ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 02, pp.1630-1633, February, 2019

DOI: https://doi.org/10.24941/ijcr.33588.02.2019

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

CORRELATION OF LIP AND FINGER PRINTS PATTERNS IN PATIENTS WITH TYPE II DIABETES MELLITUS

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ARTICLE INFO

Article History:
Received 22nd November, 2018
Received in revised form
27th December, 2018
Accepted 17th January, 2019
Published online 28th February, 2019

Key Words:

Lip prints, finger prints, Type II diabetes Mellitus, Diagnostic marker.

ABSTRACT

Background: Diabetes mellitus (DM) is a worldwide disease, and the prevalence is increasing particularly in developing countries. Individuals with undiagnosed Type II diabetes are at increased risk of developing coronary artery disease, stroke and peripheral vascular disease. Lip prints and fingerprints being genetically determined may serve as one of such biomarkers. The analysis of lip prints and fingerprints are simple and noninvasive when compared with biochemical tests for Type II Diabetes Mellitus. **Aim:** To study correlation of lip and finger print patterns in patients with Type II diabetes mellitus. **Materials and method:** The study sample included 100 subjects in 20 to 60 years of age group which were divided into two group (50 normal individuals and 50 uncontrolled Type II diabetes mellitus patients). They were selected from Outpatient Department of General hospital and Oral Medicine and Radiology from Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur. Their lip and finger prints were recorded and then classified using the classification of patterns of the lines on the lips proposed by Suzuki and Tsuchihashi and the patterns of fingers were analyzed according to Henry's system. **Result:** It was found that when seen individually each digit showed the highest percentage of loop pattern almost equally in both cases and controls. In diabetic patients whorls are seen as the most common prevalent pattern in both right and left hands. Reticular type of lip print pattern was significantly higher in diabetics (50.0%) than controls (10%). **Conclusion:** This study indicates that people with Type IV pattern of lip print may have a greater predilection for developing Type II Diabetes Mellitus. Also whorl type of fingerprint pattern was more common in diabetic than non-diabetics individuals; hence, suggesting that lip print and finger print patterns can be used as an early diagnostic marker for Type II diabetes mellitus.

***Citation: Dr. Ramhari Sathawane, Dr. GunjanV Moon, Dr. Sharthchandra Bontha, Dr. Rakhi M Chandak, Dr. Ashish BLanjekar and Dr. Romita D Gaikwad,* 2019.** "Correlation of lip and finger prints patterns in patients with type ii diabetes mellitus", *International Journal of Current Research*, 11, (02), 1630-1633.

INTRODUCTION

Diabetes is a metabolic disorder having multiple etiology. The prevalence of diabetes mellitus is tremendously higher in developing countries particularly in India due to the modern life style. Since Type 2 DM has a strong genetic consideration, it could be influenced by dermatoglyphics features. Dermatoglyphics and lip print patterns of an individual may serve as genetic marker (Nayak *et al*., 2015). For unknown deceased persons in homicide, suicide, accidents, and most disasters, personal identification is of utmost importance. For missing persons due to amnesia and culprits hiding identity, their identification is also necessary. The fingerprint is one of the common method for person identification in forensic anthropology (Adamu *et al*., 2013).

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It is an impression left by the friction ridges of human finger. Fingerprint is usually done with black print ink rolled across a contrasting white background. A white card friction ridge can also be recorded digitally using techniques called live scan. The science of fingerprints is acclaimed and reputed as aid for individualization particularly in forensic investigations (Adebisi, 2009). The comparison of several features of the print pattern requires the analysis of finger prints for matching resolution. These include patterns, which are whole attribute of ridges and the small, precise points which are unlike anything else attribute found within the patterns (Jain *et al*., 1999). The three basic patterns of fingerprint ridges are arch, loop and whorl. Characteristics of fingerprints are: ridge ending bifurcate and shorter ridge (or dot). Bifurcate are points at which a single ridge split into two ridges. Short ridges (or dot) are ridges which are significantly shorter than the average ridge length. The small, precise points and patterns are very important in the analysis of fingerprint (Langenberg, 2005).

