processed in mat lab. In fingerprint analysis, a normal person have 35.1% of whorls in fingerprint whereas diabetes affected person has more than 37.9%.

Qualitative and quantitative parameters were considered.

**Qualitative parameters:**

Increase in whorls, arches and decrease in loops is observed on finger tips in hands of diabetic patients.

**Quantitative parameters:**

Mean atd angle and mean tad angle are raised in both the groups of diabetic patients.

Mean tda angle is decreased in diabetic patient comparatively to the control group.

**Fingerprint pattern configuration:**

Galton F (1892)10, divided fingertip patterns into 3 groups – Arch, Loop, Whorl.

Finger Tip Patterns:

a) Arch (A):

An arch is the simplest pattern. It consists of more or less parallel ridges. The ridges curve the pattern area. The curve is proximally concave. The curve is gentle in low arch and sharp in high arch.

1. Simple or Plain Arch: Ridges cross fingertip from one side to the other without recurring. It is not a true pattern.

Fig. 1.1: Plain arch

2. Tented arch (At) - It appears like arch but has sharp up thrusting spike at the centre.

b) Loop (L):

Fig. 1.2: Loop

It is the most frequent pattern on fingertip. In this configuration series of sides enter and leave the pattern are on same side.

1. Ulnar loop: In Ulnar loop sides open on the ulnar side.
2. Radial loop: In Radial loop sides open on the radial side.

c) Whorl (W):

It is a ridge configuration in which ridges actually encircle core and more complex patterns are called as composites.

Fig. 1.3: Whorl

**Types**

A. Concentric Whorl (Wc): The ridges are arranged as concentric rings or ellipse (around the core).
B. Spiral Whorl (Ws): The ridges spiral around the core in clockwise or anti-clockwise direction.
C. Mixed Whorl (Wmix): It contains circles and ellipse or spirals in the same pattern.
D. Central Pocket Whorl (Wcp): It contains a smaller whorl within a loop. It is sub-classified as ulnar or radial according to the side on which outer loop opens.
E. Lateral Pocket Whorl (Wlp) or Twin Loop (Wtl): These types are morphologically similar, have 2 triradii. In lateral pocket whorl both ridges emanating from each core emerge on the same side of the pattern. In twin loop whorl the ridges emanating from each core open towards the opposite margin of the finger.
F. Accidental whorl (Acc) – Two deltas are present, one is related to up thrusting curve and another with recurring ridges.
G. The present study is aimed to analyse the fingertip patterns of the patients having type II diabetes mellitus and compare with a random non diabetic population. The inference of the present study may apply clinically to identify diabetic mellitus patients in a random population, in addition blood glucose level.

**ATD angle**

The most important one is that the atd angle tends to decrease with age because the palm grows more in length than in breadth. The size of the angle is also affected by the amount of spreading of the fingers when the patterns are printed. The pressure exerted while the palm is printed also can affect the atdangle. The most widely used method to interpret the location of axial triradius in the palm is the atd angle. The atd angle is an indication of the degree of distal displacement of axial triradius. This angle is formed by lines drawn from the digital triradius 'a' to axial triradius 't' and to digital triradius 'd'. A triradius situated near the centre of the palm is term 't''.An extremely distally placed triradius (distal to proximal transverse crease) is termed as 't"' (Fig.2).

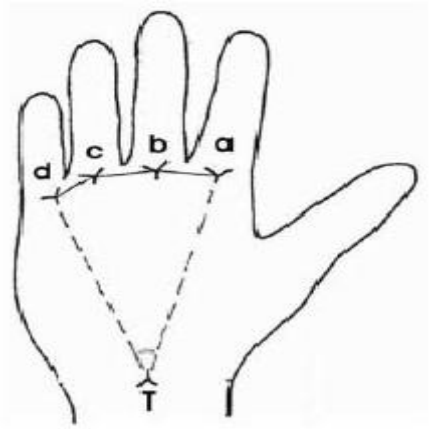


Fig. 2: A-B line, ATD angle

**System Architecture**

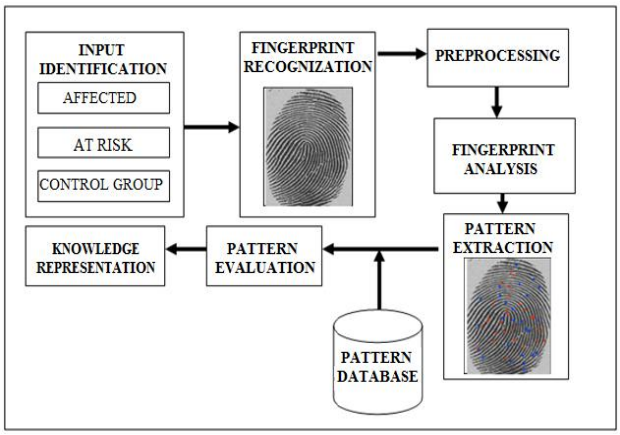


Fig.3: System Architecture

## III. DISCUSSION

Dermatoglyphics deals with the learning of epidermal ridges on fingertips, palms and soles. Dermatoglyphic patterns shows relative comparison among close relatives especially monozygotic twins suggesting that patterns are hereditarily determined. It can be valuable in predicting the hereditary diseases in patients.

In a study by Sant et al. it was noted that the frequency of whorls was increased and frequency of loops was decreased in both hands of male and female diabetic patients and both findings were significant [7] coinciding with the present study.

In a study by Sengupta S et al. it was found that there was an increased frequency of whorls in male diabetics [8] which matches with present study. Srivastava S et al found that there was increased frequency of whorl pattern in both sexes which correlates with present study.

In present study whorls were significantly increased and loops were significantly decreased in male and female diabetics as compared to controls. Arches were significantly decreased in both hands of male diabetics as compared to controls. Also arches were significantly decreased in left hand of female diabetics.

Pathan F et al observed significantly increased in whorls and significantly decreased loops in diabetics. Arches were significantly decreased in right hand of male diabetics and left hand of female diabetics. Thus, coinciding with present study.

## IV. CONCLUSION

The current work emphasizes increased number of whorl, decreased number of loops and arch in type II diabetes mellitus patients as equated with non-diabetic population. This can also be done for various other diseases.

Therefore, this method can be used as a screening tool for the analysis of individuals who are more prone to increase diabetes mellitus and thus preventing the future diabetic problem.

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