

The Study of Dermatoglyphics in Diabetics of North Coastal Andhra Pradesh Population

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ABSTRACT

The epidermis of the palmar and plantar surfaces of the human hands and feet are covered with the skin that is different from the skin of the other parts of the body. It is corrugated with the ridges and configurations. These features were found to be permanent variables and were inherited. Dermatoglyphics investigation has been undertaken to ascertain the reliability of dermatoglyphic as a predictive diagnostic tool for diabetes. 280 subjects participated in this study. In female diabetics there is increased incidence of simple arch pattern. Increased incidences of TFRC and AFRC has been observed both in male and female diabetics. Increased incidences of ATD angle is observed in male diabetics than in control. No significant features are recorded for ATD angles in female diabetes and in control.

Key Words: Radial loop, Ulnar loop, Whorl, Diabetes

Abbreviations:

ATD - 'A' as tri radius found below the index finger, 'T' as axial tri radius above the wrist crease, 'D' as tri radius present below the little finger

AFRC - Absolute finger ridge count

TFRC - Total finger ridge count

INTRODUCTION

Dermatoglyphics is the study of the patterns of the ridged skin of the digits, palms and soles (Pour-Jafari H). The epidermis of the palmar and plantar surfaces of the human hands and feet are covered with the skin that is different from the skin of the other parts of the body. It is corrugated with the ridges and configurations. These features were found to be permanent variables and were inherited. For these amazing qualities they play a very crucial and important role in the personal identification, crime detection, twin diagnosis, racial variation and have applied values in various diseases and syndromes. These features of dermatoglyphics are formed during the thirteenth week of the growing embryo and remain unchanged thereafter throughout the life of an individual except the dimensions related to the growth of the body. Diabetes has a strong hereditary background. Offspring of two diabetic parents have an 80% lifetime risk of diabetes (Kenny *et al.*, 1995). The peculiar patterns of the epidermal ridges serve as a diagnostic tool in a number of diseases that have a strong hereditary background; Diabetes -mellitus is one such disease with a strong genetic basis. The importance of dermatoglyphic studies in clinical medicine is that, during development, maternal

environment, gene deviants, and chromosomal aberrations affect ridge formation. Once formed, they are age and environment stable, becoming a reliable indicator of genetic damage. Dermatoglyphic investigation is absolutely cost effective and requires no hospitalization, and it can help in predicting the phenotype of a possible future illness. The present study was undertaken to ascertain the reliability of dermatoglyphic as a predictive diagnostic tool for diabetes.

MATERIALS AND METHODS

In the present study finger prints and palmar prints were collected from 200 subjects (100 males and 100 females) in the age group of 25 yrs to 80 yrs in whom the diabetes started 1 year to 25 years ago. About 95 % cases were non-Insulin dependent diabetics, and 5% cases were insulin dependent diabetics. The controls of 200 were collected with in the same age group. Case history was taken that included age, sex, family history and personal history. Some of the subjects were also suffering from other complaints such as cardiac problem, hypertension, cancer, renal problem, skin problem etc. These were not taken into consideration in

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the present study. The present study is restricted to 70 male diabetics and 70 female diabetics and controls of 70 males and 70 females. The following procedure is adopted for collection of palmar prints: Hands were washed with soap water and dried with a soft cotton cloth (this helps in removal of dirt, dust and grease etc). The Kores duplicating ink is applied on the palmar and digital surface uniformly and are made to roll on the paper. Each digit is given roman numerical (thumb-I, index finger II, middle finger III, ring finger IV, little finger V).

The qualitative parameters observed are: The types of patterns of each finger – loop, arch, whorls.

