

Digital Dermatoglyphics in Leprosy

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KEYWORDS Finger Print Pattern. Total Finger Ridge Count. Absolute Finger Ridge Count. Leprosy

ABSTRACT Finger print patterns of 150 leprosy patients (100 paucibacillary and 50 multibacillary leprosy) were compared with 100 controls matched accordingly. The finger print pattern such as whorls, loops, arches, total finger ridge count (TFRC) and absolute finger ridge count (AFRC) were calculated. These dermatoglyphic parameters were compared to that of the controls. It was observed that the finger print pattern showed increase in the whorls and decrease in the loops in paucibacillary leprosy patients and increase in the loops and decrease in whorls in multibacillary leprosy patients ($p < 0.001$) which is highly significant when compared to that of the control. The difference in the mean TFRC and AFRC in paucibacillary and multibacillary was also found to be highly significant ($p < 0.001$) when it was compared to the control.

INTRODUCTION

The role of dermatoglyphics is very important in the diagnosis of chromosomal disorders. Holt and Lindstein (1964) show the importance of dermatoglyphics in Turners syndrome, Schauman and Alter (1976), prove its involvement in Trisomy 18. According to Bhanu (1973), Schauman and Alter (1976) abnormal dermatoglyphic patterns have been observed in several non chromosomal and other diseases whose etiology may be influenced directly or indirectly by genetic inheritance. A study by Holt (1970) reveals its significance in Down syndrome. De Vries et al. (1976) and Shah and Agarwal (1979) have shown a genetic predisposition in leprosy. Studies by Enna et al. (1970), Kapoor and Verma (1982), Ghei et al. (1984), and Gupta et al. (1986) have shown that finger print patterns were also affected in leprosy.

The purpose of this study was to determine whether the finger print patterns have a future role in identifying persons at increased risk for leprosy.

MATERIALS AND METHODS

This study was carried out in 150 leprosy patients attending the OPD of Dermatology, Venereology and Leprology department of Goa Medical College, Bambolim, Goa. The cases of leprosy and the normal controls were selected from the Goan population. The Goan population comprises of around 55% Hindus and 45%

Christian (Roman Catholic) population. Both the cases of leprosy and normal controls were selected randomly for inclusion in this study. These patients were classified on Ridley and Jopling (1966) scale. Tuberculoid (TT) and borderline tuberculoid (BT) leprosy cases were grouped as paucibacillary leprosy. Lepromatous (LL) and borderline lepromatous (BL) cases were grouped as multibacillary leprosy.

Group I consisted of 100 paucibacillary (TT/BT) and Group II had 50 multibacillary (LL/BL) patients. These patients had no history of any other genetic disorder or hereditary diseases. They were matched with 100 controls, Group III, having no family history of leprosy or any other inheritable diseases. Finger prints were recorded with cyclostyling ink and rolled prints were taken of both hands. The finger prints were studied to classify the pattern of whorls, loops and arches. The digital patterns of both hands of paucibacillary and multibacillary patients were compared separately with those of controls.

The results were analyzed by using the student's t- test to determine the significance of difference in the finger print patterns like whorls, loops, arches as well as the TFRC and the AFRC.

RESULTS

In this study the finger print pattern of the paucibacillary (Group I) and multibacillary (Group II) leprosy patients were compared with that of the controls (Group III). The results obtained were as follows. The finger print pattern showed

predominance of whorls (69.4%) and decrease in the loops (30.3%) in paucibacillary leprosy patients, whereas the controls had decreased number of whorls (44.8%) and increased number of loops (54.7%) respectively, which is highly significant ($p < 0.001$). Since the number of arches both in the leprosy and control groups were reduced in number, the differences were statistically insignificant ($p > 0.5$) (Table 1)

In multibacillary leprosy patients, the finger print pattern showed decrease in the number of whorls (30.8%) and increase frequency of the loops (68.4%) whereas the control had increase number of whorls (44.8%) and decrease number of loops (54.7%) respectively, which is highly significant ($p < 0.001$) (Table 2).

However, when the finger print patterns of paucibacillary leprosy patients were compared with multibacillary leprosy patients, it was observed that there was increase frequency of whorls (69.4%) and decrease frequency of loops (30.3%) in paucibacillary leprosy patients ($p < 0.001$) which is highly significant, whereas there was increase frequency of loops (68.8%) and decrease frequency of whorls (30.8%) in multibacillary leprosy patients ($p < 0.001$) which is also highly significant (Table 3).

In our present study it was also observed

that the TFRC (Total Finger Ridge Count) in paucibacillary leprosy patients was 110.47 ± 73.48 and in multibacillary leprosy patients was 94.40 ± 32.32 , when compared to control 133.93 ± 55.35 , the differences were found to be highly significant ($p < 0.001$). It is also observed that the difference in TFRC between paucibacillary and multibacillary leprosy patients is also significant (Table 4).

The AFRC (Absolute Finger Ridge Count) in paucibacillary leprosy patients was 172.76 ± 59.77 and in multibacillary leprosy patients was 133.40 ± 45.93 when compared to that of the control 156.50 ± 47.27 the differences were found to be highly significant ($p < 0.001$). It is also observed that the differences in AFRC between multibacillary and paucibacillary leprosy patients is also significant ($p < 0.001$) (Table 5).

DISCUSSION

The pattern of dermal ridges and furrows are formed very early in life. Once formed they remain unchanged throughout life and vary between individuals. Walker (1958) states that the dermal ridges are of considerable clinical interest because they not only serve as a means of identification but are also affected by certain abnormalities in early development including genetic disorders.

