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Dermatoglyphic Study of Fingertip Pattern on Mental Retardation

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Abstract: *Mental retardation is a common problem. Almost 3% of the population have an intelligence quotient below 70. The severe kind of mental retardation will be diagnosed in early stages but the mild cases are remain unnoticed so It will be well treated if it has diagnosed as early as possible. The dermatoglyphic study on fingertip pattern is inexpensive and non-invasive method to early diagnosis.*

I. Introduction

Mental retardation is a common problem before adulthood characterized with impaired cognitive function and deficits in two or more adaptive behaviors. Almost 3% of the population has the intelligence quotient below 70 (swaiman 1982). The world health organization describes mental retardation as "an incomplete or insufficient general development of mental capacities".

Dermatoglyphic study of fingertips offers three major advantages

- Both brain and skin develops from same ectoderm, therefore, dermatoglyphics is an informative for early disturbances in brain development
- Epidermal ridge patterns on the hands fully developed at birth and there after remained unchanged.
- Recording permanent impressions could be accomplished rapidly, inexpensively and without any trauma to the patient. Hence finger prints and palmar patterns of children with mental retardation will recorded and analyzed in this study.

II. Review of Literature

The distal phalanges of fingures exhibit ridge patterns on the palmar surfaces. Galton (1892) divided these ridges patterns of the finger tips in the three groups.

1. Arches
2. Loops
a. Ulnar loops
b. Radial loops
3. Whorls

1. Arches

The simplest patterns found on the finger tips is an 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. The arch pattern is subdivided in to two types:

a. Simple arch
b. Tented arch

Simple arch is composed of ridges that cross the finger tip from one side to the other. Tended arch is composed of ridges meet at a point so that their smooth sweep is interrupted.

2. Loop

The most common on the finer tip is a loop. In this pattern a series of ridges enters the pattern area on the side of the digit, re-curves abruptly, and lead the pattern area on the same side. If the ridges opens of the ulnar side the resulting loop, is termed and ulnar loop (UL). Whereas if it opens toward the radial margin, it is called a radial loop (RL).

3. Whorls

In this ridges are commonly arranged as a succession of concentric rings are ellipses. It consists of two or more triradii or meeting points of three ridge systems, They are:

III. Materials and Methods

100 school going students from a nearby primary school and 200 mentally retracted subjects from institutions in Kanyakumari district were selected and categorised into three groups on age basis

1. Group I – 5-6 years
2. Group II – 7-8 years
3. Group III – 9-10 years

For obtaining finger prints, Ink method of Purvis – Smith (1969) is followed. The following materials have been used ink pad, printing paper and printing ink. Children were directed to wash their hands with soap and water and wipe them dry with a towel. The fingertips were pressed against the ink pad and prints are obtained on printing paper. Prints were clearly labelled with name of the child and other particulars.

Using the magnifying hand lens, the patterns were studied carefully. Type of pattern of finger tips was recorded as UL (Ulnar loop), RL (Radial loop), W (Whorl) and A (Arch) beginning with the little finger of the left hand and continuing to the thumb. The digits of the right hand were recorded, in order starting with the thumb and proceedings towards the little finger. Plain and tented arches were classified as arches Lateral pocket loops, twin loops and central pockets were counted as whorls Radial and ulnar loops were counted both separately and together**.**

IV. Results and Disussion

Table No. 2 mentally retarded male children showed statistically significant higher frequency of ulnar loops in all the digits taken together, digits V & II of both hands, digits I of left hand. In contrast, digit IV of both sides showed a lower frequency of ulnar loop than the control in both sexes. In digit III, it was found to be increased in left hand and decreased in right hand. No significant difference was observed in the radial loop patterns. The radial loop patter was found to be absent in digits V, III, II and I of males and V, II and I of females. It showed an increased frequency in digit IV of left hand and a decreased frequency in digit IV of left hand and a decreased frequency in digit IV of right hand in males. In case of females digit III of both sides showed increased frequency and in digit IV the opposite findings was observed. Arch pattern was significantly higher in frequency in the digits V, IV and III of mentally retarded male children but in the female the converse was observed in digits III and I of both sides. It was found to be increased in digit IV of both sides of mentally retarded females. Arch pattern was absent in digit II in both hands of male and female children. It was absent in digits I of left hand of male children and digit V of both hands of female children. Whorl pattern was significantly lower in the mentally retarded boys while the mentally retarded girls showed a higher frequency of whorls in digit III of left hand and digit IV of right hand. A decrease in frequency was observed in digits V and II on the left hands of female mentally retarded children.

