

CHEILOSCOPY IN GENDER IDENTIFICATION IN AN OUTPATIENT POPULATION - AN INSTITUTIONAL STUDY

- **Joseph George Kallivayalil**

Saveetha Dental college and Hospitals, Saveetha Institute of Medical and Technical science,
Saveetha University, 162, Poonamallee High road, Velapanchavadi, Chennai- 600077

- **Dr. Gheena.S***

Professor Department of Oral Pathology Saveetha Dental College and Hospital, Saveetha Institute of Medical
and Technical Sciences, Saveetha University, Chennai-600077.

- **Dr. Abirami Arthanari**

Department of Forensic Odontology Saveetha Dental College and Hospital, Saveetha Institute of Medical and
Technical Sciences, Saveetha University, Chennai-600077

ABSTRACT:

Introduction: The Federation Dentaire Internationale has defined forensic odontology as the branch of dentistry which, in the interest of justice, deals with the proper evaluation and presentation of dental findings. **Material and methods:** The study group consisted of 50 volunteers from the out patients of Saveetha Dental College and Hospital. Patients with hypersensitivity to cosmetics and lip lesions were not included in the study. **Results:** Type 1, 1' were most commonly seen in females whereas type 4 and 5 were seen most commonly in males. Twenty five females were correctly recognized as females and Twenty males were correctly identified as males on the basis of their lip prints. statistical significance p value is 0.063. Finally, the result was presented by using bar charts, pie charts and percentage tables. **Conclusion:** The lip prints collected helped in gender identification and lip prints varied differently from genders.

Keywords: forensic odontology; hypersensitivity; gender identification; Innovative study

INTRODUCTION

The Federation Dentaire Internationale has defined forensic odontology as the branch of dentistry which, within the interest of justice, deals with the right evaluation and presentation of dental findings. (1) It is often specified that forensic dentistry works with the 2 objectives: postmortem identification of a private and (1,2) identification of the culprit from evidence which will be left behind, for instance bite marks and lip prints. The study of lip prints is understood as cheiloscopia and comes from the Greek word cheilos meaning lips and scopia meaning to see.

In forensic identification, the mouth allows for a variety of possibilities. (3) Actually, lips, also known as vermilion are known to possess features which will cause an individual's identification. The study of lip prints is understood as cheiloscopia. Lip prints are almost like fingerprints, palm prints and footprints therein individual characteristics are used for identification. Lip prints are unique and don't change during the lifetime of an individual. (4) It has been verified that they recover after undergoing alterations like trauma, inflammation and diseases like herpes and also the disposition and sort of the furrows and doesn't vary with environmental factors (4) Among all, the smallest amount invasive and cost-effective procedure is that the study of lip prints and fingerprints. Lip prints are defined because the normal lines and fissures present within the sort of wrinkles and grooves that are located within the transition zone of the human lip, between the inner labial mucosa and therefore the outer skin, the examination of which is referred as cheiloscopia. (4)

Two Japanese scientists, Y. Tsuchihashi and T. Suzuki within the period 1968-71, established that the arrangement of lines on the red part of the human lip is individualistic and unique for every person. They named the grooves as Sulci Labiorum and lip prints consisting of those grooves as "Figuralinearumlabiorumrubrorum". (5) aside from forensic pathology, particular sorts of lip print patterns are related to the occurrence of non-syndromic harelip with or without birth defect and various studies are underway to determine facts. Parents of patients affected with harelip and/or palate are shown to possess a specific lip print pattern (6)

The oily and moist secretions from sebaceous and salivary glands located at the vermilion border and subsequent moisturization from the tongue enables the formation of a latent lip print. (7) Various physical evidences at the crime scene, like photographs, letters, glass, window panes, cutlery, cigarette butts, clothing, and even biological materials like skin may bear latent, visible, or both sorts of lip prints. (8) The present study was conducted to document and evaluate different lip groove patterns within the study population at Saveetha Dental college with an effort to find the probability of gender determination supported lip groove pattern. Our team has extensive knowledge and research experience that has translate into high quality publications (9),(10),(11),(12),(13),(14),(15),(16),(17),(18),(19),(20),(21),(22),(23),(24),(25),(26),(27),(28)

MATERIALS AND METHODS

The study group consisted of 50 volunteers from the out patients of Saveetha Dental College and Hospital. Patients with hypersensitivity to cosmetics and lip lesions were not included in the study. A single coat of dark colored lipstick (Flameless Matte) was applied evenly on the vermilion border of lips. Lip impressions were recorded. It was then stuck onto a white bond paper and the impressions were analysed. In this study, we followed the classification of patterns of the lines on the lips proposed by Tsuchihashi.

