ORIGINAL ARTICLE

Cheiloscopy and dermatoglyphics as screening tools for type 2 diabetes mellitus

Nadeem Jeddy,
T. Radhika,
L. J. Sai Lakshmi,
Rachel J. Khodabux,
R. Srilekha, G. Sruthi
Department of Oral Pathology and Microbiology, Thai Moogambigai Dental College and Hospital, Chennai, Tamil Nadu, India

Address for correspondence:
Dr. L. J. Sai Lakshmi, Thaimoogambigai Dental College, Golden George Nagar, Mogappair - 600 107, Chennai, Tamil Nadu, India.
E-mail: saigeethapriya@gmail.com

Abstract

Aim: The aim of this study is to evaluate the efficacy of cheiloscopy (the study of lip prints) and dermatoglyphics (the study of fingerprints) in screening diabetic patients. **Materials and Methods:** The study sample comprised 100 individuals in the age group of 17–60 years, of which fifty were diabetics and fifty controls who reported to the Department of Oral Medicine, Thai Moogambigai Dental College and Hospital. Lip prints were collected and categorized based on the Suzuki and Tsuchihashi system. Fingerprint patterns were obtained and classified according to the Henry's system of classification. **Results:** Type II and IV lip print patterns were predominant in diabetic patients and Type I lip print patterns in controls. The difference was statistically significant. There was no significant difference in fingerprint patterns between the study groups. Gender-wise analysis for lip print and fingerprint patterns did not yield significant results. **Conclusion:** Cheiloscopy is a potential screening tool for type 2 diabetes mellitus. Dermatoglyphics cannot be used as a screening tool in type 2 diabetes mellitus.

Key words: Cheiloscopy, dermatoglyphics, fingerprints, lip prints, type 2 diabetes

Introduction

Diabetes is a global disease and is increasing in occurrence. The prevalence of diabetes worldwide was estimated to be 2.8% in 2000 and predicted to be 4.4% in 2030 (Wild *et al*., 2004). Type 2 diabetes mellitus is more common and is genetically influenced. Estimation of blood sugar level remains the gold standard and confirmatory test for diabetes mellitus. This method has the disadvantages of being invasive, time-consuming, and not being economically feasible, although they are accurate and confirmatory. Untreated diabetes results in a series of complications. Hence, diagnosis at an early stage is key in modifying lifestyle and in early treatment. Fingerprints and lip prints, also being genetically determined traits, may serve as a biomarker in screening diabetes. Dermatoglyphics (Greek word: *Derma*-skin; glyphaecarving) is the science and art of the study of surface marking/patterns of ridges on the skin of the fingers, palm, toes, and soles.[1] Cheiloscopy {Greek word: Cheilo-lips; skopien-to see) is the study of lip prints.[2] Lip print refers to imprint produced from lines and fissures in the form of wrinkles and grooves present in the zone of transition of the human lip between the inner labial mucosa and outer skin.[3] The association between fingerprints and diabetes has been studied by many authors. However,

Submitted: 07-Nov-19 **Revised:** 11-Dec-19
Accepted: 25-Jan-20 **Published:** 03-Jun-20

Access this article online	
Website: www.jfds.org	Quick Response Code
DOI: 10.4103/jfo.jfds_87_19	

How to cite this article: Jeddy N, Radhika T, Sai Lakshmi LJ, Khodabux RJ, Srilekha R, Sruthi G. Cheiloscopy and dermatoglyphics as screening tools for type 2 diabetes mellitus. J Forensic Dent Sci 2019;11:163-6.

studies on the association between lip prints and diabetes mellitus arescarce.

The present study attempts to evaluate the efficacy of dermatoglyphics and cheiloscopy in screening type 2 diabetic patients.

