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Original Research

Dermatoglyphic study of diabetes mellitus Type 2 in Maharashtrian population

Vijay Nayak[1], Utkarsh Shrivastava[1], Sushil Kumar[2], Kailash Balkund[3]

[1]Department of Anatomy, Chirayu Medical College & Hospital, Bhopal, Madhya Pradesh, India, [2]Department of Anatomy, Armed Forces Medical College, Pune, Maharashtra, India,[3]Department of Anatomy, Malabar Medical College, Calicut, Kerala, India

ABSTRACT

Aim: To study the dermatoglyphic patterns and their role in prediction of diabetes mellitus Type 2 in Maharashtrian population. **Background:** Dermatoglyphic patterns of the individual are genetically determined and once formed they remains constant throughout the life, prevalence of diabetes mellitus is increasing drastically in developing countries particularly in India, in the present study an attempt has been made to find an association of the dermatoglyphic patterns of the individual and diabetes mellitus Type 2. **Materials and Methods:** This study was carried out on 50 patients of Type 2 diabetes mellitus confirmed by clinical and laboratory assessment obtained from outpatient department of Department of medicine from command hospital, Pune. The control group for study consists of 50 subjects and was obtained from local residents of Maharashtra, teaching and non-teaching staff from our hospital. Palmar and finger prints of both hands were taken using ink and pad method as described by Cummins and Midlow. **Result:** In the present study analysis of loops, arches and whorls revealed that there is no significant difference in the no of radial and ulnar loops, number of arches, true and composite whorls between diabetes Type-2 patient and non-diabetic (normal) subjects. On the other hand, analysis of "a-t-d" angle revealed that angle was significantly increased in diabetic patients than control subjects. **Conclusion:** It can be concluded that qualitative fingertip parameters such as arches, radial loops, ulnar loops show fluctuating asymmetry and hence are not useful for prediction of diabetes. The only parameter, which does not show fluctuating asymmetry with previous studies is "a-t-d" angle. Hence, it can be concluded that this parameter is useful for pre detection of diabetes by dermatoglyphic studies.

Keywords: Arches and whorls, 'a-t-d' angle, dermatoglyphics, diabetes mellitus, loops

INTRODUCTION

Diabetes mellitus Type 2 often simply referred as diabetes, represents a spectrum of metabolic disorders of multiple etiology. Diabetes has become a major health challenge worldwide.[1] In 2030, it is estimated that the total number of diabetes - affected people will reach 366 millions. This idea is also supported by the fact that, annually, 3.2 million persons die of diabetes, 8,700 die every day, 6 persons every minute, which explains the anticipations provided by World Health Organization, International Diabetes Federation, European Association for the Study of Diabetes and European Diabetes Care Predicators (EURO DIAB) according to which, in the future diabetes will be on the top of the mortality and morbidity causes.[2-4]

Dermatoglyphics is the study of epidermal ridges and their configurations. Dermatoglyphics (from ancient Greek derma = "skin," glyph = "carving") is the scientific study of fingerprints.[5]

Dermatoglyphics is one of the upcoming branches of medical science where the dermal ridge patterns are studied and used in prediction of genetic disorders for diagnosis of twins, questioned paternity and other hereditary disorders The formation of ridges takes place at an early stage in fetal life, beginning at the 3rd month of intrauterine life and continuing till the 4th month. Growth disturbances in the fetus at this crucial time distort the alignment at ridges when hands and/or feet are involved.[6] Ridge configuration is determined partly by heredity and partly by environmental influences.

Corresponding Author:
Dr. Vijay Nayak, B-102, Chirayu Campus, Chirayu Medical College & Hospital, Bhopal-Indore Highway, Near Bairagarh, Bhopal, Madhya Pradesh, India. Phone: +91-9806225784, E-mail: drvijayafmc@gmail.com

Some diseases are known to be caused by abnormal genes. Whenever there is any abnormality in the genetic makeup of parents, it is inherited by the children and reflected in the dermatoglyphic pattern. Hence, the study of dermatoglyphics has proved to be very useful in predicting the hereditary diseases in patients.[5]

The present study is designed to compare the dermatoglyphic patterns of patients belonging to Maharashtrian origin suffering from diabetes mellitus Type 2 with normal individuals of the same region. The findings were compared with previous studies.