Table 1: Percentage distribution of Whorls, Loops and Arches in the fingerprints of Paucibacillary leprosy and the control group and significance of difference of proportion.

Finger print pattern	Paucibacillary leprosy (I)			Control (III)			t value	p value
	Total fingers	Number of fingers	%	Total fingers	Number of fingers	%		
Whorls	1000	694	69.4	1000	448	44.8	11.47	<0.001
Loops	1000	303	30.3	1000	547	54.7	11.39	<0.001
Arches	1000	03	0.3	1000	05	0.5	0.71	>0.47

$p < 0.001$ -highly significant

$p > 0.5$ -not significant

t- student's test value

I - Paucibacillary leprosy

III - Control

Table 2: Percentage distribution of Whorls, Loops and Arches in the fingerprints of Multibacillary leprosy and the control group and significance of difference of proportion.

Finger print pattern	Multibacillary leprosy (II)			Control (III)			t value	p value
	Total fingers	Number of fingers	%	Total fingers	Number of fingers	%		
Whorls	500	154	30.8	1000	448	44.8	5.39	<0.001
Loops	500	344	68.8	1000	547	54.7	5.42	<0.001
Arches	500	02	0.4	1000	05	0.5	0.28	>0.78

$p < 0.001$ -highly significant

$p > 0.5$ -not significant

t- student's test value

II - Multibacillary leprosy

III - Control

Table 3: Percentage distribution of Whorls, Loops and Arches in the fingerprints of Paucibacillary leprosy and Multibacillary leprosy and significance of difference of proportion.

Finger print pattern	Multibacillary leprosy (II)			Control (III)			t value	p value
	Total fingers	Number of fingers	%	Total fingers	Number of fingers	%		
Whorls	1000	694	69.4	500	154	30.8	15.27	<0.001
Loops	1000	303	30.3	500	344	68.8	15.21	<0.001
Arches	1000	03	0.3	500	02	0.4	0.30	>0.76

p<0.001-highly significant p>0.5-not significant
t- student's test value
I-Paucibacillary II - Multibacillary leprosy

Table 4: Statistical evaluation of mean TFRC±S.D. in Paucibacillary leprosy, Multibacillary leprosy and Controls.

Group	Mean±SD	t value	p value
Paucibacillary (I)	110.47±73.48	6.9	<0.001
Multibacillary (II)	94.40±32.32	17.4	<0.001
Control (III)	133.93±55.35	-	-

TFRC-Total Finger Ridge Count
SD-Standard Deviation
t- student's test value
p<0.001-significant

Table 5: Statistical evaluation of mean AFRC±S.D. in Paucibacillary leprosy, Multibacillary leprosy and Controls.

Group	Mean±SD	t value	p value
Paucibacillary (I)	172.76±59.77	5.73	<0.001
Multibacillary (II)	133.40±45.93	9.03	<0.001
Control (III)	156.50±47.27	-	-

AFRC-Total Finger Ridge Count
SD-Standard Deviation
t- student's test value
p<0.001-significant

Studies by Enna et al. (1970), Gupta et al. (1986) reveal that there is increased frequency of whorls and decreased frequency of ulnar loops in multibacillary leprosy patients. Ghei et al. (1984) did not detect any significant changes in the pattern of whorls in leprosy patients. Ghei et al. (1989) further state that as for palmar creases pattern, there was double base crease in leprosy patients.

According to Holt (1968), the ridge count consists of the number of ridges which cut or touch a straight line running from the triradius to the core or centre of the pattern.

TFRC: Total finger ridge count is the count of the number of ridges from the triradius to the core pattern and is counted for all the digits of

both hands. Since the whorl has two triradii, maximum number of ridges from one of the two triradii to the core is counted.

AFRC: Absolute finger ridge count is the counting of all the ridges on the tip of all digits of both hands from all the triradii to the core. Since the whorl has two triradii there will be two ridge counts from the two triradii to the core.

In the present study it was observed that in paucibacillary leprosy patients there was an increase in the number of whorls and a decrease in the number of loops whereas in multibacillary leprosy patients there was an increase in the number of loops and a decrease in the number of whorls as compared to that of the control.

On analysis of the TFRC and the AFRC of both paucibacillary and multibacillary leprosy patients with that of the control, the differences were found to be highly significant.

The finger print patterns and the ridge counts associated with the paucibacillary and multibacillary leprosy patients indicate that digital dermatoglyphics may have a future role in identifying persons either with or at increased risk for leprosy (paucibacillary and multibacillary) so that preventive measures may be instituted.

CONCLUSION

The present study concludes that there is a possible genetic influence on the digital ridge patterns in leprosy patients in whom the palmar ridge patterns are otherwise significantly affected. Though a high risk population is epidemiologically identified, these studies will allow us to detect possibility of leprosy so as to enable us to take preventive prophylactic measures concerning the environmental factors. These relatively non invasive techniques could reasonably be used as genetic markers on selected non symptomatic persons as part of definitive risk assessment strategy.

ACKNOWLEDGEMENTS

The authors are grateful to the Dean Dr.V. N. Jindal for permission to publish this paper. We are also indebted to Dr. P. Shukla, Associate Professor of department of Dermatology, Venereology & Leprology for the clinical material and to Shri. M.S. Kulkarni for the statistical analysis.

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