Original Article

Indian Journal of Research in Anthropology
Volume 2 Number 2, July - December 2016
DOI: http://dx.doi.org/10.21088/ijra.2454.9118.2216.2

C-line Polymorphism and 4th Inter Digital Pattern in Type 2 Diabetes Mellitus Patients

Piya Ghosh Dastidar*, Biswarup Dey*, Arup Ratan Bandyopadhyay*, Jyoti Ratan Ghosh**

Author Affiliation: *Department of Anthropology, University of Calcutta, 35 B.C. Road, Kolkata–700019, West Bengal, India. **Department of Anthropology, Visva-Bharati University, Santiniketan–731235, West Bengal, India.

Reprint Request: Jyoti Ratan Ghosh, Department of Anthropology, Visva-Bharati University, Santiniketan–731235, West Bengal, India.
E-mail: jrghosh@rediffmail.com; jrghosh@visva-bharati.ac.in

Received on 23.05.2016, **Accepted on** 28.05.2016

Abstract

Diabetes mellitus is one of the most common non-communicable diseases globally. Dermatoglyphics as a diagnostic tool is now well established for a number of diseases with strong hereditary basis. The objective of the present study was to understand the association of C-line polymorphism and 4th inter digital (ID4) patterns with type 2 diabetes mellitus (T2DM). In the present study 30 clinically diagnosed cases of adult female T2DM patients from West Bengal, India and 60 healthy adult females without having the history of diabetes as controls were incorporated from the same area and population. Bilateral palm prints of each individual were collected following standard ink and roller method and analyzed for C-line termination polymorphism and ID4 patterns. The overall frequency of C line termination points on both hand of T2DM patients were 45%, 41.67% and 3.33% for ulnar, radial and proximal position, respectively. These were 64.17%, 35.83% and 13.33% for ulnar, radial and proximal position, respectively in controls. The overall frequency of absent C line was 10% in T2DM patients and 3.33% in controls. The overall frequency of occurrence of ID4 patterns in T2DM and control subject was 76.67% and 30.83%, respectively. The result also revealed significant ($p<0.05$) differences in the distribution of line C termination points and ID4 patterns between T2DM patients and controls. The present study indicated that the C-line polymorphism and ID4 pattern may be used for early identification of risk group individuals for surveillance with a view to prevent the disease onset.

Keyword: Dermatoglyphics; C-line; Type 2 Diabetes Mellitus; 4th Inter Digital Patterns; India.

Introduction

Dermatoglyphics is the scientific study of epidermal ridges on the volar aspect of the hands and feet [1]. Dermal ridges are differentiated during third to fourth month of fetal life and remain unchanged throughout the life of an individual [2, 3]. These epidermal ridges form well-defined patterns that characterize individuals and was found useful in the clinical diagnoses of several diseases [4] including chromosomal aberration [5], schizophrenia [2] and vitiligo [6]. Studies [7, 8]were also demonstrated association between diabetes mellitus and dermatoglyphics traits.

Diabetes mellitus is one of the most common non-communicable diseases globally [9]. There are two major forms of diabetes mellitus, namely type 1 diabetes mellitus and type 2 diabetes mellitus (T2DM). T2DM accounts for about 90 to 95% of those with diabetes and encompasses individuals who have

insulin resistance and usually have relative (rather than absolute) insulin deficiency [10]. Countrywide ranking on people with diabetes revealed that India, the diabetes capital of the world [11], occupies the highest position with 31.7 million diabetic people in the year 2000 and it will be about 79.4 million in the year 2030 [9,12]. It was also observed that individuals with family history of diabetes and who belongs to certain ethnic group had a higher risk of developing diabetes, and thus indicated significant genetic influences [13,14].

