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Dermatoglyphics: A Tool to predict Pulmonary Tuberculosis in Jammu Division

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Abstract
Background: *Dermatoglyphics, the ridged skin covering our palms and sole, are not only found on human beings, but all primates have ridged skin and it can also be found on the paws of certain mammals and on the tails of some monkey species. Palmar creases develop during the 2nd and 3rd month of intrauterine life and are not influenced by movement of hand in-utero. They are of considerable clinical interest because they are affected by certain abnormalities of early development including genetic disorders.*
Aim: *The present study is carried out to correlate the various dermatoglyphic features in patients of pulmonary tuberculosis, to compare dermatoglyphic features in normal subjects and patients of pulmonary tuberculosis.*
Materials and Methods: *The present study was conducted on 50 patients with confirmed diagnosis of sputum positive Pulmonary tuberculosis who were admitted in the Chest Disease Hospital of GMC-Jammu. 50 subjects were taken as controls and it was seen that they do not suffer from any relevant disease and are not on any relevant medication.*
Results: *The results showed that percentage of ulnar loops were more among the people of Jammu Region and the percentage of whorls dominated in patients of Pulmonary tuberculosis.*
Conclusion: *From this study we conclude that dermatoglyphics is a simple, non-expensive diagnostic aid for conditions like pulmonary tuberculosis. Presence of increase in number of whorls and arches can be used as one of the diagnostic criterion for patients with pulmonary tuberculosis.*
Keywords: *Dermatoglyphics, Pulmonary Tuberculosis, Finger Prints, Loops, Arches, Whorls.*

Introduction

All primates have ridged skin. It can also be found even on the paws of certain mammals and on the tails of some monkey species. In human and animals, dermatoglyphics are present on fingers, palms, toes and soles. This helps shed light on a critical period of embryogenesis, when the architecture of major organ system is developing [1]. The entire human body is clothed with skin which happens to be the largest and most important organ of the body. It performs many vital functions in the life of an individual. The skin on the ventral sides of the hands i.e. palm and plantar sides of the feet i.e. sole is exclusively designed and corrugated with ridges and configurations which are functionally useful as they help in the grasping without which the objects would easily slip away from the hands [2].

Dermatoglyphics have been extensively used to characterize and differentiate human population hence are highly suitable for studying population variations. Dermatoglyphic features due to its permanency, genetic influence as well as number of easily observable and measurable characters may be considered one of the most suitable parameters for population variability. Genetic studies and gene localization for human dermatoglyphs are currently ongoing. However, the inheritance modes of various genetic traits are not well understood because of the complexity of dermatoglyphic genetics [3]. Dermatoglyphics is a growing discipline and its easy and ready applicability render it as a useful tool to the clinician. Since most of the investigations needed to confirm the diagnosis in hereditary disorders are complex and expensive, dermatoglyphics can be effectively employed with other clinical signs as a screening procedure.

The present attempt is to study the dermatoglyphic variations in population of Jammu Division and their correlations with Pulmonary tuberculosis. Tuberculosis is a specific infectious disease caused by Mycobacterium tuberculosis. The disease primarily affects the lungs and causes Pulmonary tuberculosis. Tuberculosis remains a worldwide public health problem despite the fact that the causative organism was discovered more than 100 years ago and highly effective drugs and vaccine are available making tuberculosis a preventable and curable disease [4].

In India 1.8 million persons develop tuberculosis every year out of which 0.8 million are new smear positive highly infectious cases. Incidence of tuberculosis in India is 170 per 100,000 population per year. Prevalence of tuberculosis in India is185 per 100,000 population per year. Genetic contribution is one of the causes of Pulmonary tuberculosis. Susceptibility to Pulmonary tuberculosis in India has been linked to mannose binding protein gene[5]. Significant association has been found between IL-1 gene clusters and host susceptibility to tuberculosis [6, 7].

The study of dermatoglyphic patterns in patients of Pulmonary tuberculosis has been done with aim to determine whether the dermatoglyphics in patients of Pulmonary tuberculosis and of control differ or not.

Aims and Objectives

1. To analyze the prevalent pattern of Dermatoglyphics in population of Jammu Division of North India.
2. To determine prevalent Dermatoglyphic parameters in patients of Pulmonary tuberculosis.

Materials and Methods

1) The present study was conducted on 50 patients with confirmed diagnosis of sputum positive Pulmonary tuberculosis who were admitted in the Chest Disease Hospital, Government Medical College, Jammu.
2) 50 subjects were taken as controls and it was seen that they do not suffer from any related disease.

