

Study of palmar dermatoglyphics in vitiligo and normal individuals

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Abstract: *Background & Objective:* Vitiligo is a common idiopathic & hereditary disease characterized by one or more patches of de-pigmented skin due to degeneration or disappearance of cutaneous melanocytes. Variations in dermatoglyphic pattern are noted in many genetic & hereditary disorders. Altered dermatoglyphics pattern is well established as a diagnostic aid in such disorders. Early diagnosis is also possible. Therefore this Study was conducted to analyse dermatoglyphic patterns in Vitiligo cases & their deviations from normal individuals & to find out any existence of specific dermatoglyphic pattern in Vitiligo cases. *Method:* Study conducted across 100 Vitiligo cases and 100 normal individuals. Finger tips and palmar prints were studied. *Result:* Finger tips pattern of Vitiligo males showed increased loop patterns on 2nd, 3rd & 4th finger tips of both hands. There is an overall highly significant diminution in whorl pattern in hands of males. Arch pattern is shown in all finger tips of female cases exceedingly. The main line formula evidenced in Vitiligo cases is 7 6 5' & while as reference sample 11 9 7 in both sexes. Distal displacement of axial triradius is increased significantly in left hands of female cases. ATD angle is reduced significantly in male vitiligo cases. Classical distribution formula for palmar pattern frequency is altered as the pattern frequency is increased in hypothenar & ID2 of right hands of vitiligo males while as hypothenar & ID1 in right hands of vitiligo females. *Conclusion:* Deviations in dermatoglyphic pattern might be a marker for individual diagnosis of vitiligo & a simple & inexpensive means to determine the disease which have hereditary background & can be employed as a method for screening Vitiligo.

Keywords: Dermatoglyphics, Vitiligo, deviations, loops, arch, whorl.

Introduction

About Vitiligo: Being commonest type of leucoderma, vitiligo signifies loss of skin colour & appearance of patches, greatly in extent, without affecting skin texture, resulting in cosmetic disfigurement & cause social inhibition in the vitiligo cases. Worldwide distribution is 1-4% [1] while in India is as high as 8.8% [2], in states like Gujarat, Rajasthan its prevalence is epidemic affecting all races & sexes [3]. Commonest age of onset is before 40 years [4-5]. Prevalence of familial vitiligo varies from 28-35% [6]. About 20% of vitiligo patients have at least one 1st degree relative & risk of vitiligo for 1st degree relative is increased by 10 fold [7].

Vitiligo is a progressive disorder, may become stationary, affecting small areas initially and may progress steadily to involve extensive areas

involving entire skin surface & hair. Hereditary disease governed by set of alleles, situated at several unlinked autosomal dominant loci which are involved in oxidative stress, melanin synthesis, auto immunity that could collectively confer this phenotype [7].

Vitiligo involves environmental & genetic factors that could ultimately contribute to melanocyte destruction, resulting in the characteristic depigmented lesions without affecting structural change in the skin & hair may or may not be affected [8]. In India there is a stigma associated with vitiligo affected individuals & their families, they are ostracised for marital purpose [9].

From Hereditary Perspective: Study on twins & families affected by vitiligo evidenced

genetic basis of vitiligo & pattern of depigmentation is determined genetically. Bleehen & Ebling [5] stated that vitiligo may be inherited as autosomal dominant trait without any sex predomination.

About Dermatoglyphics: Skin of palm & sole is specialised. Basal layer shows more pronounced undulations & pattern known as ridges & furrows which produce finger prints & palm feet & toes prints. This ridge structure is never influenced by age or environmental factors [10]. By the end of 2nd trimester dermatoglyphic pattern completely develops & never alters thereafter [10]. Galton [11] studies evidenced that ridge patterns are under genetic influence. Abnormality in genes would alter the dermatoglyphic pattern in individuals.

This fact provides basis for utilising dermatoglyphic in study of medical genetics. It is a simple & inexpensive tool for determining genetic abnormality & can be used as supportive diagnosis for definitive diagnosis [12]. Dermatoglyphic study had been proven to be of great use in predicting possibility of inheriting hereditary disease in patients. Considering above observation present paper is devoted to study these morphological characteristics in dermatoglyphics of group of subjects suffering from vitiligo.

