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Digito-Palmer Dermatoglyphic Profile in Jatyaandh: A Case Control Study

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ABSTRACT
Significant advancements have been achieved in exploring and comprehending the connections between dermatoglyphics and various medical conditions. Consequently, dermatoglyphic analysis has gained recognition as a valuable diagnostic instrument, particularly in disorders arising from chromosomal abnormalities. These conditions often lead to alterations in patterns, further supporting the utility of dermatoglyphic analysis as a diagnostic aid. The objective of this study is to investigate the correlation between dermatoglyphics and Jatyaandh. In this study, 250 children diagnosed with Jatyaandh were examined and their dermatoglyphic patterns were compared with those of age and sex matched controls. Significant differences were observed in various dermatoglyphic traits among the patients. The case group exhibited variations in Finger ridge count, demonstrated an increased atd angle and higher number of whorl patterns on their digits.
Keywords: *Jatyaandh, Chakshurindriya, Jnanendriya, Dauhrudaya-apchar, Janmabala-pravruta vyadhi.*

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INTRODUCTION

The skin on the fingertips of the Palmer and Plantar surfaces is not smooth; instead, it forms unique grooved ridges. These ridge patterns have fascinated both laymen and scientists for over three centuries. The word "Dermatoglyphic" has been derived from Greek language (derma- skin, glyphic-carve) and is a branch of science which deals with the study of ridge patterns on finger tips, palms, soles, and toes [1]. They have particularly attracted the attention of forensic officials, who utilize these distinct ridge configurations as a reliable method of personal identification. From birth until death, the handprints of an individual remain unchanged, except for proportional adjustments due to growth [2]. In recent decades, there has been a growing global interest in epidermal ridges, especially when it became evident that patients with chromosomal deviations often exhibit unusual ridge formations. By examining these skin ridges, it has become possible to determine whether a patient has a specific chromosomal defect in a simple and cost-effective manner [3]. As a result, clinicians can use knowledge of these dermatoglyphic patterns associated with various medical disorders as a diagnostic tool, especially for diseases with definite genetic background [4]. Till now, many similar studies have been carried out in genetically inherited conditions such as Down's syndrome [5], schizophrenia [6], cerebral palsy [7], leprosy [8], congenital heart diseases [9] and others. This study aims to investigate and emphasize whether there exists a distinct set of dermatoglyphic patterns in individual with *Jatyaandh.* The '*Netra*' holds utmost significance in *'sharira'*, as without them, the whole world would be engulfed in darkness, rendering life meaningless. These essential organs predominantly contain the element of '*Agni mahabhuta*' responsible for the process of *'Roopagrahana'*[10]. During the *garbhakala* (pregnancy period), if *Agni mahabhuta* fails to enter '*drishti*' (vision), it may lead to *jatyaandh* [11]. The word *'Jatyaandh'* originates from *'jata'* meaning 'born' or 'become' and *'andh'* signifying 'blindness', collectively referring to someone born blind or become blind after birth [12]. "*Jatyaandh*" can be compared with the congenital blindness in contemporary science. The Genetic factors play a role in many kinds of eye disease, including those diseases that are the leading cause of blindness among infants, children and adults. About 60 percent of cases of blindness among infants are caused by inherited eye diseases such as congenital glaucoma, congenital cataracts, optic atrophy, retinal degeneration and ocular malformations i.e. anophthalmia, microphthalmia, microcornea, coloboma, leukocoria etc. [13]. Dermatoglyphics, including both Digital and Palmer dermatoglyphics have been studied for their potential

to predict various genetic and acquired disorders with genetic influence due to their stable nature throughout life.

Digital patterns: There are three basic finger ridge patterns a) Arches b) Loops c) Whorls [14]

- In the arch pattern, the ridges enter from one side and flow to the other side, creating a simple and tented arch appearance. These arches have a zero ridge count meaning there is no delta (triangular area) within the pattern.
- A loop pattern in fingertips is characterized by the presence of triradius (convergence point of three ridges), at least one ridge that recurve back and a minimum ridge count of one across the recurving ridge. If any of these features are absent, the pattern is considered as a tented arch and not a loop. Loops are identified by ridges entering from one side, curving back and exiting on the same side of the finger. Depending on whether the ridges exit from the ulnar side or the radial side, the loop is classified as an ulnar loop or a radial loop respectively. It's important to note that a loop pattern contains only one triradius.
- The whorl is the most intricate type of fingerprint pattern, forming a continuous circular shape bounded by the type lines extending from the two triradii (convergence point of three ridges). The region enclosed by these type lines is referred to as the pattern area [15]. Whorls can be classified into various subtypes, including the simple whorl, symmetrical whorl, double loop whorl, accidental whorl. Each subtype exhibits its own unique characteristics within the overall whorl pattern.