- Type 1 : Clear-cut vertical grooves that run across the entire lips
- Type 1' : Similar to type 1, but do not cover the entire lip
- Type 2 : Branched grooves
- Type 3 : Intersected grooves
- Type 4 : Reticular grooves
- Type 5: Grooves do not fall into any of the type 1-4 and cannot be differentiated morphology

- Type 1, 1' : Pattern dominant - Female
- Type 2 : Patterns are dominant - Female
- Type 3 : Pattern present - Male
- Type 4 : Male
- Type 5 : (varied patterns) - Male

RESULTS AND DISCUSSION

Among the study population, Type 1', Type 1, Type 4, and Type 5 were found to be common lip groove patterns. Figure 2 shows the standardisation of Suzuki and Tsuchihashi Classification of Lip Groove Lines. Figure 3 represents the lip groove pattern. Males showed predominance on Type 1' and Type 1 lip groove patterns, whereas females showed predominance on Type 4 and Type 5 lip groove patterns. No two lip prints matched with each other, thus establishing the uniqueness of the lip prints. Type 1, 1' were most commonly seen in females whereas type 4 and 5 were seen most commonly in males. Twenty five females were correctly recognized as females and Twenty males were correctly identified as males on the basis of their lip prints. 25 males were assessed for their lip groove patterns and were assessed for 6 types of lip groove patterns: Type I, Type I', Type II, Type III, Type IV, and Type V and results turned out to be Type 1 -3 type I' 1 Type II 2 Type III -3 Type IV-10 Type V -6 (Table 1) 25 females were assessed for their lip groove patterns and were assessed for 6 types of lip groove patterns: Type I, Type I', Type II, Type III, Type IV, and Type V and results turned out to be Type 1 -6 type I'-9 Type II- 2 Type III -3 Type 2 Type V - IV- 3. (Table 2). The bar graph depicts the association between gender and the mean value of the respondents of different lip primers. The chi-square test was analysed P value= 0.063(p > 0.05) which is statistically not significant. Pearson chi square test shows p value is 0.063. (Figure- 6).

Table 1: Shows lip groove patterns among Males. 25 males were assessed for their lip groove patterns and were assessed for 6 types of lip groove patterns: Type I, Type I', Type II, Type III, Type IV, and Type V.

Lip groove patterns	Number of observed in this pattern
Type 1	3
Type I'	1
Type II	2
Type III	3
Type IV	10
Type V	6

Table 2: Shows lip groove patterns among Females. 25 females were assessed for their lip groove patterns and were assessed for 6 types of lip groove patterns: Type I, Type I', Type II, Type III, Type IV, and Type V

Lip groove patterns	Number of observed in this pattern
---------------------	------------------------------------

Type I	6
Type I'	9
Type II	2
Type III	3
Type IV	2
Type V	3



Figure 1: Picture of patient with lipstick applied over the lip.