Aims & Objectives

1. To analyse finger & palmar dermatoglyphic pattern in vitiligo
2. To provide evidence of sexual & digital difference in dermatoglyphic pattern in vitiligo cases
3. To compare dermatoglyphic pattern in vitiligo & normal persons.

Material and Methods

Present study is conducted in northern Karnataka region during 2010-2013. 100 clinically diagnosed cases of vitiligo aged between 20-50 years, out of which 50 were males & 50 female, were investigated for dermatoglyphics. Same sample size for control group who were free from any skin disease or genetic disease was also investigated. Consent had been taken from all the

persons. On individual enquiry we found that 35% of vitiligo cases have hereditary background.

Method applied here is Cumin & Midlo [13] ink method, here pre inked strips (K9 scene of crime equipment limited, Northampton NN1) were used. After taking consent ink was applied to fingers palms of both the hands with roller. Then prints were taken on white paper & observed.

Results

200 prints of finger tips & palm, of 100 vitiligo cases & 100 normal individuals were observed. Their dermatoglyphics pattern is compared with same number of control group, observed & analysed for following parameters according to side, sex, also both sides & both sex together. Qualitatively fingerprints were analysed through Whorls, Loops & Arches. Quantitatively palmar & finger prints were analysed through TFRC, AFRC, Main Line Formula, Position of axial triradius, ATD angle & pattern frequency of palm.

Finger tips pattern: Vitiligo male patients evidenced significant increase percentage (67%) of loop patterns in both hands (Table.2) as compared to control group (57%) particularly in 2nd, 3rd & 4th both finger tips (Table.1). Vitiligo females show reduced percentage of loop patterns in both hands as compared to control group. About the specific expression of ulnar/radial loops; vitiligo & control groups are showing ulnar loops in equal frequencies, noticeable difference we could get is radial loops in left hands of vitiligo male & female cases (85.7% & 40.0%) have been increased as compared left hands of both sex of control group (62.5% & 15.38%).

Whorl pattern is very significantly reduced in male vitiligo group. While female vitiligo cases show significant increased whorl pattern specifically in 4th & 5th fingertips of both hands as compared to normal group (Table.1). Arches increased in vitiligo females group especially in 1st fingertip of both hands.

Table-1: Frequency and Percentage distribution of finger tip patterns among Vitiligo and Control

Digits	FTP	Males			Females		
		Right	Left	Total	Right	Left	Total
		Co V	Co V	Co V	Co V	Co V	Co V
I.	L	23 25	24 22	47 47	34 24	30 25	64 49
	W	26 25	25 28	51 53	15 18	18 17	33 35
	A	1 0	1 0	2 0	1 8	2 8	3 16
II.	L	21 38	25 38	46 76	32 21	22 25	54 46
	W	27 10	22 09	49 19	11 19	19 15	30 34
	A	2 2	3 3	5 5	7 10	9 10	16 20
III.	L	33 44	32 41	65 85	42 39	35 36	77 75
	W	16 5	16 6	32 11	8 7	9 9	17 16
	A	1 1	2 3	3 4	0 4	6 5	6 9
IV.	L	17 24	22 28	39 52	34 28	36 30	70 58
	W	32 26	27 22	59 48	15 21	12 17	27 38
	A	1 0	1 0	2 0	1 1	2 3	3 4
V.	L	44 37	45 41	89 78	46 41	48 39	94 80
	W	6 12	5 8	11 20	3 7	2 9	5 16
	A	0 1	0 1	0 2	1 2	0 2	1 4

FTP-Finger Tips Pattern, Co-Control, V-Vitiligo

Table-2: Frequency and Percentage distribution of finger tip patterns among Vitiligo and control

Group	Sex	Side	Whorls		Arches		Loops	
			No.	%	No.	%	No.	%
Vitiligo	M	R	78	31.2	4	1.6	168	67.2
		L	73	29.2	7	2.8	170	68
		R+L	151	30.2	11	2.2	338	67.6
	F	R	72	28.8	25	10	153	61.2
		L	67	26.8	28	11.2	155	62
		R+L	139	27.8	53	10.6	308	61.6
Control	M	R	107	42.8	5	2	138	55.2
		L	95	38	7	2.8	148	59.2
		R+L	202	40.4	12	2.4	286	57.2
	F	R	52	20.8	10	4	188	75.2
		L	60	24	19	7.6	171	68.4
		R+L	112	22.4	29	5.8	359	71.8