MATERIALS AND METHODS

The present study was carried out on 50 patients of Type 2 diabetes mellitus confirmed by clinical and laboratory assessment obtained from outpatient department of Department of Medicine from Command hospital, Pune. The control group for study consists of 50 subjects and was obtained from local residents of Maharashtra, teaching and non-teaching staff from our hospital.

Cases and controls were selected after a brief history of any known genetic disorder, without any congenital disease or fingerprint or other dermatoglyphic abnormalities. The controls group individuals were selected after ruling out the history of polyuria, polyphagia, and polydipsia.

The purpose of this study was explained to both cases and controls. Then proper information regarding the procedure of recording prints was given to members of both groups who agreed for the study. After their written consent the palm and finger prints were taken.

Dermatoglyphic Printing

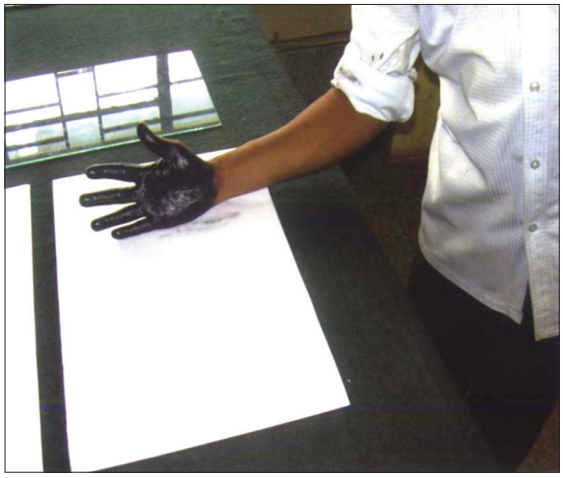
Palmar and fingerprints of both hands were taken using ink and pad method as described by Cummins and Midlow (1961).[7]

Equipment Used

Ink roller and inverted "T" shaped cotton pad made up of ball of cotton covered by three layers of soft cotton cloth, Ink slabs made up of plain glass with smooth surface, white paper, Kover's duplicating ink, firm surface used under the sheet of paper on which finger was pressed, magnifying lens, protractor, scale, and pencil.

Procedure

Hands were cleaned using soap and sufficient water and then dried using clean towel. The requisite amount of ink was placed on inking slab and spread evenly using roller and inverted "T" shaped pad to form a thin film of ink. The palmar surface of each finger was rolled on the inking slab starting from one side to the other and then it is rolled over the sheet of paper in one firm step. The palm prints were taken by applying ink over the palm and then directly pressing inked palm over the printing sheet. Firm pressure was applied over the dorsum of hand and inter digital areas for obtaining complete and uniform print. While removing the palm it was lifted from radial end toward the ulnar. Identity of the concerned subject was written on the print and was stapled to the consent form. The prints were examined with the help of 75 mm diameter magnifying lens for studying the dermatoglyphic patterns. The marking in the pattern areas were made using sharpened HB pencil.



RESULTS

Totally 50 cases diagnosed as diabetes mellitus Type-2 belonging to Maharashtrian origin and 50 controls (non-diabetics) were taken. Different parameters were studied separately and observations were recorded. The observations are tabulated and analyzed.

Total no of arches, loops and whorls were counted by taking the fingerprints for both diabetic and non-diabetic population. After this *Z*-test was applied and standard deviation was calculated. Results showed that average no of arches, loops and whorls in diabetics are not statistically significant as compared to non- diabetics ($P > 0.05$). The results are shown in Table 1 and Figure 1.

