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Original Article

Correlation of Atd-Angle Between non-Insulin Dependent Diabetes Mellitus and Normal Individuals in Bangladeshi Population.

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Abstract:

Dermatoglyphics is the study of configuration of the epidermal ridges in palms, soles and digits. Development of dermatoglyphic pattern in under genetic control, it does not change throughout the life once development being completed. As a diagnostic aid, Dermatoglyphic pattern analysis can successfully predict onset of many diseases, which has a strong hereditary basis. Diabetes mellitus (DM) is a condition of partial genetic background. The aim of this study was to compare the atd-angle of dermatoglyphicsin order to identify as a risk factor to predict diabetes in future.This observational cross-sectional study was conducted in Sylhet MAG Osmani Medical College from July 2018 to June 2019. There were a total of 200 subjects recruited in this study; among them 100 were healthy individuals and the rest 100 were the diagnosed patients of type II DM.The studied groups were matched for age and sex of the study subjects. Paper and ink method was used for making print of fingers and palms. The prints were examined using mounted hand lens. The mean atd-angle was higher in cases in both hands compared to the control. On the left hand, the mean 43.23±2.14 in cases and 41.11±1.65 in control; and 42.87±2.25 in cases and 41.19±1.89 in control on the right hand. Unpaired t-test showed statistical significant mean differences between the studied groups both in left hand (t = -7.844, p = <0.001, 95% confidence interval: -2.651 to -1.585) and right hand (t = -5.749, p = <0.001, 95% confidence interval: -2.267 to -1.109). So,based on the result of this study, it can be concluded that the atd-angle would be a helpful parameter to find out high risk individuals for NIDDM in future.

Key word: Dermatoglyphics, atd-angle, Non-Insulin dependent diabetes mellitus.

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Introduction:

The palmar and planter surfaces of the human hand and foot are clothed by skin, which is different from that covering other parts of the body[1]. Skin is composed of epidermal and dermal layer.The projection of dermis is called papillae, which are interdigitate with evagination of the epidermis known as epidermal ridges[2].

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These ridges begin to appear in embryos in 10thweeks and are permanently established by 17thweeks of intrauterine life[3].

The dermal ridges and configurations which are once formed are not affected by the age, development and environmental changes in the postnatal life except for an increase in size in parallel with general growth[4]. So, it has potential to predict various genetic acquired disorder with a genetic influence[5]. The term "Dermatoglyphics" was coined by Cummin and Midlo in 1926. It was derived from the Greek words "derma" means skin and "glyphic" means carvings[6]. Dermatoglyphics deals with the scientific study of epidermal ridge patterns on the palmar and planter aspect of finger tips, palms, soles and toes[1]. Epidermal ridge patterns show significant findings in patients of diseases with a strong or partial genetic background[7].

Diabetes mellitus is a condition with a partial genetic background that leads metabolic abnormality. It affects about 424.9 million people worldwide and an estimation showed that

the number of diabetic population will reach up to 628.6 million by the year 2045[8].Since diabetes mellitus has genetic predisposition and dermatoglyphics pattern is the phenotypic presentation of genetic code, one can assume that there might be certain dermatoglyphics findings specific to diabetic patients[9]. Previous study reports included other population showed inconclusive findings[10-16]. Furthermore, scarcity of similar study in Bangladesh till date is painful. Hence, this study was aimed to compare the atd-angle between diabetic and non-diabetic Bangladeshi population to find out any correlation and possibility of using as a predictive parameter for the future development of diabetes mellitus.

Material and Methods:

This observational cross-sectional study conducted in Sylhet MAG Osmani Medical College, Sylhet, Bangladesh from July 2018 to June 2019. Institutional ethical approval obtained prior to commencement of the study. All the known cases of T2DM were recruited as case and age and sex matched apparently healthy (not having any diseases of genetic background) adult individuals (age >35 years) were recruited as control in this study. Persons having any kind of dermatoglyphic abnormalities were excluded too from this study.