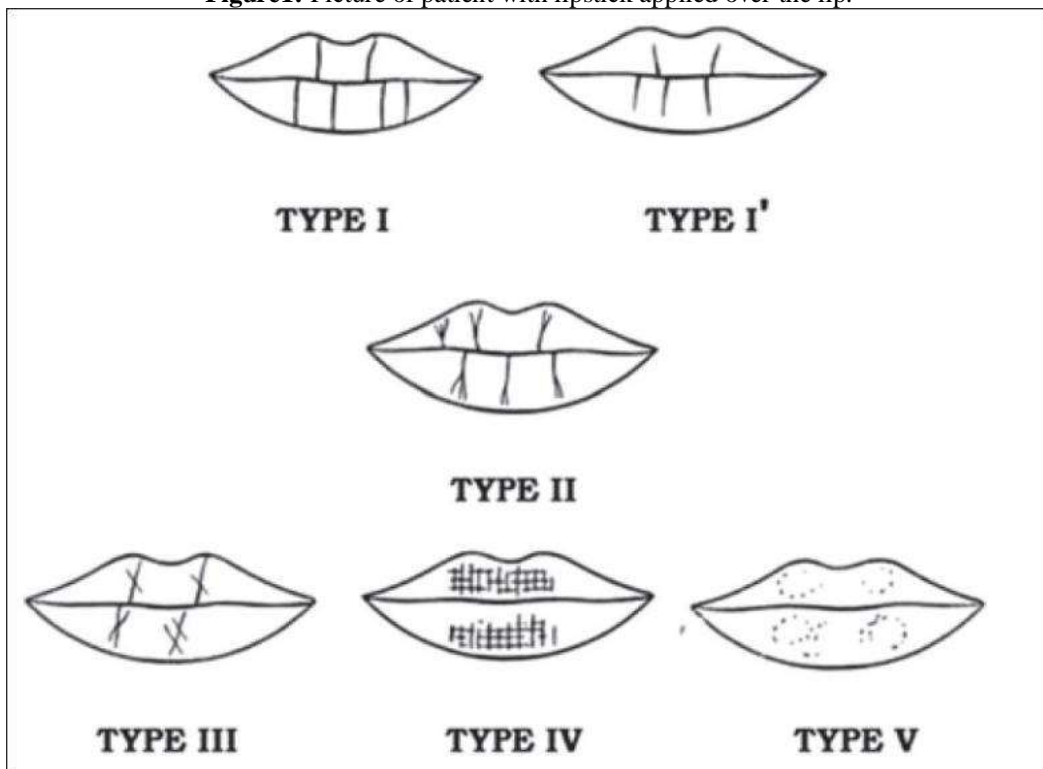


Figure 2: Suzuki and Tsuchihashi Classification of Lip Groove Lines.



Figure 3: Lip Groove Pattern obtained from study subject.

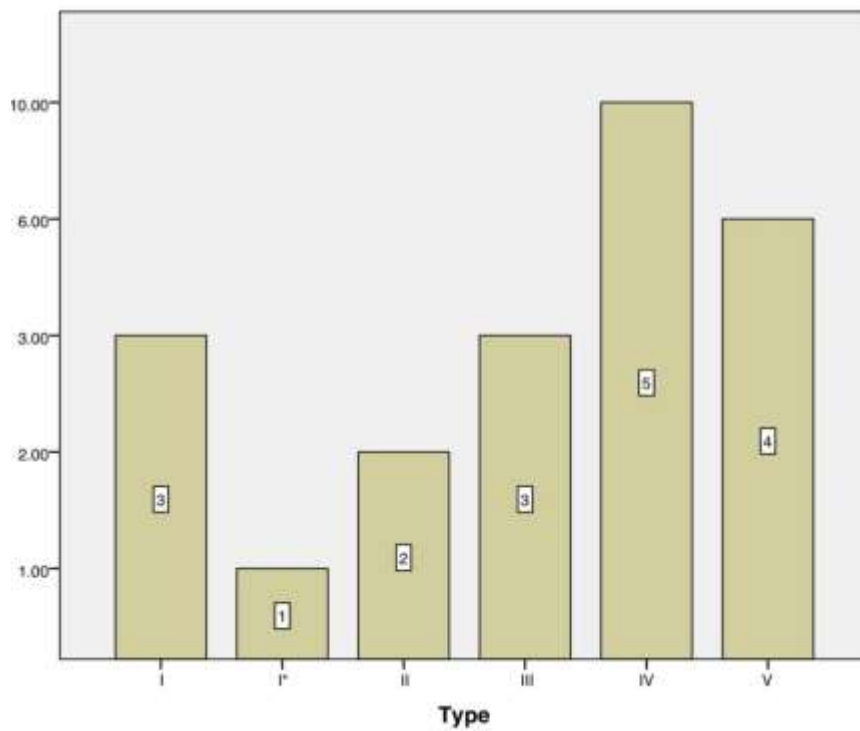


Figure 4: This bar graph represents the Females with their individual lip print Type 1-3, Type I'- 1, Type II -2 Type III- 3, Type IV- 5 Type V-4