Maximum and Minimum a-t-d Angle

Fingerprints were taken of both diabetic and non-diabetic population. 'a-t-d' angle was calculated for diabetic as well as non-diabetic population. The mean 'a-t-d' angle in diabetics was found to be 43.75 as compared to 38.35 in non-diabetics population. *Z*-Test was applied and $P < 0.01$ i.e., statistically significant. It means that the 'a-t-d' angle is significantly increased in diabetics as compared to non-diabetics as seen in Table 2 and Figure 2.

DISCUSSION

Arches

Panda *et al.*[6] found there was increase in arches in diabetic patients as compared to control subjects. Pattern frequency was not statistically significant in the diabetic group in the study done by Rajanigandha *et al.*[8] and Mandascue *et al.*[9] Sant *et al.*[10] pointed out a significant increase in the arch pattern in female diabetics only. In our study, the arches in

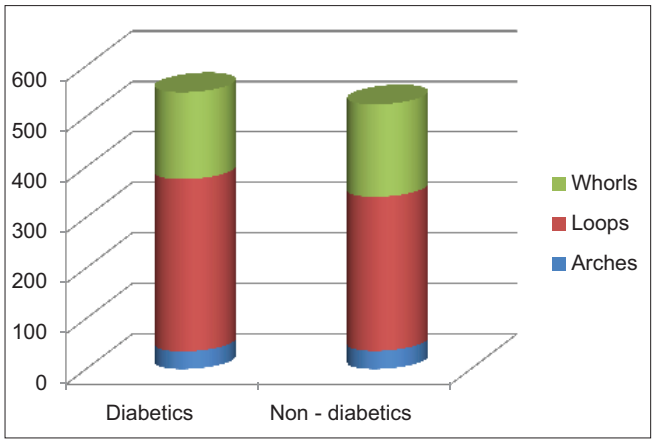


Figure 1: Pattern of finger prints in diabetic and non-diabetic subjects

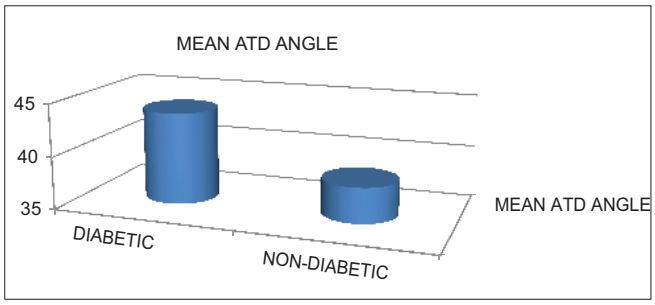


Figure 2: "a-t-d" angle among diabetic and non-diabetic subjects

Table 1: Pattern of finger prints in diabetic and non-diabetic subjects

Pattern	Diabetic	Standard deviation	Non-diabetic	Standard deviation
Arches	35	0.54	36	0.48
Loops				
Radial	35	0.51	31	0.46
Ulnar	306	0.46	274	0.77
Whorls				
True	140	0.84	153	0.95
Composite	32	0.47	30	0.46

Table 2: 'a-t-d' angle among diabetic and non-diabetic subjects

	Diabetic	Non-diabetic
Right	43.5	38.22
Left	44.0	38.48
Mean	43.75	38.35

diabetics and normal (non-diabetics) groups were not found to be statistically significant. This difference in observation is because readings in our study were taken in an assorted group. No sex differentiation was considered.