The presence of strong genetic influences in both Dermatoglyphics and T2DM makes dermatoglyphics an important supporting evidence and diagnostic aid for T2DM [15].Though, a number of studies has been done in Indians to understand the association between diabetes mellitus and dermatoglyphics traits [16-18], their findings demonstrated contradicting results[4]. Moreover, very few studies [13]has been done on T2DM patients and to best of our knowledge no study has been done to understand the association of C-line polymorphism and 4th inter digital patterns with T2DM in India, especially in Eastern India. In view of the above, the objective of the present study was to understand the association of C-line polymorphism and 4th inter digital patterns with T2DM.

Materials and Methods

This case control study involved 30 clinically diagnosed T2DM adult female patients of Bengalee Hindu caste population of Kolkata, West Bengal, India. Control includes, 60 apparently healthy adult females without having history of diabetes as controls were incorporated from the same area and population. Only female were chosen to avoid gender bias. Bilateral palm prints of each individualwere collected according to the widely used standard ink and roller method proposed by Cummins and Midlo [1]. The print of the palm was taken by making an impression on the paper and the prints of the fingers were taken by roll on technique where the coated finger will be rolled from the edge of the finger to the other end on the white paper until a visible print is seen. The patient's gender, age, and family history were noted.

The termination of palmar C line was classified according to Plato's [19] classification. The termination of C-line was classified in to four basic types- ulnar/U (4, 5, 6 or 7 position), radial/R (9, 10, 11, 12 or 13 position), proximal/P (X, x or 8 position) and absent/A.The palmar 4th inter digital patterns (ID4) in terms of present or absent were also recorded. Informed consent was obtained from each participant before the commencement of the study. Chi-square test was used to compare palmar C line termination and 4th inter digital patterns (ID4)between T2DM patients and controls. All the data were interpreted and analyzed in SPSS (version 16.0) and the cut off value were set as, $p < 0.05$.

Results

The distribution of palmar main line C termination points among the T2DM patients and controls are presented in Table 1. It showed that the palmar C line termination points in the left hands of T2DM patients were 40%, 40% and 6.67% for ulnar, radial and proximal position, respectively. However, in 13.33% T2DM patients the C line was absent. Contrary to that the palmar C line termination points in the left hands of control patients were 51.67%, 26.67% and 18.33% for ulnar, radial and proximal position, respectively. However, in controls the frequency of absent C line was only 3.33%. On the other hand, the C line termination point for right hand of T2DM patients were 50% and 43.33% for ulnar and radial position. There was no proximal termination of C line in right hand of T2DM patients. The C line termination points on right hand of controls were 43.33%, 45% and 8.33% for ulnar, radial and proximal position, respectively. However, the frequency of absent C line was 6.67% in T2DM patients and 3.33% in controls. The overall frequency of C line termination points on both hand of T2DM patients were 45%, 41.67% and 3.33% for ulnar, radial and proximal position, respectively. These were 64.17%, 35.83% and 13.33% for ulnar, radial and proximal position, respectively in controls. The overall frequency of absent C line was 10% in T2DM patients and 3.33% in controls. The result of the chi-square test revealed significant ($p<0.05$) differences in the distribution of palmar main line C termination characteristics between T2DM patients and controls.

Table 2 shows the distribution of palmar 4th inter digital patterns (ID4) among T2DM patients and controls. It revealed that the frequency of occurrence of ID4 pattern in the left hand was 73.33% in T2DM patients and 30% in controls. With regard to the right hand, ID4 was present in 80% T2DM patients and 31.67% and controls. The overall frequency of occurrence of ID4 patterns in T2DM and control subject was 76.67% and 30.83%, respectively and there were significant ($p<0.05$) differences in the distribution of ID4 patterns between T2DM patients and control subjects.