The materials used for the study were: Kores printer ink, Clean glass slab, Bond paper, Rubber roller, Magnifying lens, Soap, Cotton swabs, Scale, Pointer. After taking informed consent from the subjects, they were asked to wash their

hands with soap and water so as to remove any oil or dirt. Standard Indian ink method was used for taking impressions with Kores duplicating ink. A small drop of duplicating ink was squeezed out on a glass slab and spread on it evenly by rolling the roller over the ink on the slab so that a thin layer was formed. Fingertip of both the hands were impregnated with ink, one by one, by placing the finger on its edge on the slab and then rolling it over gently to the other edge by applying continuous correct pressure. After the fingers were inked, rolled impressions were taken on A4 sheet of bond paper one by one. Rolled fingerprints were taken because they show the full pattern area. The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens, scale and ridge counting was done with the help of sharp needle. The qualitative parameters observed were the types of patterns of individual digit or finger i.e. loop, arch, whorl and composite. The quantitative parameter observed were: 1. The ridge counts of individual fingers of both right and left hands. 2. Total finger ridge count. For finger ridge counting, the basic dermatoglyphic landmarks were considered i.e. triradius and core. A triradius is formed by confluence of three ridge systems and core is the approximate centre of the pattern.

Results

In present study all the data obtained from both Pulmonary tuberculosis group and controls were analysed qualitatively and quantitatively then depicted in the form of tables and graphs as under.

Table 1: Distribution of Pattern types in Control Group (n=50) in the right, left and both hands

Pattern Type	Right Hand Digits (n=50*5=250)		Left Hand Digits (n=50*5=250)		Both Hand Digits (n=50*10=500)	
	No.	%age	No.	%age	No.	%age
Arches	21	8.40	27	10.80	48	9.60
Radial Loops	60	24.0	36	14.4	96	19.20
Ulnar Loops	100	40.0	142	56.8	242	48.4
Whorls	67	26.8	45	18.0	112	22.40
Composite	2	0.80	0	0	2	0.40
Total	250	100	250	100	500	100

In the frequency distribution of pattern in Control group, ulnar loops (100; 40.0%) had the highest occurrence in the right hand digits, followed by whorls (67; 26.8%). Similarly, in the left hand digits, ulnar loops (142; 56.8%) had the highest occurrence followed by whorls (45; 18.0%). Taking average of ten fingers, overall 24.2 (48.4%) had ulnar loops, 11.2 (22.40%) had whorls, 9.6 (19.20%) had radial loops, 4.8 (9.60%) had arches and 0.02 (0.40%) subjects had composite type of pattern among control group.

Fig 1. Bar Chart Showing distribution of Pattern types in Control group in the right, left and both hands

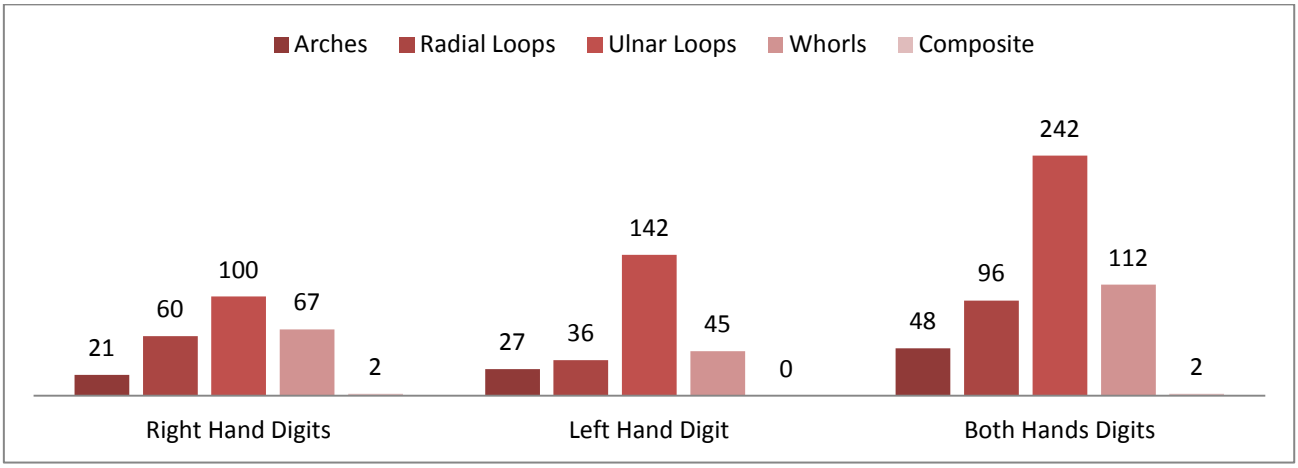

Table 2: Distribution of Pattern types in Pulmonary Tuberculosis Group (n=50) in right, left and both hands

