



Analytical Pattern in Dermatoglyphics

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim was to study the analytical pattern in dermatoglyphics.

Materials and Methods: The study was conducted in Skin Opd, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India. A total of 100 participants with different hand dermatitis pattern were included in the study. All patients were subjected to: 1. Complete history, 2. Dermatological examination, 3. Finger print pattern of all the patients, 4. Informed consent.

Results: This hospital-based study involved 100 patients with Psoriasis (47) Eczema (23) Dermatophytosis (12), Syphilis (3), Drug reaction (5) Palmar keratoderma. (10), the most common being psoriasis and eczema. In psoriasis patients, whorl pattern was the commonest (48.29%), followed by 31.43% loop, 21.43% arch and 2.86% composite pattern. In eczema patients, loop and whorl pattern was found in (44.74%) followed by 34.23% loop, 22.43% arch and 1.86% composite pattern.

Conclusion: The palmar pattern intensities were increased in both sexes, while the digital pattern intensities were increased in males and decreased in females. TFRC was increased in males and decreased in female patients. In both cases and controls, TFRC was more in males than females. A-b count showed a significant reduction in both sexes.

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Keywords: Dermatoglyphics; palmar pattern; loop and whorl.

1. INTRODUCTION

Dermatoglyphics comes from two Greek words (Derm = skin, and glyph = carving.) Dermatoglyphics, as a scientific tool, came into use only towards the end of the 19th century. Dermatoglyphic traits are polygenetically regulated and are non – adaptive. It has distinct methodological advantages over anthropometry and serology. Dermal ridge differentiation takes place in the third and fourth month of fetal life. By the end of the fourth month, the ridges and their arrangements are in their complete and permanent form. From this time onwards until the death there is no morphological change either in the detailed structure of the ridges or in the patterns formed by them [1].

Dermatoglyphic traits do not vary with age or environment except in size. The differentiation occurs very early and the lines are permanent. Hence dermatoglyphics has become one of the important parameters in defining the characteristic features of the patients and is therefore of diagnostic value in screening mentally retarded children for large-scale. It has become a valuable tool in the medical field for delineating a number of clinical syndromes; such as chromosomal and genetic anomalies as well as congenital malformations of various organs.

Dermatoglyphic disturbances in chromosomal aberrations such as Downs syndrome, Trisomy 13 and Trisomy 18 are particularly striking and can be used to strengthen a diagnostic impression. Single gene mutations causing malformations of the hands and feet such as syndactyly, polydactyly, and brachydactyly are associated with dermatoglyphic features significantly varying from Normal [2].

2. METHODS

A total of 100 participants with different hand dermatitis pattern were included in the study. Initially complete medical history of each patient was recorded. The regular dermatological examination (Parameters like ulnar loop, radial loop, number of whorls and arches were assessed on the palmar and digital areas) was carried out along with the finger print pattern of all the patients [3].

3. RESULTS AND DISCUSSION

Dermatoglyphic traits do not vary with age or environment except in size. The age distribution among the cases was given in Table 1.

Table 1. Age distribution among cases (n=100)

Age in years	No: of cases	Percentage (%)
1 – 10	5	5%
11 – 20	16	16%
21 – 30	26	26%
31 – 40	23	23%
41 – 50	12	12%
51 – 60	11	11%
61 – 70	6	6%
> 70	1	1%
Total	100	100%
Mean	34.62	

Table 2. Sex wise incidence of various dermatitis

Sex	No of cases	Percentage%
Male	52	52%
Female	48	48%
Total	100	100%

Table 3. Distribution of various dermatitis among cases

Clinical findings	No of cases	Percentage (%)
Psoriasis	47	47%
Eczema	23	23%
Dermatophytosis	12	12%
Syphilis	3	3%
Drug reaction	5	5%
Palmar keratoderma	10	10%
Total	100	100%

Table 4. Duration of disease

Duration of disease	No of cases	Percentage %
0 - 6 months	38	38%
6 months - 1 year	30	30%
More than 1 year	32	32%
Total	100	100%

4. ANALYSIS OF QUALITATIVE PARAMETERS

4.1 Comparison of Finger Tip Pattern in Total Number of Cases

The percentage of arches in all fingers of the cases is 2.9%, The percentage of whorls in all

the fingers of the cases is 36.1. It was found that the percentage of loops in all the fingers of the cases is 61. In the previous study they found similar differences between the cases and controls [4].

