



Original Research Article

Compare and correlation of dermatoglyphic patterns (fingerprint and palm patterns) among normal individuals and patients with type-2 Diabetes Mellitus attending the medicine OPD in a tertiary care Hospital

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ABSTRACT

Diabetes is a global disease and is rising in occurrence though the rate of increase is higher in developing countries than that in the developed countries. Dermatoglyphics is a branch of science involved in the study of epidermal ridges on the surface of fingertips, palms, soles and toes. A case control study was conducted at Bapuji Hospital, Davangere to compare dermatoglyphic patterns in patients with Type 2 Diabetes Mellitus and normal subjects and also to check if an association between type 2 Diabetes Mellitus and dermatoglyphics exists. The study concluded that there was no association between dermatoglyphics (pattern of fingerprints and triradii angles) and diabetes mellitus when the population was considered as a whole (males and females together) but there were significant differences when the sexes were considered separately.

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1. Introduction

Diabetes is a chronic metabolic disorder of multiple aetiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism due to disturbance in insulin secretion, insulin action or both.¹ There are two variants of diabetes namely Type 1 and Type 2. Type 1 diabetes mellitus is majorly due to T-cell mediated destruction of the beta cells.² Though type 2 diabetes mellitus is affected by a variety of dietary and lifestyle factors, a number of genetic factors are implicated in the development of diabetes mellitus.³ Type 2 diabetes mellitus is more common in the population. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs.¹ Diabetes is a global disease and is rising in occurrence though the rate of increase is higher in developing countries than that in the developed

countries.⁴ The global prevalence of diabetes in population aged more than 18 years of age has increased from 4.7% in 1980 to 8.5% in 2014.⁵ The total number of people suffering from diabetes is expected to increase from 366 million in the year 2011 to 552 million in the year 2030 (6). WHO predicts that it may be the seventh leading cause of death in 2030 (WHO, 2011). Diabetes mellitus also doubles the risk of cardiovascular accidents in the population.⁶ The global cost of diabetes is now 825 billion dollars per year.⁷ More than two-thirds of the world's diabetic cases are predicted to occur in the world's low and middle income countries by 2030.⁸ Type 2 Diabetes mellitus thus threatens the health and economy of all the nations, especially the developing nations.⁴ Thus developing better screening tests to detect the high risk population to inculcate better lifestyle and dietary practices is better than treating the disease after developing complications from medical and financial point of view.

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Dermatoglyphics is a branch of science involved in the study of epidermal ridges on the surface of fingertips, palms, soles and toes.⁹ The dermatoglyphic patterns are formed in the first trimester of pregnancy under the control of genetic factors and environmental factors. Fingerprint is formed due to the friction of the ridges on the fingers.¹⁰

Different patterns of fingerprints have a well documented correlation with the genetic factors. Thus fingerprints being genetically determined can be used as a tool to predict various genetically determined diseases.¹¹ Obtaining fingerprints is simple and requires minimal resources and thus can be used on a large population for the least cost.

Dermatoglyphics and diabetes mellitus are both genetically controlled and polygenic in inheritance. Deducing a relationship between the two will aid in developing a screening test to identify high-risk individuals early as the fingerprints form before birth and are not affected by any factors after birth and remain the same unless they are permanently disturbed

by a deep seated injury.¹² Thus it helps the individuals to inculcate healthier lifestyles to prevent or delay the development of the disease or at least help in reducing the morbidity and mortality of the disease and thus help in reducing the cost of treatment.¹³ Dermatoglyphics requiring minimal manual labour and funds have the advantage of being applied to the general population as a whole thus determining their predisposition early on before the development of the disease. Thus finding an association between dermatoglyphics and diabetes mellitus helps us in building up better resources to prevent the disease.

2. Objectives

To compare dermatoglyphic patterns in patients with Type 2 Diabetes Mellitus and normal subjects.

To check if there is an association between type 2 diabetes mellitus and dermatoglyphics.

3. Methodology

3.1. Type of study

Case-control study.

3.2. Study site

Bapuji Hospital OPD(Medicine), Davanagere.

3.3. Duration of study

3 months [16th June, 2018-16th September, 2018].

3.4. Subjects of study

120 subjects of which 60 were cases and 60 were controls.

3.5. Case selection criteria

30 male cases and 30 female cases aged more than 18 years who have been diagnosed with type 2 Diabetes Mellitus at least 3 months ago.

3.6. Control selection criteria

30 male controls and 30 female controls aged more than 35 years who have no diabetes mellitus and have no other morbid conditions, with no positive family history of diabetes mellitus.

3.7. Exclusion criteria

People who have had severe burns on their palms or have amputated fingers or palms and people who refuse to give their consent.

3.8. Sampling method

Random.

3.9. Confidentiality and consent

An informed consent was obtained from the patients and the data obtained was used solely for research purposes and no other purposes.

Confidentiality will be strictly maintained and the outcome of the analysis will not be disclosed to anyone else.

4. Method of data collection

The research is started after obtaining approval from the Institutional Ethics Committee. An informed consent is obtained from the patient after explaining the whole procedure and its outcome to the patient in his/her own vernacular language and stating that the prints will only be used for research purposes. The patient is then asked to wash his/her hands to remove any contaminants present. The palm and fingers are carefully smeared with the help of a sponge soaked in Camlin inkpad. The palm is pressed on a plain white sheet of paper to obtain the impression and the impressions of each finger is obtained individually on the paper separately by rolling all the finger from the radial to ulnar side to obtain the complete print. Care is taken not to apply excessive pressure while taking the prints to prevent overlapping of the patterns. The prints are examined with the help of a magnifying lens.

