DERMATOGLYPHIC STUDY: A COMPARISON IN FINGER TIPS OF TYPE II DIABETES MELLITUS PATIENTS AND NORMAL PERSONS

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Abstract
Background: To compare the differences in the finger tips patterns in patients with type II diabetes mellitus with non-diabetic as control group. **Materials and methods:** The study is conducted in 100 type II diabetic patients and 100 non-diabetic persons as a control group. For collection of palmar prints 'Cumins and midlo' method has been used. **Result & Conclusion:** Statistical differences in fingertip patterns were found. This inference may be widely applied clinically for the early diagnosis of type II diabetes mellitus mainly in a mass screening of a population as an additional diagnostic tool.

INTRODUCTION

The study of the epidermal ridge patterns of the skin of the fingers, palms, toes, and soles is known as "dermatoglyphics."[1] It is probably the oldest of all sciences, since its importance featured significantly millions of years ago. "Dermatoglyphics", as defined by Cummins and Midlo,[2] refers to the study on the intricate dermal ridge configuration on the skin covering the palmar and plantar surfaces of the hands and feet. Dermal configurations appear at the 12th week of intra-uterine life and they are established by the 24th week.[3] thereafter, they remain constant, except for the change in their sizes. Dermatoglyphics has been reported to be associated with a number of conditions.[3]

Dermatoglyphics is a branch of Anatomy that is devoted to the study of ridges and their configurations on the skin of the volar surfaces and the application of this science to the fields of criminology and personal identification, as well as to areas of embryology, comparative anatomy, physical anthropology, genetics and medicine.[4] Dermatoglyphic patterns make good material for genetic studies because their arrangement is stable throughout life, unique to the individual, and unlike stature, intelligence and body weight; they are not influenced by age or by post-natal environmental factors.[4]

It is a simple, inexpensive, safe and non-traumatic procedure and the taking of a good print makes a permanent and complete record. It can be easily included in the physical examination as a bedside procedure.[4]

Type 2 Diabetes Mellitus (DM2) is a global public health crisis, particularly threatening the economies of developing nationsand India is a global leader in diabetes, currently with largest pool of diabetes in the world.[5,6] DM2 is the most common form of diabetes constituting 90% of the diabetic population. The number of patients with diabetes in India is currently around 80-90 million,[5] 7.3% of the population, and the prevalence of prediabetes is 10.3% (WHO Criteria) or 24.7% (ADA criteria)and is expected to rise to 101 million by 2030.[7,8] Diabetes is slated to be the largest epidemic in human history.[5]

DM2 has been shown to be associated with certain dermatoglyphic traits and Indians in particular have been shown to be predisposed to DM type 2.[9,10] It can be used for early and inexpensive screening of individuals at risk for DM2.[4] Recently an Indian study indicated that dermatoglyphic abnormalities may be used as a diagnostic tool for predicting the

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possibility of the development of diabetes at a later date. The etiology of diabetes mellitus is multifactorial with genetics playing an important role. Taking into consideration of genetic predisposition of dermatoglyphics and diabetes mellitus, the study was undertaken to find out the correlation between them, so that the dermatoglyphics may be helpful in the diagnosis of predisposition towards diabetes at an earlier age. The knowledge of dermatoglyphic patterns in patients with diabetes mellitus is an interesting matter and little information is available about this relation. Thus, with regard to the higher incidence of diabetes mellitus in the world, the existence of such relation might be important in the screening programme for prevention of diabetes mellitus. If an individual with specific pattern of dermatoglyphics is determined, then the person can be screened for prevention by controlling the other risk factors in early detection programme.

There is scarcity of dermatoglyphic data on the prevalence of diabetes in a population of India. This created an interest in attempting the present study. The aim of the present study is to collect dermatoglyphic pattern in patients with diabetes mellitus type 2 and control and to compare same parameters in control group.

MATERIALS AND METHODS

The present comparative case control study was performed to collect dermatoglyphic pattern of finger tips in patients with diabetes mellitus type 2 and control and to compare same parameters in control group in the Department of Anatomy/Department of Medicine, LN Medical College & Hospital, Bhopal. Clearance from the ethical committee of the institute and written informed consent from all the patients taking part in the study was taken.

A total 100 patients of clinically diagnosed type II diabetic patients compared with the same age group of 100 non- diabetic patients as the control group.