The quantitative parameters observed are: The ridge counts of individual fingers of both right and left hands; total finger ridge count; absolute finger ridge count; inter digital ridge counts of right and left hand (a-b, b-c, c-d); and main line index of right and left hand (a, b, c, d). The data thus obtained has been computed for comparative study with previous authors



Figure 1. Hand Print of Male Diabetic



Figure 3. Hand Print of female Diabetic

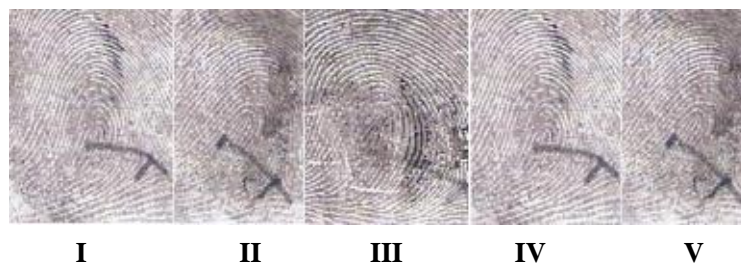


Figure 2. I-V. Finger prints of Male Diabetic with High Incidence of Ulnar Patterns

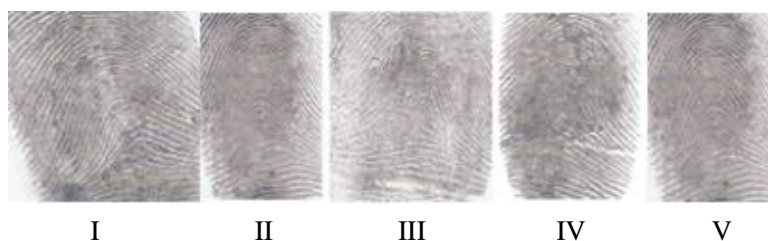


Figure 4. I-V. Finger prints of female diabetics with high incidence of arch pattern

Table 1. Distribution of study subjects by both hands.

S. No.		Controls		Diabetics		‘t’TEST	‘p’factor
	Variables	Mean	S.D	Mean	S.D		
1	Ulnar loop	81.6	22.94	83.2	20.06	0.1659	> 0.9
2	Radial loop	2.5	4.209	2.4	3.186	0.0598	< 0.9
3	Simple arch	7.8	6.313	8.1	4.677	0.1209	> 0.9
4	Tented arch	1	1.527	1.3	1.599	0.4287	> 0.6
5	Simple whorl	22.7	12.66	20.6	13.04	0.362	< 0.7
6	Spiral whorl	22	11.575	20.2	9.23	0.384	< 0.7
7	Double pocket whorl	2.4	2.525	3	3.99	0.448	> 0.6
8	Composite whorl	0.4	0.603	1.8	0.4518	2.8548	> 0.01
9	TFRC	95.5	31.08	108.6	32.52	3.465	< 0.001
10	AFRC	122.1	48.67	138.55	58.46	2.5623	0.02
11	ATD angle						
A	Right hand	40.73	6.09	42.15	4.64	2.113	0.02
B	Left hand	42.09	7.026	40.89	6.17	1.463	> 0.1
12	DAT angle						
A	Right hand	56.86	7.085	59.77	5.584	3.701	< 0.001
B	Left hand	55.91	6.162	62.3	8.482	6.944	< 0.001
13	ADT angle						
A	Right hand	78.48	7.192	78.13	4.75	0.4635	< 0.6
B	Left hand	80.47	5.137	79.44	5.012	1.633	0.1
	a-b ridge count						
14							
A	Right hand	28.06	5.015	25.07	4.911	4.861	< 0.0001
B	Left hand	29.31	4.833	25.72	4.593	6.276	< 0.0001
	b-c ridge count						
15							
A	Right hand	19.56	5.687	15.03	4.125	7.341	< 0.0001
B	Left hand	17.79	5.125	15.51	4.414	3.835	> 0.001
	c-d ridge count						
16							
A	Right hand	26.16	5.565	22.26	5.162	8.767	< 0.0001
B	Left hand	23.8	5.997	21.25	5.588	4.932	< 0.0001

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Table 2. Sex wise distribution of study subjects by both hands in male controls and diabetics.