Palmer Patterns

The palmer area is subdivided into different zones, each of which may or may not contain a specific pattern.These zones consists of four interdigital areas (I1, I2, I3 and I4 from the radial to the ulnar side), the axial triradius (t, t', t'' located based on triradius position), as well as the hypothenar eminence and the thenar eminence. *Chakshu* and *twak* are two of the *panch-jnanendriyas* which develops during the third month of *Garbhavakranti* [16]. According to modern science, both of these sensory organs are formed from ectoderm during the period of 3rd to 8th week of intrauterine development [17]. Since they arise from the same ectodermal origin, any developmental anomaly in the ectoderm should manifest in both *chakshu* and *twak*. To explore this concept, researchers are studying dermatoglyphics, which involves evaluating the unique patterns on the skin's surface. The objective of this research is to identify dermatoglyphic features and specific variations that can be used as an affordable screening tool in populations at risk. Early detection of such variations can aid in anticipating and preventing diseases or complications associated with them.

MATERIALS AND METHODS

Sample Size

The present study is an observational case control study, here the sample size taken is 500 (250 patients and 250 controls) based on prevalence rate. The sample size for unmatched case control study is calculated by Kelsey method [18].

Selection of Patients

- A total of 250 participants with *jatyaandh* aged between 0-16 years will be recruited from blind schools. An ophthalmologist will assess the visual acquity and central visual field of each child with ocular malformation, confirming that their visual acuity is less than 6/60 or their central visual fields are less than 20 degrees in the better eye. 250 subjects of same age group and from the same region, without any family history of ocular malformation will be selected as controls.
- The study has obtained ethical clearance from the institutional ethics committee, and it has been registered with the Clinical Trials Registry of India under the registration number CTRI/2021/10/037152 before collecting the dermatoglyphic imprints.
- Informed consent has been obtained from both the patients and their relatives. Verbal consent is taken from the patient and signed consent is obtained from the first degree relative.

Inclusion Criteria

- Patients diagnosed with *jatyaandh* aged between 0-16 years, regardless of their gender, will be included in the study.
- Dermatoglyphic study will be conducted using Palmer imprints.

Exclusion criteria

- Diseases of hands, Keratosis Palmaris, Impetigo, Palmar psoriasis, Leprosy.
- Children with Neurological disorder/ Psychiatric illness/ Genetic disorder.
- Injuries and scars of hand.
- Plantar imprints will be omitted for the study.

Method of taking Dermatoglyphic prints

- The dermatoglyphics prints were obtained using 'Ink Method' as described by Cummins and Mildo (1961). Prior to the procedure, patients were thoroughly informed about the process, and verbal consent was obtained from them. Signed consent was also obtained from their first degree relative.
- Subjects were instructed to wash their hands with soap and water and then dried with a soft cotton cloth to ensure the removal of any oil or dirt. A blue duplicating ink was applied uniformly on their hands, paying particular attention to ink the hollow of palm and flexor creases of the wrist evenly.
- Next, the patient's hands were placed on bond paper, starting from proximal to distal end. Gentle pressure was applied to imprint the palm between the intermetacarpal grooves at the root of the fingers and on the dorsal side, corresponding to the thenar and hypothenar regions. The finger ridges were then printed in sequential order from the thumb to little finger.
- Subsequently, the palm was lifted from the paper in reverse order, starting from the distal to proximal end. Afterward, the palm was cleaned, washed and dried with a hand towel. The same standardized procedure was followed for the control group as well.
- The printed sheets were coded with essential information such as name, age, and sex for both the case and control groups. Dermatoglyphic analysis was performed using a magnifying hand lens and ridge counting was carried out with the assistance of a sharp needle.

Parameters observed

(a) Quantitative

- Finger ridge count
- a-b ridge count
- atd angle.

(b) Qualitative

- Finger ridge patterns

Statistical analysis: Imprints analyzed statistically by using proper statistical data. The data obtained was analyzed using SPSS (statistical programme for social sciences, version 18.0) computer software package. Descriptive statistics analysis of variance two way were applied and p-value <0.05 was consider as significant. Fisher test (parametric) and Chi-square (non-parametric) have been used to find the significance of quantitative and qualitative parameters studied between cases and controls. For F-Test, if the observed value higher than the tabulated value of F statistic having 250 and 250 as the degree of freedom for p-value 0.05 is 1.231774215 and for 0.01 is 1.343245782 are significant at 0.05 and 0.01 significance levels.

RESULT

Data was collected by recording both quantitative and qualitative dermatoglyphic features from the handprints of 250 children having *jatyaandh* and 250 controls. Case group exhibited a noteworthy rise in the finger ridge count when individual fingers were compared. A marked disparity in the ridge count was observed between the right and left thumb, the middle, ring, little finger of right hand and little finger of left hand, in both the case and control groups [Table 1]. The mean value of the a-b ridge count of the patients is 30.76 and that of controls is 43.52, showed an insignificant difference [Table 2]. In case group, the mean of atd angle was 50.11 in comparison to the controls in which they are 42.78. This difference was significant ($p<0.05$) for atd angle [Table 3]. The frequency of finger ridge patterns of case group shows significant difference on Chi-square test from the dermatoglyphic patterns of controls i.e. healthy children. In *jatyaandh* cases, the whorl, radial-ulnar loop and simple-tented arch frequency were 58%, 17%, 16%, 4% and 5% in comparison to the controls in which they were 21.52%, 33.10%, 35.04%, 6% and 4.32% respectively. A significant increase in the Whorls is noted in cases as compared to controls in combined count of both hands. There is also a significant difference found between Simple arch and Ulnar loops but values were found to be insignificant for tented arch and radial loop pattern of cases and controls. [Table 4 & 5]