The researcher approached individually to the study subjects. The subjects were briefly described about purpose of the study and assured to maintain the secrecy of the data strictly. Once they showed their willingness to join this study, an informed written consent was signed and proceed for a mini interview followed by taking dermatoglyphic print. Demographic data included address, sex, age, family history and other medical history of importance.

The dermatoglyphic prints in present study have been taken by paper and ink methods (Figure 1).The hands were cleaned up by using soap water. Adequate amount of ink was put on the glass plate, spread symmetricallyusing a rubber roller to made a thin film of ink on the glass plate. Then palm of both hands of the study subjects press over the inked glass plate sufficiently to made inked whole palms including hollow area and up to the flexor creases of the wrist. Both hands of the subject werethen placed on the white paper by the way from proximal to distal manner. The palm was gentlypressed at the root of fingers in between intermetacarpal groove. The palm was lifted from paper in reverse order.The printed sheets were coded according to name, sex and age for case group (DM) and control group. The prints were then subjected for recountdermatoglyphic analysis by using a magnifying hand lens and sharp needle for ridge counting. Essential information's was recorded into the questionnaire.

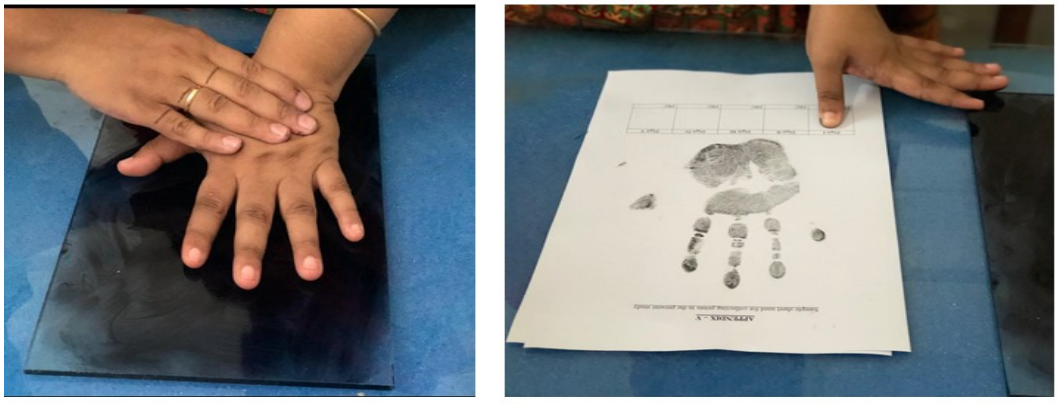

Figure 1: The paper and ink method of dermatoglyphic printing.

atd-angle:Digital triradii located in proximal to the bases of the digits II, III, IV and V. In order they are coded a, b, c and d. The axial triradius is coded as t, and located most commonly close to the proximal margin of the palm, in between thenar and hypothenar eminences. They may occur, however, as far distal as the center of the palm. The ATD-angle was measured by lines drawn from the axial triradius "t" to the digital triradius "a" and "d". Another line drawn from the digitaltriradius "a" to the digital triradius "d". The more distal to the position of "t",that indicatethe larger is atd-angle (Figure 2).

Figure 2: atd-angle.

Collected data were analyzed using SPSS, version 21. Both descriptive and inferential statistics were used. Qualitative data were expressed as frequency with percentage and compared by Chi-squared test. Quantitative data were expressed in mean with standard deviation and compared by unpairedt-test between the study group.

Result:

There were a total of 200 study subjects recruited in this study; 100 into the diabetes mellitus group and 100 into the age (p = 0.27) and sex (p = 1.00) matched apparently healthy control group (Table 1). Mean age of the control group was 48.44±8.18 years ranging from 36 to 58 years and of the case group was 49.92±10.85 years ranged from 37 to 54 years. Equal number of male and female participants were recruited in the study groups; 50 males and 50 females in each study groups.

Table 1: Demographic characteristics of the study subjects.

Sl. No.	Parameters	Control group	Case group	p-value
1.	Age			
	Mean	48.44±8.18	49.92±10.85	0.028*
	Maximum	58	54	
	Minimum	36	37	
2	Sex			
	Male	50	50	1.00**
	Female	50	50	

*Unpaired t-test, **Chi-squared test.