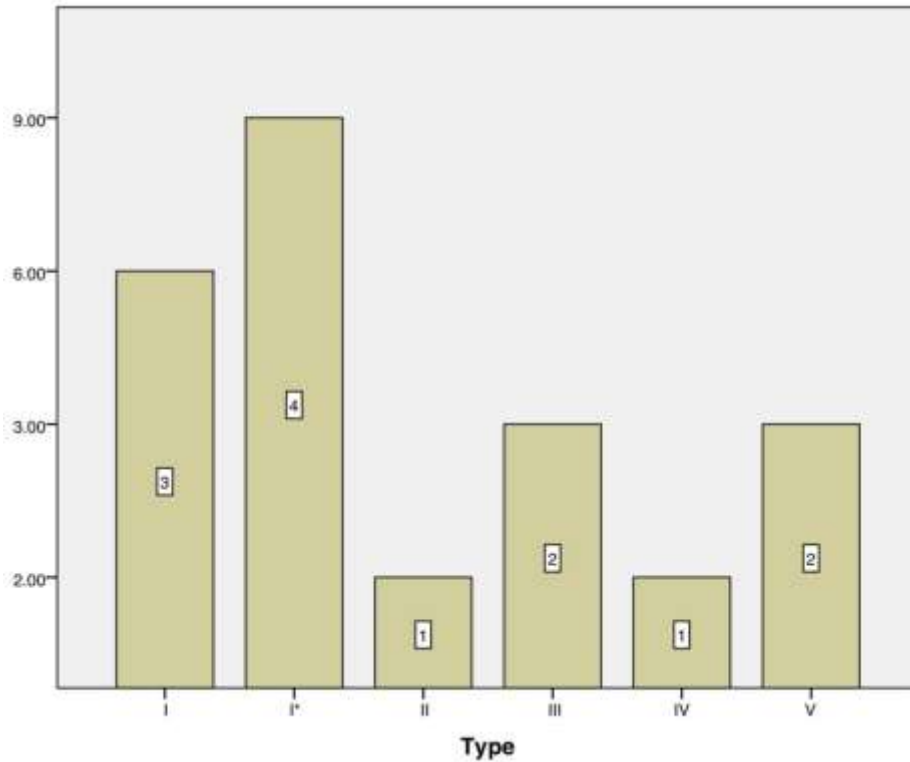


Figure 5: This bar graph represents the Males with their individual lip print Type 1-3 Type I'-4, Type II -1 Type III- 2 Type IV- 1 Type V —2