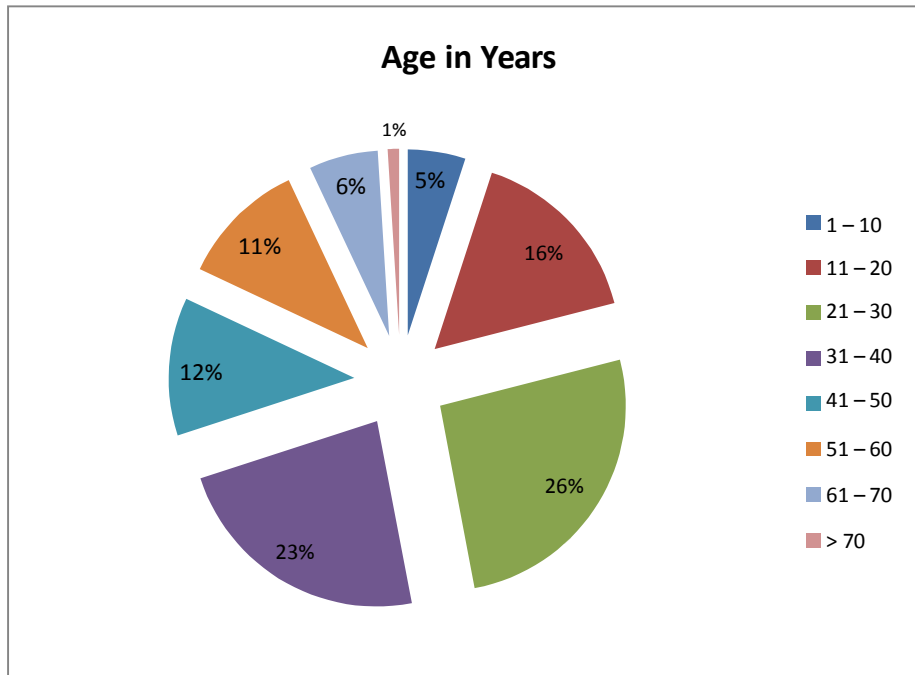


Fig. 1. Age distribution among cases (N=100)