Table 1: The distribution of palmar main line C among the T2DM patients and controls

		Ulnar (%)	Radial (%)	Proximal (%)	Absent (%)	χ^2
C-line polymorphism	Left hand T2DM	12 (40.00)	12 (40.00)	2 (6.67)	4 (13.33)	15.59*
	Left hand control	31 (51.67)	16 (26.67)	11 (18.330	2 (3.33)	
	Right hand T2DM	15 (50.00)	13 (43.33)	0 (0.00)	2 (6.67)	9.95*
	Right hand control	26 (43.33)	27 (45.00)	5 (8.330	2 (3.33)	
	Both hand T2DM	27 45.000	25 (41.67)	2 (3.33)	6 (10.00)	11.94*
	Both hand controls	57 (47.51)	43 (35.83)	16 (13.33)	4 (3.33)	

*p<0.05,

Table 2: The distribution of palmar 4thinter digital patterns (ID4) among the T2DM patients and controls

		Present (%)	Absent (%)	χ^2
ID4 Patterns	Left hand T2DM	22 (73.33)	8 (26.67)	37.59*
	Left hand controls	18 (30.00)	42 (70.00)	
	Right hand T2DM	24 (80.00)	6 (20.00)	47.36*
	Right hand controls	19 (31.67)	41 (68.33)	
	Both hand T2DM	46 (76.67)	14 (23.33)	42.26*
	Both hand controls	37 (30.83)	83 (69.17)	

*p<0.05

Discussion

Dermotoglyphics as a diagnostic tool is now well established for a number of diseases with strong hereditary basis. Commins [20] was the first person to show the possible use of dermatoglyphics in clinical medicine [3,20]. The present study to understand the association of C-line polymorphism and ID4 patterns with T2DM revealed that the palmar C line termination point on radial direction in the left hand of patients were significantly higher (40% vs. 26.67%) than that of controls. Contrary to that, ulnar (40% vs. 51.67%) and proximal (6.67% vs. 18.33%) C line termination points in the left hand of patients were significantly lower than that of controls. Interestingly, an inverse pattern of C line termination points were observed in right hand, when compared with left hand patterns of patients and controls. For example, in patients, the presence of ulnar C line termination point was significantly higher and the radial C line termination point was lower. This was in contrary to the previous studies [7,21], which demonstrated decreased ulnar, proximal, absent patterns in the patients compared to controls. However, significant differences in C line terminations of patient and controls in the present study was in corroborated with study of Eswaraiah and Bali [16]. The cardinal features of the present study were the significantly lower prevalence of proximal C line termination point and higher prevalence of absent C line termination in T2DM patients, compared to controls.Previous studies [21,22] observed that the proximal variety were absent on both hands in the diabetics, whereas in the present study it was absent only in right hand.The little agreement between the findings of other studies with the present study may be due to the ethnic variations. Moreover, all these studies [7, 16, 21, 22] have been done among diabetes patients, which includes different forms of diabetes including type 1 and type 2 diabetes. Thus, the present study is the first of its kind to understand the association of C-line polymorphism and ID4 patterns with T2DM.

However, as observed in the present study, a typical manifestation of higher prevalence of absent C line termination in T2DM cases was also observed by Pathan and Hashmi [23].When we considered both hands the prevalence of C-line termination distribution was U>R>A>P direction in patients and U>R>P>A direction in controls. Comparison of ID4 patterns revealed an inverse association in terms of significantly ($p<0.05$) higher occurrence of ID4 pattern in both hands of T2DM patients as compared to controls. However, Eswaraiah and Bali [16] observed significantly lower ID4 pattern among diabetes (included both type 1 and type 2) patientscompared to controls.

Conclusion

In conclusion, the result of the present study to understand the association of C-line polymorphism and ID4 patterns with T2DM revealed significant ($p<0.05$) differences in the distribution of line C termination points and ID4 patterns between T2DM patients and controls. Thus, the dermatoglyphic features of the present study may be used as a screening tool to identify the persons who are at risk. Because, early prediction and diagnosis of patients

with T2DM may improve the treatment result and prevent further complications. 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.

Acknowledgements

Authors are grateful to all the participants for their cooperation.