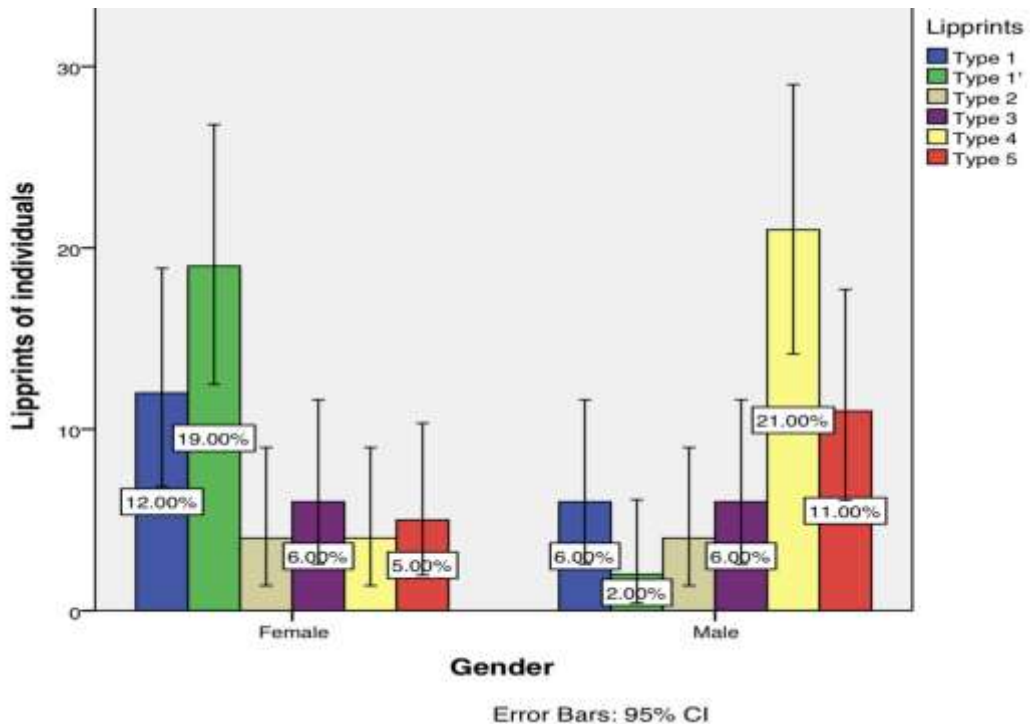


Figure 6: This bar graph depicts the association between gender and the mean value of the respondents of different lip primers. The X-axis represents the gender of the respondents Y-axis represents the number of respondents with their unique lip prints. The green bar represents the respondents with lip prints as Type 1' Red bar represents the respondents who have type V lip print. Yellow represents type IV and blue denotes Type 1. The chi-square test was analysed P value= 0.063($p > 0.05$) which is statistically not significant. Pearson chi square test shows p value is 0.063. It depicted that male has Type IV lip print the highest while the female has Type I'.

DISCUSSION

In the field of forensic odontology, cheiloscropy and rugoscropy are still being used on a large scale. Cheiloscropy is applicable mostly in identifying the dead, since lip prints are usually left at crime scenes, and may provide an immediate link to the suspect. (29) In recent years, lipsticks that don't leave any visible trace after contact with surfaces like glass, clothing, cutlery, or cigarette butts have been developed. According to other studies Type IV lip groove pattern was found to be predominant among Kerala population which is in accordance with the predominant pattern among females in the current research. (30) A cheiloscropy study on Rajasthan population revealed a significant difference among gender, which is in accordance with the current research results. (31) Type IV and Type I lip groove patterns were found to be predominant among Karnataka and Punjab population, which is again consistent with the results thus research (32) These lip prints are characterized by their permanence and are, therefore, mentioned as persistent lip prints. Although invisible, these prints are often lifted using materials like aluminium powder and magnetic powder. (7) The edges of the lips have sebaceous glands, with sweat glands in between. Thus, secretions of oil and moisture from these enable development of latent lip prints, analogous to latent finger-prints. (7) Although lip prints have previously been utilized in a court of law, the utilization isn't consensual and a few authors believe further evidence is required to verify their uniqueness. (33) Lip prints were first described by Fisher in 1902, however, it had been only in 1930 that de Lille developed some studies which led to lip print use in criminology. (34) Thomas and van Wyk, have mentioned that it had been Edmond Locard, one among France's greatest criminologists, who recommended the utilization of lip prints in human identification. Snyder in his book 'Homicide Investigation,' written as early as 1950, mentions the possible use of lip prints within the identification of people. (35) Suzuki and Tsuchihashi proposed a classification dividing the pattern of grooves on the lip into six types and also named the wrinkles and groove visible on lips as 'sulci labiorumruberum'. researchers have worked on lip prints to prove that a gender difference does exist in lip print. (36) consistent with a study by Vahanwala et al. type 1 and sort 1' patterns were found to be dominant in females while type 3 and sort 4 patterns were dominant in males. (37) In another study by Vahanwala and Parekh, it had been shown that each one four quadrants with an equivalent sort of lip prints were predominantly seen in female subjects and male subjects showed the presence of various patterns during a single individual. They also found type 1 and sort 1' patterns to be dominant in females while type 4 and sort 5 patterns were dominant in males, reinforcing previous observations. (38)

CONCLUSION

From this study we can conclude that lip prints are unique and do not change during the life of a person. The lip prints collected helped in gender identification and lip prints varied between genders. The tremendous research done in this field itself proves its worth as a unique entity, and can be used as crime scene evidence and in identification of individuals.

CONFLICT OF INTEREST Nil

ACKNOWLEDGEMENT

The team extends our sincere gratitude to the Saveetha Dental College and hospitals for their constant support and successful completion of this work.

SOURCE OF FUNDING

The present study was supported by the following agencies

- Saveetha Dental College,
- Saveetha Institute of Medical and Technical Science,
- Saveetha University
- Anbu Offset AchagamPvt Ltd

REFERENCES:

1. Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (cheiloscropy). Indian J Dent Res. 2001 Oct;12(4):234-7.
2. Harris HA. Review of: Criminalistics An Introduction to Forensic Science, Seventh Edition [Internet]. Vol. 46, Journal of Forensic Sciences. 2001. p. 15141J. Available from: <http://dx.doi.org/10.1520/jfs15141j>
3. Adams BJ. The diversity of adult dental patterns in the United States and the implications for personal identification. J Forensic Sci. 2003 May;48(3):497-503.
4. Tsuchihashi Y. Studies on personal identification by means of lip prints. Forensic Sci. 1974 Jun;3(3):233-48.
5. Teare RD, Donald Teare R. Review: Dental Identification and Forensic Odontology [Internet]. Vol. 44, Medico-Legal Journal. 1976. p. 97-97. Available from: <http://dx.doi.org/10.1177/002581727604400304>
6. Ball J. The current status of lip prints and their use for identification. J Forensic Odontostomatol. 2002 Dec;20(2):43-6.
7. Bansal N, Sheikh S, Bansal R, Pallagati S. Correlation between lip prints and finger prints in sex determination and pattern predominance in 5000 subjects. J Forensic Odontostomatol. 2013 Dec 1;31(1):8-14.
8. Raghu AR, Mutalik V, Menon A, Jayalakshmi N, Kamath A. Utility of cheiloscropy, rugoscropy, and dactyloscopy for human identification in a defined cohort [Internet]. Vol. 5, Journal of Forensic Dental Sciences. 2013. p. 2.

Available from: <http://dx.doi.org/10.4103/0975-1475.114535>

9. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. *Eur J Dent.* 2020 Dec;14(S 01):S105–9.
10. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig.* 2020 Sep;24(9):3275–80.
11. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *J Oral Pathol Med.* 2019 Apr;48(4):299–306.
12. R H, Hannah R, Ramani P, Ramanathan A, Jancy MR, Gheena S, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene [Internet]. Vol. 130, *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology.* 2020. p. 306–12. Available from: <http://dx.doi.org/10.1016/j.oooo.2020.06.021>
13. Antony JVM, Ramani P, Ramasubramanian A, Sukumaran G. Particle size penetration rate and effects of smoke and smokeless tobacco products - An invitro analysis. *Heliyon.* 2021 Mar 1;7(3):e06455.
14. Sarode SC, Gondivkar S, Sarode GS, Gadbail A, Yuwanati M. Hybrid oral potentially malignant disorder: A neglected fact in oral submucous fibrosis. *Oral Oncol.* 2021 Jun 16;105390.
15. Hannah R, Ramani P, WM Tilakaratne, Sukumaran G, Ramasubramanian A, Krishnan RP. Author response for “Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review” [Internet]. Wiley; 2021. Available from: <https://publons.com/publon/47643844>
16. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. *ProgOrthod.* 2020 Oct 12;21(1):38.
17. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent.* 2018 Jan;12(1):67–70.
18. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. *Eur J Dent.* 2018 Jan;12(1):21–6.
19. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. *ToxicolMech Methods.* 2019 May;29(4):276–90.
20. Sundaram R, Nandhakumar E, HaseenaBanu H. Hesperidin, a citrus flavonoid ameliorates hyperglycemia by regulating key enzymes of carbohydrate metabolism in streptozotocin-induced diabetic rats. *ToxicolMech Methods.* 2019 Nov;29(9):644–53.
21. Alsawalha M, Rao CV, Al-Subaie AM, Haque SKM, Veeraraghavan VP, Surapaneni KM. Novel mathematical modelling of Saudi Arabian natural diatomite clay. *Mater Res Express.* 2019 Sep 4;6(10):105531.
22. Yu J, Li M, Zhan D, Shi C, Fang L, Ban C, et al. Inhibitory effects of triterpenoidbetulin on inflammatory mediators inducible nitric oxide synthase, cyclooxygenase-2, tumor necrosis factor-alpha, interleukin-6, and proliferating cell nuclear antigen in 1, 2-dimethylhydrazine-induced rat colon carcinogenesis. *Pharmacogn Mag.* 2020;16(72):836.
23. Shree KH, Hema Shree K, Ramani P, Herald Sherlin, Sukumaran G, Jeyaraj G, et al. Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis [Internet]. Vol. 25, *Pathology & Oncology Research.* 2019. p. 447–53. Available from: <http://dx.doi.org/10.1007/s12253-019-00588-2>
24. Zafar A, Sherlin HJ, Jayaraj G, Ramani P, Don KR, Santhanam A. Diagnostic utility of touch imprint cytology for intraoperative assessment of surgical margins and sentinel lymph nodes in oral squamous cell carcinoma patients using four different cytological stains. *DiagnCytopathol.* 2020 Feb;48(2):101–10.
25. Karunagaran M, Murali P, Palaniappan V, Sivapathasundharam B. Expression and distribution pattern of podoplanin in oral submucous fibrosis with varying degrees of dysplasia – an immunohistochemical study [Internet]. Vol. 42, *Journal of Histotechnology.* 2019. p. 80–6. Available from: <http://dx.doi.org/10.1080/01478885.2019.1594543>
26. Sarode SC, Gondivkar S, Gadbail A, Sarode GS, Yuwanati M. Oral submucous fibrosis and heterogeneity in outcome measures: a critical viewpoint. *Future Oncol.* 2021 Jun;17(17):2123–6.
27. Raj Preeth D, Saravanan S, Shairam M, Selvakumar N, Selestina Raja I, Dhanasekaran A, et al. Bioactive Zinc(II) complex incorporated PCL/gelatin electrospun nanofiber enhanced bone tissue regeneration. *Eur J Pharm Sci.* 2021 May 1;160:105768.
28. Prithiviraj N, Yang GE, Thangavelu L, Yan J. Anticancer Compounds From Starfish Regenerating Tissues and Their Antioxidant Properties on Human Oral Epidermoid Carcinoma KB Cells. In: *PANCREAS. LIPPINCOTT WILLIAMS & WILKINS TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA ...*; 2020. p. 155–6.
29. Rai B, Kaur J. Role of Dentist and Forensic Odontologist in Child Abuse Cases [Internet]. *Evidence-Based Forensic Dentistry.* 2013. p. 175–83. Available from: http://dx.doi.org/10.1007/978-3-642-28994-1_19
30. Shilpa PS, Kaul R, Padmashree S, Bhat S, Sultana N. Study of lip prints in different ethno-racial groups in India [Internet]. Vol. 28, *Indian Journal of Dental Research.* 2017. p. 545. Available from:

