

Dermatoglyphics and Health

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ABSTRACT

Dermatoglyphics is a growing discipline and its easy and ready applicability renders it as a useful tool to the clinician. The relevance of dermatoglyphics is not to diagnose, but to prevent by predicting a disease; not for defining an existing disease, but to identify people with genetic predisposition to develop certain diseases. In the present study we try to determine significant palmar Dermatoglyphic parameters in case of sputum positive Tuberculosis, Diabetes Mellitus Type II with Essential Hypertension, Eczema, Congenital Heart Disease and Down syndrome are compared with the control group. The present study indicates that there are some genetic factors which are involved in the causation of various diseases like pulmonary tuberculosis, Diabetes Mellitus Type II Essential Hypertension & Eczema and it is possible to certain extent to predict from dermatoglyphics individual's chance of acquiring disease. Like clinical history, examination and investigations, the dermatoglyphics will play an important role revealing the genetic susceptibility to pulmonary tuberculosis. It will also be contributory in the assessment of contacts of pulmonary Tuberculosis; So that they are diagnosed and treated early.

KEY WORDS *Dermatoglyphics, Eczema finger print, palm print, Tuberculosis*

INTRODUCTION

In ancient India, palmistry, an art of fortune telling by reading the pattern of friction ridges and palmar lines, dates from about 2000 B.C.¹ Skin is one of the largest organs of the body. The skin over most of the body is relatively smooth. Friction ridges however are found on the digits, palms and soles. There are approximately 2700 ridge units per square inch of friction skin. Each ridge unit corresponds to one primary ridge. The term Dermatoglyphics [from the Greek, Derma = skin, glyphic = carvings] is the scientific term coined by Prof. Harold Cummins. The analysis of dermal ridges and their configurations by studying prints of them is called Dermatoglyphics. The term is also used as a collective name for all the features of ridged skin. The skin patterns are studied from prints or impressions.²

Tuberculosis, caused by *Mycobacterium tuberculosis*, remains a worldwide public health problem. It is one of the oldest diseases known to affect humans. Tuberculosis is not a hereditary disease; however twin studies indicate that susceptibility is an important risk factor.³ Susceptibility to pulmonary tuberculosis in India has been linked to Mannose binding protein gene.⁴ Significant association has been found between IL-1 gene clusters and host susceptibility to tuberculosis.⁵ Considering the high mortality and morbidity due to tuberculosis in our country and previous studies showed that tuberculosis and genetics are linked, this study is done in order to observe the difference in Dermatoglyphic pattern between sputum positive pulmonary tuberculosis patients and normal persons between 20-60 years age group and to determine the usefulness of Dermatoglyphics in studying the genetic susceptibility to pulmonary Tuberculosis. Thus the study can be used to predict the susceptibility to pulmonary tuberculosis.

Eczema is a pattern of inflammatory responses of the skin, which can be defined either clinically or histological. Clinically, acute eczema is associated with marked erythema, superficial papules and vesicles which easily excoriate and lead to crusts. Chronic eczema is composed of rather faint erythema, infiltration and scaling.⁶ The word eczema seems to be originated in 543AD and is derived from the Greek word eczema meaning 'to boil forth or to effervesce'. Histologically Eczema is an inflammatory skin reaction characterized by spongiosis with varying degrees of acanthosis and a superficial perivascular lymphocytic infiltrate.⁷

MATERIALS AND METHOD

Material used: Wooden table of suitable height, 'Kores' duplicating ink, Roller, White crystal bond paper, Soap, water and towel, Magnifying lens, Needle, Scale

Method: The materials to be used are stamp pad, bond paper and roller. The modified Purvis Smith method will be applied. Patients will be asked to wash both their hands with soap and water so as to remove any oil or dirt. Black

duplicating ink (Kores, Bombay) will be smeared on both hands one by one and prints will be taken by rolling the hands from wrist creases to finger tips on the roller covered with bond paper.