References

1. Cummins H, Midlo C. Finger prints, palms and soles: an introduction to dermatoglyphics. Dover publication, INC. New York, 1943.
2. Van OCJ, Baare WF, Hulshoff PHE, Haag J, Balazs J, Dingemans A, Kahn RS, Sitskoorn MM. Differentiating between low and high susceptibility to schizophrenia in twins: the significance of dermatoglyphic indices in relation to other determinants of brain development. Schizophrenia Res. 2001; 52: 181-93.
3. Bhat GM, Mukhdoomi MA, Shah BA, Ittoo MS. Molecular dermatoglyphics: in health and disease - a review. Int J Res Med Sci. 2014; 2: 31-7.
4. Igbigbi PS, Msamati BC, Ngambi TN. Plantar and digital dermatoglyphic patterns in Malawian patients with diabetes, hypertension and diabetes with hypertension. Int J Diabetes and Metab. 2001; 9: 24-31.
5. Suzumori K. 1980. Dermatoglyphics analysis of fetues with chromosomal aberration. American journal of human genetics. 1980; 32: 859-68.
6. Bhakta A, Mistri S, Mondal GC, Bandyopadhyay M, Bhattacharaya T, Ghosh SK. True palmar pattern in vitiligo-a case control study. Nepal Med Coll J. 2011; 13: 241-6.
7. Platilova H, Pobisova Z, Zamrazil V, Vondra K. Dermatoglyphics-an attempt in predicting diabetes mellitus. Vnitrlek. 1996; 42: 757-60.
8. Taiwo IA, Adebanjo OO. Evaluation of association between digital dermatoglyphic traits and type-2diabetes in Lagos, Nigeria. Nig Q J Hosp Med. 2012; 22: 191-9.
9. World Health Organization. Health situation in the South-east Asia region 1998-2000. World Health Organization. Regional office for South-East Asia. New Delhi. India. 2002.
10. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Dia Care. 2006; 29: S43-8.
11. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007; 125: 217-30.
12. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Dia Care. 2004; 27: 1047-53.
13. Shivaleela C, Hanji CV, Kumar GV. Utility of dermatoglyphics in type 2 diabetes mellitus (T2DM) to assess the risk for IHD: a pilot study. Biomed Res. 2013; 24: 242-44.
14. Karim JK, Saleem ALMA. Dermatoglyphics study of finger prints pattern's variations of a group of type II diabetic mellitus patients in Erbil City. Zanco J Pure and Appl Sci. 2014; 26: 11-6.
15. Alter M. Dermatoglyphic analysis as a diagnostic tool. Medicine. 1966; 46: 35-6.
16. Eswaraiah G, Bali RS. Palmar flexion creases and dermatoglyphics among diabetic patients. Am J Phys Anthropol. 1977; 47: 11-3.
17. Iqbal MA, SahayBK, Ahuja YR. Finger and palmar ridge counts in diabetes mellitus. Acta Antropogenetica.1978; 2: 35-8.
18. Ravendranath R, Thomas IM. Finger ridge count and finger print pattern in maturity onset diabetes mellitus. Indian J Med Sci. 1995; 49: 153-6.
19. Plato CC. Polymorphism of the C-Line of palmar dermatoglyphics with a new classification of the cline terminations. Am J Phys Anthropol. 1970; 33: 413-9.
20. Commins H. Dermatoglyphics stigmata in Mangolisim. Anat Rec. 1936; 64: 11.
21. Sharma MK, Sharma H. Dermatoglyphics: a clinical tool to predict diabetes. JCDR. 2012; 6: 327-32.
22. Sant SM, Vare AM, Fakruddin S. Dermatoglyphics in diabetes mellitus. JASI. 1983; 35: 29-32.
23. Pathan FKJ, Hashmi RN. Variations of dermatoglyphic features in noninsulin dependent diabetes mellitus. Int J Rec Tren Sci Tech. 2013; 8: 16-9.