

## Dermatoglyphical Studies in Primary Amenorrhea

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**ABSTRACT** The frequency of digital patterns and their indices, mean values and  $t'$  values of finger ridge count and interdigital ridge counts, frequency of patterns in hypothenar, thenar and interdigital areas, frequency of various types of axial triradii of 70 primary amenorrhea cases and 30 controls are presented. It is observed that there is a slight increase of loop ulnar and arches in the study group compared to the control group. In the ridge count also the study group exhibited less mean values than control group. Furthermore, there is evidence for the association of accessory axial triradii and elevated axial triradii in the primary amenorrhea cases likely to have chromosomal abnormalities.

### INTRODUCTION

Dermatoglyphics as a scientific tool came into use only towards the end of 19th century. Since then the fact that each individual's ridge configurations are unique has been utilised as a means of personal identification. Their significance was emphasized both by Herschel and Faulds in 1880. Francis Galton (1892) pioneered the fundamental finger print studies concerned with morphology, classification, inheritance and racial variation. Cummins (1926) laid foundation for the scientific study of dermal ridges on fingers, palms, soles and toes. The dermal ridge differentiation, which is genetically determined takes place early in foetal life and is completed between fourth and sixth months (Patten, 1953). The ridges once formed are not altered by environmental agents.

Association of dermatoglyphics with simian crease for trisomy 21 (Penrose, 1969), high frequency of arches and increased atd angle for Edward's syndrome (Taylor, 1968), Wilson's disease (Hodges and Simon, 1962), Huntington's chorea (Barbean et al., 1965), phenylketoneuria (Hirsch, 1964) were established in literature. For the present study 70 primary amenorrhea cases and 30 controls are taken for dermatoglyphic

studies to find out the association, if any of primary amenorrhea with dermatoglyphics.

### MATERIAL AND METHODS

One of the best known and most widely used printing methods is the inking method, which utilizes, printer's ink, a roller, a glass or metallic inking slab, a sponge or rubber pad and good quality glazed paper. A little quantity of ink was placed on the ceramic slab and spread with the roller to form a thin even film. The fingers were applied with ink film using the indigenously made cotton puff. Finger prints were obtained using a hard sunglass pad as a firm surface under the sheet of a paper by rolling the digits in radio-ular direction on the sheet in the prespecified space. Making use of the other side of sunglass pad, which is fixed with one centimetre thick soft sponge, the palm was pressed on the sheet of paper to obtain the palm prints.

The finger and palm prints were analysed using the standard method described by Cummins and Midlo (1961). Galton (1892) divided the finger print patterns by observing with magnifying glass into three groups *viz.*, arch, loop and whorl. The ridge counts and axial triradii are located with magnifying glass. The atd angle is measured with a protractor.

### RESULTS AND DISCUSSION

The percentage frequencies of digital patterns for both hands combined and the various indices are given in table 1. It is observed from the table that the values of different indices are almost the same in the case of both primary amenorrhea patients and control group. However, Dankmeijer's index was lower in the study group compared to controls.

The mean value of finger ridge counts and *interdigital ridge counts of both study and control*

**Table 1: Total frequency of digital patterns and their indices in primary amenorrhea cases and controls**

Pattern type/ Index	Study group		Control group	
	Number	Per cent	Number	Per cent
Whorl	212	30.28	90	30.00
Loop	427	61.00	177	59.00
Arch	61	8.72	33	11.00
Total	700	100.00	300	100.00
Furuhata's index	49.6487		50.8474	
Dankmeijer's index	28.7735		36.6666	
Pattern intensity index	12.1571		11.9000	

**Table 2: Mean value of finger ridge counts and interdigital ridge counts in primary amenorrhea cases and controls**

Ridge Count	Side	Study group				Control group							
		Total ridge count		Absolute ridge count		Total ridge count		Absolute ridge count					
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.				
Finger ridge count	Left hand	54.00	21.34	67.60	33.68	59.43	26.03	78.13	40.06				
	Right hand	53.75	21.27	67.91	32.88	59.60	22.98	72.37	39.58				
	Both hands	108.43	52.57	135.66	65.35	119.03	48.11	151.87	71.28				
		a-b		b-c		c-d		a-b		b-c		c-d	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Inter digital count	Left hand	30.73	4.75	18.37	6.16	26.09	5.99	33.43	5.49	22.56	6.44	30.50	5.24
	Right hand	29.61	7.08	17.92	6.53	26.36	6.09	31.13	5.68	23.13	6.21	30.70	4.36
	Both hands	59.74	8.61	36.02	12.97	51.25	12.66	64.23	10.66	45.70	11.82	61.20	8.69

group are given in table 2 along with their standard deviation. It is evident from the given table that the study group exhibited less mean values of finger ridge counts and interdigital ridge counts than the control group.