The appearances of lip prints vary from persons to persons. Lip prints, which are normal lines and fissures in the form of wrinkles and grooves present in the province of metamorphosis of human lip between the inner labial mucosa and outer skin (Caldas et al., 2007). The most commonly used classification of lip-prints was invented by Suzuki and Tsuchihashi (1970) (Suzuki and Tsuchihashi, 1970). They classified lip prints as follows: Type I: a clear-cut groove vertically across the lips, Type I': a partial length groove of Type I, Type II: a branched groove, Type III: an intersected groove, Type IV: a reticular pattern and Type V: undifferentiated grooves. Cheiloscopyis one of the special techniques used for personal identification. The history of lip prints and importance of its evidence in the courts as well as its status as a source of forensic evidence is accepted (Ball, 2002). Hence, when traditional method of identification are not available in criminal identification, lip print can definitely be used as good as fingerprints (Aggrawal, 2004). In order to find out an easy and presumptive test for Type II diabetes mellitus, the present study aims to assess correlation of lip print and fingerprints pattern with Type II diabetes mellitus.

MATERIAL AND METHODS

Study Sample: The study sample included 100 subjects in 20 to 60 years of age group which were divided into two groups (50 normal individuals and 50 Type II diabetes mellitus patients) .The samples were selected from Outpatient Department of General Hospital and Oral Medicine, at Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur and confirmed by clinical and laboratory assessment of the last three consecutive fasting blood sugar values >140 mg/100 ml orlast three postprandial blood sugar value >200 mg/100 ml or haemoglobin A1C value >7% was set as the criteria to proffer the uncontrolled state of the disease. Fifty normal individuals without diabetes and without any family history of diabetes were taken as controls. While selecting cases and controls, individuals with any inflammation, trauma, congenital deformity or any other disease of the lips and fingers, those with known hypersensitivity to lipstick and ink and those with other systemic diseases were excluded from the study.

Method of collection of data

Subjects: A detailed case history was taken from all the individuals. A thorough clinical examination was performed with the diagnosis of Type II diabetes mellitus. An informed consent was obtained from all the patients after proper explanation of the procedure to be performed. Only those patients who were willing to participate in the study were included. Subjects were categorized in following groups: Group I:50 normal individuals without Type II diabetes mellitus. Group II:50 individuals with Type II diabetes mellitus.

Lipprint procedure and analysis: The lips were first cleaned thoroughly. Lipstick enough for upper lip was taken on one end of an ear bud and applied uniformly, starting at the midline and moving laterally. The same technique was followed for the lower lip. The individuals were asked to gently rub the lips together for its uniform application and then asked to maintain a relaxed lip position and impression was taken on plane white A 4 sheet paper.

Lip prints were obtained by dabbing in the center first and then pressing it comfortably toward the corner of the lips. Cotton and Vaseline were used to remove lipstick. After acquiring the patterns of the individuals, each of them was assigned a number and studied carefully with a magnifying lens. The lip prints were divided into four quadrants and patterns were assessed. The classification of patterns of the lines on the lips proposed by Suzuki and Tsuchihashi was followed (Kundu *et al*., 2016).