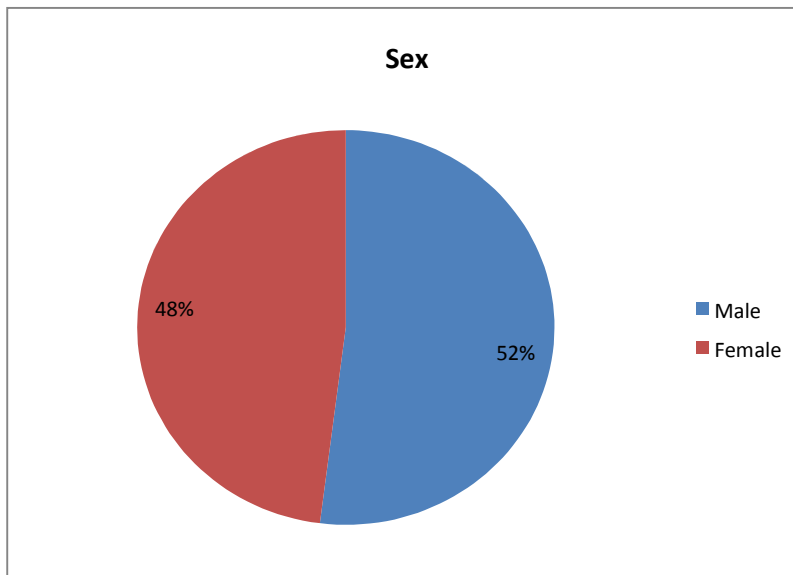


Fig. 2. Sex wise incidence of various dermatitis

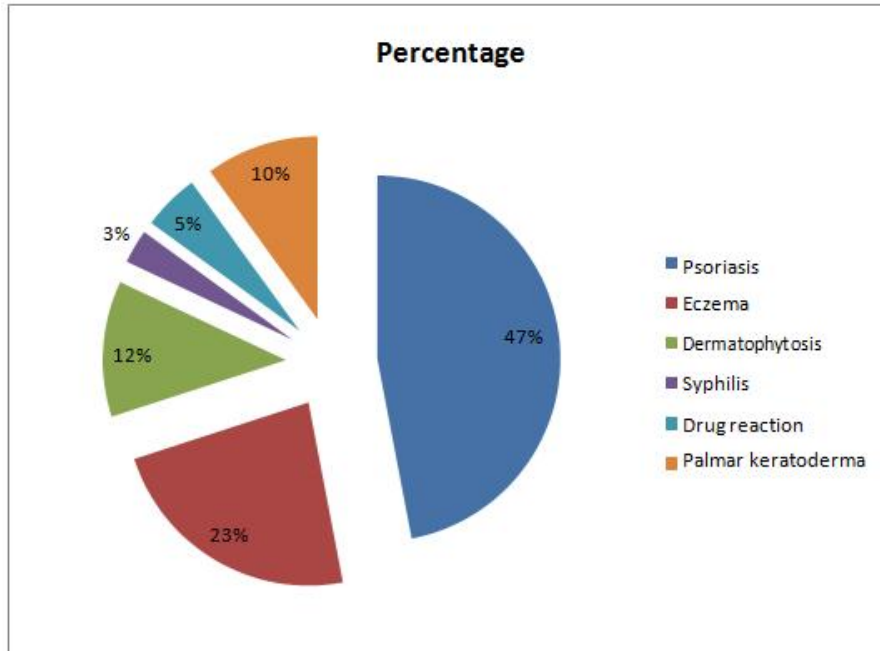


Fig. 3. Showing various dermatitis among cases

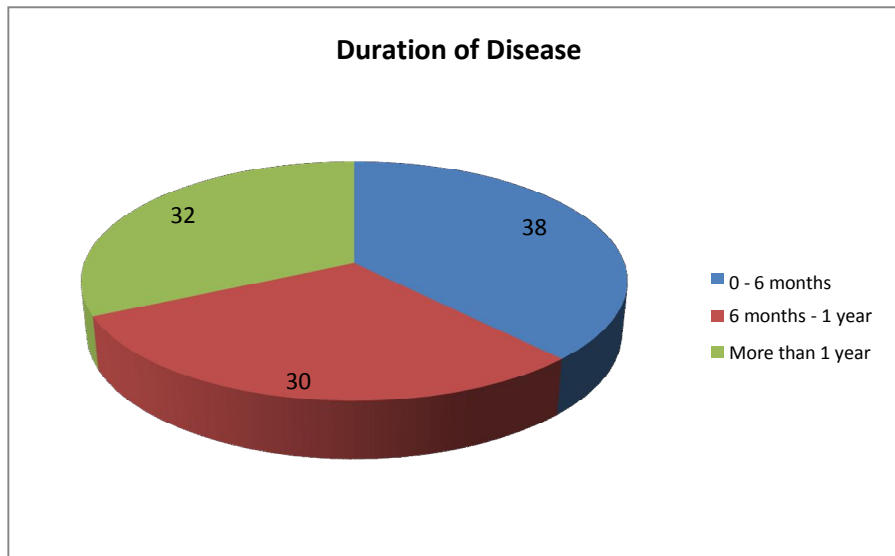


Fig. 4. Duration of disease

Table 5. Activity of disease

Type	No of patients		Total	Percentage %
	M	F		
Progressive	25	32	57	57%
Quiescent	20	13	33	33%
Regressive	7	3	10	10%
Total	52	48	100	100%

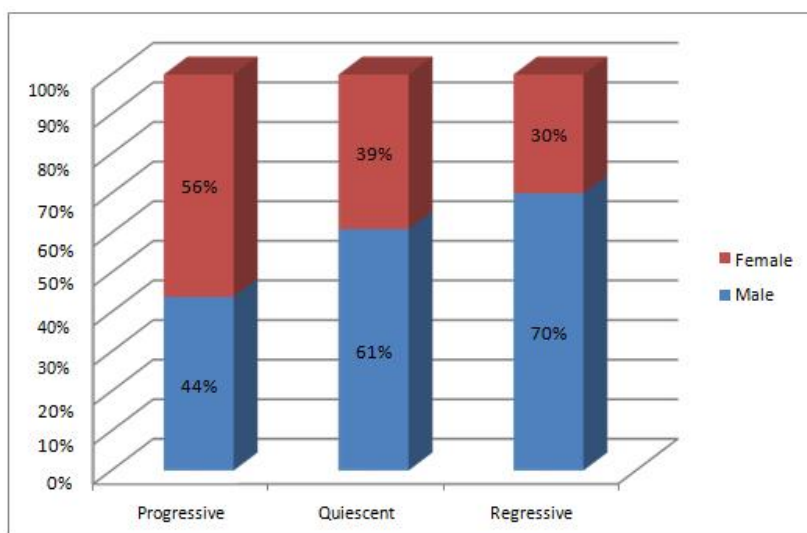


Fig. 5. Activity of disease

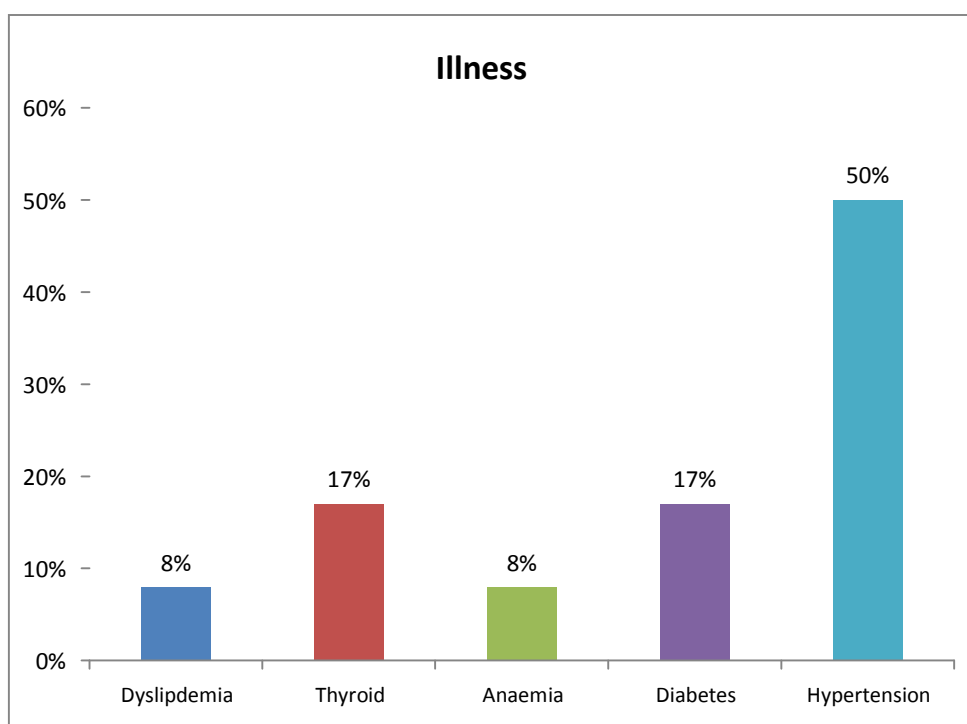


Fig. 6. Association - systemic and autoimmune

Table 6. Association - systemic and auto immune

Illness	No of patients	Percentage %
Dyslipidemia	1	8%
Thyroid	2	17%
Anemia	1	8%
Diabetes	2	17%
Hypertension	6	50%
Total	12	100%

Table 7. Comparison of finger tip pattern- percentage wise distribution

Type	Cases					
	RT hand (n=100)		LT hand (n=100)		Both RT+LT (n=100)	
	No	%	No	%	No	%
A	17	3.4	12	2.4	29	2.9
W	180	36	181	36.2	361	36.1
L	303	60.6	307	61.4	610	61
Total	500	100	500	100	1000	100

