

## STUDY OF ATD ANGLE AND FINGER RIDGE COUNT IN LEPROSY PATIENT OF BHAVNAGAR DISTRICT

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### ABSTRACT

**Introduction:** The ATD angle and finger ridge count, are palmar dermatoglyphics features of an individual. During the first & second trimester of pregnancy epidermal growth occur in stages and result in an increase epidermal thickness. Epidermal ridges begin to appear in embryos at 10<sup>th</sup> week and are permanently established by 17<sup>th</sup> weeks. The types of pattern develop in palm & soles are genetically determined. They are of considerable clinical interest because they affected by certain anomalies of early development including genetic disease.

**Objective:** There are certain genetic (Chromosomal), Non chromosomal & metabolic disease shows particular palmer dermatoglyphics features so in this study we were trying to find out the difference in dermatoglyphics features in leprosy patient and control group.

**Materials and Methods:** The sample consists of 100 cases of leprosy in age group of 18-60 year from Bhavnagar district. The finger print and palm print were taken by using ink & pad method and Compared with Control group of 18-60 years. The dermatoglyphics parameter like ATD angle, TFRC & AFRC were studied and evaluated for statistical significance.

**Results and Conclusion:** There was statistically significant difference was observed in ATD angle as compared with control. There was no statistically significant difference observed in TFRC & AFRC as compared with control. The dermatoglyphics features can be useful diagnostically to differentiate the leprosy patient and control group.

**KEY WORDS:** Dermatoglyphics, Leprosy, Genetic, finger ridge count, ATD angle.

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### INTRODUCTION

Epidermal ridges begin to appear in embryos at 10<sup>th</sup> week and are permanently established by 17<sup>th</sup> weeks. The types of pattern develop in palm & soles including the digits (fingers & toes) are genetically determined and any developmental

anomalies in embryo affect the development of ridge pattern [1].

The importance of dermatoglyphics is due to its permanence; once formed it remain unchanged throughout life, so these are age stable and there is no change in their arrangement and structure

after birth, they are influenced by insults during early fetal life. The inheritance of most of dermatoglyphics features confirm to a polygenic system with individual gene contributing a small additive effect. The process of dermal ridge formation begins with the formation of fetal volar pads. These are mound-shaped formations of mesenchymal tissue elevated over the end of the most distal metacarpal bone on each finger, in the interdigital areas just below the fingers, and on the hypothenar and thenar areas of the palms and soles. Secondary pads are found in other areas such as in the center of the palm and on the proximal phalanges. The fingertip formations of volar pads are first visible in the sixth to seventh week of development. Abnormal dermatoglyphics pattern observed in certain non chromosomal disease whose etiology may be influence directly or indirectly by genetic inheritance. [2].

It is well accepted that the pattern of leprosy determine by the host cells mediated immunity showing tuberculoid leprosy with high intact cellular immunity and lepromatous leprosy with absence or very low cell mediated immunity (Ridley and Jopling 1996) [3]. Studies have shown that the genetic susceptibility to develop different type of leprosy and now there are enough evidence in favour of possible genetic influence [4]. Studies have shown that leprosy is HLA- linked genetic disease and genetic influence on leprosy has been documented in various studies [4,5]. Dermatoglyphics play an important role in diagnosis of certain genetic disease like Dermatoglyphics in Turner's syndrome, Holt and Lindstain (1964) [6]. The study of dermatoglyphic pattern in leprosy has been done by few workers [7-12] and it was not done in Bhavnagar region, therefore I have done the study of dermatoglyphic patterns in leprosy in Bhavnagar region.