Table 1: Showing Comparison between Individual Finger Ridge Count of Case and Controls

	Range		Mean ± Std error		Std deviation			
	Case	Control	Case	Control	Case	Control	F-value (Observed)	Significance
Thumb (RH)	32	28	17.68 ± 0.64	15.47 ± 0.41	10.1	6.42	2.47	S
Index (RH)	34	30	18.49 ± 0.54	14.20 ± 0.52	8.57	8.15	1.10	NS
Middle (RH)	32	31	19.96 ± 0.62	14.08 ± 0.46	9.84	7.22	1.85	S
Ring (RH)	33	28	19.67 ± 0.60	14.22 ± 0.43	9.48	6.87	1.91	S
Little (RH)	35	33	18.35 ± 0.67	13.78 ± 0.47	10.52	7.44	2.00	S
Thumb (LH)	34	29	18.56 ± 0.55	16.34 ± 0.45	8.71	7.19	1.47	S
Index (LH)	33	33	19.07 ± 0.53	13.92 ± 0.55	8.37	8.67	1.07	NS

Middle (LH)	35	31	19.79 ± 0.54	15.00 ± 0.49	8.6	7.82	1.21	NS
Ring (LH)	35	30	20.67 ± 0.50	15.04 ± 0.45	7.85	7.14	1.21	NS
Little (LH)	32	29	18.84 ± 0.53	13.65 ± 0.40	8.41	6.32	1.77	S

Table 2: Showing Comparison between a-b Ridge Count of Case and Control

a-b Ridge		
	CASE	**CONTROL**
N	250	250
MEAN	30.76	43.52
S.D	4.63	5.06
S.E	0.29	0.32
F-value (obs.)	1.19	
Significance	NS (p>0.05)	

Table 3: Showing comparison between atd Angles of Case and Controls

	atd Angle	
	CASE	**CONTROL**
N	250	250
MEAN	50.11	42.78
S.D	4.44	1.95
S.E	0.28	0.12
F-value (obs)	5.21	
Significance	S (p<0.05)	

Table 4: Showing Difference in Frequency in Finger Ridge Pattern of Case and Control

Ridge Patterns	FREQUENCY (%)	
	CASE	**CONTROL**
R. Loop	17%	33.10%
U. Loop	16%	35.04%
Whorl	58%	21.52%
S. Arch	4%	6%
T. Arch	5%	4.32%

Table 5: Showing Comparison between Finger Ridge Pattern of Case and Control

	SIMPLE ARCH		TENTED ARCH		WHORL		RADIAL LOOP		ULNAR LOOP	
	CASE	CONTROL	CASE	CONTROL	CASE	CONTROL	CASE	CONTROL	CASE	CONTROL
N	250	250	250	250	250	250	250	250	250	250
MEAN	0.43	0.6	0.5	0.43	5.84	2.11	1.7	3.37	1.54	3.48
S.D	0.51	0.63	0.54	0.56	0.83	0.68	0.7	0.67	0.53	0.75
S.E	0.03	0.04	0.03	0.04	0.05	0.04	0.04	0.04	0.03	0.05
F-value (obs)	1.6		1.1		1.52		1.11		2.01	
Significance	S (p<0.05)		NS(p>0.05)		S (p<0.05)		NS(p>0.05)		S (p<0.05)	

DISCUSSION

The study focused on investigating dermatoglyphic patterns in individuals having *jatyaandh* and compared them to control group. It was observed that the eye and skin, both the sensory organs have common origin from surface ectoderm, and their differentiation occurs during a similar period of intrauterine development. The researchers hypothesized that any insult causing *jatyaandh* during the critical stage of development in the first trimester might also influence the dermal ridge pattern. To explore this concept, the researchers examined the palmer dermatoglyphic patterns of 250 individuals with *jatyaandh* and 250 control subjects. The results showed a significant difference between the dermatoglyphic palmer patterns of both the groups. Specifically, the cases with *jatyaandh* exhibited a higher finger ridge count in all the fingers of right hand except index finger. The same was also found in thumb and little finger of left hand. The analysis also revealed that atd angles in both hands were higher in the cases compared to the controls

and these differences were statistically significant. Also the cases exhibited a higher distribution of whorls on their digits, with more than 5 whorls out of 10 digits. On the other hand, the control group showed a higher distribution of ulnar loops.

CONCLUSION

The current research aims to investigate whether specific dermatoglyphic patterns exist in individuals with blindness. The focus of the study is not to define existing diseases but rather to identify individuals who may have a genetic predisposition to develop certain medical conditions. The dermatoglyphic features of the present study may be used as a suggestive diagnostic tool to make a provisional diagnosis and to identify the persons who are at risk, but it requires more extensive studies in a large number of patients.

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