Materials and Methods

Study sample

The study sample included a total of 100 individuals in the age group of 23–60 years, of which fifty were diabetics (16 males and 34 females) and fifty were controls (2 males and 48 females) who reported to the Department of Oral Medicine, Thai Moogambigai Dental College and Hospital. All cases were clinically diagnosed and confirmed by investigations as diabetic. The patients fasting blood sugar level >140 mg/100 ml and postprandial level >200 mg/100 ml was set as criteria to proffer the uncontrolled state of diabetes. The fifty healthy individuals without diabetes and without any family history of diabetes were taken as controls. Patients with inflammation, trauma, congenital deformity, or any other diseases of the lips and fingers, those with known hypersensitivity to lipstick and stamp ink and those with other systemic diseases were excluded from the study. The procedure of taking lip prints and fingerprints was explained to the patient. The written informed consent was obtained from the study participants, and the study was approved by the Institutional Review Board.

Lip print analysis

Procedure

The lips were first cleaned thoroughly. Lipstick was applied uniformly starting from one end of the upper lip and then moving laterally using an earbud. The same procedure was repeated for the lower lip. The earbud was discarded maintaining strict aseptic conditions. The individuals were asked to gently rub his/her lips together to spread the lipstick evenly. The lipstick was allowed to dry for half a minute. The individuals were asked to retain a relaxed lip position, and the impression was taken on the glued portion of the cellophane tape. The tape was carefully removed without smudging, and the impression was stuck on plain paper [Figure 1]. Cotton and vaseline were used to remove the lipstick. After acquiring the pattern of the individuals, each of them was assigned a definite number and studied with a magnifying lens.

Lip prints were categorized based on Suzuki and Tsuchihashi system [Table 1], since it gives a clear description of nearly all of the commonly encountered lip patterns.[4]

Fingerprint analysis

Procedure

Patients' hands were cleaned and dried before printing. The patients' fingerprint was collected by using a stamp pad, and the prints were made onto a plain paper. Prints were dried and studied using a magnifying lens to identify the fingerprints. The fingerprint patterns were classified according to the Henry's system of classification which categorizes fingertip patterns into loops, whorls, and arches [Figure 2].[5]

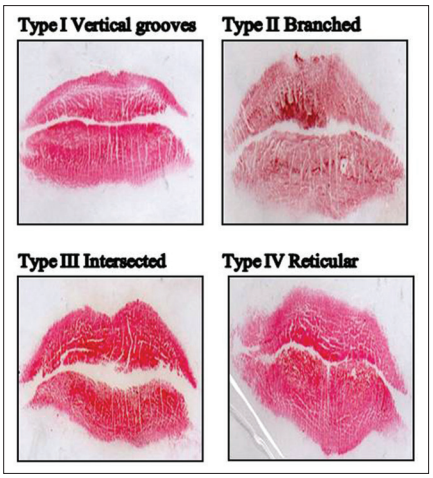

Figure 1: Lip print patterns in the study - Suzuki and Tsuchihashi system

Table 1: Suzuki and Tsuchihashi classification

Type I: Clear-cut vertical grooves that run across the entire lips
Type I': Similar to Type I, but do not cover the entire lip
Type II: Branched grooves
Type III: Intersected grooves
Type IV: Reticular grooves
Type V: Grooves do not fall into any of Type I-IV and cannot be differentiated morphologically (undetermined)

Statistical analysis

The Statistical Package for the Social Sciences version 21 (IBM Business Corporation, Chicago, IL, USA) was used for statistical analysis. The data were analyzed using the Chi-square test. Kappa statistics was done to rule out interobserver variation. P <0.05 was considered statistically significant.

Results

Lip print patterns in diabetics and controls were classified into Type I, II, III, IV, and V. The percent distribution of each lip print pattern in people with diabetes mellitus were 8% Type I, 17% Type II, 6% Type III, 16% Type IV, and 3% in Type V. In controls, 33% Type I, 7% Type II, 3% Type III, 4% Type IV, and 3% Type V. Type II and IV lip print pattern were predominant in diabetic patients and Type I lip print pattern in controls [Table 2 and Figure 3]. The difference were statistically significant (Chi-square value = 27.611[a], degree of freedom = 4, P = 0.000*). There was no significant difference in fingerprint patterns between the study groups [Figure 4]. Gender-wise analysis for lip print and fingerprint patterns did not yield significant results.