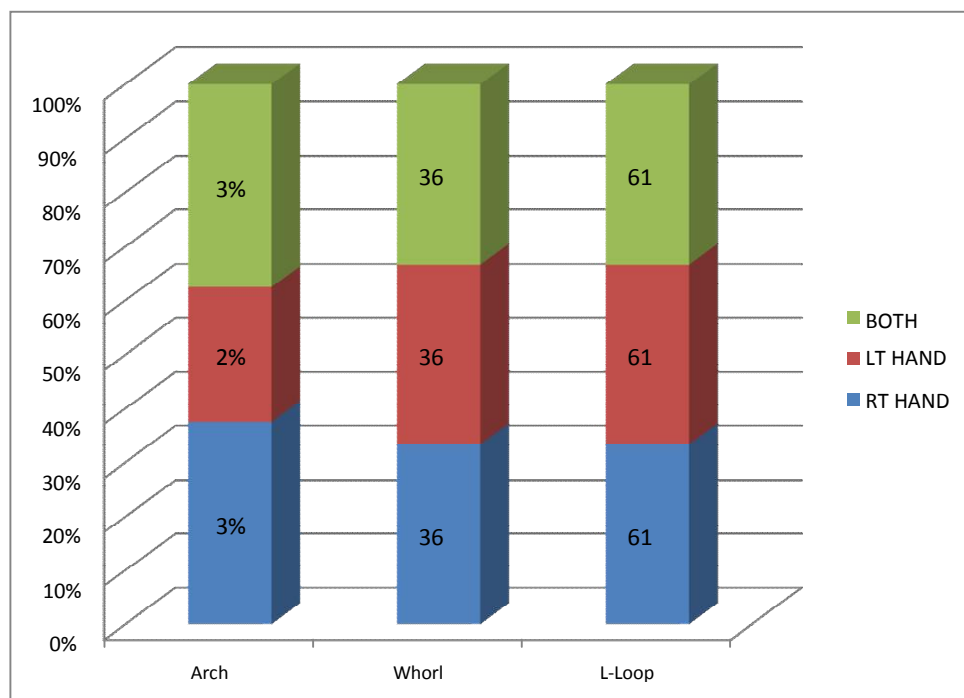


Fig. 7. Comparison of finger tip pattern- percentage wise distribution
A-Arch, W-Whorl, L-Loop, n=number of cases and controls

Table 8. Analysis of finger tip patterns – in digits separate, Right hand & left hand

Digit	Finger tip pattern	Right hand				Remark
		RH	Lf	Chi square value	P value	
Thumb	Arches	2	5	1.286	0.257	NS
	Whorls	45	43	0.45	0.831	NS
	Loops	53	52	0.010	0.922	NS
Index	Arches	7	14	0.846	0.106	NS
	Whorls	23	31	0.674	0.203	NS
	Loops	70	55	3.987	0.028*	S
Middle	Arches	7	13	1.800	0.180	NS
	Whorls	42	27	3.261	0.071	NS
	Loops	51	60	0.730	0.393	NS
Ring	Arches	1	3	0.817	0.179	NS
	Whorls	58	43	3.760	0.048*	S
	Loops	41	54	1.385	0.239	NS
Little	Arches	0	1	-	>0.05	NS
	Whorls	12	8	0.800	0.371	NS
	Loops	88	91	0.089	0.766	NS

In this study, a statistical significance in the comparison of the loops of right index finger between cases and controls and also between the whorls of right ring finger between cases and controls were found with the p values being 0.028 and 0.048 respectively.

5. ANALYSIS OF QUANTITATIVE PARAMETERS

Based on the ridge counts, the parameters taken are:

5.1 Total Finger Ridge Count (TFRC)–a Statistical Evaluation (Table 9)

The difference in the mean value of TFRC values between right and left were, RT side- 11.52 and left side - 10.60 and with respect to both hands, the difference in mean value was 22.12. All the values of TFRC, right side and left side and both together were compared statistically using the 2-tailed independent sample t -test had a significant difference, p < 0.001.

5.2 Absolute Finger Ridge Count (AFRC)- Statistical Evaluation (Table 10)

The difference in the mean value of AFRC values between RT side- 12.02 and left side- 12 and

with respect to both hands, the difference in mean value was 24.02. All the values of AFRC, right side and left side and both together were compared statistically using the 2- tailed independent sample t-test, and it was found that the values against cases and controls had a significant difference, p< 0.001

A – b ridge count – statistical evaluation: The a-b ridge count in all the cases and control were assessed separately on both sides. The difference in the mean value of ABRC values between cases and controls were, Right side - 5.48 and left side - 7.99 and with respect to both hands, the difference in mean value was 13.48. All the values of ABRC, right side and left side and both together were compared statistically using the 2 - tailed independent sample t-test, and it was found that the values against cases and controls had a significant difference, p < 0.001.

Angles of the palm: The ATD, DAT and ADT angles were compared for the right hand between cases and controls. The data were statistically evaluated using the t -test and was found that the act angles between cases and controls showed a statistical significance (p-value = 0.026).

