

Sexual Dimorphism in Dermatoglyphic Pattern Study

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ABSTRACT

Objectives: This Dermatoglyphics study was focused on to evaluate bilateral Dermatoglyphics dimorphism, gender Dermatoglyphics dimorphism, pattern occurrence and difference from mean pattern occurrence. **Study Design & Method:** It was conducted at B.J.Medical College, Ahmedabad, 152 students of 1st year MBBS (session2009-2010) took part as subjects. Data was obtained with use of ink pad. Patterns were recorded, classified, statistically analyzed and discussed. **Results & Conclusion:** Arithmetic mean, percentage and mode of data were calculated. Analysis showed that loop pattern has the highest frequency (51.1%) followed by whorl pattern (36.8%). Arch pattern is the rarest pattern (7.8%). There is more predominance of arch and loop pattern than average values in this study.

Key Words: Dermatoglyphics, sexual dimorphism, arch, ulnar loop, radial loop, whorl

1. INTRODUCTION

Dermatoglyphics is a term coined by Cummins and Mido. It is the study of ridged skin found on the finger pad, palms and soles (Cummins and Midlo, 1943). It includes anthropologic, genetic and Egypt logic study of finger prints. Finger prints are dermal ridge configurations having grooves in between them (Gray, 2008). They develop at 13th week of prenatal life and remain unchanged throughout the remaining life, thus providing mark of individuality (Poch and Smith, 1970). Finger print is a multifactor trait. Large number of genes plays their role along with environmental influence (Ahuja, 1990). Monozygotic twins have close resemblance in Dermatoglyphics pattern showing common genetic factors and least differences showing influences of other factors (Uehida, 1963). Actually there is large number of genes determining the ridge pattern. Chromosomal aberrations affect these genes and produce variations in Dermatoglyphics pattern in various chromosomal syndromes (Hirsch, 1978). There are three basic Dermatoglyphics patterns (Figure 1); whorl, loop and arch (Cummins and Midlo, 1943). Whorl pattern has two deltas, Loop has one delta and Arch has one central or no delta at all. Loop pattern is further classified into Radial and Ulnar loop depending on the side to which loop opens. Average frequency of Whorl, Ulnar loop, Radial loop and Arch in whole world population is 25%, 70%, <1% and 5 % respectively In recent years interest increased among the clinicians in medical application of Dermatoglyphics (Hirsch, 1978). It has been proved valuable marker trade. Its diagnostic value is well documented e.g. in Down's syndrome; there is absence of simian crease (Moore & Dally, 2009). In hypospadias, ulnar loop and whorl pattern occurs more and less than normal respectively. High proportion of arches is associated with mental abnormalities

(Laha, 1987). Apart from it, its importance in investigation and forensic is well known (US department of justice, 1960).

2. MATERIALS AND METHODS

For Dermatoglyphics, Ink method was used as described by Cummins & Midlow which requires ink slab, inverted 'T' shaped pad, Kore's duplicating ink, white paper, magnifying lens, protractor, scale, soap & pencil. Hands were thoroughly washed with soap before taking prints (Figure 2). Then

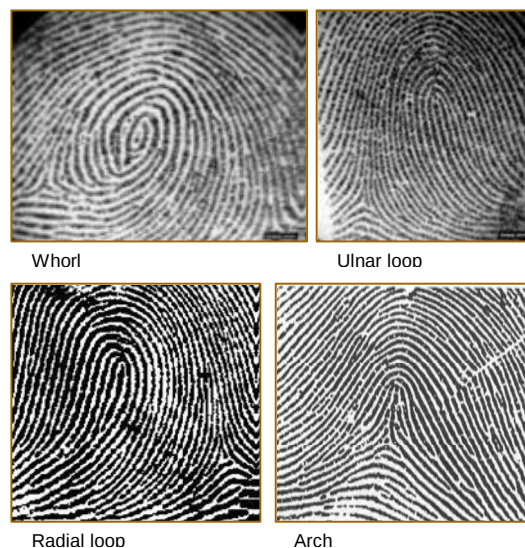


Figure 1
Different types of Loops

Dermatoglyphics:

It is a branch of science, which deals with the study of ridge patterns on finger tips, palms, soles and toes.

Whorl:

It is any ridge configuration with two or more triradii. One triradius is on the radial and the other on the ulnar side of the pattern.

Subtypes: - Simple whorl, concentric whorl, Spiral whorl and Double loop whorl.

Arch:

It is the simplest pattern found on the fingertips. It is formed by a succession of more or less parallel ridges, which traverse the pattern area and form a curve that is concave proximally.