Fingerprints: The distal phalanges of person's hand were inked over the tile by firm pressure on the dorsum, starting from little finger. Rolled finger prints were recorded after applying uniform pressure on white bond paper as following order. [Ulnar to radial side]⁸

Palm Print: Palm prints of both hands were obtained after inking them with help of rubber roller. A white crystal bond paper was wrapped around a wooden rod placed on the table. The hand was horizontally placed against it and the rod was gradually rolled on the table. Complete palm impression, including the hollow or the palm was obtained over paper.

Collection of Data: With the help of above method, finger and palm prints of sputum positive pulmonary tuberculosis, Diabetes Mellitus Type II with Essential Hypertension & Eczema patients were obtained from:

1. BLDEU'S Shri B.M. PATIL Medical college, Hospital and Research Centre, Bijapur
2. District Tuberculosis Centre, Bijapur
3. Department of Dermatology, Venerology and Leprology.

Finger and palm prints of normal people for control were obtained from

1. Staff of BLDEU'S Shri B.M. PATIL Medical college, Hospital and Research Centre , Bijapur
2. Post Graduate residential doctors of BLDEU'S Shri B.M. PATIL Medical college, Hospital and Research Centre, Bijapur

All the data was analyzed qualitatively and quantitatively, findings of each case were recorded in separate forms.

Method of Data Collection

Sample Size:

Table 1 shows sample size.

Table no 1 Sample Size

	Study Group			Control		
	Male	Female	Total	Male	Female	Total
Tuberculosis	50	50	100	50	50	100
Diabetes mellitus type II & hypertension	40	60	100	63	37	100
Eczema	25	25	50	25	25	50

The study is carried for a period of 4 years from November 2008 to April 2012, in the age group of 20-60 years

Type of Study: The quantitative study includes total finger ridge count (TFRC), absolute finger ridge count (AFRC), mean 'atd' angle.

The **qualitative study** includes finger print patterns

(whorls, radial loops, ulnar loops and arches) and palmar pattern (simian line and Sydney line).

Statistical analysis for quantitative analysis, the arithmetic mean and standard deviation will be calculated, 'Z' test will applied. For qualitative analysis, the 'Chi' square test will applied whenever necessary.

To analyze finger pattern frequency, the fingertip pattern configurations were classified as arches (A), loops (L), whorls (W). Loops (L) were recorded as ulnar or radial depending upon the side on which it opened.

OBSERVATIONS

Development of dermatoglyphic pattern is under genetic

control. Hence qualitative and quantitative study of dermatoglyphic traits may give us a clue to the susceptibility of pulmonary Tuberculosis, type II diabetes mellitus with hypertension and eczema.

Fingertip patterns: Fingertip patterns were studied in both groups for arches (A), ulnar loops (L_u) and radial loops (L_r) and whorls (W).

Table No. 2 Frequency of Pattern in Male & Female Study Groups (tuberculosis) and Controls (Both Hand)

Pattern	Study groups		Controls		Z – test	P- Value	Inference
	No.	%	No.	%			
Arch(A)	36	3.6	37	3.7	0.11	0.91	Not Significant
Radial Loop(L_r)	46	4.6	42	4.2	0.43	0.66	
Ulnar Loop(L_u)	407	40.7	423	42.3	0.72	0.47	
Whorl(W)	511	51.1	498	49.8	0.58	0.56	

Table No. 3 Frequency of Patterns in Male & Female Study Groups (diabetes Mellitus Type II & Hypertension) and Controls (Both Hand)

Pattern	Study groups		Controls		P- Value	Inference
	Male	Female	Male	Female		
Arch(A)	18	16	14	04	P<0.05	Significant
Radial Loop (L_r)	05	09	04	11		
Ulnar Loop(L_u)	237	316	350	222		
Whorl(W)	140	259	262	133		

Table no. 2 Whorls were predominantly seen in patients as compared to controls, while Arches were the least common pattern seen. But this difference is not statistically significant.