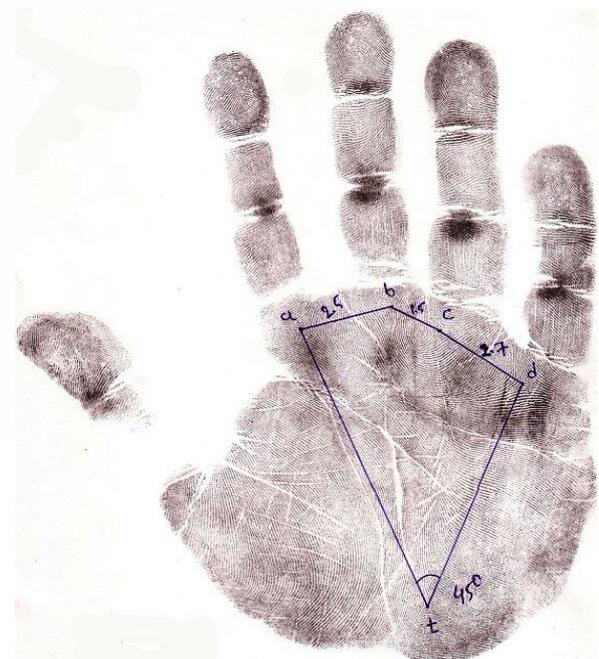
### MATERIALS AND METHODS

The sample consists of 100 cases of leprosy in the age group of 18 to 60 years. All cases are Indian belonging to Bhavnagar Region, Gujarat. The patients were selected from outpatient Department of Skin & VD, Sir.T. Hospital Bhavnagar and M.P. Shah Leprosy Hospital, Bhavnagar. Study was carried out with prior permission of institutional review board (human

ethics committee) of Govt. Medical College, Bhavnagar. Inform consent of all subjects was taken. Out of 100 cases, 70 cases (40 males and 30 females) are of multibacillary leprosy (MB) and 30 cases (16 males and 14 females) are of paucibacillary leprosy (PB). The cases taken into consideration had a long incubation period, gradual onset and included both the groups multibacillary and paucibacillary leprosy. The patients are classified on Ridley and Jopling scale [3]. 100 Control of different age group, 74 males and 26 females were selected from Bhavnagar city, not having any family history of Leprosy, or any other congenital or hereditary illness. Fingerprints and palm prints were taken, using the Ink and Pad method, described by Harold Cummins and Midlo [13, 14] Fingerprints & palm prints were obtained by using Kores thumb impression ink, Zink plate, Roller, white drawing sheet & Magnifying hand lens.

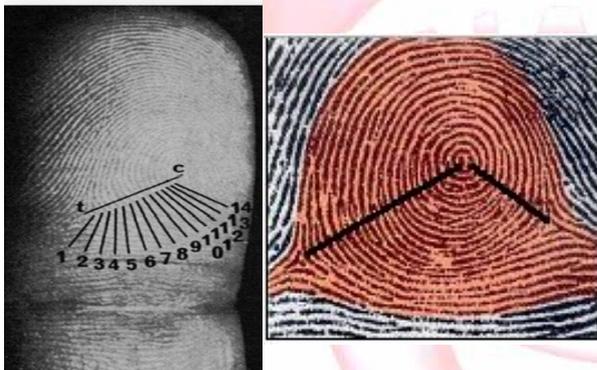
There are four digital triradii at the base of each finger from index finger to little finger (a, b, c, and, d). The Axial triradius "t" is between the thenar and hypothenar area in line of fourth metacarpal. "ATD" Angle: is constructed by joining the three triradius –a, t, and d. the ATD angle is decided genetically and determined in fetal life itself (Sadler 2006) [15]. Normal value of ATD angle is around  $45^{\circ}$ . When more than one axial triradii are present the most distal one is used for measurement of 'ATD' angle (Fig. 1).

**Fig. 1:** Dermatoglyphics of control group showing digital & axial triradii and ATD angle.



According to Holt SB (1968) [16] finger ridge count (FRC) we draw a line from the centre of triradius (t) to the centre of core (c) of the pattern, the number of ridges which intersect or touch this line is FRC of the finger. In Arch the FRC is zero. In Whorl FRC can be counted from two side, but we scored only largest count among two in case of counting the total finger ridge count (TFRC) and both count should be calculated in case of counting the absolute finger ridge count (AFRC). Total finger ridge counts (TFRC):- the sum of the finger ridge count of 10 digits of both the hand. Absolute finger ridge count (AFRC):- is the counting of all ridges on the tip of all digits of both hands from all triradius to the core, since the whorl has two triradii there will be two ridge count form triradii to core (Fig. 2&3).