The 't' value of finger ridge counts and interdigital ridge counts of both study group and control group are given in table 3. There is evidence from this table that the 't' value of both left and right hands are the same for the control

**Table 3: 't' values of finger ridge counts and interdigital ridge counts in primary amenorrhea cases and controls**

Ridge count	Side	Total ridge count	Absolute ridge count	
Finger ridge count	Left hand	1.00	1.66	
	Right hand	1.00	0.55	
	Both hands	0.98	1.07	
		a-b	b-c	c-d
Inter digital ridge count	Left hand	2.34	3.01	3.68
	Right hand	1.13	3.75	4.01
	Both hands	2.05	3.64	4.54

Tabulated 't' value =  $t_{n_1 + n_2 - 2} (0.05) = t_{30 + 70 - 2} (0.05) = t_{98} (0.05) = 1.66$

and the study group. It is also clear from this table that 't' values of inter digital ridge counts for the study group are different from that of the control group, except for the right hand a-b ridge count which is similar to that of control group ( $t=1.13$ ).

The chi-square values of patterns of hypothenar, thenar and interdigital areas of both study and control group are presented in table 4. Since all the calculated values of  $\chi^2$  are less than the tabulated values of  $\chi^2 (0.05) = 3.84$  there is no

**Table 4: Chi-square values of patterns of thenar area, hypothenar area, and interdigital areas of primary amenorrhea cases and controls**

Pattern type	Study group	Control group
Hypothenar	0.7	0.1
Thenar/Interdigital I	0	0
II Interdigital	3.06	0.34
III Interdigital	1.34	0.14
IV Interdigital	0.32	0.1

Tabulated value of  $\chi^2 (0.05) = 3.84$

evidence for any association between the patterns of palm and the hand. Therefore we conclude that there is no association between different patterns of palm and the hand (left of right).

Frequency of various types of axial triradii in primary amenorrhea cases and control group are given in table 5. It is clear from the table that the position of axial triradius at t in both study group and controls is almost same with 84.29% and 83.33%. The same trend is observed with regards to the t' with 7.14% and 10.00% in both study and control groups. But there is a marked difference observed in having an accessory axial triradius

**Table 5: Frequencies of various types of axial triradii in primary amenorrhea cases and controls**

Type of Triradi	Study group						Control group					
	Left hand		Right hand		Both hands		Left hand		Right hand		Both hands	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
t	57	40.71	61	43.57	118	84.29	25	41.67	25	41.67	50	83.33
t'	5	3.57	5	3.57	10	7.14	3	5.00	3	5.00	6	10.00
t''	1	0.72	1	0.72	2	1.43	-	-	-	-	-	-
tt'	6	4.29	2	1.43	8	5.71	2	3.33	2	3.33	4	6.67
tt''	1	0.71	1	0.72	2	1.43	-	-	-	-	-	-
Total	70	50.00	70	50.00	140	100.00	30	50.00	30	50.00	60	100.00

and highly elevated axial triradius in the study group when compared to the control group. There was one case with t'' in the study group. In the control group this position is totally absent and this particular case happened to be a chromosomal abnormality 45, X with gonadal dysgenesis. The next type of tt' was found with 5.71% (6 palms in the left hand and 2 palms in the right hand) in study group and 6.67% in the control group. Out of these 6 cases, 2 cases have a chromosomal abnormality - two cases with 45,X/46,XX and with gonadal dysgenesis. The remaining 4 cases have normal chromosomal complement but with primary amenorrhea and gonadal dysgenesis. The type tt'' is present in one case in the study group and this case also happens to carry a chromosomal abnormality. (45,X/47,XXX) with gonadal dysgenesis. This shows that the primary amenorrhea with accessory axial triradius and elevated axial triradius have a chromosomal abnormality and sometimes with congenital abnormalities like gonadal dysgenesis in this particular study.

It is observed there is a slight increase of loop ulnar and arches in the study group when compared to the control group. In the ridge count also the study group exhibited less mean values than control group. There is evidence from this study for the association of accessory axial

triradii and elevated axial triradii in the primary amenorrhea cases likely to have chromosomal abnormalities.

#### REFERENCES

- Barbeau, A., Trudeau J.G. and Costeux, C.: Finger prints in Huntington's chorea. *Union Medicale du Canada*, **942**: 166-170 (1965).
- Cummins, H.: Epidermal ridge configurations in developmental defects with particular reference to the ontogenetic factors which condition ridge direction. *Am. J. Anat.*, **39**: 89-151 (1926).
- Cummins, H. and Midlo, C.: *Finger Prints Palms and Soles. An Introduction to Dermatoglyphics*. Dover Publications, New York (1961).
- Faulds, H.: On the skin-furrows of the hand. *Nature*, **22**: 605 (1980).
- Galton, F.: *Finger Prints*. MacMillan, London (1892).
- Herschel, W.: On finger prints. *Nature*, **23**: 23 (1980).
- Hirsch, W.: Biological aspects of finger prints, palms and soles. *Finger Print and Identification Magazine*, August 3 (1964).
- Hodges R.E. and Simon J.R.: Relationship between fingerprint patterns and Wilson's disease. *J. Lab. Clin. Med.*, **60**(4): 629-240 (1962).
- Patten, N.: *Human Embryology* Blakiston, New York (1953).
- Penrose, L.S.: Effects of additive genes at many loci compared with those of a set of alleles at one locus in parent and sib correlation. *Ann. Hum. Genet.*, **33**: 15-21 (1969).
- Taylor A.I.: Autosomal trisomy syndrome. A detailed study of 27 cases Edward's syndrome and 27 cases of Patau's syndrome. *J. Med. Genet.*, **5**: 227-252 (1968).