http://dx.doi.org/10.4103/ijdr.ijdr_352_14

31. Mishra G, Ranganathan K, Saraswathi TR. Study of lip prints [Internet]. Vol. 1, Journal of Forensic Dental Sciences. 2009. p. 28. Available from: <http://dx.doi.org/10.4103/0974-2948.50885>
32. Ahuja P, Butani TP, Dahiya MS. CHEILOSCOPY: A Study on Lip Print Patterns among the Gujarati Population [Internet]. Vol. 12, Indian Journal of Forensic Medicine & Toxicology. 2018. p. 148. Available from: <http://dx.doi.org/10.5958/0973-9130.2018.00030.0>
33. Fernandes LCC, de Araújo Oliveira J, Santiago BM, Rabello PM, de Carvalho MVD, Campello RIC, et al. Cheiloscopic Study among Monozygotic Twins, Non-Twin Brothers and Non-Relative Individuals [Internet]. Vol. 28, Brazilian Dental Journal. 2017. p. 517–22. Available from: <http://dx.doi.org/10.1590/0103-6440201700922>
34. Debnath N, Gupta R, Nongthombam R, Chandran P. Forensic odontology [Internet]. Vol. 30, Journal of Medical Society. 2016. p. 20. Available from: <http://dx.doi.org/10.4103/0972-4958.175794>
35. Sharma E, Sharma B, Gupta V, Vij H, Tyagi N, Singh S. Cheiloscopy: A tool for antemortem identification [Internet]. Vol. 9, Indian Journal of Dental Sciences. 2017. p. 176. Available from: http://dx.doi.org/10.4103/ijds.ijds_60_17
36. Peter T, Chatra L, Ahsan A. Cheiloscopy [Internet]. Vol. 1, International Journal of Forensic Odontology. 2016. p. 48. Available from: <http://dx.doi.org/10.4103/2542-5013.194272>
37. Kumar EDB, Bharat Kumar ED. Study of Lip Prints as a Tool for Identification: An Assessment on 200 Subjects in South India [Internet]. Vol. 11, Indian Journal of Forensic Medicine & Toxicology. 2017. p. 31. Available from: <http://dx.doi.org/10.5958/0973-9130.2017.00059.7>
38. Koneru A, Surekha R, Nellithady GS, Vanishree M, Ramesh D, Patil RS. Comparison of lip prints in two different populations of India: Reflections based on a preliminary examination. J Forensic Dent Sci. 2013 Jan;5(1):11–5.