Original Communication

Dermatoglyphics in Diabetics and Non-Diabetics in Udupi District, Karnataka – A Comparative study

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Abstract

The present study was conducted to analyze the dermatoglyphic patterns in patients diagnosed with Diabetes Mellitus (DM) type II and controls, not diagnosed with DM type II and find a possible association between dermatoglyphic patterns and type II DM. A prospective observational study was conducted in the medicine department at Kasturba Hospital, Manipal among 65 diabetics and an equal number of non-diabetics. Fingerprint patterns were obtained from each individual and results were observed, analyzed and interpreted. The present study shows the frequency of arches and whorls to be increased in the left hand of the females in the non-diabetic group. The frequency of radial loops in the left hand was significantly more among diabetics than controls of both sexes. There was however no statistical significance in the frequencies of fingerprint patterns obtained from the right hand of the individuals.

Although a few studies have been undertaken to establish an association between DM with dermatoglyphics, the results obtained so far have been ambiguous. Contradictory results have been observed mostly from different populations due to a vast difference among the patterns in various populations. More extensive research is required for the establishment of dermatoglyphics as a screening tool. Findings of the present study indicate that there is a need for further study on a larger sample size and more diverse population to shed light on the role of finger print pattern expression as an aid to screening strategies for type II DM.

Keywords: Dermatoglyphics, type II Diabetes Mellitus, screening tool

Introduction:

Every human being possesses a unique finger print. An individual's finger print acts as one of the most important and reliable method of identification. Fingerprints can be matched at two levels - coarse level and fine-level. At the coarse level, fingerprints can be classified into six main groups: arch, tented arch, right loop, left loop, whorl and twin loop. The fine- level matching is performed by extracting ridge endings and branching points, called minutiae from a fingerprint image. It has been suggested that the significance of finger prints may not be limited to an individual's identification alone. Recent evidences that have emerged point to a possible association between various finger print patterns and the likelihood of a mother delivering a baby suffering from Down's syndrome.[1, 2]

Diabetes mellitus (DM), a disorder of blood glucose metabolism, is one of the most prevalent non-communicable disease globally. Recent estimates, peg the figure of diabetics worldwide at a very discouraging 387 million [3]. Further, type 2 DM accounts for 90% share of this pie and if one is to go by the recent trends,

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the number is only expected to swell further [4].

Type 2 DM has a very strong genetic etiological component. Since fingerprints expression is controlled by a polygenic inheritance, it opens up a window of opportunity, where fingerprints pattern expression, be it at a coarse or fine level, could potentially be utilized to aid in the screening of diabetics. Presently, non-interventional screening for diabetes is still in the research stage.

In light of the upward trend that DM is presently exhibiting, a quick, cheap and non-invasive tool for diagnosis of diabetes mellitus can prove to help the population in general and reduce the disease load by providing efficient and early intervention in the affected group. Our literature search revealed a few unique studies that have pointed to a potential association between finger print patterns and the individual's glycemic status [5, 6, 7]. In light of this, we, through our study intend to assess coarse fingerprints and evaluate the differences as observed in between diabetics and non-diabetics of Udupi district, Karnataka who are attending Kasturba Hospital, Manipal.

Review of Literature

Our extensive literature search revealed a few studies that have evaluated the association between an individual's fingerprints and their glycemic status.

A few studies noted a significant difference in the frequency of arches among diabetics and non-diabetics. Burute P *et al* observed a significant difference in the frequency of arches among female diabetics as compared to that of control group [5]. This was in concordance with the results of Sant SM *et al*[8], Verbov J [9], Ravindranath R *et al*[10], Sengupta S [11] and Pathan FJ *et al*[6].

Besides arches, ulnar loops was another class that was observed at a higher frequency in diabetic groups than control groups [5, 10]. However, Burute P *et al* did not observe any statistical significance between the diabetics and controls [5]. Sant SM *et al* reported contradictory findings in that the frequency of ulnar loops and radial loops were decreased in both male and female diabetics[8].