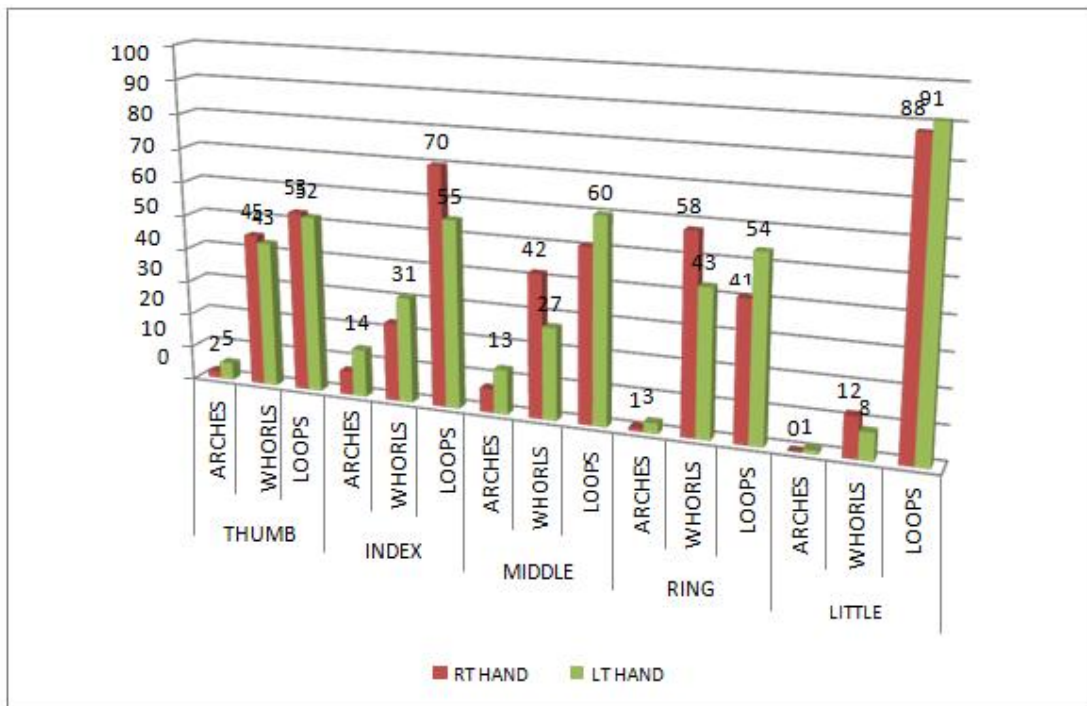


Fig. 8. Analysis of finger tip patterns – in digits separate, right hand & left hand

Table 9. Total finger ridge count (TFRC)

TFRC	Mean±SD Cases (n=100)	P value	Remark
Right	63.13±13.546	<0.001**	S
Left	62.88±13.586	<0.001**	S
Total	126.01±18.763	<0.001**	S

** - Significant at 1%, S –Significant.

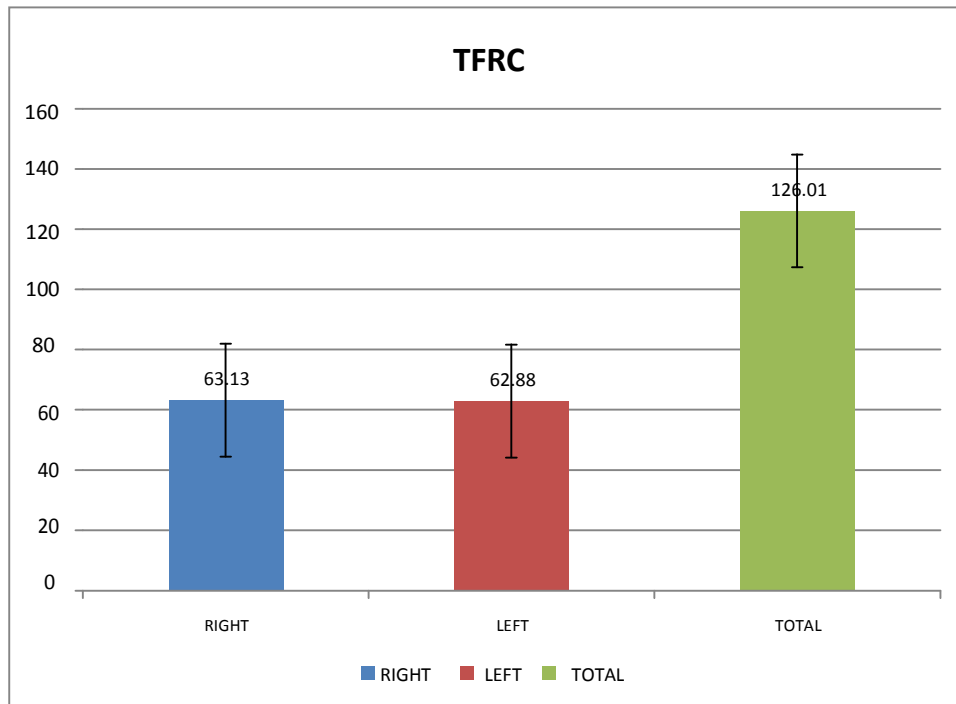


Fig. 9. Total finger ridge count (TFRC)
Total finger ridge count (TFRC)– statistical evaluation (Fig. 9)