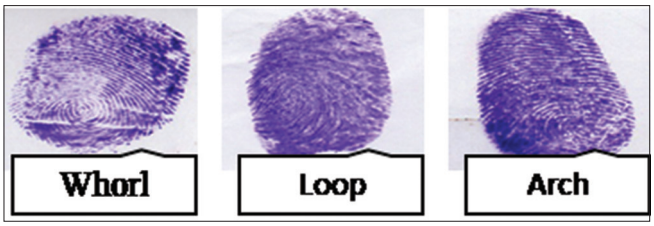

Figure 2: Fingerprint patterns in our study - Henry's system

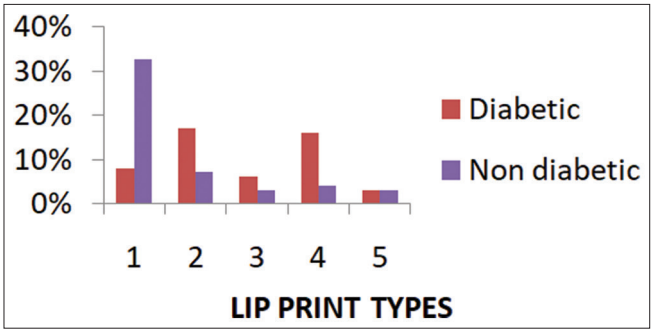

Figure 3: Comparison of lip print patterns between diabetics and nondiabetics

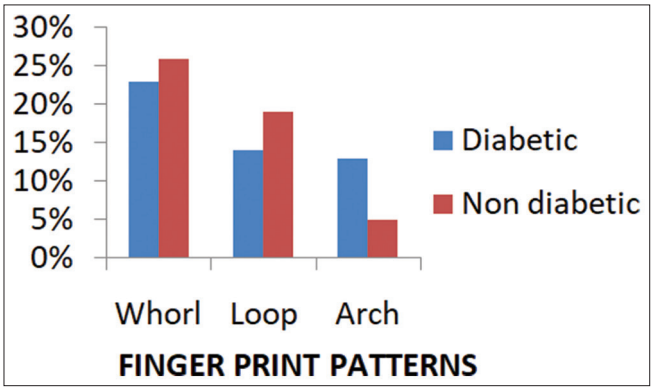

Figure 4: Comparison of fingerprint patterns between diabetics and nondiabetics

Table 2: Distribution of lip print patterns in diabetics and controls

Study groups	Lip print type					Total	χ^2	Degrees of freedom	*P*
	1	2	3	4	5				
Diabetics	8	17	6	16	3	50	27.611[a]	4	0.000*
Controls	33	7	3	4	3	50			
Total	41	24	9	20	6	100			

*$P<0.05$=Significant, a=4 cells (40.0%) have expected count less than 5. The minimum expected count is 3.00

Discussion

Diabetes mellitus is a chronic multifactorial metabolic disorder and a rising epidemic with its prevalence increasing during recent times. Diabetes mellitus is classified into two etiopathogenic categories – Type 1 diabetes mellitus and Type 2 diabetes mellitus. More than 90% of the global cases of diabetes are Type 2, including gestational diabetes. The World Health Organization (WHO) anticipates diabetes mellitus to be the seventh leading cause of death in 2030 (WHO, 2011).

Dermatoglyphics and cheiloscopy as screening tools offer the advantages of being simple, economical, and noninvasive when compared to other biochemical tests for diabetes mellitus. Umana *et al*. reported that people with reticular and undifferentiated pattern has a higher probability of developing diabetes and those with branched and intersected pattern who were at a low risk.[6] The study showed branched and reticular lip pattern were predominant in diabetic patients. Sant *et al*. reported an increased number of whorls and decreased the number of loops of fingerprint patterns in diabetic patients.[7] Study by Akshailekshmi and Anandarani showed the frequency of whorls was significantly more in diabetics, and the frequency of ulnar loops and arches were significantly less in both hands of male and female cases.[8] The present study also showed similar results with the higher number of whorls compared to loop and arch patterns. Study by Ataman and Okoro also reported ulnar loop and whorl patterns were insignificantly more while the arch and radial loop patterns were insignificantly lesser in people with diabetes mellitus compared to controls.[9]

