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Finger and Palmar Ridge Pattern in NIDDM Patients and Controls

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ABSTRACT

Dermatoglyphics is a heritable, durable, and age-independent trait in man and widely used as a model trait for population genetics and medical research. Present study is an attempt to understand the association of finger and hypothenar pattern types with non-insulin dependent diabetes mellitus (NIDDM). To achieve the purpose bilateral palm prints of 30 clinically diagnosed adult female NIDDM patients and 60 healthy adult females without having the history of diabetes as non-diabetic were incorporated from the Bengalee Hindu caste population of West Bengal, India. The result demonstrated higher frequency of ulnar loop, radial loop, composite and plain arch in NIDDM patients than non-diabetic individuals. The result also revealed higher occurrence of hypothenar pattern in NIDDM patients than that of non-diabetic individuals. There were significant ($p<0.05$) differences in finger ridge and hypothenar patterns between NIDDM and non-diabetic individuals. Therefore, the present study indicated that higher frequency unlar loop and hypothenar pattern as well as lower frequency of whorl may be used as a screening tool to identify the person at risk of developing NIDDM.

Keyword: *Dermatoglyphics, finger pattern type, hypothenar pattern, non-insulin dependent diabetes mellitus*

INTRODUCTION

Dermatoglyphics is the study of complex patterns of parallel ridges on the digits, palm and sole of humans (Cummings and Midlo, 1926). Dermal patterns are genetically determined and fully formed between 7^{th} to 24^{th} weeks of gestation (Bablar, 1991), and remain unaltered throughout the life of an individual (Cummins and Midlo, 1943). Dermatoglyphics as a diagnostic tool is well established for a number of diseases with strong hereditary basis and is also used as a screening aid for abnormal anomalies (Schumann and Alter, 1976; Bhat et al., 2014), including chromosomal aberrations (Suzumari, 1980). In addition to that, dermatoglyphics has also been subject matter of many studies of complex and non-communicable diseases like congenital heart disease (Alter and Schulenberg,1970), schizophrenia (Van et al., 2001), breast cancer (Chintamani et al., 2007), autism (Dey et al., 2014), and E-β thalassemia (Das *et al.,* 2015). Apart from these, several studies also demonstrated significant association of dermatoglyphic traits with diabetes mellitus (Sant *et al*., 1983; Sengupta and Boruah, 1996; Sharma and Sharma, 2012; Srivastava and Rajasekar, 2014). However, very few studies (Ravindranath *et al*., 2005; Vadagaonkar *et al.,* 2006; Rakete *et al*., 2013) have been done on NIDDM patients, especially in Eastern India. In view of the above, the objectives of the present study ware to understand the associations of finger and hypothenar pattern types with NIDDM.

MATERIALS AND METHODS

The present cross-sectional study was carried out on ninety adult Bengalee Hindu females of Kolkata, West Bengal, India. Among them 30 individuals were clinically diagnosed NIDDM patients and 60 were apparently healthy individuals, without having the history of diabetes. The mean age of NIDDM patients and controls was 55.8 (±12.96) years and 52.84 (±8.96) years, respectively. Data on age, sex, ethnicity, medical and family history of diabetes were obtained by using structured questionnaire. For dermatoglyphic print, subjects were asked to wash their hands with soap and water to remove any dirt or oil. Bilateral finger and palm prints of each individuals were then collected according to the widely used standard ink and roller method proposed by Cummins and Midlo, 1943. The finger and palmer prints were analyzed qualitatively and quantitatively following Schumann and Alter's (1976) classification. Parameters studied were finger print patterns and hypothenar ridge patterns. Individuals were informed in detail about the study and their informed consent was obtained before the commencement of the study. Chi-square test was used to compare the finger print and

hypothenar ridge pattern between NIDDM patients and normal individuals. All the data were analyzed by using SPSS (version 16.0) and the cut off value was set as, $p < 0.05$.

