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Asymmetry of Dermatoglyphic Features in Selected Families- Qualitative Parameters

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ABSTRACT

Dermatoglyphic features of fifteen families from different locations of Kodungallur municipality (south western border of Thrissur district, Kerala) were studied. The selected families belong to Hindu Ezhava community, 4 membered families and have 2 children each. Palm prints of all the family members were collected for the study. Qualitative features like fingertip patterns, patterns on thenar and hypothenar area and interdigital patterns were taken sex wise and generation wise. The interdigital areas, thenar and and hypothenar areas were looked for the presence of true patterns. The patterns on fingertips are studied and recognized the types of patterns. The overall picture shows the difference existed among parents and children in the case of parameters studied.

KEY WORDS: Dermatoglyphics, thenar, hypothenar, interdigital patterns

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INTRODUCTION

Dermatoglyphics is the scientific study of finger prints. 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. In humans, dermatoglyphics are present on fingers, palms, toes and soles and give insight into a critical period of embryogenesis. Dermal ridge configurations are genetically determined and influenced by environmental forces¹.

The term dermatoglyphics was coined by Harold Cummins and Midlo in 1926. The ridge formations of the skin of an individual begin to appear during the 3rd and 4th month of foetal development. One established pattern do not change throughout the life and individual. After death, decomposition of the skin is the last to occur in the area of the dermatoglyphic configurations. There are many instances in which the only identifiable part of a deceased person was the friction ridge formations.

Characteristically hair doesnot grow from the area of ridge formations. The ridging formations serve cell to enhance contact, an area of multiple nerve ending (Dermal papillae) and aids in the prevention of slippage. People of African ancestry display reduced skin pigmentation in the designated locations. All studies of the dermal ridge arrangements including genetics, anthropology and Egyptology are classified under the term dermatoglyphics².

A small area of a finger of a palm is not duplicated either in another regions or in a different individual. So the individual epidermal ridges are highly variable. The dermatoglyphic patterns are widely accepted as genetic marks^[3]. Its role in the diagnosis of monozygotic twins and chromosomal and non chromosomal genetic disorders has been well established. These dermatoglyphic patterns are classified by Henry- Gatton system.

One should distinguish between flexion creases and dermatoglyphic patterns. As simple inspection of the palm shows major thick deep lines on the palm and interphalangeal joints of the finger. They are known as flexion creases. Three major creases are found on the palm. They are the palmist 'line of life', 'line of head' and 'line of heart'. All fingers except the thumb have two flexion creases⁴. Scientific study of finger, palm and sole print have long been indispensable in crime detection. The ridges show a lot of consistency in ethnic variations. Medical geneticists and physicians study correlation of specific ridge patterns with certain genetic disorders⁵.

A review of literature on the subject shows that other clinical entities with dermatoglyphic studies are going on in various parts of the world, such as rheumatism, diabetes, leprosy, celiac diseases, leukemia, schizophrenia, childhood cirrhosis, Wilson's disease, sickle cell disease, rubella syndrome, retinoblastoma etc. Some social problems like juvenile delinquency, criminal behavior,

mental retardation etc. are also investigated for dermatoglyphical markers. Harris Hawthorne Wilder initiated dermatoglyphical studies in America. Klaus Patun, Irene Auchida and David N Smith found D&E trisomy syndromes associated with unusual dermatoglyphics. These discoveries led many workers to the study of dermatoglyphics of persons suffering from disease due to congenital and hereditary diseases.

The study of dermatoglyphic patterns are popularized recently. Its usefulness in medical diagnosis, prognosis and other genetic studies are highly appreciated. Various workers have postulated the significance of dermatoglyphics in various population. The present study is made on the view to compare the inheritance pattern of dermatoglyphic features.

MATERIALS AND METHODS

Fifteen families from different locations of Kodungallur municipality (south western border of Thrissur district, Kerala) were selected for the collection of palm prints. The selected families belongs to Hindu Ezhava community, 4 membered families and have 2 children each.