Table no. 3 Diabetes Mellitus type II & Hypertension increase in number of arches and loops while decrease in number of ulnar loops and whorls in male study group when

compared to controls with both hands combined. In female increase in number of arches, ulnar loops and whorls while decrease in number of radial loops in study group when compared to controls with both hands combined.

Table No. 4 Ulnar loops were predominant pattern seen in patients as compared to controls. While Radial loops were the least common pattern. Whorls were statistically

Table No. 4 Frequency of Patterns in Male & Female Study Groups (eczema) and Controls (Both Hand)

Pattern	Study groups		Controls		Z – Test	P- Value	Inference
	No.	%	No.	%			
Arch(A)	21	4.2	17	3.4	0.7	P>0.05	Significant WITH WHORLS
Radial Loop(L _r)	13	2.6	13	2.6	00	P>0.05	
Ulnar Loop(L _u)	312	62.4	287	57.4	1.6	P>0.05	
Whorl(W)	154	30.8	183	36.6	2.0	P<0.05	

Table No. 5 Presence of Sydney Line

		Hands	Study Groups	Controls	Z –	P-	Inference
			(%)	(%)	test	Value	
Tuberculosis	Male	Right	00	00	00	-	Not
		Left	01(2%)	00	1.00	0.31	Significant
	Female	Right	00	00	00	-	Not
		Left	00	00	00	-	Significant
Diabetes Mellitus type II & Hypertension	Male	Right	00	00	00	-	Not
		Left	01.01	00	00	-	Significant
	Female	Right	00	00	00	-	-
		Left	00	00	00	-	
Eczema	Male	Right	04	04	0	-	Not
		Left	04	00	1.03	P>0.05	Significant
	Female	Right	04	00	1.03	P>.05	Not
		Left	00	00	00		Significant

Table No. 6 Presence of Simian Line

		Hands	Study Groups (%)	Controls (%)	Z – test	P-Value	Inference
Tuberculosis	Male	Right	00	00	-	P>0.05	NS
		Left	02(4%)	00	1.42		
	Female	Right	00	00	00	P>0.05	NS
		Left	00	00	00		
Diabetes Mellitus type II & Hypertension	Male	Right	04(4.04%)	02		P>0.05	NS
		Left	06(6.06%)	02			
	Female	Right	04(4.04%)	03(3.03%)		P>0.05	NS
		Left	12(12.12%)	04(4.04%)		P<0.05	Significant
Eczema	Male	Right	04	00	1.03	P >0.05	NS
		Left	00	00	00		
	Female	Right	04	00	1.03	P >0.05	NS
		Left	04	00	1.03		

Table No.7 Mean Total Finger Ridge Count (tfr) in Study Group

	Study Groups		Controls	Z – Test	P-value	Inference
	Mean (SD)	Mean (SD)	Mean (SD)			
Tuberculosis	131.43(43.44)		127.46 (26.40)	11.01	P< 0.001	Highly Significant
DM & Hypertension	Male	121.9(39.88)	134.98(42.68)	1.58	P>=0.1141	Not significant
	Female	132.68(40.83)	126.19(35.1)	0.83	P>=0.4066	Not significant
Eczema	77.95(20.01)		69.21(24.12)	2.83	P< 0.05	Significant

Table No.8 Mean Absolute Finger Ridge Count (Afrc) in Study Group

	Study Groups		Controls	Z –	P- Value	Inference
	Mean (SD)		Mean (SD)	Test		
Tuberculosis	168.15(46.98)		161.37(24.10)	18.80	P< 0.001	Highly Significant
DM &	Male	157.77(78.89)	186.35(80.62)	1.77	P>=0.07677	Not Significant
Hypertension	Female	181.55(73)	156.13(62.74)	1.79	P>=0.07	Not Significant
Eczema	101.42(46.45)		93.77(42.24)	1.12	P>.05	Not Significant