In Table No. 3 the ulnar loop frequency was observed to be significantly lower in both the hands in the mentally retarded ame and female children. The frequency was increased in digits V and II of male and digit V of mentally retarded female children. Radial loop pattern was found to be significantly higher in digits V, IV and II in the right hsnd of mrntally retarded male and digit IV in both hands and digit III in the left hand of mutually retarded female children. No radial loop was observed in any of the other digits. Arch frequency was observed to be higher in digits IV, III and I in the mentally retarded boys and digit IV on both sides in the mentally retarded girls. It was found to be lower in frequency in digit V in both sides of mentally retarded male children. All other fingers showed absent arch pattern. Whorl pattern was found to be significantly higher in

digit I of both hands in mentally retarded male and female children. It was observed to be increased in digits V and III of mentally retarded boys on both sides. In case of female mentally retarded children the observation was not constant. It was increased in some digits and decreased in some other digits.

In Table No. 4 ulnar loop frequency showed no statistically significant difference, when all the digits are considered together. But digits V & III of both hands showed significantly higher frequencies in male and female mentally retarded children. Digit II showed a decrease in the left side and an increase in the right side of mentally retarded male and female children. Digit I showed an increased frequency in the left hand and a decreased frequency in the right hand of mentally retarded boys and girls. Radial loop pattern was dound to be absent in digits V, II & I of both sexes. No significant difference in frequency was observed in this group. Arch pattern was observed to be absent in digits V, II and I in the left hand and V, III, II and I in the right hand of mentally retarded male children. It was found to be significantly lower frequency in all digits in mentally retarded female children. Whorls showed no overall significant difference in frequency but in digit V of mentally retarded male and female children the whorl frequency was significantly lower. Other digits showed increased or decreased pattern frequency. No constant findings were observed.

V. Figures and Tables

Table – 1

Distribution of control(C) and mentally retarded(MR) children

Group	Age in years	Number of children					
		Male		Female		Total	
		C	MR	C	MR	C	MR
I	5-6	16	48	16	36	32	84
II	7-8	16	38	17	24	33	62
III	9-10	20	34	15	20	35	54
Total		52	120	48	80	100	200

Table – 2

Mean percentage frequency of fingertip pattern of group I

pattern type	Gender		Left					Right					
			Digits										
			I	II	III	IV	V	V	IV	III	II	I	All Digits
Ulnar Loop	Male	C	75	45	60	60	65	65	55	80	40	80	63
		MR	92	54	63	55	83	79	50	71	71	79	70
	Female	C	80	50	60	45	65	65	60	70	60	80	64
		MR	83	44	55	39	78	67	44	72	61	78	62
Radial Loop	Male	C	0	0	0	0	0	0	5	0	0	0	5
		MR	0	0	0	8	0	0	0	0	0	0	8
	Female	C	0	0	5	15	0	0	5	5	0	0	8
		MR	0	0	6	11	0	0	0	6	0	0	8
Arch	Male	C	0	0	5	5	0	0	10	0	0	0	7
		MR	0	0	17	17	5	5	25	8	0	5	12
	Female	C	5	0	15	5	0	0	10	10	0	5	8
		MR	0	0	6	11	0	0	11	0	0	0	9
Whorl	Male	C	25	55	35	35	35	35	30	20	60	20	35
		MR	8	46	21	29	13	17	33	21	29	17	23
	Female	C	15	50	20	35	35	35	25	15	40	15	29
		MR	17	56	33	39	22	33	44	22	39	22	33