The mean atd-angle was higher in cases in both hands compared to the control (Table 2). On the left hand, the mean 43.23±2.14 in cases and 41.11±1.65 in control; and42.87±2.25in cases and 41.19±1.89 in control on the right hand. Unpaired t-test showed statistical significant mean differences between the studied groups both in left hand (t = -7.844, p = <0.001, 95% confidence interval: -2.651 to -1.585) and right hand (t = -5.749, p = <0.001, 95% confidence interval: -2.267 to -1.109). However, mean differences between left and right hands among the cases and controls were found statistically insignificant.

Table 2: Comparison of atd-angle of both hands between the studied groups.

Hands	Control Mean ± SD	Case Mean ± SD	Mean difference	t-value	p-value	Confidence interval at 95%	
						Lower bound	Upper bound
Left hand	41.11 ±1.65	43.23 ±2.14	2.12	-7.844	<0.001	-2.651	-1.585
Right hand	41.19 ±1.89	42.87 ±2.25	1.68	-5.749	<0.001	-2.267	-1.109

Discussion:

There were 200 study subjects recruited in this study and they were matched for age and sex between the study group. The aim of this study was to evaluate the difference in mean atd-angle between the diabetic and non-diabetic population in Bangladesh. The mean atd-angle was significantly higher in right hand of cases (42.87±2.25) than control (41.19±1.89) and also significantly higher in left hand of cases (43.23±2.14) than control (41.11±1.65). Similar result to this study observed in several previous studies conducted in different population. Nayak et al. (2015) studied the dermatoglyphic patterns and their role in prediction of DM type II in Maharashtrian population. Their study was carried out on 50 patients of type 2 diabetes mellitus, and control group consists of 50 subjects. The mean atd-angle in diabetics was found to be 43.75 as compared to 38.35 in non-diabetic population with a p-value of < 0.01. It means that atd-angle was significantly increased in diabetics compared to non diabetics[3].

Mittal et al. (2013) not only found association of the dermatoglyphics patterns of the healthy individuals and DM patients, but also their subgroup analysis showed positive association for DM both in males and females[10].Sharma (2012) and Udoakaet et al. (2009) also described higher atd-angles in diabetic subjects compared to healthy subjects[5,11].Anju-Bala et al., (2016) studied a total of 100 type 2 diabetic patients (50 males and 50 females) and compared with 100 diabetics with hypertension patients of Hilly region. The mean atd-angle were higher in type II DM than diabetic with hypertension patient[12]. However, Sudagar et al. (2014) worked on 150 Diabetic patient and 150 normal individuals as control found opposite result to this study. They were 75 males and 75 females in each group, they found mean atd-angle is slightly decreased in diabetic patient[13].Hadimani (2013) also found significantly lesser atd-angle in patients with type II DM when compared with controls[14].

Srivastava and Rajasekar (2014) worked on 74 type II Diabetes mellitus patients (37 males and 37 female) and 74 healthy persons as a control, and they found insignificant difference in atd-angle between diabetic and non-diabetic group[9].Shamim KM (1988) was found that the mean maximal atd-angle on the left was greater in controls than in patients and greater in patients than in controls on the right. A value like 60 degree has affected the mean much on the right of patients.However, differences were not statistically significant between controls and patients regardingatd-angle[15].

Both the positive and negative association for atd-angle with diabetes mellitus observed in several study reports. Most of them showed positive association; means comparatively higher atd-angle in diabetic subjects than that of non-diabetic subjects. This study also showed positive association between atd-angle and diabetes mellitus compared to comparatively healthy individuals. However, this study included limited sample size only from one center. Hence, authors would like to recommend further multi-center study.

Conclusion:

From the present study,it may be stated that there is significant difference in atd-angle between diabetic patient and normal individuals. Mean atd-angle was significantly higher in both hands among the diabetic subjects compared to the control. Therefore, based on this result, it could be stated that the atd-angle will be helpful to find out high risk individuals for Non-insulin dependent diabetes mellitus before onset of the disease.

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