Table No. 9 Mean 'atd' Angle

		Hands	Study Groups	Controls	Z –	P-Value	Inference
			(SD)	(SD)	test		
Tuberculosis	Male	Right	40.58(5.66)	42.68(6.51)	4.11	P< 0.001	Highly Significant
		Left	41.08(5.23)	43.84(6.76)	5.39		Significant
	Female	Right	39.58(5.11)	43.20(6.55)	7.09	P< 0.001	Highly Significant
		Left	42.14(8.60)	44.36(7.08)	4.35		Significant
Diabetes Mellitus type II & Hypertension	Male	Right	41.98(6.44)	41.03(5.6)	0.78	P>=0.43	Not Significant
		Left	41.28(4.92)	41.76(5.93)	0.45		P>=0.77
	Female	Right	40.38(3.71)	40.73(4.15)	0.42	P>=0.67	Not Significant
		Left	40.60(4.04)	41.75(5.29)	1.14		P>=0.25
Eczema	Male	Right	41.92(5.1)	41.56(4.2)	0.44	P< 0.05	Significant
		Left	38.96(4.2)	41.64(5.2)	2.31		
	Female	Right	40.0(4.2)	40.80(6.1)	1.4	P> 0.05	Significant
		Left	39.20(4.4)	46.36(3.9)	5.9	P< 0.05	ith left hand only

significant that is, percentage of whorls was less in cases as compared to controls.

Table No. 5 Sydney crease is very rare. Only 1 patient had it among study group of Tuberculosis and Diabetes Mellitus type II & Hypertension, while in controls it was not present in any subject. Only Eczema patients show the Sydney crease but it was also rare finding. This finding was statistically not significant.

Table No. 6 Simian line is very rare; no controls had it except few. Among study group left hand of female with diabetes mellitus had maximum simian lines, this difference was not statistically significant. No significant difference was seen in remaining all study groups.

Table No. 7 Mean Total Finger Ridge Count (TFRC) in study group was higher i.e. 131.43 with S.D. of 43.44 as compared to control group which had TFRC of 127.46 with S.D. of 26.40. This difference was highly statistically significant in tuberculosis. Males with diabetes mellitus type II and hypertension showed decrease in mean total finger ridge count. Females showed increase in mean TFRC but difference is not statistically significant. TFRC in study group of eczema was higher as compared to control group. This difference was statistically significant.

Table No. 8 Mean Absolute Finger Ridge Count (AFRC) in study group of tuberculosis was higher 168.15 with S.D. of 46.98 as compared to control group which had AFRC 161.37 with S.D. of 24.31. This difference was highly statistically significant. In patients with diabetes mellitus type II & hypertension and eczema AFRC difference was not statistically significant.

Table No. 9 Mean 'atd' angle in tuberculosis patients was lesser than that of controls. This difference was statistically significant. Mean 'atd' angle was lesser in patients with diabetes mellitus type II & hypertension when compared with controls; this difference was statistically not significant. Mean 'atd' angle in both the hand of female patients was lesser than that of controls. This difference was statistically significant with left hand only.

DISCUSSION

Several observations suggest that genetic factors play a key role in innate non-immune resistance to infection with *Mycobacterium tuberculosis*. In mice a gene called *Nramp1* has a regulatory role in resistance/susceptibility to *Mycobacterium tuberculosis*. The human homologue *NRAMP1*, cloned to chromosome 2q, may have a role in

determining susceptibility to tuberculosis as is suggested by a study among West Africans.¹⁰ Heredity plays an important role in the formation of dermatoglyphics patterns. Considering the high mortality and morbidity due to tuberculosis in our country and studies showed that tuberculosis and genetics are linked, this study is done in order to observe the difference in dermatoglyphic pattern between sputum positive pulmonary tuberculosis patients, Diabetes Mellitus type II & Hypertension and eczema with normal subjects between 20-60 years age group and to determine the usefulness of dermatoglyphics in studying the genetic susceptibility to pulmonary tuberculosis, Diabetes Mellitus type II & Hypertension and eczema. Thus the study can be used to predict the susceptibility to pulmonary tuberculosis; Diabetes Mellitus type II & Hypertension and eczema. The relevance of dermatoglyphics is not to diagnose, but to prevent by predicting a disease; not for defining an existing disease, but to identify people with genetic predisposition to develop certain diseases.¹¹

