Al Ameen J Med Sci 2018;11(3):161-165 ● US National Library of Medicine enlisted journal ● ISSN 0974-1143

ORIGINAL ARTICLE CODEN: AAJMBG

Correlation between fingerprint patterns in type-II diabetes mellitus

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Abstract: *Objective:* To describe the association of Dermatoglyphics with type II Diabetic Disease and to support as evidence in court of law regarding identification of persons. *Methodology:* In this study one hundred type II Diabetes mellitus patients (50male and 50 female) were selected and compared with equal number of controls. Hand fingerprints were taken by Indian ink method. The Parameters such as arches, whorls, loops were studied. Fingerprint tip patterns are not same in Diabetics and controls. *Result:* Out of 100 Diabetic Mellitus type II patient's when compared frequency of Whorls was significantly increased in both hands of males and females around 67 %,whereas Loop with 26% and Arches least with 5%. *Conclusion:* The dermatoglyphic study revealed that majority of the patients were belonging to Whorl pattern of finger prints followed by patients belonging to Loop pattern and the least patterns were Arch. The results of the present research work indicate that dermatoglyphic abnormalities may be used as a diagnostic tool for predicting the possibility of the development of diabetes at a later date Personal identification is becoming increasingly important not only in legal medicine but also as evidence in the court of law in criminal investigation and identification.

Keywords: Finger print, Dermatoglyphics, Type II Diabetes mellitus, Whorl, Loop, Arch.

Introduction

The diabetes mellitus is a non communicable disease which is rising in India. The Diabetes mellitus is one such a disease with strong genetic basis and a metabolic disorder which is characterized by hyperglycemia resulting the defects in insulin secretion. Based on etiopathogenic categories, it is classified as Type 1 and Type 2 diabetes mellitus. In Type 1 there is absolute deficiency of insulin secretion. In Type 2 there is a combination of resistance to insulin action and inadequate compensatory insulin secretory response [1]. Diabetes is a multi system disorder that affects many organs of the body [2].

Diabetes is increasing in several parts of the world, especially in developing countries like India. The total number of diabetics is projected to rise from 171 million in the year 2000 to 366 million in 2030 [3-4]. Today around 3.2 million persons die of diabetes, 8700 die every day 6 persons every minute, which explains the anticipations provided by World Health Organization (WHO), International Diabetes Federation (IFD), European Association for the Study of Diabetes (EASD) according to which, in the future diabetes will be on top of the mortality and morbidity causes along with cardiovascular disease and cancer [5-7].

Epidermal ridges are formed in between 11-24th week of intrauterine life, after this period epidermal ridges do not change. The critical growth of the brain is also occurring during this period. Since the skin and brain develop from the same ectoderm dermatoglyphics variations are informative for early developmental brain disturbances. There are three basic patterns of fingerprints named Arch, Loop, Whorl and composite.

Dermatoglyphic patterns are genetically determined and can be used as supportive for the diagnosis of various hereditary disorders including type II diabetes. Though extensive research work has been carried out regarding dermatoglyphics and diabetes mellitus independently; combined study correlating the two entities are few. So, to bring forth correlation between dermatoglyphics and type - II diabetes mellitus and evaluate their significance, present study has been carried

out. Therefore, identifying the risk category and taking up the preventive measures is highly economical. The importance of dermatoglyphics studies in clinical medicine is that, during developmental stages the ridge formation is affected by maternal environment, gene deviants and chromosomal aberrations. Once formed they are age and environmental stable, becoming a reliable indicator**.** It will be possible to identify the person at high risks of developing Diabetes mellitus. Dermatoglyphics is mainly related to the prognosis of a disease.

Material and Methods

One hundred type-II diabetes mellitus patients (50male and 50 female) were selected for study and compared with equal number of controls from Medicine OPD & wards of Al-Ameen Medical College & Hospital from November 2017 to April 2018.Written informed consent was taken from the study subjects. Dermatoglyphic prints were taken by using Ink Method by "Cummins and Midlo" [8]. First both the hands are washed with the soap and dried with cloth, so that the hand is not moist. Fingerprints were obtained by using Kores duplicating ink and cotton ball on white paper.

The fingers were printed by rolling them from radial to ulnar side to include the patterns. Fingertip patterns of all the digits were recorded and studied with the help of magnifying lens. Screenings of finger prints were done by using magnifying lens and scanner. Parameters observed were loops, whorls, arches. The printed sheets were coded with name, age, sex, address of the diabetic patients. Ethical clearance was obtained from the Institutional Ethical Committee.

Exclusion Criteria for cases includes: Blood sugar level-Fasting-120mg% & postprandial 180mg%. Seen that they are not having any other genetic disorder like any chronic skin diseases having scars, congenital or acquired anomalies due to trauma on the fingers. Inclusion Criteria includes peoples of either sex above 30-40 years has a normal blood sugar levels with no familial history of diabetes mellitus.

Results

The present study recorded the finger print patterns of all 10 fingers of 100 patients of age group 35-70 years of either sex. Analysis in this study was descriptive. A total of 100 patients participated in this study which were all known case of Diabetes mellitus II. The Table 1 shows that out of these 100 patients the majority of the patients were belonging to Whorl pattern of finger prints digits i.e.571 (62.06%) where as the number of patients belonging to Loop pattern was 257 (27.93%) pattern of Arch was 92 (10%).