**Fig. 2 and 3:** Shows how to count finger ridges in Loop & Whorls.



**RESULT AND OBSERVATIONS**

Data was statistically analyzed by using student’s t-test to determine significance of difference in ATD angle (Photograph- 4, 5), TFRC & AFRC. If p value < 0.05 is significant. The result of present study shown in table 1 to 4.

**Fig. 4:** Dermatoglyphics of Multibacillary Leprosy patient showing ATD angle is 36°.



**Fig. 5:** Dermatoglyphics of Paucibacillary Leprosy patient showing ATD angle is 35°.



**Table 1:** Comparison of ATD angle, TFRC, and AFRC of total cases and Control.

Parameters	Hand	Total (MB +PB) Mean +/- SD	Control Mean +/- SD	P value
ATD angle	Right	37.95+/-3.54	41.95+/-3.98	<0.001
	Left	38.10+/-3.65	42.49+/-4.34	<0.001
	Right + Left	76.05+/-6.52	84.44+/-7.88	<0.001
TFRC	Right	67.20+/-18.24	71.75+/-18.97	>0.05
	Left	70+/-18.17	71.58+/-18.49	>0.05
	Right + Left	137.20+/-35.06	143.33+/-36.40	>0.05
AFRC	Right	95.16+/-38.69	94.35+/-34.80	>0.05
	Left	95.96+/-36.31	89.57+/-30.39	>0.05
	Right + Left	191.12+/-72.98	183.92+/-62.70	>0.05

**Table 2:** Comparison of ATD angle, TFRC and AFRC of Total cases MB and PB.

Parameters	Hand	Total MB Mean +/- SD	Total PB Mean +/- SD	P value
ATD angle	Right	38.17+/-3.65	37.43+/-3.27	>0.05
	Left	38.37+/-3.89	37.47+/-2.97	>0.05
	Right + Left	76.54+/-6.78	74.90+/-5.82	>0.05
TFRC	Right	67.46+/-18.04	66.60+/-18.99	>0.05
	Left	70.24+/-18.08	69.46+/-18.68	>0.05
	Right + Left	137.70+/-34.59	136.03+/-36.72	>0.05
AFRC	Right	96.83+/-38.46	91.27+/-39.60	>0.05
	Left	96.33+/-36.37	95.10+/-36.79	>0.05
	Right + Left	193.16+/-72.51	186.37+/-75.09	>0.05

**Table 3:** Comparison of ATD angle, TFRC and AFRC of Total cases MB and Control.

Parameters	Hand	Total MB Mean +/- SD	Control Mean +/- SD	P value
ATD angle	Right	38.17+/-3.65	41.95+/-3.98	<0.001
	Left	38.37+/-3.89	42.49+/-4.34	<0.001
	Right + Left	76.54+/-6.78	84.44+/-7.88	<0.001
TFRC	Right	67.46+/-18.04	71.75+/-18.97	>0.05
	Left	70.24+/-18.08	71.58+/-18.49	>0.05
	Right + Left	137.70+/-34.59	143.33+/-36.40	>0.05
AFRC	Right	96.83+/-38.46	94.35+/-34.80	>0.05
	Left	96.33+/-36.37	89.57+/-30.39	>0.05
	Right + Left	193.16+/-72.51	183.92+/-62.70	>0.05

**Table 4:** Comparison of ATD angle, TFRC and AFRC of Total cases PB and Control.

Parameters	Hand	Total PB Mean +/- SD	Control Mean +/- SD	P value
ATD angle	Right	37.43+/-3.27	41.95+/-3.98	<0.001
	Left	37.47+/-2.97	42.49+/-4.34	<0.001
	Right + Left	74.90+/-5.82	84.44+/-7.88	<0.001
TFRC	Right	66.60+/-18.99	71.75+/-18.97	>0.05
	Left	69.43+/-18.68	71.58+/-18.49	>0.05
	Right + Left	136.03+/-36.72	143.33+/-36.40	>0.05
AFRC	Right	91.27+/-39.60	94.35+/-34.80	>0.05
	Left	95.10+/-36.79	89.57+/-30.39	>0.05
	Right + Left	186.37+/-75.09	183.92+/-62.70	>0.05