Procedures and Methods
The Indian ink method was to take hand prints with camel duplicating ink as suggested by Cumins and Midlow, in year 1961.
The Materials used: double plain paper (8.5" x 11"), glass plate (4"x10"), round bottle (10"x4"), roller for spreading the ink, table, scale, pointed H.B. pencil, mercury lamp, protractor, soap and ether for washing hands and a good magnifying lens.
The hands were washed with soap and water, and humidity cleaned off with ether. A small daub of camel duplicating ink was squeezed out on inking slab and spread with the help of roller into a thin film for direct inking of fingers. Palm was carefully and uniformly smeared with inked roller to cover the wide area of palm to be printed for examination. The paper was set over the round bottle and the moderately open finger and palm was successively rolled with some pressure on it, permitting the bottle and paper to move forward. Roller fingerprints were taken by rotation of fingers both in inking and printing to obtain a complete impression of finger tips. This method enables recording the complete imprints of palm including palmar surface of all five digits in one attempt. These prints were studied with the help of a magnifying lens for observation under different heads. The printed sheets were coded with name, age, sex, address.
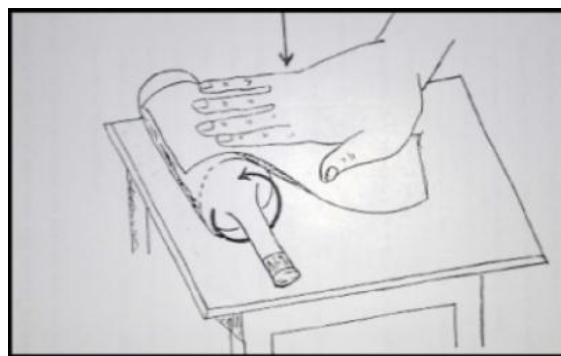

Figure 1: Illustration of the technique will be used in taking a print.

RESULTS

The present comparative case control study was established to collect dermatoglyphic pattern in patients with diabetes mellitus type 2 and control and to compare same parameters in control group in the Department of Anatomy/Department of Medicine, LN Medical College& Hospital, Bhopal. A total 200 adult group patients of both sex were enrolled in this study; in which 100 patients were clinically diagnosed type II diabetic patients compared with the same sex and age group of 100 normal blood sugar level patients as control group.
Observations were compared between controls and diabetics. Observations were tabulated as under:
1. Both hand Ridge Pattern distribution in both study group
2. Both hand Ridge Pattern distribution in both study groups male patients.
3. Both hand Ridge Pattern distribution in both study groups female patients

Table 1: Both hand Ridge Pattern distribution in both study group

Ridge Pattern			Total No. of Patients (n=200)	Group		P value
				DM (n=100)	Normal (n=100)	
Right	Thumb	Loop	108 (54.0%)	66 (66.0%)	42 (42.0%)	0.003
		Whorl	75 (37.5%)	28 (28.0%)	47 (47.0%)	
		Arch	17 (8.5%)	6 (6.0%)	11 (11.0%)	

	Index	Loop	123 (61.5%)	72 (72.0%)	51 (51.0%)	<0.001
		Whorl	40 (20.0%)	6 (6.0%)	34 (34.0%)	
		Arch	37 (18.5%)	22 (22.0%)	15 (15.0%)	
	Middle	Loop	109 (54.5%)	41 (41.0%)	68 (68.0%)	<0.001
		Whorl	64 (32.0%)	43 (43.0%)	21 (21.0%)	
		Arch	27 (13.5%)	16 (16.0%)	11 (11.0%)	
	Ring	Loop	125 (62.5%)	78 (78.0%)	47 (47.0%)	<0.001
		Whorl	65 (32.5%)	16 (16.0%)	49 (49.0%)	
		Arch	10 (5.0%)	6 (6.0%)	4 (4.0%)	
	Littlie	Loop	132 (66.0%)	60 (60.0%)	72 (72.0%)	<0.001
		Whorl	36 (18.0%)	14 (14.0%)	22 (22.0%)	
		Arch	32 (16.0%)	26 (26.0%)	6 (6.0%)	
Left	Thumb	Loop	75 (37.5%)	31 (31.0%)	44 (44.0%)	0.022
		Whorl	107 (53.5%)	63 (63.0%)	44 (44.0%)	
		Arch	18 (9.0%)	6 (6.0%)	12 (12.0%)	
	Index	Loop	72 (36.0%)	29 (29.0%)	43 (43.0%)	0.002
		Whorl	95 (47.5%)	60 (60.0%)	35 (35.0%)	
		Arch	33 (16.5%)	11 (11.0%)	22 (22.0%)	
	Middle	Loop	114 (57.0%)	47 (47.0%)	67 (67.0%)	0.016
		Whorl	72 (36.0%)	45 (45.0%)	27 (27.0%)	
		Arch	14 (7.0%)	8 (8.0%)	6 (6.0%)	
	Ring	Loop	77 (38.5%)	29 (29.0%)	48 (48.0%)	0.018
		Whorl	111 (55.5%)	63 (63.0%)	48 (48.0%)	
		Arch	12 (6.0%)	8 (8.0%)	4 (4.0%)	
	Littlie	Loop	122 (61.0%)	53 (53.0%)	69 (69.0%)	0.007
		Whorl	75 (37.5%)	47 (47.0%)	28 (28.0%)	
		Arch	3 (1.5%)	0 (0.0%)	3 (3.0%)	