A small drop of duplicating ink was placed on a glass slab. The ink was evenly spread over the slab using a roller to form a thin film. For taking rolled impressions, the bulb of the finger is placed at right angles to the surface of the plate. The finger was then rolled until the bulb faced in the opposite direction. By pressing the finger lightly on the paper and rolled in the same manner, a clear, rolled impression of the finger pattern surface was obtained. To take impressions of the palm, it was stretched and a thin film of ink was applied with the help of the roller. Special care was provided to apply ink on inter digital areas and centre of the palm. Then the palm was kept over the paper and firm pressure was applied over the centre of the dorsum of the hand and in the digital areas.

Since dermatoglyphics is the study of ridges and grooves on the epidermis, a wide range of area is available for study. Separate observations and comparisons can be done on the following anatomical regions⁶.

1. Patterns on fingertips
2. Patterns on middle and proximal phalanges
3. Palmar pattern configurations
4. Patterns on toes
5. Plantar (soles) pattern configurations

For the present study I selected qualitative features like fingertip patterns, patterns on thenar and hypothenar areas and inter digital patterns. The inter digital areas, thenar and hypothenar areas were looked for the presence of true patterns. The patterns on fingertips were studied and recognized the types of patterns. The patterns are divided into 3 groups arches, loops and whorls. Triradius is a

basic land mark on fingertip patterns⁷. A Tri radius is formed by the meeting of 3 ridge systems that forms angles of approximately 120 with one another.

Fingertip patterns

1. Arch

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.

2. Loop

A series of ridges enters the pattern area on one side of the digit, reverses abruptly and leaves the pattern area on the same side.

3. Whorl

Two or more triadic are present. Ridges are arranged as succession of concentric rings or spiral around the core in either a clockwise or a counter clockwise direction.

Palmar pattern configurations

- Thenar and first inter digital areas

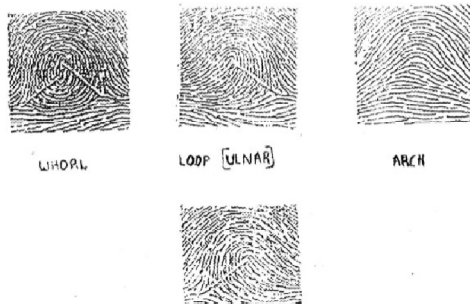
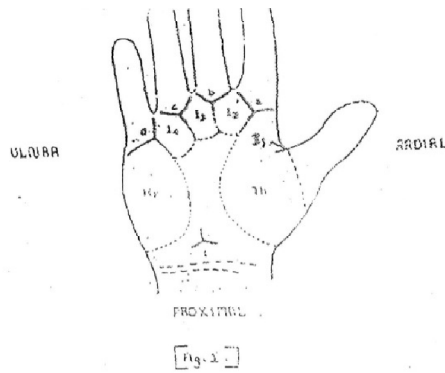
These two areas are closely related anatomically, true patterns are mostly loops.

- Second, third and fourth inter digital areas

The second inter digital area (I2) lies between triradius a and b, the third inter digital area (I3) between b and c and fourth inter digital area (I4) between c and d. Loops are the most common patterns.

- Hypothenar area

Most commonly present patterns are whorls, loops and arches. Other configuration like vestige and open field were not studied.



RESULTS AND DISCUSSION

The analysis is made on the view to compare the inheritance pattern of dermatoglyphic features. Out of the fifteen families selected for the study, 8 families have both sons and daughters while 5 families have only daughters and 2 families have only sons. Qualitative features like fingertip patterns, patterns on thenar and hypothenar area and inter digital patterns were taken for analysis. Average values of different parameters were taken sex wise and generation wise. The values were compared among sons and fathers ;daughters and mothers.

The data collected are presented in table.

Table 1: Dermatoglyphic features of 15 families

Individual Identification	Age	Sex	Fingertip patterns						Patterns on													
			Arch		Loop		Whorl		Thenar		Hypothenar		I1		I2		I3		I4			
			L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R		
1	1/2	48	M	-	-	1	1	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	1/2	42	F	-	-	3	2	2	3	-	-	-	1	-	-	-	-	-	-	-	1	1
	1/3	12	M	-	-	1	1	4	4	-	-	-	-	-	-	-	-	1	1	-	-	-
	1/4	8	F	-	-	5	2	-	3	-	-	-	-	-	-	-	-	-	-	-	1	1
2	2/1	50	M	-	-	5	5	-	-	-	-	-	1	-	-	-	-	1	1	-	-	-