Radial Loops

Panda *et al.*[6] Similarly Ravindranath *et al.*[11] found, an increase in radial loops in diabetics of both sexes. Bets *et al.*

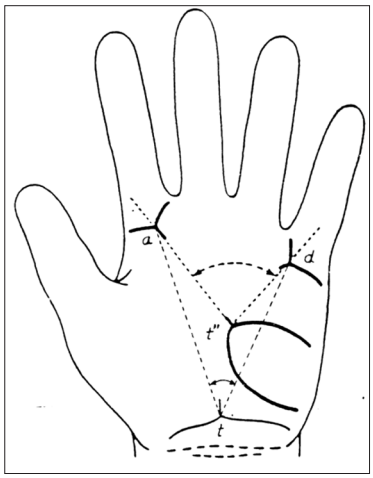


Figure 3: Maximum and minimum "a-t-d" angle

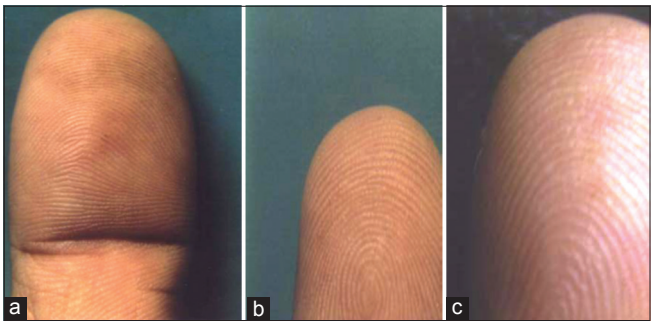


Figure 4: Fingertip patterns. (a) arch, (b) whorl, (c) loop

found reduced incidence. Verbov *et al.*[12] and Sant *et al.*[10] did not reveal any significant finding regarding radial loop pattern. However pattern frequency was not statistically significant in the diabetic group in the study done by Rajanigandha *et al.*[8] and Mandascue *et al.*[9]

In our study done on people of Maharashtrian origin radial loops were not significantly different in diabetics and non-diabetics. This matched with the observations by Sant *et al.* who also carried out his study in Maharashtrian population.

Ulnar Loops

Panda *et al.*[6] found there was increase in ulnar loops in their study but pattern frequency was not statistically significant in the diabetic group in the study done by Rajanigandha *et al.*[8] and Mandascue *et al.*[9] Sant *et al.*[10] reported a decrease in ulnar loops in diabetics of both sexes while Ravindranath *et al.*[11] found increase in ulnar loops in diabetics of both sexes.

In our study, the number of ulnar loops was not significantly differing in diabetics and non-diabetic subjects. This matched with the study carried out by Rajanigandha *et al.*[8]

Whorls

Sant *et al.*[10] reported a significant increase in the frequency of whorls in diabetics of both sexes. However, Ravindranath *et al.*[11] and Panda *et al.*[6] found a decrease in whorls of diabetic as compared to controls. Pattern frequency was not

statistically significant in the diabetic group in the study done by Rajanigandha *et al.*[8] and Mandascue *et al.*[9]

In our study, it was found that whorls were distributed equally in diabetics and non-diabetic subjects. Similar results have been quoted by Rajanigandha *et al.*[8]

'a-t-d' Angle

Rajanigandha *et al.*[8] showed a statistically significant increase in the 'a-t-d' angle in diabetics of both sexes when compared with controls who showed acute angles. In a study by Mandascue *et al.*[9] right hand 'a-t-d' angle was significantly lower in male diabetics only.

In our study, analysis of 'a-t-d' angle revealed that it was significantly increased in diabetic patients as compared to control group. These results are in line with above mentioned previous studies.

In the present study, we found that qualitative fingertip patterns like arches, loops and whorls were not found to be statistically different in diabetics and non-diabetics. Further on analysis of loops and whorls revealed that there is no significant difference in the number of radial and ulnar loops and number of true and composite whorls respectively in diabetes and non-diabetics. However, analysis of "a-t-d" angle revealed that angle was significantly increased in diabetic patients than control subjects (Figures 3 and 4).

CONCLUSIONS

It can be concluded that qualitative fingertip parameters like arches, loops, whorls show fluctuating asymmetry and hence are not useful for prediction of diabetes. The only parameter which does not show fluctuating asymmetry is "a-t-d" angle. Hence, this parameter is useful for pre-detection of diabetes by dermatoglyphic studies.

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PEER REVIEW

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CONFLICTS OF INTEREST

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