Pattern Type	Right Hand Digits (n=50*5=250)		Left Hand Digits (n=50*5=250)		Both Hand Digits (n=50*10=500)	
	No.	%age	No.	%age	No.	%age
Arches	7	2.80	10	4.00	17	3.40
Radial Loops	37	14.80	31	12.4	68	13.60
Ulnar Loops	84	33.6	87	34.8	171	34.20
Whorls	122	48.80	119	47.6	241	48.20
Composite	0	0	3	1.20	3	0.60
Total	250	100	250	100	500	100

In the frequency distribution of pattern in Pulmonary tuberculosis group, whorls 122 (48.80%) had the highest occurrence in the right hand digits, followed by ulnar loops 84 (33.60%). Similarly in the left hand digits, whorls 119 (47.6%) had the highest occurrence, followed by ulnar loops 87 (34.8%). Overall whorls (241; 48.20%) had the highest occurrence in Pulmonary tuberculosis group followed by ulnar loops (171; 34.20%) while composite pattern had (3; 0.60%) least occurrence.

Fig 2. Bar Chart showing distribution of pattern types in Pulmonary tuberculosis group in the right, left and both hands.

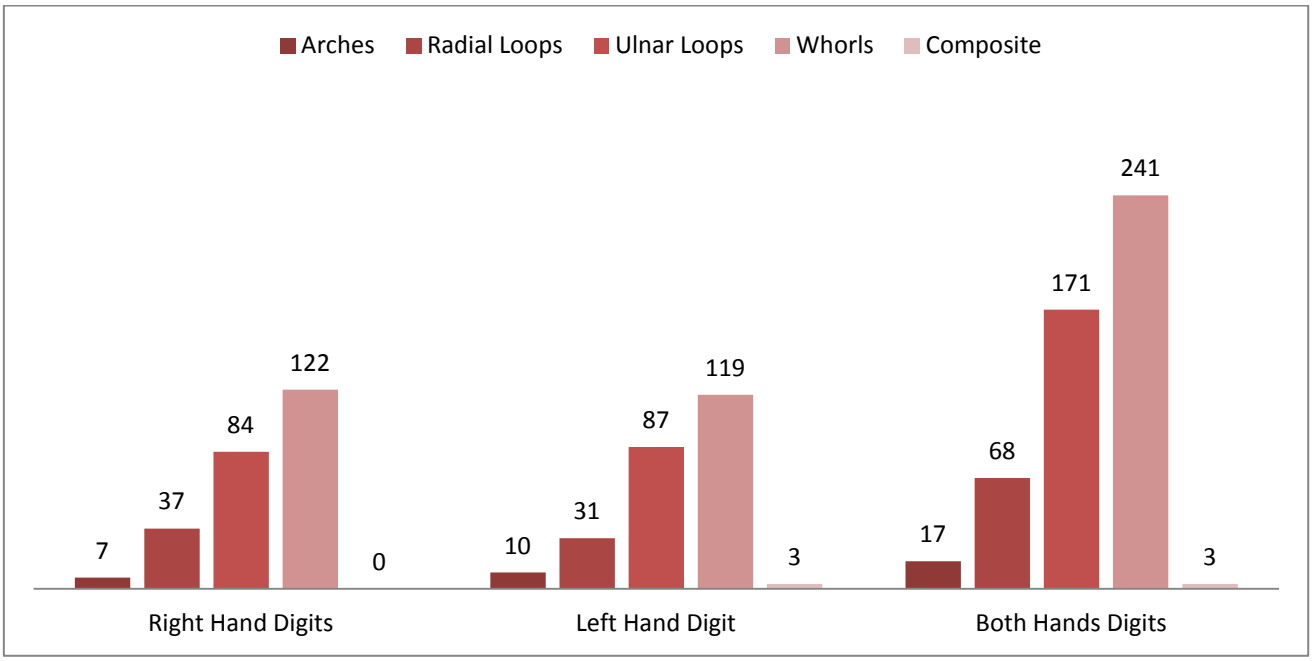

Table 3: Relationship of dermatoglyphic patterns in Control group and Pulmonary tuberculosis group