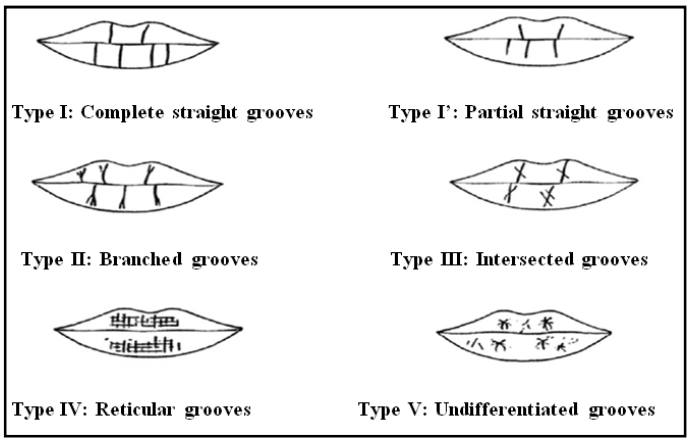

Fig.1. Types of lip-prints

Fingerprint procedure and analysis: Patient's hands were cleaned and dried before printing. A thin layer of blue ink was applied to the fingers using ink pad. Imprints of five fingertips were recorded on an A4 sheet. The same procedure was repeated for the other hand. After taking the fingerprints of all fingers, ink was removed initially using gauze pieces and hand rub followed by use of soap and water. Fingerprints were studied using a magnifying lens. The patterns of fingers were analyzed according to Henry's system of classification of fingertip patterns which classifies fingertip patterns into loops, whorls and arch (Manjusha *et al*., 2017).

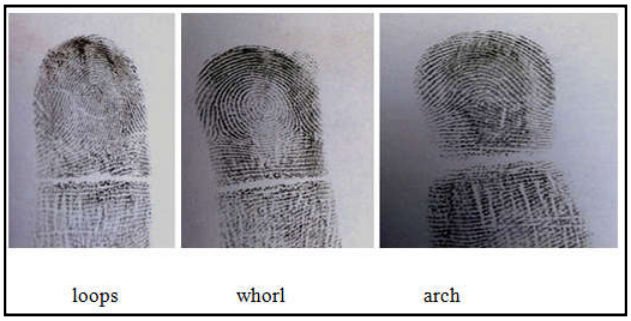

Fig. 2. Types of fingerprints

Statistical analysis: The software SPSS 22.0 and Graph Pad Prism 6.0 version was used for statistical analysis. $p<0.05$ is considered as level of significance. Chi square Test was used for comparison.

RESULTS

It was found that each digit showed the highest percentage of loop pattern in both cases and controls. In diabetic patients whorls are most common pattern in both right and left hands than arch pattern. Reticular type of lip print pattern was significantly higher in diabetics (50.0%) than normal controls (10%).

Table 1. Comparison of Lip pattern in cases and controls

lip print Patterns	Cases	Controls	⨯2-value	p p-valueue
I	3(6%)	16(32%)	43.92	0.0001 **
I’	1(2%)	1(2%)		
II	18(36%)	6(12%)		
III	2(4%)	21(42%)		
IV	25(50%)	5(10%)		
V	1(2%)	1(2%)		

**Highly significant when tested by chi square test

Table. 2 Gender wise comparison of Lip pattern in cases and controls

Lip Patterns	Cases		Controls		⨯2-value	p-value
	Male	Female	Male	Female		
i	0(0%)	3(6%)	2(4%)	14(28%)	55.49	0.0001*
I’	0(0%)	1(2%)	0(0%)	1(2%)		
ii	2(4%)	16(32%)	0(0%)	6(12%)		
iii	1(2%)	1(2%)	5(10%)	16(32%)		
iv	10(20%)	15(30%)	2(4%)	3(6%)		
v	0(0%)	1(2%)	0(0%)	1(2%)		
Total	13(26%)	37(74%)	9(18%)	41(82%)		

* * Highly significant when tested by chi square test

Table 3. Comparison of finger print pattern in left hand in cases and control

Finger Patterns r ns	Cases	Controls	⨯2-value	p-value
Loop	96(38.4%)	100(40%)	4.08	0.04, *
Whorl	94 (37.6%)	72(28.8%)	18.98	0.0001**
Arch	54 (21.6%)	80 (32%)	33.96	0.0001 **

*significant ** highly significant

Table 4. Comparison of finger print pattern in right hand in cases and controls

Finger patterns	cases	controls	⨯2-value	p-value
Loop	100(40%)	98(39.2%)	2.02	0.15
Whorl	90(36%)	72(28.8%)	10.53	0.0001**
Arch	32(12.8%)	84(33.6%)	27.02	0.0001**