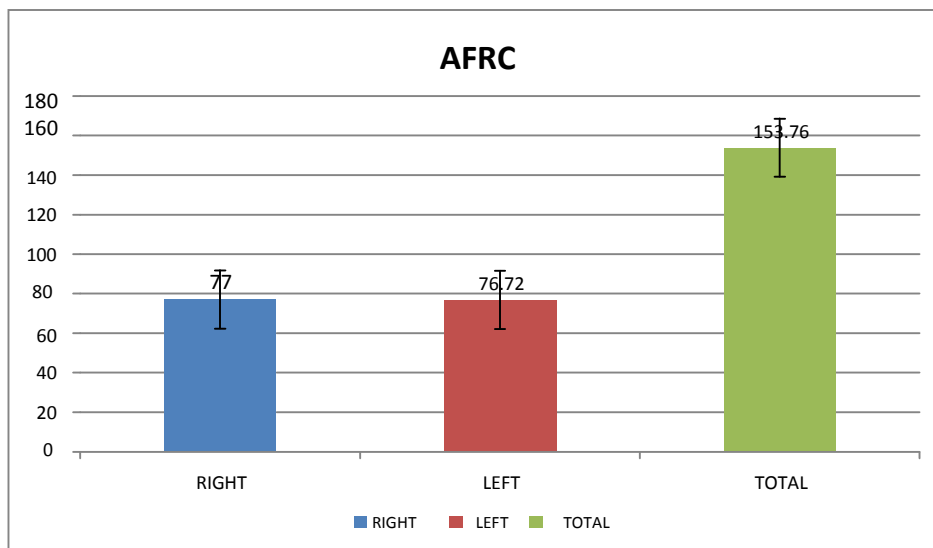


Fig. 10. Comparison of absolute finger ridge count in right and left hand

Table 10. Absolute finger ridge count (AFRC)

AFRC	Mean±SD		Remarks
	Cases (n=100)	p	
Right hand	77.04±9.672	<0.001**	S
Left hand	76.72±9.951	<0.001**	S
Both hands	153.76±14.714	<0.001**	S

** - Significant at 1%, S –Significant.

Table 11. A-b ridge count - statistical evaluation

ABRC	Mean±SD	p Value	Remark
	Cases (n=100)		
Right	32.26±6.045	<0.001**	S
Left	33.10±4.939	<0.001**	S
Total	65.36±8.613	<0.001**	S

** - Significant at 1%, S –Significant.

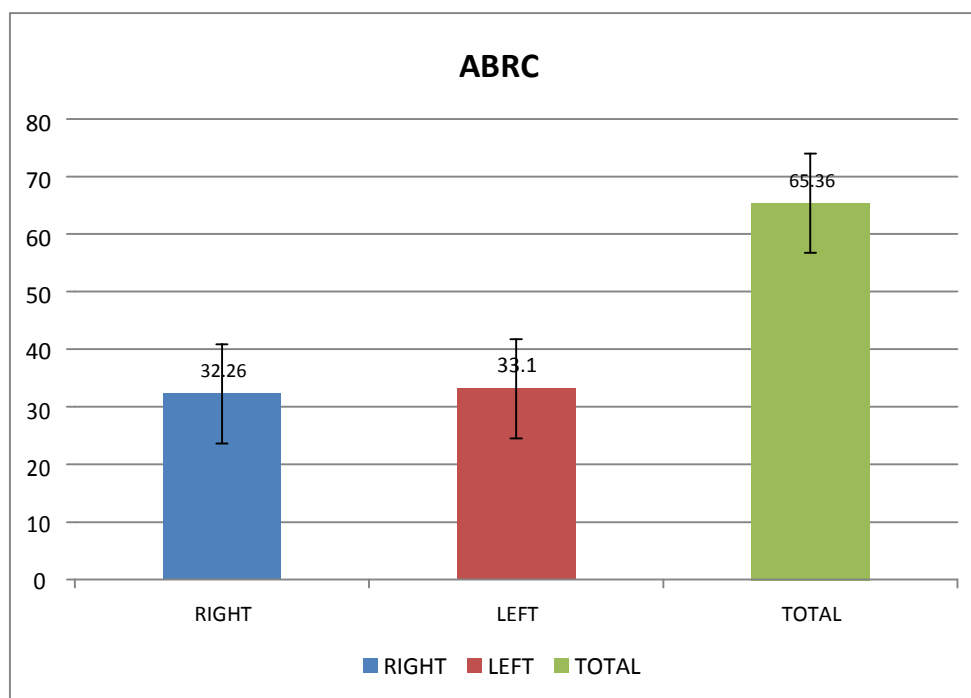


Fig. 11. Comparison of a-b ridge count in right and left hands

Table 12. ATD, DAT, ADT angles right and left hands were assessed separately

Angle	Right hand and left hand		p value
	Mean±SD		
	Right	Left	
ATD	42.77±4.707	42.69±4.809	0.905
DAT	58.95±5.059	57.24±5.159	0.195
ADT	78.28±5.591	80.07±5.732	0.026*