Pattern Type	Control Group (n=50*10=500)		Pulmonary Tuberculosis Group (n=50*10=500)		Statistical Inference
	No.	%age	No.	% age	
Arches	48	9.60	17	3.40	t=2.644223; p=0.016489; Significant
Radial Loops	96	19.20	68	13.60	t=2.229129; p=0.038785; Significant
Ulnar Loops	242	48.40	171	34.20	t=2.436076; p=0.025465; Significant
Whorls	112	22.40	241	48.20	t=4.88156; p=0.000120; Highly Significant
Composite	2	0.40	3	0.60	t=0.397360; p=0.695775; Not Significant
Total	500	100	500	100	_

- Relationship of arches in Control group and Pulmonary tuberculosis group was statistically significant (p=0.016489) due to few number of arches in Pulmonary tuberculosis group.
- Relationship of radial loops in Control group and Pulmonary tuberculosis group was statistically significant (p=0.038785) due to few number of radial loops in Pulmomary tuberculosis group.
- Relationship of ulnar loops in Control group and Pulmonary tuberculosis group was significant (p=0.025465) due to few number of ulnar loops in Pulmonary tuberculosis group.
- Relationship of whorls in Control group and Pulmonary tuberculosis group was statistically highly significant (p=0.000120) due to more number of whorls in Pulmonary tuberculosis group.
- Relationship of composite pattern in Control group and Pulmonary tuberculosis group was statistically not significant (p=0.62).

Fig 3: Bar Chart showing relationship of dermatoglyphic patterns in Control group and Pulmonary tuberculosis group

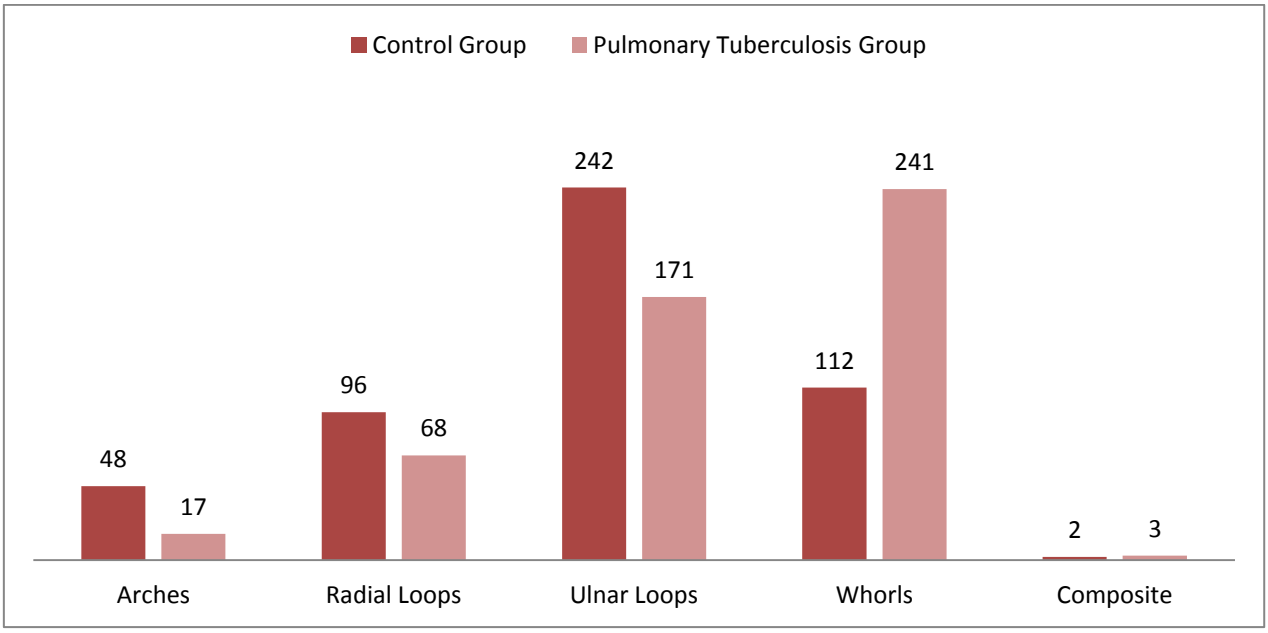

Table 4: Relationship of total finger ridge count(TFRC) in Control group and Pulmonary tuberculosis group

Parameter	Control Group Mean±SD	Pulmonary Tuberculosis Group Mean±SD	Statistical Inference
TFRC	108.6000±20.5573	144.8800±16.49693	t=9.73273; p=0.000000; Highly Significant

- Relationship of mean total finger ridge count in Control group and Pulmonary tuberculosis group was statistically highly significant (p=0.000000).