## DISCUSSION

**ATD Angle:** Singhal M et al (2010) [7] in their study they found that there was significant difference ( $p < 0.05$ ) in ATD angle in total cases of leprosy compared with control. There was no significant difference in ATD angle in Multibacillary (MB) leprosy as compared with control in right hand ( $p > 0.05$ ), But there is significant difference found in ( $p < 0.05$ ) in left hand. Bumb R A et al (1985) [8] ATD angle in both Paucibacillary (PB) and MB leprosy did not differ significantly ( $p > 0.05$ ) as compared with control. Gupta C M et al (1986) [9] did not found statistically significant difference in ATD angle in MB and PB leprosy as compared with control in both hands. Ghei S K et al (1995) [10] did not found statistically significant difference in ATD angle in the leprosy and control in both hands ( $p > 0.05$ ). Nagar K S et al (1991) [11] observed the ATD angle between leprosy and control in both sexes showed that there was no statistically significant difference ( $p > 0.05$ ).

In present study ATD angle in MB, PB, and total leprosy cases shows highly significant Difference as compared with control ( $p < 0.001$ ). Our finding was supported by study of Singhal M. et al [7], except in right hand of MB leprosy patient. Our finding was contrary with the finding of Bumb R A et al (1985), Gupta C M et al (1986), Ghei S K et al (1995), Nagar K S et al (1991) [8-11] (Ref. table no. 1,2,3,4).

**Total finger ridge count (TFRC):** In study by Bumb R A et al (1985) [8] TFRC in both PB and MB leprosy patient did not differ significantly ( $p > 0.05$ ) as compared with control. Gupta C.M et al (1986) [9] found TFRC in both type of leprosy slightly lower than the control group. A

significant difference ( $p < 0.05$ ) in individual finger ridge count on digit 1 of right hand was noted in PB leprosy as compared with control. Nagar K S et al (1981) [11] found in male right digit I ridge count showed a statistically significant difference ( $p < 0.05$ ), left digit I, II, III, IV all were having significant difference ( $p < 0.05$ ). In female only right digit II showed a statistically significant difference ( $p < 0.05$ ). Value in other digit in both sexes do not shows statistically significant difference ( $p > 0.05$ ). Natekar P.E. et al (2007) [12] in their study of Digital dermatoglyphics in leprosy showed that the TFRC in PB and MB leprosy patients was highly significant ( $p < 0.001$ ). It is also observed that the difference in TFRC between PB and MB leprosy patients is also significant ( $p < 0.05$ ). Present study that there was no statistically significant difference observed in TFRC of MB, PB, and Control ( $p > 0.05$ ), (Ref. table no1, 2, 3, 4). Our finding was Supported by Bumb R A et al (1985) [8]. Our finding was contrary with the finding of Gupta C.M et al (1986) [9], Nagar K S et al (1981) [11], and Natekar P.E. et al (2007) [12].

**Absolute finger ridge count (AFRC):** Natekar P.E. et al (2007) [12] in their study showed the AFRC in PB leprosy patients and in MB leprosy patients when compared to that of the control the difference was found to be highly significant ( $p < 0.001$ ) it is also observed the differences in AFRC between MB and PB leprosy patients is also significant ( $p < 0.001$ ). In present study there was no statistically significant difference in AFRC of MB, PB & Control ( $p > 0.05$ ), (Ref. table no.1, 2, 3, 4). Our finding was contrary to the finding of Natekar P.E. et al (2007) [12].

## CONCLUSION

The present study shows that highly significant Difference found in ATD angle in total cases of leprosy as well as total MB cases and total PB cases as compared with control group. The ATD angle is less in patient with leprosy. This finding is useful to screening for leprosy can ensure early diagnosis of disease and reduction in morbidity & deformity.

**Conflicts of Interests: None**

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