Table - 3

Mean percentage frequency of fingertip pattern of group II

pattern type	Gender		Left					Right					
			Digits										
			I	II	III	IV	V	V	IV	III	II	I	All Digits
Ulnar Loop	Male	C	95	45	80	70	75	65	60	85	60	95	73
		MR	74	53	58	68	84	68	37	78	53	68	64

	Female	**C**	**95**	**70**	**80**	**70**	**70**	**70**	**65**	**85**	**75**	**95**	**78**
		MR	**83**	**42**	**58**	**75**	**83**	**67**	**33**	**75**	**50**	**83**	**65**
Radial Loop	**Male**	**C**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		MR	**0**	**0**	**0**	**0**	**0**	**5**	**26**	**0**	**5**	**0**	**12**
	Female	**C**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
		MR	**0**	**0**	**8**	**8**	**0**	**0**	**0**	**8**	**0**	**0**	**8**
Arch	**Male**	**C**	**0**	**0**	**0**	**0**	**10**	**10**	**0**	**0**	**0**	**0**	**10**
		MR	**5**	**0**	**11**	**5**	**0**	**5**	**5**	**5**	**0**	**5**	**6**
	Female	**C**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
		MR	**0**	**0**	**0**	**8**	**0**	**0**	**8**	**0**	**0**	**0**	**8**
Whorl	**Male**	**C**	**5**	**55**	**20**	**30**	**15**	**25**	**40**	**15**	**40**	**5**	**25**
		MR	**21**	**47**	**26**	**26**	**16**	**26**	**32**	**16**	**42**	**26**	**27**
	Female	**C**	**5**	**30**	**20**	**25**	**30**	**30**	**35**	**15**	**25**	**5**	**22**
		MR	**17**	**58**	**20**	**5**	**17**	**20**	**58**	**17**	**30**	**17**	**26**

Table – 4

Mean percentage frequency of fingertip pattern of group III

pattern type	**Gender**		**Left**					**Right**					
			Digits										
			I	**II**	**III**	**IV**	**V**	**I**	**II**	**III**	**IV**	**V**	**All Digits**
Ulnar Loop	**Male**	**C**	80	48	**56**	**52**	**56**	**60**	**52**	**60**	**48**	**88**	**60**
		MR	**82**	**41**	**71**	**53**	**76**	**71**	**47**	**76**	**53**	**71**	**64**
	Female	**C**	**89**	**50**	**44**	**33**	**44**	**50**	**33**	**67**	**50**	**89**	**55**
		MR	**80**	**30**	**50**	**40**	**60**	**70**	**40**	**70**	**60**	**90**	**59**
Radial Loop	**Male**	**C**	**0**	**0**	**4**	**4**	**0**	**0**	**8**	**0**	**0**	**0**	**5**
		MR	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**6**	**0**	**0**	**12**
	Female	**C**	**0**	**0**	**0**	**6**	**0**	**0**	**17**	**6**	**0**	**0**	**10**
		MR	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**20**
Arch	**Male**	**C**	**0**	**0**	**8**	**4**	**0**	**0**	**4**	**0**	**0**	**0**	**5**
		MR	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**0**	**6**
	Female	**C**	**6**	**6**	**16**	**11**	**11**	**6**	**0**	**0**	**6**	**6**	**9**
		MR	**0**	**0**	**10**	**10**	**0**	**0**	**10**	**0**	**0**	**0**	**10**
Whorl	**Male**	**C**	**20**	**52**	**32**	**40**	**44**	**40**	**36**	**32**	**52**	**12**	**36**
		MR	**18**	**59**	**29**	**41**	**24**	**29**	**29**	**18**	**47**	**29**	**32**
	Female	**C**	**6**	**44**	**39**	**50**	**44**	**44**	**50**	**28**	**44**	**6**	**36**
		MR	**20**	**70**	**40**	**30**	**40**	**30**	**50**	**30**	**40**	**10**	**36**

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