S. No.		Controls		Diabetics		't' TEST	'p'factor
	Variables	Mean	S.D.	MEAN	S.D.		
1	Ulnar loop	40.4	13.97	41.6	10.006	0.2207	> 0.8
2	Radial loop	0.8	1.24	1.7	2.53	0.89	< 0.4
3	Simple arch	5.4	4.24	2.4	0.791	1.867	> 0.1
4	Tented arch	0.8	1.45	1	1.33	0.519	> 0.6
5	Simple whorl	8.9	5.49	10.1	6.06	0.4651	< 0.6
6	Spiral whorl	11.5	5.1	10.4	4.16	0.422	< 0.6
7	Double pocket whorl	1.5	1.47	1.9	1.7	0.5641	> 0.6
8	Composite whorl	0.9	0.6	0.9	0.25	1.929	< 0.05
9	TFRC	97.25	26.67	106.25	31.6	1.825	< 0.05
10	AFRC	121.65	52.95	137.58	57.41	1.7073	< 0.1
11	ATD angle						
	A Right hand	41.68	6.8	39.15	5.11	2.34	> 0.02
	B Left hand	40.92	6.14	41.67	6.03	0.729	< 0.4
12	DAT angle						
	A Right hand	56.05	7.92	56.02	5.02	1.512	< 0.1
	B Left hand	56.62	5.32	62.42	5.32	5.065	> 0.0001
13	ADT angle						
	A Right hand	78.38	7.41	80.45	4.17	2.0058	> 0.05
	B Left hand	83.22	4.96	80.4	3.75	5.136	< 0.0001
	a-b ridge count						
14							
	A Right hand	27.4	5.86	25.12	5.34	2.45	> 0.02
	B Left hand	28.8	5.02	26.67	5.37	2.759	< 0.001
	b-c ridge count						
15							
	A Right hand	19.37	6.01	15.91	4.51	3.857	< 0.001
	B Left hand	17.42	5.25	16.14	4.69	1.523	> 0.1
	c-d ridge count						
16							
	A Right hand	25.91	5.23	22.82	5.61	3.438	< 0.001
	B Left hand	23.28	5.81	21.62	5.81	1.725	> 0.5

Table 3. Sex wise distribution of study subjects by both hands of female controls and diabetics.

S. No.		Controls		Diabetics		't' TEST	'p'factor
	Variables	Mean	S.D	Mean	S.D		
1	Ulnar loop	41.2	9.72	41.5	10.55	0.066	< 0.9
2	Radial loop	1.5	0.933	0.7	0.199	0.842	< 0.8
3	Simple arch	2.3	1.79	5.7	3.73	2.599	> 0.02
4	Tented arch	-----	-----	0.4	1.23	2.649	< 0.01
5	Simple whorl	13.8	7.37	10.5	7.72	0.976	< 0.3
6	Spiral whorl	11.2	7.2	8.9	4.98	0.833	< 0.4
7	Double pocket whorl	8	1.1	11	1.6	0.488	< 0.6
8	Composite whorl	-----	-----	0.8	0.7	3.636	< 0.001
9	TFRC	93.74	24.96	110.94	32.59	3.51	< 0.001
10	AFRC	122.54	43.7	139.52	52.6	2.078	< 0.05
11	ATD angle						
A	Right hand	42.32	4.27	42.61	6.07	0.329	< 0.7
B	Left hand	43.25	7.37	40.06	5.57	2.863	> 0.01
12	DAT angle						
A	Right hand	57.67	6.06	61.6	6.49	3.704	< 0.0001
B	Left hand	55.2	6.86	62.17	9.26	5.069	< 0.0001
13	ADT angle						
A	Right hand	78.61	6.189	75.81	5.72	2.788	< 0.01
B	Left hand	77.71	5.31	78.49	6.02	0.67	> 0.5
14	a-b ridge count						
A	Right hand	28.72	3.7	25.02	3.84	5.873	> 0.001
B	Left hand	29.82	4.74	24.77	3.88	6.91	< 0.0001
15	b-c ridge count						
A	Right hand	19.15	5.8	14.15	3.47	6.939	< 0.0001
B	Left hand	18.15	5.16	14.91	3.96	4.019	< 0.0001
16	c-d ridge count						
A	Right hand	21.7	4.74	26.35	5.16	5.56	< 0.0001
B	Left hand	20.88	5.38	24.32	6.32	3.499	< 0.001