Additionally, we also observed contradictory results with reference to whorls fingerprint patterns among the various studies. Sant SM *et al*[8], Sengupta S[11] and Pathan FJ et al[6] observed an increase in the frequency of whorls among the diabetics whereas Verbov J[9], Ravindranath R *et al*[10] reported a decrease in the frequency of whorls among the diabetics.

Objectives

The specific objective of the study was to assess differences in dactylographic markings between diabetics and non-diabetics and determine a specific pattern which would help in the effective screening of patients with type II DM.

Hypothesis

Assumed hypothesis was that "A direct co-relation exists between specific dermatoglyphic data and Diabetes Type II"

Methodology

After obtaining the approval of the Institutional Ethics Committee, a prospective observational study was conducted in the medicine department at Kasturba Hospital, Manipal.

In this study, we decided to enroll subjects into two groups; i.e. Group 1 included subjects diagnosed with type II DM and Group 2 included subjects, who had not been clinically diagnosed with type II DM. The inclusion and exclusion criteria mentioned below were used as a guide to recruit the subjects as well. The study population was fixed at 130 in total, with 65 subjects in each group, keeping the power of study at 80% and the confidence interval at 95%. Written, informed consent was obtained from all subjects after detailed explanation of the procedure and details of the study. The study was conducted over a period of 6 months.

Fingers were cleaned and fingerprint patterns from all ten finger-tips were taken on white A4 sheets using duplicating ink. Clinical and

laboratory data were perused for confirmation of the diagnosis of type II DM in subjects belonging to group 1.

Fingerprint patterns were studied with magnifying lens. Results of both cases and controls were compared. All tabulations were done on Microsoft Excel Sheets using SPSS software and in consultation with statistician.

The following fingerprint parameters were studied: Arch, Whorl, Radial& Ulnar Loops.

Inclusion Criteria

1. All adults (between 18-80 years of age)
2. Both sexes

Exclusion Criteria

1. Borderline diabetics
2. Type I diabetes

Results:

The data obtained was qualitative data. Further, we aimed at determining whether any association exists between fingerprint expression patterns and the glycemic status of the subjects. Hence, our data was analyzed using chi-square test and expressed using frequency and percentages. The level of significance or p value was kept at 0.05.

We found a significant difference in the expression of the fingerprint patterns among diabetics and the controls in the left hand. We noted that the frequency of arches and whorls were more among controls. However the frequency of radial loops was more among diabetics than controls.

Table 1: Comparison of distribution of fingertip patterns in diabetics and controls

Pattern	Right Hand		Left Hand	
	Diabetic	Control	Diabetic	Control
Arch	7 (10.8%)	5 (7.7%)	4 (6.2%)	8 (12.3%)
Whorl	21 (32.3%)	28 (43.1%)	24 (36.9%)	31 (47.7%)
Radial Loop	6 (9.23%)	3 (4.6%)	12 (18.5%)	2 (3.1%)
Ulnar Loop	31 (47.7%)	29 (44.6%)	25 (38.5%)	24 (36.9%)

The results are expressed in frequency and percentage in brackets. p=0.494 for the right hand and p=0.025 for the left hand

In a similar manner, when comparing the fingerprint patterns of female diabetics with that of female controls, a significant difference was observed in the expression of the fingerprint patterns in the left hand. The results showed that the frequency of arches and whorls were more among controls. However the frequency of radial loops was more among diabetics than controls.

Table 2: Comparison of distribution of fingertip patterns in female diabetics & controls

Pattern	**Right Hand**		**Left Hand**	
	Diabetic	Control	Diabetic	Control
Arch	5 (18.5%)	4 (14.8%)	3 (11.1%)	6 (22.2%)
Whorl	8 (29.6%)	12 (44.4%)	6 (22.2%)	13 (48.1%)
Radial Loop	2 (7.4%)	1 (3.7%)	6 (22.2%)	1 (3.7%)
Ulnar Loop	12 (44.4%)	10 (37.0%)	12 (44.4%)	7 (25.9%)

The results are expressed in frequency and percentage in brackets. p=0.699 for the right hand and p=0.037 for the left hand.