Srivastava and Rajasekhar found that there was an increased frequency of whorl pattern in both sexes which correlates with the present study.[10] Our study showed an increased frequency of whorl and loop pattern between cases and controls, but the results obtained were not statistically significant. In contrast to our study, Burute *et al*. reported significantly higher frequency of arches in fingerprints of Type 2 diabetic females.[11] Findings of Sant *et al*., Sengupta and Borush, and Roshani *et al*. also coincides with our study as the frequency of whorls were increased in diabetic patients.[7,12,13] Manjusha *et al*. reported an increased frequency of loop pattern in a study in Kerala,[14] this is in contrast to our study which showed whorl being more common among cases and controls as well as when considering gender wise.

Umana *et al*. reported that people with a reticular and undifferentiated pattern of lip prints have a higher probability of developing diabetes, and those with branched and intersected pattern were at low risk.[6] Our study showed the predominance of branched and reticular lip print patterns in diabetic patients. Gender-wise predilection depicted a similar increase of reticular and undifferentiated lip print patterns in diabetic patients. The absence of undifferentiated lip print in a nondiabetic patient was significant. The variation in results could be due to ethinical and cultural variations as the study by Umana *et al*. was done in the Nigerian population.

Conclusion

Type 2 and Type 4 lip print patterns were predominant in patients with Type 2 diabetes mellitus. Hence, cheiloscopy can be used as a potential mass screening tool for Type 2

diabetes mellitus. Fingerprint patterns cannot be used as a screening tool for diabetes as there was no significant difference in fingerprint patterns between diabetics and controls.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Cumins HM. Palmer and planter epidermal ridge configuration in European Americans. Am J Phys Anthropol 1926;9:471-502.
2. Gowhar O, Ain TS, Sultan S. Cheiloscopy-tool for gender determination. Forensic Odontol 2016;15:98-100.
3. Reddy L. An overview in forensic dentistry. J Adv Dent Res 2011;11:16-20.
4. Suzuki K, Tsuchihashi Y. New attempt of personal identification by means of lip print. J Indian Dent Assoc 1970;42:8-9.
5. Henry ER. Classification and Uses of Finger Prints. 4th ed. London: George Routledge and Sons Limited; 1900.
6. Umana UE, Ronke R, Timbuak J, Ibegbu A, Musa SA, Ikyembe D, *et al.* Dermatoglyphic and cheiloscopic patterns among diabetic patients: A study in Ahmadu Bello University teaching hospital Zaria, Nigeria. J Biol Life Sci 2013;4:206-14.
7. Sant S, Vare A, Fakhurudin S. Dermatoglyphics in diabetes mellitus. J Anat Soc India 1983;32:127-30.
8. Akshailekshmi P, Anandarani VS. Dermatoglyphics of fingers and its clinical correlation with Type II diabetes mellitus. Internet J Sci Res 2016;5:195-6.
9. Ataman JE, Okoro EC. Fingerprint distribution patterns in diabetics and non diabetics at central hospital, Benin city Nigeria. Int J Dent Diabetes Endocrinol Oral Hyg 2018;1:1-11.
10. Srivastava S, Rajasekhar S. Comparison of digital and palmar dermatoglyphic patterns in diabetic and non-diabetic individuals. IOSR J Dent Med Sci 2014;13:93-5.
11. Burute P, Kazi SN, Vatsalaswamy, Arole V. Role of dermatoglyphic fingertip patterns in the prediction of maturity onset diabetes mellitus (Type II). IOSR J Dent Med Sci 2013;8:1-5.
12. Sengupta S, Borush J. Finger dermatoglyphic patterns in diabetes mellitus. J Hum Ecol 1996;7:203-6.
13. Sehmi S. Dermatoglyphic patterns in type 2 diabetes mellitus. Anat J Afr 2018;7:1162-8.
14. Manjusha P, Sudha S, Shameena PM, Chandni R, Varma S, Pandiar D. Analysis of lip print and fingerprint patterns in patients with type II diabetes mellitus. J Oral Maxillofac Pathol 2017;21:309-15.