** Highly Significant

Lip print pattern: The lip print patterns in cases and controls were classified into Types I, I’, II, III, IV and V. The percent distribution of each lip print pattern in cases were 6% Type I, 2% Type I’, 36% Type II, 4% Type III, 50% Type IV and 2% Type V patterns. The percentage distribution of lip print patterns in controls was 32% Type I, 2% Type I’, 12% Type II, 42% Type III, 10% Type IV and 2% Type V patterns Table 1. Shows a comparison of lip print pattern between cases and controls (Chi-square value: 43.92, degree of freedom: 5). The difference in lip print patterns between cases and controls were statistically highly significant (P = <0.001). The difference was also compared in both sexes (Table 2). Results were statistically significant in both gender (Chi-square value: 55.49, degree of freedom: 5, P = <0.001).

Fingerprint pattern: The fingerprint patterns were assessed for both hands starting from thumb to little finger .We analyzed the patterns of fingers according to Henry's system of classification (1900). The percent distribution of these patterns was calculated for both the hands and the difference in fingerprint patterns between cases and controls was assessed [Table 3 and 4**]**. The differences were found statistically significant for both hands except for right hand the difference was not found statistically significant for loop pattern.

DISCUSSION

Blood test is the most widely used and validated method for diabetes mellitus which requires more time and resources. In the present study, since lip and fingerprints are genetically determined and have the pattern that is unique for each individual, now a days, these lip and fingerprints are used as marker for predicting Type 2 DM. There is exiguous record on comparative study of lip print and finger print analysis with Type 2 DM in literature. In controls, the maximum percentage was found for Type III and Type I lip print pattern which was 42.0% and 32 .0%, respectively. Type I’ and V were the least prevailing type of patterns in controls (2.0% each).However, in the present study, it was found that 50.0% of the cases showed a Type IV (reticular) lip print pattern, followed by Type II (36%) , Type I (6.0%), type III(4.0%) ,Type I’ (2.0%) and Type V (2.0%). The observation of present study are in correlation with study conducted by P Manjusha *et al.* (2017) who reported the percent distribution of each lip print pattern in cases as 57% Type IV, followed by 20% Type III,8% Type I, 6% Type I’, 4% Type II, and 5% Type V patterns. Reticular type of lip print pattern was significantly higher in cases (50.0%) than controls (10%).These findings indicate that the people with reticular type of lip pattern are at higher risk of developing type II diabetes mellitus. However, the group of people with clear -cut vertical groves and branched pattern are less likely to develop diabetes. Hence, lip print is a reliable early biomarker which can be used for mass screening of a genetically vulnerable population with a minimum financial burden and greater patient comfort. Fingertip patterns were analyzed in all the digits of both hand in diabetics and controls. Loop type of finger pattern was not significant in right hand in Type II diabetes mellitus and control group. In the present study, it was found that when seen individually each digit showed the highest percentage of loop patterns in both cases and controls. In diabetic patients whorls are most common pattern in both right and left hands than arch pattern. It is in accordance to the findings of Rakate NS *et al*. (2013) who reported that there is an increase in number of whorls in Type

II diabetes mellitus patients. Shrivastava Roshani *et al*. (2016) also observed the similar findings that in both diabetic males and females whorls are most common pattern in both right and left hands. However, in non -diabetic subjects, with the both males and females, loops are most common. In contrast, Manjusha *et al*. (2017) reported that for the left hand, loop and whorl were in higher percentage in normal subjects and arch pattern was more in diabetics. However, the results were not statistically significant. The whorl finger print pattern is more predictive pattern for Type II diabetes mellitus.

Conclusion

This study indicates that people with type IV pattern of lip print may have a greater predilection for developing Type II Diabetes Mellitus. Also whorl type of fingerprint pattern was more common in diabetic than non diabetic's individuals; hence, suggesting that the lip print and finger print patterns can be used as an early diagnostic marker for Type II diabetes mellitus.

Funding: Nil

Conflicts of interest: No

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