5. Data analysis

The fingerprints are assessed for the following parameters: whorls, loops and arches according to Henry's system of classification of fingerprints. The prevalence of each of the parameters in the right and left hands of the diabetic and control population is calculated with the help of percentages and the 'p' value is found out.

Triradius is a point from which ridge system courses in three different directions at an angle of about 120° , according to Henry's system of fingerprint classification. The palm is assessed to find four such triradii on the distal border of the palm, each proximal to the four fingers except the thumb and named 'a', 'b', 'c' and 'd' consecutively from the little finger to the index finger. One more point is found out commonly lying over the fourth metacarpal near the proximal border of the palm and is named as 't'. The points 'a', 'd' and 't' are joined to form a triangle and the angles 'adt', 'atd' and 'dat' are calculated for each hand with the help of a protractor and the data is statistically analyzed using T test.



Fig. 1:

6. Discussion

The results obtained here point that dermatoglyphics can be used as a tool to identify individuals with high risk for developing diabetes mellitus in the future.

There were no significant difference of the patterns in the diabetics when considered as a whole (males and females considered together) agreeing with a study conducted by Manjusha et al¹⁴ showing that there is no significant difference in fingerprint patterns in the population as a whole. The male fingerprint analysis demonstrated that there was an increase in the total number of whorls and total number of arches, and a decrease in the total number

of loops in the hands of diabetics compared to the non-diabetics. A study by Sengupta et al¹⁵ showed similar results showing an increase in the frequency of whorls in the male diabetics. There are no significant changes in the right hand though there is a significant increase in the number of whorls and a significant decrease in the number of loops in the left

hand of diabetic males. In the females there was a significant decrease in the total number of loops and when the left hand was considered alone in the diabetic population. It is partially in agreement to a study conducted by Sant SM and others,¹⁶ which showed an increase in whorls and decrease in loops significant in both hands of female and male cases compared to controls. A study by Srivastava and others,¹⁷ found an increase in the prevalence of whorls in both sexes in both hands of cases of diabetes mellitus.

The analysis of the triradii angles pointed that there were no significant difference in the angles when the population was considered as a whole in contrast to a study conducted by Sona Mohan et al which showed a significantly narrower 'dat' angle in the right hands of the diabetics compared to non-diabetics.¹⁸ The angle 'atd' is significantly narrower in both the hands and the angle 'dat' is significantly wider in the right hand of diabetic male population. This finding is in partial agreement to a study by Mukesh Mittal et al which showed that there was significant difference between 'atd' angle of diabetic and control group but in contrast this study does not show any variation of 'adt' angle shown by the above study and also there are no significant differences in the angles in the female diabetic population.¹⁹ There were no significant differences in the angles in female population when considered alone.

The above discrepancies in the results of the present study compared to the previous studies may be due to the small number of subjects considered and the subjects being considered from the same locality leading to maintaining of the same genetic characteristics due to pooling of genes in the same location as a result of marriages among the members of the same community. The small percentage of it may be due to inter-observer variation.

Disregarding the slight differences in the results of the various studies, the findings of the study show that there is an association between the occurrence of diabetes mellitus and dermatoglyphics opening up a new topic for more research with larger study groups involving a larger demographical area. It may also involve more research into the sensitivity and specificity of the test to make it more precise and reliable for use on a larger population.

7. Conclusion

The association of dermatoglyphics with diabetes mellitus is hence proved by the above study thus providing us with a cost effective and easy screening tool to identify

Table 1: Comparison of fingerprint patterns in general population

Finger Print Pattern	Total			Right			Left		
	Diabetic (%)	Non-diabetic (%)	SD	Diabetic (%)	Non-diabetic (%)	SD	Diabetic (%)	Non-diabetic (%)	SD
Whorls	38.16	36.33	0.511	35	37	0.933	41.33	37.33	0.315
Loops	49.50	51.67	0.563	54.67	58	0.943	44.33	49.33	0.219
Arches	12.33	12.5	0.928	10.33	11.67	0.604	14.33	13.33	0.722
	100	100		100	100		100	100	

SD-standard deviation

The above data it is clearly shown that there is no significant association between fingerprints and diabetes mellitus when the population is considered as a whole

high risk individuals for diabetes mellitus and thus prevent complications and the cost of treatment. It predicts the future burden of the disease and helps us to build up better resources to tackle the disease and educate people to adopt better lifestyle to prevent or at least delay the disease and its complications knowing the proportion of population that might be affected by the disease.

8. Summary

Diabetes is a chronic condition affecting millions of people worldwide half of whom are undiagnosed according to CDC reports. This leads to complications of the disease thus increasing the cost of treatment and increasing morbidity and mortality associated with the disease. Thus finding a correlation between dermatoglyphics and diabetes mellitus both of which are genetically controlled helps in the developing a cost effective screening process. The dermatoglyphic patterns were compared between the diabetic and non-diabetic population by a randomised-controlled trial in a local tertiary care unit for two entities namely the pattern of fingerprints and the triradii angles. There were no association between dermatoglyphics (pattern of fingerprints and triradii angles) and diabetes mellitus when the population was considered as a whole (males and females together) but there were significant differences when the sexes were considered separately. Fingerprints in the male diabetics showed a significant increase in the whorls and a significant decrease in the loops when considered in total and in the left hand. There was an also a significant increase in the arches when considered in total. Fingerprints in the female diabetics showed a decrease in the number of loops when considered in total and when the right hand was considered alone. The triradii angles showed no significant difference in the females while the males had significantly narrower 'atd' angle in both the hands and significantly wider 'dat' angle in the right hand. This clearly shows that there is an association between the occurrence of diabetes mellitus and dermatoglyphic patterns which can be used as a cheap, easy and noninvasive screening technique to recognize high risk individuals.

9. Conflict of Interest

None.

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