Table 1
Arithmetic mean of each pattern

X	Males	Females	Combined
XW	1.676	1.976	1.842
XU	2.764	2.428	2.578
XR	0.220	0.155	0.184
XA	0.338	0.440	0.395

Table 2
Percentage of each pattern

%	Male	Female	Combined
W	33.529	39.524	36.842
U	55.294	48.578	51.175
R	4.412	3.095	3.684
A	6.165	8.810	7.895

Table 3
Mf & Mp in male students

	I	II	III	IV	V	Mp
W	38	24	14	27	11	I
U	27	23	48	37	53	V
R	1	6	3	3	2	II
A	2	15	1	3	2	II
Mf	W	W	U	U	U	

Table 4
Mf & Mp in female students

	I	II	III	IV	V	Mp
W	46	37	20	44	19	I
U	32	23	51	37	61	V
R	1	10	1	0	1	II
A	5	14	12	3	3	II
Mf	W	W	U	W	U	



Figure 2
Kit for dermatoglyphics pattern

requisite amount of ink was placed on the ink slab & inverted 'T' shaped pad was soaked in it. The ink was evenly spread on the ink slab by light dusting. Then fingers were rolled laterally on the slab on which ink was transferred. Then they were placed on a white paper with one lateral edge & then rolled over in opposite direction. To take palm print palm was lightly dusted with the same 'T' pad. The palm was then kept on white paper & firm pressure was given on the center of the dorsum of hand & interdigital areas (Figure 3). A total of 250 students were taken as subjects. But the finger prints of only 152 students were accepted. Remaining finger prints were discarded for being incomprehensible. These 152 include 68 male students and 84 female students. The fingerprints were studied with the help of magnifying glass. Following symbols allotted to denote the study.

A = Arch M = Mode
U = Ulnar loop W = Whorl
% = Percentage
X = Arithmetic mean AM) R = Radial loop

3. RESULTS

Subsequent three aspects have been studied using mathematical formulas.

X = Arithmetic mean (A.M) Arch

To know relative occurrence of each pattern thus providing the basis for comparison both in between patterns and sexes AM is used. Following formula was used to calculate AM.

$$X = \frac{x_1 + x_2 + x_3 + \dots + x_n}{N} \quad N = \frac{\sum x_n}{N}$$

N = total No of individuals having specific pattern. n1, n2, n3 = No of pattern in individual 1, 2, 3 and so on respectively. The study illustrates four types of X (A.M) showing prevalence of each pattern. Table 1 summarizes them and depicts the values taken from the analysis of collected data.

3.1. Percentage

Being more general than arithmetic mean, it gives an instant idea of comparison. Table 2 shows % of each pattern in males, females and the combined percentage of each pattern.

3.2. Mode

It shows prevalence of specific pattern at specific finger and vice versa. So, in accordance, there are two Modes. Mf; shows predominance of certain pattern at specific finger. Mp shows predominance of specific pattern at certain finger. Table 3 and 4 shows their comprehensive values taken from this study.

4. DISCUSSION AND ANALYSIS

Table 1 shows that;

U pattern is the most predominant pattern both in males and females. U pattern is comparatively more prevalent in males than in females.

W pattern is second most prevalent pattern. In this case it is comparatively more prevalent in females than males.

A pattern is third one in predominance having more comparative prevalence in females than in males.

R is most rare pattern. In female it is comparatively rarer.

Table 2 shows relative abundance of pattern. It can be compared with average values of the whole world population. Following deviations are well apparent; U pattern is less prevalent as compared with other world population studies, 52% vs. 70%. W, A and R, all other three patterns are more prevalent as compared with other world population studies (W 37% vs. 25%), (A 7.8% vs. 5%), (R 3.6% vs. <1%). Sexual Dermatoglyphics dimorphism is not significant statistically when compared with other studies ($p > 0.5$). Table 3 and 4 tells which specific pattern occurs more frequently or less frequently at which specific finger and vice versa. Tables show that finger specific predominance in both male and female is same except in the case of 4th finger. In male U and in female W pattern predominates. The most predominant pattern at finger 1 and 2 is W while at finger 3 and 5 is U. There is not sexual dimorphism in the case of pattern specific distribution. W and U pattern predominates at finger 1 and 5 respectively. Both R and A predominates at finger 2.

5. CONCLUSION

Analysis showed significant and non significant deviation from average values. It is to be noted that both A and R pattern are more predominant in our people than average values.

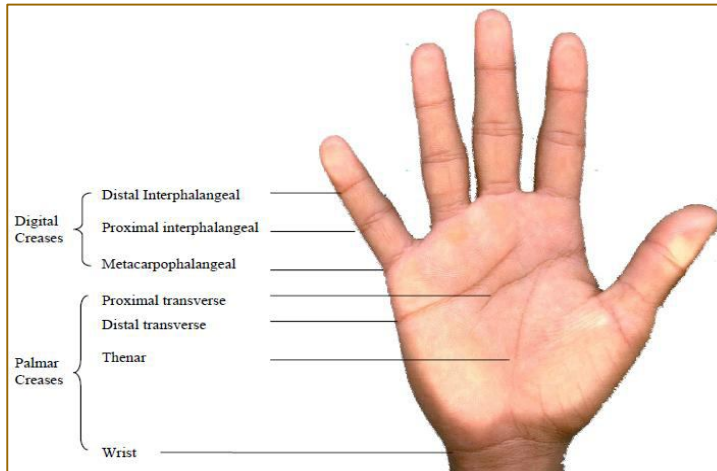


Figure 3
Normal flexion creases

SUMMARY OF RESEARCH

1. Dermatoglyphics is the study of skin ridges present on palm & sole. It is postulated that sex chromosomes influence Dermatoglyphics development by controlling tissue sensitivity to fetal sex steroids.
2. Increasing numbers of sex chromosomes appear to have a negative correlation with the intensity of the finger print pattern producing simple patterns like arch or loop.

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