M-Male, F-Female, R-Right, L-Left

Absolute finger ridge count & Total finger ridge count: Vitiligo males & females show increased frequency of AFRC (Table.3) in range of 150-175 (34% & 14% respectively) as compared to normal males & females (16% & 8%), range of 176-200 decreased in both sex of vitiligo

cases(12% & 12%) as compared to normal cases (18% Vs 22%). However the mean value of all ranges of AFRC shows no significant difference (Table. 3). TFRC in ranges of 101-125 & 126-150 is increased in vitiligo males, as compared to normal males

(Table.3). Female vitiligo cases show reduced frequency (8% &16%) of TFRC in same range, as compared to normal female group (16% & 32%).

However the mean value (Table.3) of all ranges of TFRC shows no significant difference.

		Vitiligo	Normal	t value	p value
Mean AFRC	Male	166.14	188.16	1.840	>0.05
	Female	167.16	165.32	0.891	>0.05
Mean TFRC	Male	131.42	137.36	0.998	>0.05
	Female	126.08	131.9	0.681	>0.05

NM-Normal Male, VM-Vitiligo Male, NF-Normal Female, VF-Vitiligo Female

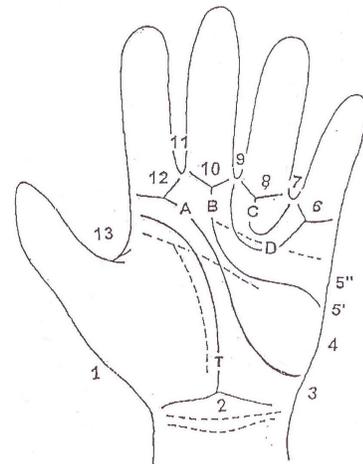
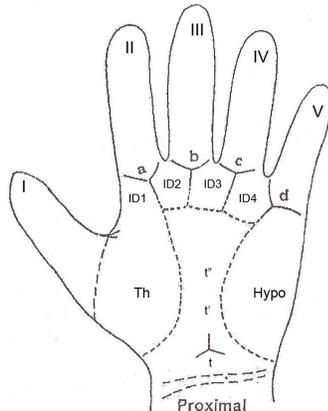
Index	Sample	Male			Female			Total
		Right	Left	R+L	Right	Left	R+L	
MLF 1197	V	21	20	20	12	12	12	16
	C	24	23	23	26	27	26	25
7 6 5'	V	21	23	22	42	42	42	32
	C	13	13	13	11	11	11	12
PAT to	V	50.00	50.00	56.76	50.00	50.00	43.24	74.00
	C	50.62	49.38	51.27	49.35	50.65	48.73	79.0
t'	V	50.00	50.00	35.00	50.00	50.00	65.00	20.0
	C	44.44	55.56	45.00	63.64	36.36	55.00	10.0

V- Vitiligo, C-Control

Main Line formula: Main line formula is the termination of main lines (Fig. I), indicating the course of the main lines. It was observed that 7 6 5' formula is expressed more frequently by vitiligo individuals while as 11 9 7 formula is exhibited by control group (Table.4). Vitiligo group is showing less curving of the Main lines.

Figure-2: Showing numerical values used to designate termini of Main Lines

Figure-1: Showing Palmar Pattern Configuration and Palmar Areas with Palmar Triradii



Position of axial triradii (Figure II): Positioning of axial triradii are almost same in normal & vitiligo individual however left hand of vitiligo females show significant increased frequency of axial t' triradii (table.4).

Number of triradii (Figure II): 5 triradii are observed equally in palms of both groups, but increased percentage of 6 palmar triradii are observed in vitiligo female cases as compared to normal female group (Table.5). However this altered pattern is not significant.

ATD Angle: There is a slight difference in ATD angle of male vitiligo cases as compared to normal males, but left hand of vitiligo females show significant increase in ATD angle as compared to left hand of normal females (Table.6).