* - Significant at 5% level

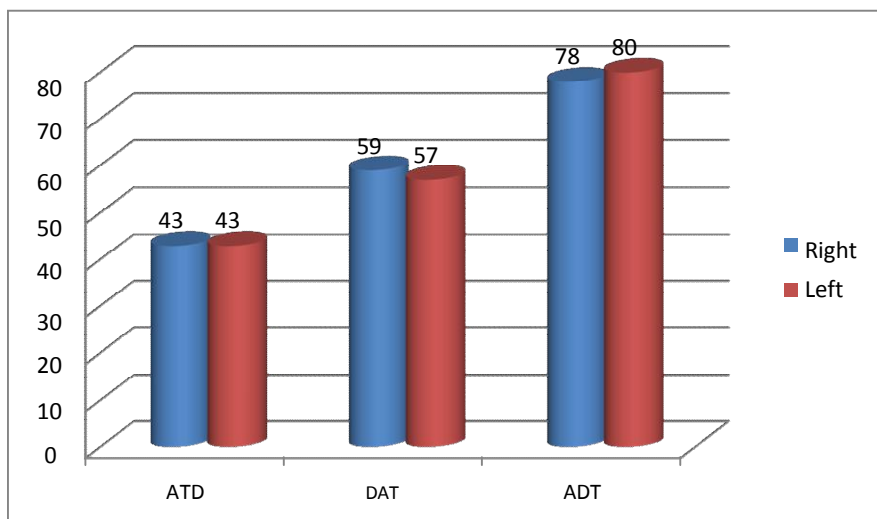
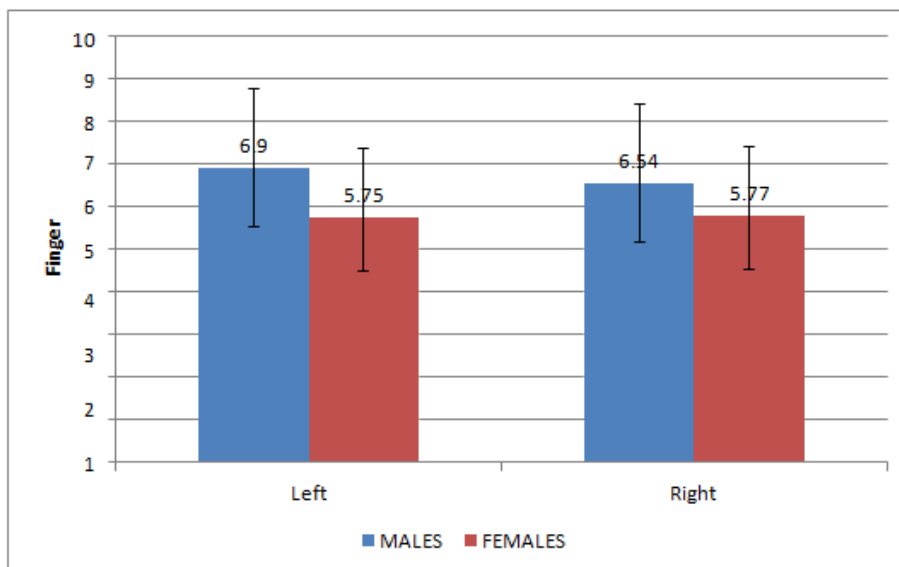


Fig. 12. ATD, DAT, ADT angles right and left hands were assessed separately

Table 13. Comparison of pattern intensity in males and females

Pattern Intensity	Males (n=52)	Females (n=48)	P value
Finger			
• Left	6.90±1.83	5.75±1.38	<0.001**
• Right	6.54±1.61	5.77±1.26	0.008*
• Total	13.44±3.17	11.52±2.27	0.001**
Palmar			
• Left	0.98±0.85	0.54±0.61	0.003**
• Right	1.17±0.87	0.60±0.66	<0.001**
• Total	2.15±1.19	1.13±0.84	<0.001**



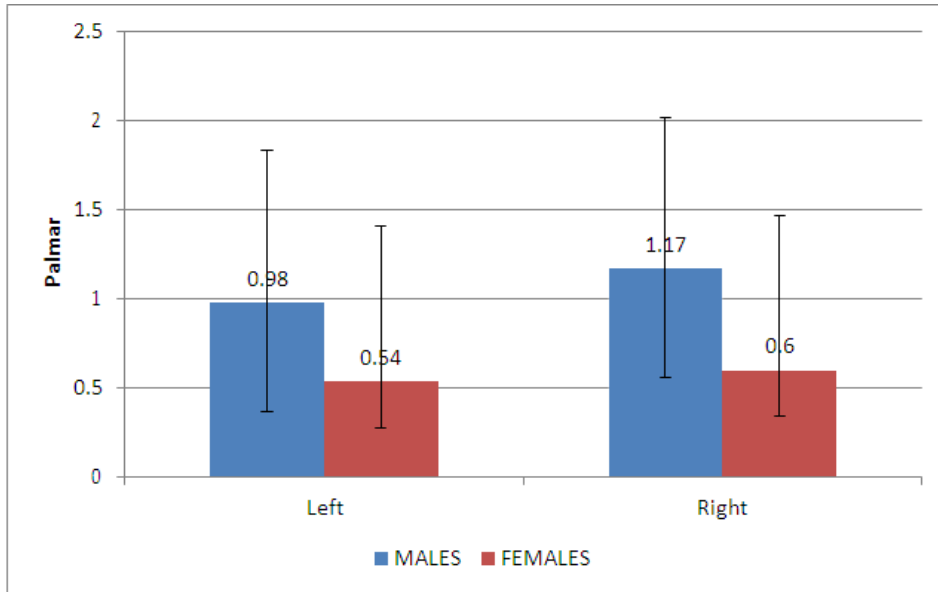


Fig. 13. Comparison of pattern intensity in males and females
(A) In finger; (B) In palm

Table 14. Comparison of ridge count in males and females

Ridge count	Males (n=52)	Females (n=48)	P value
Finger			
• Left	72.69±8.63	63.06±12.98	<0.001**
• Right	74.27±7.82	62.69±12.33	<0.001**
• Total	146.96±12.36	125.75±23.18	<0.001**
Palmar (a-b)			
• Left	22.15±4.39	35.04±4.66	<0.001**
• Right	18.38±6.07	35.06±4.54	<0.001**
• Total	40.54±8.42	70.10±6.89	<0.001**