	2/2	39	F	-	-	-	1	5	4	-	-	1	-	-	-	-	1	1	-	-	
	2/3	18	M	-	-	3	3	2	2	-	-	-	-	-	1	-	1	1	-	-	
	2/4	12	F	1	1	1	-	3	4	-	-	-	1	-	-	-	1	-	-	-	
3	3/1	48	M	-	-	4	2	1	3	-	-	1	1	-	-	-	1	-	-	1	
	3/2	41	F	-	-	5	5	-	-	-	-	-	1	-	-	-	1	1	-	-	
	3/3	18	M	-	1	5	4	-	-	-	-	-	-	-	-	-	1	1	1	-	
	3/4	12	F	-	-	4	2	1	3	-	-	-	1	-	1	-	-	1	-	-	
4	4/1	72	M	-	1	5	4	-	-	-	-	-	-	-	-	-	1	1	-	1	
	4/2	62	F	-	-	5	5	-	-	-	-	-	1	1	1	-	-	1	1	-	-
	4/3	41	F	-	-	5	5	-	-	-	-	-	1	-	-	-	-	1	1	-	-
	4/4	39	M	-	-	4	2	1	3	-	-	-	-	-	-	-	-	1	1	1	-
5	5/1	60	M	-	-	-	1	5	4	-	-	1	1	-	-	-	1	1	1	-	
	5/2	49	F	-	-	2	-	3	5	-	1	-	-	-	-	-	-	-	1	-	
	5/3	22	F	1	-	1	3	3	2	-	-	1	1	-	-	1	1	1	1	-	1
	5/4	20	F	-	-	-	1	5	4	-	-	-	-	-	-	-	1	1	1	1	-
6	6/1	53	M	-	-	3	5	2	-	-	-	-	-	-	-	-	1	1	-	-	
	6/2	43	F	-	-	5	5	-	-	-	-	-	-	-	1	-	1	1	1	1	
	6/3	20	F	-	-	4	3	2	2	-	-	-	-	-	-	-	1	1	-	-	
	6/4	10	M	1	-	4	5	-	-	-	-	1	1	-	-	-	1	1	-	-	
7	7/1	42	M	-	-	5	5	-	-	-	-	-	-	-	-	-	1	1	-	-	
	7/2	39	F	-	1	4	3	1	1	1	1	-	-	1	-	-	1	1	1	1	
	7/3	12	M	1	1	4	4	-	-	1	-	1	1	-	-	-	1	1	1	1	
	7/4	8	F	-	1	4	2	1	2	1	1	-	-	-	1	-	-	1	1	-	-
8	8/1	77	M	1	2	3	2	1	1	-	-	-	-	1	1	-	-	1	1	-	-
	8/2	75	F	-	-	2	2	3	3	-	-	1	-	-	-	1	-	-	1	1	-
	8/3	48	F	2	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	1	
	8/4	42	M	-	-	5	5	-	-	-	-	-	-	-	-	-	-	1	1	-	-

Individual Identification	Age	Sex	Fingertip patterns						Patterns on												
			Arch		Loop		Whorl		Thenar		Hypothenar		I1		I2		I3		I4		
			L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	
9	9/1	48	M	-	-	1	1	4	4	1	-	-	-	-	-	-	-	1	-	-	
	9/2	44	F	-	-	3	1	2	4	-	-	-	-	-	-	-	-	-	-	2	1
	9/3	17	F	-	-	1	1	4	4	-	-	-	-	-	-	-	-	1	1	-	1
	9/4	9	F	-	-	1	1	4	4	-	-	-	-	-	-	-	1	1	1	1	1
10	10/1	35	M	1	-	3	2	1	3	-	-	1	-	-	-	-	-	1	1	1	-
	10/2	26	F	-	-	2	3	3	2	-	-	1	-	-	-	-	-	1	1	1	-
	10/3	4	F	-	1	5	4	-	-	-	-	-	-	-	-	-	-	1	1	-	-