When comparing the fingerprint patterns of male diabetics with that of male controls, no significant difference was observed in the expression of the fingerprint patterns. However, the frequency of radial loops in the left hand was more among diabetics than controls, thus maintaining a consistency in our overall findings.

Table 3: Comparison of distribution of fingertip patterns in male diabetics and controls.

Pattern	**Right Hand**		**Left Hand**	
	Diabetic	Control	Diabetic	Control
Arch	2 (5.3%)	1 (2.6%)	1 (2.6%)	2 (5.3%)
Whorl	13 (34.2%)	16 (42.1%)	18 (47.4%)	18 (47.4%)
Radial Loop	4 (10.5%)	2 (5.3%)	6 (15.8%)	1 (2.6%)
Ulnar Loop	19 (50%)	19 (50%)	13 (34.2%)	17 (44.7%)

The results are expressed in frequency and percentage in brackets. p=0.727 for the right hand and p=0.218 for the left hand.

Discussion

In the present study, the frequency of arches and whorls were more among the fingerprint patterns in the left hand of the females in the control group. However the frequency of radial loops in the left hand was more among diabetics than controls of either sex. The difference in the fingerprint patterns obtained from the right hand was statistically not significant.

Burute P *et al* observed a significant difference in the frequency of arches among female diabetics as compared to that of control group[5]. This was in concordance with the results of Sant SM *et al*[8], Verbov J[9], Ravindranath R *et al*[10], Sengupta S[11] and Pathan FJ *et al*[6]. Our findings do not correlate with the above studies, as our results show an increased frequency of arches in the control group, particularly in the left hand of the females.

Sant SM *et al* (8) reported an increased frequency of whorls in diabetic males and females. Verbov J[9] found a decreased frequency of whorls in diabetic females. Ravindranath R *et al*[10] reported a decreased frequency of whorls in diabetic males and in left hands of diabetic females and Sengupta S[11] found increased frequency of whorls in male diabetics. In the present study, whorls are found to be decreased in the left hand of female diabetics than controls. This correlates with the findings of Verbov J [9] and Ravindranath R *et al*[10].

According to Pathan FJ *et al*[6], radial loops showed no significant difference between diabetics and controls in both hand of both sexes, but Sant SM *et al*[6] reported decreased frequency of radial loops only in males. It is noteworthy that in the present study, the frequency of radial loops was higher in the left hand in diabetics of both sexes than the controls, more significantly in the females. The variation in findings may be due to the possibility that such a study was being conducted for the first time in this geographical region. Our sample size was not adequate enough in order for us to be able to extrapolate our findings to the clinical population.

Thus, on the back of our results, we believe that there may be a relationship between the distribution of finger print patterns and the glycemic status of humans. In our opinion, a large sample size, including different population groups from different geographical regions as well as other demographic parameters may be able to reveal the full scope of dermatoglyphics in screening of DM. With preliminary results and observations, our hypothesis that "A direct co-relation exists between specific dermatoglyphic data and Diabetes Type II" appears to have been supported. Once a relationship between different fingerprint patterns and the glycemic status is established, dermatoglyphics may be used as a means for the effective screening of population to detect the persons at risk for DM type II. Early diagnosis will surely lead to more effective treatment, as well as prevention and management of complications.

Conclusion

- We observed differences in fingerprint patterns among diabetics and non-diabetics
- The frequency of arches and whorls were noted to be more among the fingerprint patterns in the left hand of the females in the non-diabetic group. On the other hand, frequency of radial loops in the left hand was more among diabetics than controls of both sexes. There was however no statistical significance in the frequencies of fingerprint patterns obtained from the right hand.
- Deviation from previous works was attributed to newer geographical location

and smaller sample size.

- Larger scale study, with the consideration of various demographic factors other than gender is necessary to come to firm conclusion.
- In our opinion, dermatoglyphics may have a role in the screening of population for the early detection of DM Type II in the future.

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