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OBSERVATIONS

In the present study there was higher incidence of variation in means of ulnar loops (83.2), composite whorl (1.8), Total finger ridge count (TFRC (108.6), Absolute finger ridge count (AFRC (138.55), and DAT angles of right hand (59.77) and left hand (62.3) in diabetics than in controls, when compared with that of controls with a mean of (81.6) for ulnar loops, (0.4) for composite whorl, (95.5) for TFRC, (122.1) for AFRC and (56.86), (55.91) for DAT angles of right and left hands. Rest of the parameters was low in diabetics than in controls (Table 1).

One can see fig.1 showing hand print of male diabetic. There is an increase in means of ulnar loops (41.6) (Fig.2), radial loops (1.7), TFRC (106.25), AFRC (137.58) and ATD angle of right hand (41.68) and left hand (41.67), DAT angles of left hand (62.42), and ADT of right hand (80.45) in male diabetics than in controls with ulnar loops (40.4), radial loops (0.8), TFRC (97.25), AFRC (121.65), ATD angle of right hand (39.15) and left hand (40.92), DAT of left hand (56.62), ADT of right hand (78.38). Rest of the parameters in diabetic patients are lower than in controls (Table 2).

Figure 3 showing hand print of female diabetic. There is significant increase in simple arches (5.7) (Fig.4), TFRC (110.94), AFRC (139.52), DAT angles of both hands right (61.6) and left (62.17) in female diabetics than in controls with means of simple arch (2.3), TFRC (110.94), AFRC (139.52) and DAT angles of right hand (57.67), left (55.2). Rests of the parameters of diabetics are lower than in controls (Table 3)

DISCUSSION

Verbov (1973) in his study found increased arch pattern in female diabetics only. Sant (1983), reported a significant increase in the frequency of whorls and decrease in ulnar loops in diabetics of both sexes and found a significant increase in arch pattern in female diabetes only. In the present study there is also higher incidence of arch pattern in female diabetics. Vera (1995), in his study with 158 Insulin Dependent Diabetes Mellitus (IDDM) children with limited joint mobility found higher frequency in the number of arches. Ravindranath (1995) in his study with 150 NIDDM patients found increase in ulnar loops and radial loops and decrease in whorls in diabetics of both sexes. In present study higher incidence of variations are seen in ulnar loops, simple arch, composite whorl and double pocket whorl in diabetics than in controls.

Barta (1978), in his study with 90 children and 180 adults, found that a high TFRC value was more in both

girls and boys with diabetes mellitus than in controls. In present study there is a significant increase in TFRC and AFRC in diabetics than in controls of both sexes. Rajanigandha *et al.*, (2006) in 112 Non Insulin Dependent Diabetes Mellitus (NIDDM) patients found the presences of wider ATD angles as more reliable indicator. In the present study higher incidence of ATD angles in males is observed. Higher incidences of DAT angles are found on right hand and left hand of both sexes.

In female diabetics there is increased incidence of simple arch pattern. Increased incidences of TFRC and AFRC has been observed both in male and female diabetics. Increased incidences of ATD angle is observed in male diabetics than in control. No significant features are recorded for ATD angles in female diabetes and in control. Though dermatoglyphics generally do not play any major role in clinical diagnosis, yet it can serve as an icon to select individuals from a larger population or further investigations to confirm or rule out diabetes mellitus.

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