	10/4	2	F	-	-	4	3	1	2	-	-	-	-	-	-	-	1	1	-	-
11	11/1	48	M	-	-	1	1	4	4	-	-	-	-	-	-	-	-	-	-	-
	11/2	42	F	-	-	3	2	2	3	-	-	-	1	-	-	-	-	-	1	1
	11/3	12	M	-	-	1	1	4	4	-	-	-	-	-	-	-	1	1	-	-
	11/4	8	F	-	-	5	2	-	3	-	-	-	-	-	-	-	-	-	1	1
12	12/1	50	M	-	-	5	5	-	-	-	-	-	1	-	-	-	1	1	-	-
	12/2	39	F	-	-	-	1	5	4	-	-	1	-	-	-	-	1	1	-	-
	12/3	18	M	-	-	3	3	2	2	-	-	-	-	-	1	-	1	1	-	-
	12/4	12	F	1	1	1	-	3	4	-	-	-	1	-	-	-	1	-	-	-
13	13/1	48	M	-	-	4	2	1	3	-	-	1	1	-	-	-	1	-	-	1
	13/2	41	F	-	-	5	5	-	-	-	-	-	1	-	-	-	1	1	-	-
	13/3	18	M	-	1	5	4	-	-	-	-	-	-	-	-	-	1	1	1	-
	13/4	12	F	-	-	4	2	1	3	-	-	-	1	-	1	-	-	1	-	-
14	14/1	72	M	-	1	5	4	-	-	-	-	-	-	-	-	-	1	1	-	1
	14/2	62	F	-	-	5	5	-	-	-	-	-	1	1	1	-	-	1	1	-
	14/3	41	F	-	-	5	5	-	-	-	-	-	1	-	-	-	-	1	1	-
	14/4	39	M	-	-	4	2	1	3	-	-	-	-	-	-	-	1	1	1	-
15	15/1	60	M	-	-	-	1	5	4	-	-	1	1	-	-	-	1	1	1	-
	15/2	49	F	-	-	2	-	3	5	-	1	-	-	-	-	-	-	-	1	-
	15/3	22	F	1	-	1	3	3	2	-	-	1	1	-	-	1	1	1	-	1
	15/4	20	F	-	-	-	1	5	4	-	-	-	-	-	-	1	1	1	1	-

Table 2: Dermatoglyphic features in families- Fingertip patterns in percentage

	Father	Son	Mother	Daughter
Arch	4	4	1	5
Loop	57	65	59	51
Whorl	39	31	40	44

The fingertip patterns of parents and children are compared (table 2). In the case of females daughters have more arch patterns. Sons have more loop pattern while daughters have less loop pattern in comparison to mothers. But in the case of whorl pattern sons have less while daughters have more.

Table 3: Dermatoglyphic features in families- Patterns on palm in percentage

	Thenar area		Hypothenar area		Interdigital area (I1)		Interdigital area (I2)		Interdigital area (I3)		Interdigital area (I4)	
	L	R	L	R	L	R	L	R	L	R	L	R
Father	3	0	13	7	3	3	3	0	27	33	20	15
Son	4	0	8	7	0	0	4	4	27	54	23	15
Mother	10	10	17	13	13	10	3	3	17	27	27	20
Daughter	0	3	9	18	3	9	3	9	32	38	24	15

It is clear from the Table 3 that the thenar patterns and patterns on interdigital area (I1) are few in all groups except mothers. More patterns in all categories are observed in interdigital area 3

and 4. Significantly higher percentage of patterns are observed in the I3 area of right palm of sons and left palm of daughters. One of the most important observation is that all have patterns in one or another position on the palm. Another important observation is that in an overall consideration mothers have more patterns than fathers.

Discussion

From the present study it is clear that the most frequent type of fingertip pattern is loop in all categories followed by whorl and very few number of arches. This is in concordance with the rates of general population.

The presence of patterns on any of the region of palm on all individuals is an important observation. Similarly the presence of patterns on the I3 region of right palm of sons is another important observation. Fifty four percentage of sons have patterns on this region. The observation that mothers have more patterns than fathers is a matter of interest.

The present study is a small one and no many conclusions can be drawn. However the overall picture shows the difference existed among parents and children in the case of parameters studied.

CONCLUSION

The most frequent type of fingertip pattern is loop in all categories followed by whorl and very few number of arches. In palmar region the thenar patterns and patterns on interdigital area II are few in all groups except mother have more patterns than fathers. Overall picture shows the difference existed among parents and children in the case of the parameters studied.

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