Table 2: Both hand Ridge Pattern distribution in both study groupsMale patients

Ridge Pattern			Total No. of Patients (n=120)	Group		P value
				DM (n=60)	Normal (n=60)	
Right	Thumb	Loop	61 (50.8%)	36 (60.0%)	25 (41.7%)	0.125
		Whorl	48 (40.0%)	19 (31.7%)	29 (48.3%)	
		Arch	11 (9.2%)	5 (8.3%)	6 (10.0%)	
	Index	Loop	68 (56.7%)	43 (71.7%)	25 (41.7%)	<0.001
		Whorl	39 (24.2%)	4 (6.7%)	25 (41.7%)	
		Arch	23 (19.2%)	13 (21.7%)	10 (16.7%)	
	Middle	Loop	69 (57.5%)	26 (43.3%)	43 (71.7%)	0.007
		Whorl	38 (31.7%)	26 (43.3%)	12 (20.0%)	
		Arch	13 (10.8%)	8 (13.3%)	5 (8.3%)	
	Ring	Loop	71 (59.2%)	46 (76.7%)	25 (41.7%)	<0.001
		Whorl	42 (35.0%)	9 (15.0%)	33 (55.0%)	
		Arch	7 (5.8%)	5 (8.3%)	2 (3.3%)	
	Littlie	Loop	85 (70.8%)	39 (65.0%)	46 (76.7%)	0.081
		Whorl	24 (20.0%)	12 (20.0%)	12 (20.0%)	
		Arch	11 (9.2%)	9 (15.0%)	2 (3.3%)	
Left	Thumb	Loop	43 (35.8%)	16 (26.7%)	27 (45.0%)	0.011
		Whorl	66 (55.0%)	41 (68.3%)	25 (41.7%)	
		Arch	11 (9.2%)	3 (5.0%)	8 (13.3%)	
	Index	Loop	41 (34.2%)	16 (26.7%)	25 (41.7%)	0.006
		Whorl	59 (49.2%)	38 (63.3%)	21 (35.0%)	
		Arch	20 (16.7%)	6 (10.0%)	14 (23.3%)	
	Middle	Loop	70 (58.3%)	26 (43.3%)	44 (73.3%)	<0.001
		Whorl	43 (35.8%)	31 (51.7%)	12 (20.0%)	
		Arch	7 (5.8%)	3 (5.0%)	4 (6.7%)	
	Ring	Loop	48 (40.0%)	18 (30.0%)	30 (50.0%)	0.075
		Whorl	66 (55.0%)	38 (63.3%)	28 (46.7%)	
		Arch	6 (5.0%)	4 (6.7%)	2 (3.3%)	
	Littlie	Loop	76 (63.3%)	35 (58.3%)	41 (68.3%)	0.271
		Whorl	43 (35.8%)	25 (41.7%)	18 (30.0%)	
		Arch	1 (0.8%)	0 (0.0%)	1 (1.7%)	

Table 3:Both hand Ridge Pattern distribution in both study groupsfemale patients

Ridge Pattern			Total No. of Patients (n=80)	Group		P value
				DM (n=40)	Normal (n=40)	
Right	Thumb	Loop	47 (58.8%)	30 (75.0%)	17 (42.5%)	0.010
		Whorl	27 (33.8%)	9 (22.5%)	18 (45.0%)	
		Arch	6 (7.5%)	1 (2.5%)	5 (12.5%)	
	Index	Loop	55 (68.8%)	29 (72.5%)	26 (65.0%)	0.056
		Whorl	11 (13.8%)	2 (5.0%)	9 (22.5%)	
		Arch	14 (17.5%)	9 (22.5%)	5 (12.5%)	
	Middle	Loop	40 (50.0%)	15 (37.5%)	25 (62.5%)	0.073