Table-1: Distribution of Finger Print Patterns in Both hands

Pattern of finger prints	Numbers	Percentage
Whorls	571	62.06%
Loops	257	27.93%
Arches	92	10%
Total	920	100%

There is need to develop a detailed and vast study to explore the association of finger print pattern with Diabetes mellitus II. This study offered sensible weighting on distribution of finger print pattern among the Diabetes mellitus II patients. Table 2 and 3 shows slight different finger print pattern in both left and right hand, but overall the whorl, loop and arches decrease respectively. This study was only limited to Al-Ameen Medical College Hospital OPD patients and limited only to Diabetes mellitus II patients. The study was considered on small and selected area, and if it will be conducted on Nationwide on a larger scale we can find out the expected morbidity and mortality.

Table 4 shows the distribution of fingertip patterns on right hand in diabetics in male, from the table it is evident that whorls were significantly increased whereas loops and arches were significantly decreased. Also, table 5 shows that whorls were significantly increased while loops were significantly decreased however arches were significantly decreased in left hand in female diabetics.

Table-2: Distribution of Whorls, Loops and Arches in Right Hand						
Types of finger prints	**Thumb**	**Index**	**Middle**	**Ring**	**Little**	**Total**
Whorl	65	60	52	64	62	303(65.86%)
Loop	22	19	30	21	21	113 (24.40%)
Arch	11	12	10	7	4	44 (9.50%)
						460 (100%)

Table-3: Distribution of Whorls, Loops and Arches in Left Hand						
Types of finger prints	**Thumb**	**Index**	**Middle**	**Ring**	**Little**	**Total**
Whorl	59	51	53	53	52	268 (58.26 %)
Loop	22	30	32	30	30	144 (31.50 %)
Arch	12	10	8	8	10	48 (9.62 %)
						460(100%)

Table-4: Distribution of Fingertip Patterns in Male Diabetics and Controls				
Finger print patterns	**Right Hand**		**Left Hand**	
	Controls	**Diabetics**	**Controls**	**Diabetics**
Whorl	32.20%	65.86%	32.50%	58.26%
Loop	59.80%	24.40%	60%	31.50%
Arch	8%	9.50%	7.50%	9.62%

Table-5: Distribution of Fingertip Patterns in Female Diabetics and Controls				
Finger print patterns	**Right Hand**		**Left Hand**	
	Controls	**Diabetics**	**Controls**	**Diabetics**
Whorl	26%	47.80%	23.10%	49%
Loop	66.20%	45%	64.60%	42.40%
Arch	8.80%	7.20%	12.30%	8.60%

Discussion

Dermatoglyphics deals with the study of epidermal ridges on fingertips, palms and soles. Now, interest has been developed in associating Dermatoglyphics with disease. Dermatoglyphic patterns show relative similarity among close relatives especially monozygotic twins [9] suggesting that patterns are genetically determined. It can be useful in predicting the hereditary diseases in patients. Dermatoglyphics is a scientific method for anthropological, medico- legal and genetic studies. Identification is a set of individual physical characteristics, functional or psychic, normal or pathological that defines an individual. The role of fingerprint should not be underestimated as the patterns of finger prints are unique to each and every individual. Due to their uniqueness they can be used to identify the culprits at crime scene and blast injuries and in mass disaster injuries and as well as for national identification.

A number of studies have indicated dermatoglyphic correlation in a large number of genetic disorders, which include diabetes mellitus' Schizophrenia. Congenital heart disease and Down syndrome. WHO projects that diabetes will be the 7th leading cause of death in 2030 (WHO, 2011). This has intensified the quest for further scientific

understanding of the etiology and pathogenesis of the disease; with the ultimate aim of improving its management. Studies are continuously being done in various fields of medicine to identify the potential early biomarkers of diabetes.

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 [10] is 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 [11] which matches with present study. Srivastava S et al found that there was increase frequency of whorl pattern in both sexes [12] 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 [13]. Thus; these previous findings are coinciding with present study. This present study can be used as a screening tool for the diagnosis of individuals who are more prone to develop diabetes mellitus and thereby preventing the future diabetic complications. If the association between a permanent fingerprint characteristic and diabetes can be confirmed in other populations, then fingerprints could be employed at any age to enhance etiologic investigations of diabetes or possibly to improve the prediction of diabetes before its clinical diagnosis.

Conclusion

- The dermatoglyphic investigation is absolutely cost-effective and requires no hospitalization and it can help in predicting the phenotype of a possible future illness. This study would be helpful to formulate counseling messages based on dermatoglyphic pattern prevalent among young generation and their possible stimulation to determine the young people's likelihood to develop diabetes in their later age. It can be used for mass screening program for prevention of DM. The finger prints which are used here as a tool to find genetic diseases, can also be used to identify the culprits at crime scene, blast injuries and in cases of mass disaster injuries and as well as national identification.
- Majority of the patients were belonging to Whorl pattern of finger prints followed by patients belonging to Loop pattern and the least patterns were Arch.

Recommendations

1. Similar studies should be conducted on a larger sample at a National level so as to increase the accuracy of prediction.
2. There is a need to establish Finger printing bank for research purpose.
3. There is a need to evaluate the finger printing in genetic diseases along with familial diseases.
4. Finger print pooling in banks is needed of patients especially in genetical and familial disorders.

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Cite this article as: Kakkeri SR, Attar A and Khan J. Correlation between fingerprint patterns in type-II diabetes mellitus. *Al Ameen J Med Sci* 2018; 11(3):161-165.

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