Krishnan M et al studied dermatoglyphics of tuberculosis patients and found arches as the least common pattern i. e. in 3% of the patients while in controls it was 8.2%.¹²

Babu S et al studied dermatoglyphics of tuberculosis patients and found that arches were very much reduced in the study group (3.3%) while in controls found to be 11.3%. But these differences were not statistically significant. According to study by Babu S et al TFRC in the controls was 99.8 ± 6.18 and in patients it was 112 ± 7.36 . The mean TFRC was higher in study group and this difference was statistically highly significant ($P < 0.02$). According to study by Babu S et al, AFRC in the controls was 122 ± 18.9 and in patients it was 180 ± 50.6 . The mean TFRC was higher in study group and this difference was statistically highly significant ($P < 0.05$).¹³

Pour-Jafari H studied dermatoglyphics of eczema patients and found that arches were very much reduced in the study group (6.46%).¹⁴

In ancient India, palmistry, an art of fortune telling by reading the pattern of friction ridges and palmar lines dates from about 2000 B.C.¹⁵

Dermatoglyphics has been studied extensively in chromosomal disorders, single gene disorders and those disorders whose genetic basis is not clear. Dermatoglyphic studies have proved quite useful at least in three fields medico-legal, anthropological and clinical.

Dermatoglyphics is a growing discipline and its easy and ready applicability renders it as a useful tool to the clinician. The relevance of dermatoglyphics is not to diagnose, but to prevent by predicting a disease; not for defining an existing disease, but to identify people with genetic predisposition to develop certain diseases.¹⁶

Heredity plays an important role in the formation of dermatoglyphics patterns. The inheritance of dermatoglyphic traits was initially studied by Galton in 1892, Wilder in 1902, Penrose in 1954 and Holt in 1968.¹⁷

Eczema is not a hereditary disease however twin studies indicate that susceptibility is an important risk factor. Susceptibility to eczema has been related to Multiple foci linked on chromosomes are identified, such as 1q21, 3p24-22, 3q21, 3q14, 4p15, 5q, 13q14. A number of candidate genes have been implicated in eczema. They fall in two groups. Those related to physical epidermal barrier formation/homeostasis, named as Filaggrin, Stratum corneum chymotrophic enzyme, serine protease inhibitor, Cystatin A, Collagen XXIX alpha 1. Second type is genes mainly related to immune signaling, such as Toll-like receptor 2, Cytotoxic T Lymphocyte associated-4/Interleukin-4, Interleukin-18.¹⁷

CONCLUSIONS

The analysis revealed the following findings:

Significant findings in qualitative and quantitative analysis of both sexes of sputum positive pulmonary tuberculosis were:

1. The mean 'atd' angle was lower in study group.
2. The Mean Absolute Finger Ridge Count (AFRC) in study group was higher
3. The Mean Total Finger Ridge Count (TFRC) in study group was

No Significant difference was noted in following parameters:

1. Whorls
2. Sydney line
3. Simian line

Significant findings in qualitative and quantitative analysis of both sexes of type II diabetes mellitus with hypertension were;

1. Presence of decreased whorls
2. Presence of increased ulnar loops and whorls

3. Presence of increased simian line in the left hand of patients

No Significant difference was observed in case of either hand, combined or separate, in both sexes in the following parameters;

1. Total Finger Ridge Count (TFRC)
2. Absolute Finger Ridge Count (AFRC)
3. Sydney line
4. Fingertip pattern with both hands separate

Significant findings in qualitative and quantitative analysis of both sexes of eczema:

1. The mean 'atd' angle was lower in study group.
2. The Mean Absolute Finger Ridge Count (AFRC) in study group was higher
3. The Mean Total Finger Ridge Count (TFRC) in study group was higher

No Significant difference was noted in following parameters:

1. Ulnar loops were the predominant pattern in study group
2. Sydney line
3. Simian line

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