		Whorl	26 (32.5%)	17 (42.5%)	9 (22.5%)	
		Arch	14 (17.5%)	8 (20.0%)	6 (15.0%)	
	Ring	Loop	54 (67.5%)	32 (80.0%)	22 (55.0%)	0.058
		Whorl	23 (28.8%)	7 (17.5%)	16 (40.0%)	
		Arch	3 (3.8%)	1 (2.5%)	2 (5.0%)	
	Littlie	Loop	47 (58.8%)	21 (52.5%)	26 (65.0%)	<0.001
		Whorl	12 (15.0%)	2 (5.0%)	10 (25.0%)	
		Arch	21 (26.2%)	17 (42.5%)	4 (10.0%)	
Left	Thumb	Loop	32 (40.0%)	15 (37.5%)	17 (42.5%)	0.784
		Whorl	41 (51.2%)	22 (55.0%)	19 (47.5%)	
		Arch	7 (8.8%)	3 (7.5%)	4 (10.0%)	
	Index	Loop	31 (38.8%)	13 (32.5%)	18 (45.0%)	0.194
		Whorl	36 (45.0%)	22 (55.0%)	14 (35.0%)	
		Arch	13 (16.2%)	5 (12.5%)	8 (20.0%)	
	Middle	Loop	44 (55.0%)	21 (52.5%)	23 (57.5%)	0.494
		Whorl	29 (36.2%)	14 (35.0%)	15 (37.5%)	
		Arch	7 (8.8%)	5 (12.5%)	2 (5.0%)	
	Ring	Loop	29 (36.2%)	11 (27.5%)	18 (45.0%)	0.233
		Whorl	45 (56.2%)	25 (62.5%)	20 (50.0%)	
		Arch	6 (7.5%)	4 (10.0%)	2 (5.0%)	
	Littlie	Loop	46 (57.5%)	18 (45.0%)	28 (70.0%)	0.013
		Whorl	32 (40.0%)	22 (55.0%)	10 (25.0%)	
		Arch	2 (2.5%)	0 (0.0%)	2 (5.0%)	

Finger Tip Patterns: [Table 1], Fingertip patterns in Rt. Hands of both study groups are seen Loop was significantly increase in thumb, index and ring finger 66 %, 72 % & 78 % in diabetics respectively. Whorl and arch were significantly increased in middle and little finger 43 % and 26 % in diabetics respectively. In left hand whorl was significantly increase in thumb, index, middle, ring and little finger 63 %, 60 %, 45 %, 63 % and 47 % diabetics respectively.

[Table 2], Finger tip patterns in Rt. Hands of male groups are seen Loop was significantly increased in index and ring finger 43 % & 46 % in diabetics respectively. In index finger loop was also increase but statistically insignificant. Whorl and arch were significantly present in middle and little finger 43 % and 26 % in diabetics respectively. In left hand whorl was significantly increase in thumb, index, and middle finger 41 %, 38 %, 31 %, diabetics respectively, and insignificantly increase in ring and little finger 38 % and 25 %.

[Table 3], Finger tip patterns in Rt. Hands of female groups are seen Loop was significantly increase in thumb, index and ring finger 30 %, 29 % & 32 % in diabetics respectively. Whorl and arch was significantly increased in middle and little finger 17 % and 17 % in diabetics respectively. In left hand whorl was significantly increase in only little finger 22 %, and insignificantly increase in thumb, index and ring finger 22 %, 22 %, and 25 % in diabetics respectively. Loop was insignificantly increased in middle finger 21 %.

DISCUSSION

Comparison with the Previous Studies:

			DM Cases	Control
SatabdiS et al[1]	Case-control study	200 (100 male+100 female)		200(100male+100female)
Trivedi PN et al[2]	Case-control study	100 (50 male+50 female)		100 (50 male+50 female)
MK &Sharma H[3]	Case-control study	50(25 male+25 female)		50(25 male+25 female)
Present study	Case-control study	100 (60 male+40 female)		100 (60 male+40 female)

Our present study, sample size, sex distribution and type of study were similar to the previous study conducted by Satabdi S et al,[Error! Bookmark not defined.] Trivedi PN et al[Error! Bookmark not defined.] and MK & Sharma H.[Error! Bookmark not defined.]

CONCLUSION

The present study was undertaken to study dermatoglyphics patterns in finger tips of type II diabetes mellitus and its role in early detection of type II diabetes.

Qualitative Dermatoglyphic fingertip patterns are:
Fingertip patterns in Rt. Hands of both study groups are Loop was significantly increase in thumb, index and ring finger in diabetics respectively. Whorl and arch were significantly increased in middle and little finger in diabetics respectively. In left hand whorl was significantly increase in thumb, index, middle, ring and little finger in diabetics respectively as compared to controls group.

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