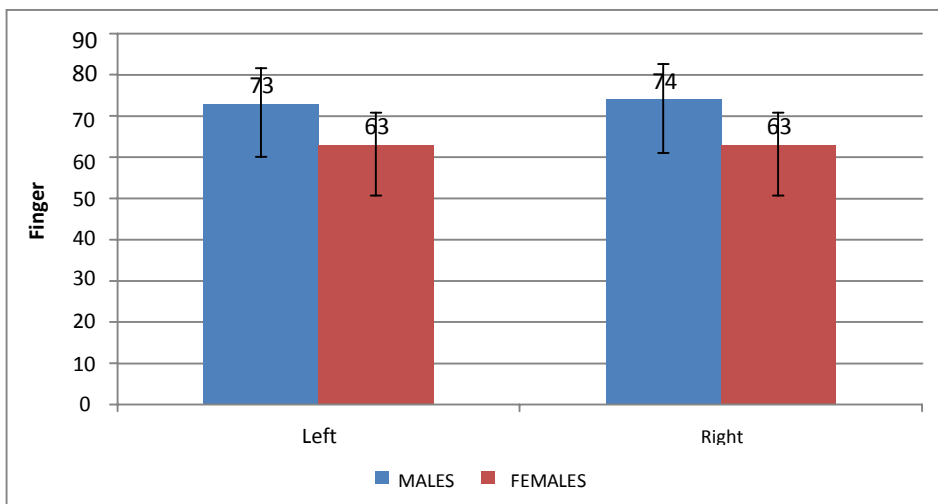


Fig. 14. Comparison of ridge count in males and females

Table 15. Comparison of angle 'ATD' in males

Angle ATD	Males (n=52)	Females (n=48)	P value
• Left	39.37±2.19	39.13±2.59	0.625
• Right	39.29±2.23	39.42±2.16	0.755
• Total	78.65±3.93	78.56±4.15	0.904

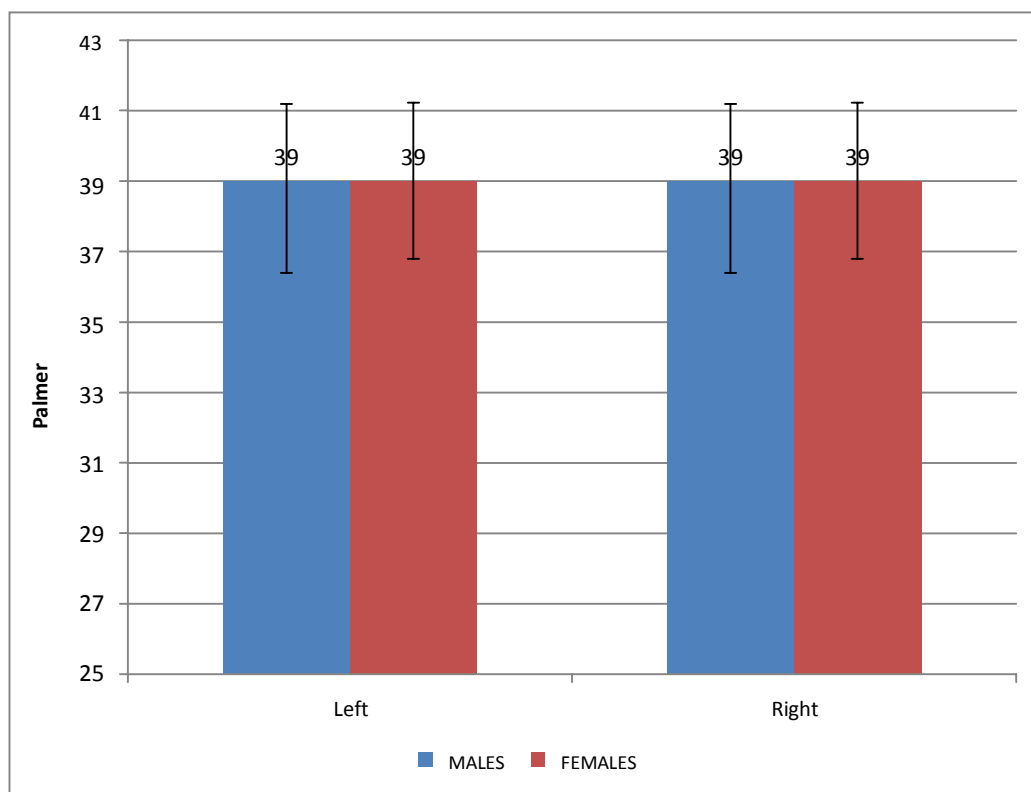


Fig. 15. Comparison of Angle 'ATD' in Males

On quantitative analysis of the finger prints, the TFRC between cases and controls were evaluated using the t test and it was found to be 75 statistically significant in comparison of cases to controls. In the previous reports, they also found significant differences in TFRC values between cases and controls. The mean values of AFRC values between cases and controls were also analyzed using the t test and a statistical difference was found. The earlier study found that the mean ridge count in the right hand between cases and controls to be statistically significant, $p < 0.05$ [5].

The mean ridge count of left hand also showed significance in that mean ridge count in cases was lower than in controls. The a-b ridge count of the cases and controls were tabulated in Table 7, and a statistical difference was found between cases and controls on both right and left sides. In

previous study, they found statistical differences between cases and controls [6].

6. CONCLUSION

In the analysis of qualitative patterns, the percentage of arches in all the fingers of the cases is 2.9%, and in that of controls, the percentage is 6%. The percentage of whorls in all the fingers of the cases is 36.1%, the percentage in controls being 32.1%. It was found that the percentage of loops in all the fingers of the cases is 61%, while that in controls it is 61.9%. From this I conclude that the percentage of arches is more in controls than in cases. And also, the percentage of whorls is more in cases than in controls accompanied with a negligible difference in the percentage of loops. The mean value of TFRC in both hands of cases is 126.01 with a standard deviation of 18.763 and the total

mean of TFRC in controls is 103.89 with a standard deviation of 17.754. This difference in mean value is found to be statistical increase in the mean value of cases with p value < 0.001.

CONSENT

Informed and written consent was obtained from the each patient and was preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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