RESULTS AND DISCUSSION

Distribution of finger ridge patterns among NIDDM and non-diabetic individuals are presented in Table 1. It revealed that the prevalence of whorl, ulnar loop, radial loop, plain arch, tented arch and composite among NIDDM patients were 18.33%, 60%, 2%, 9%, 0.33% and 10.67%, respectively. However, these were 32.5%, 52.67%, 1.33%, 5.17%, 1.5% and 6.83%, respectively for whorl, ulnar loop, radial loop, plain arch, tented arch and composite among non-diabetic individuals. Thus, ulnar loop was commonly observed in NIDDM patients as compared to non-diabetic and the frequency of whorl was reduced in NIDDM patients as compared to non-diabetic individuals. The frequency of plain arch and composite were also higher among NIDDM patients than non-diabetic individuals and there were significant ($p<0.05$) differences in the finger ridge patterns between NIDDM and non-diabetic individuals. In accordance with other studies (Ravindranath *et al.*, 2005; Gabriel and Babajide, 2004), the present study also observed higher ulnar loop and lower whorl frequency among patients. Lower frequency of whorl and higher frequency of ulnar loop and arch among NIDDM females than non-diabetics were also observed by Burute et al., 2013. However, in contrast to the present study, a recent study by Rakate et al. (2013) demonstrated increased frequency of whorl and lower frequency of ulnar loop among NIDDM patients.

The distribution of hypothenar ridge patterns among NIDDM and non-diabetic individuals (Table 2) revealed that the pattern was present in 66.67% and 73.33% on left and right hand of NIDDM patients, respectively. On the other hand, the pattern was present in only 31.67% and 28.33% on left and right hand of non-diabetic individuals, respectively. When both hands were considered, the hypothenar pattern was present in 76.67% NIDDM patients and 40% non-diabetic individuals. The present study revealed significantly ($p<0.05$) higher frequency of hypothenar (palmar) patterns on both hands of NIDDM patients than that of non-diabetic individuals. A recent study by Sharma and Sharma (2012) was also observed higher frequency of hypothenar patterns among patients compared to controls. The association of palmar ridge patterns with medical disorders were observed in other studies also (Cummins and Midlo, 1943; Penrose, 1963; Schumann and Alter, 1976).

CONCLUSION

In conclusion, the result of the present study revealed increased number of unlar loop and decreased number of whorl in NIDDM patients along with higher prevalence of hypothenar pattern as compared to non-diabetic individuals. Thus, the dermatoglyphic features of the present study may be used as a screening tool to identify the persons at risk of developing NIDDM. However, one of the limitations of the present study is the small sample size. Further studies are needed among a larger sample for effective prevention strategies.

Table 1: Distribution of finger ridge patterns among NIDDM and non-diabetic individuals

Groups		Finger Pattern Types (%)						χ^2 value
		Whorl No (%)	**Ulnar Loop** No (%)	**Radial Loop** No (%)	**Plain Arch** No (%)	**Tented Arch** No (%)	**Composite** No (%)	
Left hand	**NIDDM patients**	23(15.33)	90(59.99)	4(2.67)	15(9.99)	1(0.67)	17(11.33)	22.744*
	Non-diabetic	100(33.00)	157(52.33)	3(1.4)	17(5.67)	6(2.4)	17(6.8)	
Right hand	**NIDDM patients**	32(21.33)	90(59.99)	2(1.33)	12(7.99)	0(0)	14(9.33)	8.186
	Non-diabetic	96(31.99)	158(52.99)	4(1.4)	15(4.86)	3(1.2)	24(9.6)	
Both hand	**NIDDM patients**	55(18.33)	180(60)	6(2)	27(9)	1(0.33)	32(10.67)	27.574*
	Non-diabetic	195(32.5)	316(52.67)	8(1.33)	31(5.17)	9(1.5)	41(6.83)	

*p<0.05

Table 2: Distribution of hypothenar ridge patterns among the NIDDM and non-diabetic individuals

Groups		Hypothenar patterns present (%)	Hypothenar patterns absent (%)	χ^2 value
Left hand	**NIDDM patients**	66.67	33.33	9.977*
	Non-diabetic	31.67	68.33	
Right hand	**NIDDM patients**	73.33	26.67	16.493*
	Non-diabetic	28.33	71.67	
Both hand	**NIDDM patients**	76.67	23.33	10.777*
	Non-diabetic	40	60	

*p<0.05

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