Table-5: Frequency and percentage distribution of palmar triradii in Vitiligo and Control group

No. of Palmar Triradii	Vitiligo						Control					
	Right		Left		Total		Right		Left		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
4	4	4	4	4	8	4	6	6	6	6	12	6
5	84	84	83	83	167	83.5	76	76	76	76	152	76
6	11	11	12	12	23	11.5	17	17	18	18	35	17.5
7	1	1	1	1	2	1	1	1	0	0	1	0.5

Table-6: ATD Angle

Group	Sex	Control(Mean)	Vitiligo (Mean)	t-value	d.f	P-value
Right	M	43.04	39.66	3.876	48	<0.0002*
	F	41.72	40.70	1.032	48	>0.05
Left	M	43.16	40.26	3.107	48	<0.0002*
	F	40.66	41.88	1.169	48	>0.05
Total		42.46	40.32	4.493	98	<0.0001*

*Indicates significant difference

Table-7: Percentage distribution of palmar pattern frequency

Group	Sex	hyothnar		thenar		ID1		ID2		ID3		ID4	
		C	V	C	V	C	V	C	V	C	V	C	V
Right	M	20	12.5	2.2	2.9	5.4	2	0	6.1	27.2	25.0	28.2	25.5
	F	11.1	18	3.1	0.7	5.1	0.8	0	0.1	25.1	22.3	24.6	24.2
Left	M	9	13.7	4.3	2.5	0.7	2	0.8	7.2	16.8	20.0	30	28.4
	F	16.6	15	0.8	3.2	0.5	1.6	4.7	1.5	24	18.3	26.6	22.3

ID- Inter digital Area, C-Control, V-Vitiligo, M-Male, F-Female

Classical distribution formula in palm (Figure II): Inter digital area I shows reduced pattern frequency in right hands of vitiligo male & female. Inter digital area 2 is spectacularly increased in vitiligo male cases (Table.7), hence Classical distribution formula changes in vitiligo male to IV>III>Hyp>II>The>I instead of IV>III>Hypo>I/The>II, whereas vitiligo female show same palmar pattern frequency as that of control group i.e IV>III>Hypo>I/The>II.

significance. Thus we can utilise these anomalies sensibly to differentiate from control group. Differences in this anomalies in vitiligo affected males & females are less expressed.

Study showed higher ratios of Loops in 2nd, 3rd & 4th finger tips of both hands in males. Our finding matches with Shashrabudhe et al [14]. About the specific presentation of loops; We found that radial loops are expressed more in left hands of vitiligo affected male & female cases as compared to left hands of both sexes of control group. Ulnar loop is not showing difference, it is been equally expressed in right hands of both groups & both sexes.

Discussion

Study of Palmar dermatoglyphics of vitiligo affected individuals has evidenced some changes as noticed by 6 anomalies bearing deep clinical

Our study does not match with Kapur et al [15] & S Iqbal et al [16], who observed increased ulnar loops in vitiligo affected group, this results may be due to more sample size. We found highly significant reduction of whorl pattern in vitiligo males. Our findings correlate with findings of Iqbal et al [16]. Vitiligo affected females show increased whorl pattern in 4th & 5th finger tips of both hands. Arches are expressed well in 1st fingertip of both vitiligo hands of females. This finding correlates with findings of Kapur et al [15] though they have taken more vitiligo female sample size. Mean values of AFRC & TFRC shows no significant change although particular ratio being more.

There is less curving of Main lines in vitiligo group palms as evidenced by increased ratio of 7 6 5' main line formula. Distal triradius is increased in left hand of vitiligo females. ATD angle in both hands of vitiligo males & right hand of female vitiligo cases reduced significantly, while left hands of vitiligo affected females show increased ATD angle. This is because of distal positioning of axial triradius in left hand of vitiligo affected female cases. Classical distribution formula is altered IV>III>Hypo>II>The>I in vitiligo male group as

inter digital area 2 is significantly increased in vitiligo male cases. Our finding correlates with Bhakta et al [17], their finding is increased ID2 pattern in both hands of vitiligo male group. Vitiligo female show same palmar pattern frequency as that of control group i.e IV>III>Hypo>I/The>II.

Conclusion

To conclude with, there is existence of altered dermatoglyphics pattern with deep clinical significance in Vitiligo cases thus the above study suggested the multiple parameters to be taken into consideration for individual diagnosis of vitiligo through dermatoglyphic test, which is simple & inexpensive, as compared to usual clinical tests. Altered ratios might be marker for precocious diagnosis of vitiligo in Indian population. This study might be further employed as reference data for the study of dermatoglyphics in vitiligo in other populations.

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