Discussion

Pulmonary tuberculosis caused by Mycobacterium tuberculosis is now becoming the major health Problem in developing countries. Host genetic factors such as Human Leucocyte Antigen (HLA) and non HLA genes are associated with the susceptibility of tuberculosis. As there is a link between susceptibility of tuberculosis with genetic markers, present study was done to predict the genetic susceptibility of tuberculosis. The dermatoglyphics can play an important role in revealing the individuals who are susceptible to

Pulmonary tuberculosis owing to genetic constitution. It will also be contributing in the evaluation of genetic susceptibility to the disease of known contacts of Pulmonary tuberculosis, so that appropriate intervention can be done.

In the present study, the results revealed highest occurrence of whorls (49%) in Pulmonary tuberculosis subjects, followed by ulnar loops (34.20%), radial loops (13.60%), arches (3.40%) and composite pattern (0.40%). These observations can be an additional support in diagnosing patients of Pulmonary tuberculosis. The relationship of fingertip pattern in control group and Pulmonary tuberculosis group showed significant variations with respect to whorls (p=0.000120), ulnar loops (p=0.025465), radial loops (p= 0.038785).

The value of total finger ridge count in Pulmonary tuberculosis patients was significantly raised (144.88+_16.49) and showed significant variation when compared with controls (p=0.000120).

Genetic contribution is one of the causes of Pulmonary tuberculosis. Susceptibility to Pulmonary tuberculosis in India has been linked to mannose binding protein gene [5]. Significant association has been found between IL-1 Gene clusters and host susceptibility to tuberculosis [6].

A study conducted by Sidhu LS et al, 1978 [8] observed no statistical significant differences in fingerprint patterns in Pulmonary tuberculosis patients compared with controls. The present study is not in agreement with their study as in our study we observed significant statistical differences in fingerprint patterns in Pulmonary tuberculosis patients as compared to controls.

Palmar dermatoglyphics in Pulmonary tuberculosis patients were studied by Babu SS et al, 2005 [9] and observed that whorl pattern was predominant (56.6%) with a decrease in loop pattern (32.1%) as compared to controls and the difference was highly significant (p<0.01). Difference in mean total finger ridge count of controls and study group was found to be highly significant.

The results of present study are in agreement with their study as we also observed higher percentage (48.20%) of whorls and lower percentage (3.40%) of arches. Mean total finger ridge count was also significantly higher as compared to controls.

Chaudhari J et al, 2011 [10] studied Palmar dermatoglyphics of 100 Pulmonary tuberculosis patients of Bhavnagar District and observed no statistically significant difference in fingerprint pattern between male and female and total cases and controls.

The present study findings are not in agreement to the above study wherein significant variation in fingerprint pattern was observed between cases and controls.

Palmar dermatoglyphic patterns in Pulmonary tuberculosis patients were collected from 100 diagnosed patients by Khairnar KB et al, 2012 [11] and many dermatoglyphic patterns seen in Pulmonary tuberculosis patients were found to be statistically significant as compared to controls.

The results of present study are in consonance with their study as we also observed statistically significant dermatoglyphic patterns in Pulmonary tuberculosis patients as compared to controls.

Navgire VR & Meeshram MM, 2013 [12] studied palmar dermatoglyphics in Pulmonary tuberculosis and found significant increase in total finger ridge count and absolute finger ridge count in both hands of Pulmonary tuberculosis cases as compared to controls, which is in agreement with the present study, which also showed increased total finger ridge count.

Conclusion

The present study used dermatoglyphic markers such as fingertip ridge pattern and total finger ridge count to analyze the prevalent pattern of dermatoglyphics among the population of Jammu Division. The results showed that percentage of ulnar loops were more among the people of Jammu Region and the percentage of whorls dominated in patients of Pulmonary tuberculosis. These features can be used in early detection of Pulmonary tuberculosis in the society. This will

definitely have an impact on reducing mortality and morbidity from these diseases. Finally it can be said that dermatoglyphics is not only related to the diagnosis of a disease but more to its prognosis, its main purpose is not to give a new definition to an existing disease but to identify individuals who are genetically more susceptible to develop certain diseases. If any association can be established then it can be used as a cheaper way to screen the populations who are at risk and they may be watched to see for any early onset of symptoms.

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