# Title: Analysis of Total Lip Score System and Total Groove Score for gender identification: A cross sectional study

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**Background:** Endless ink and pixel space have been spent to validate the use of cheiloscopy classification systems in the field of identification. It is becoming evident that lip-print patterns may provide indications about an individual's gender, race, occupation, habits, blood type, and paternity. Over the course of time, much data has been collected on a substantial population in this field.

**Methods:** In the present study, we strive to see how well a noble total lip scoring system (TLS) works in identifying a person's gender among College of Dentistry students. We also quantified the total groove score (TGS) and compared it with each quadrant for better authentication of the set study design. Materials & Method: A cross-sectional descriptive study was conducted among 60 dental students (30 males and 30 females), with an age range of 18–30 years. Lip prints were recorded using the writing pad method and subsequently digitalized by capturing the images using Adobe Photoshop CS 6 Extended Version, counted and summed up, quadrant wise, in both upper and lower lip. The TLS and TGS between males and females were statistically calculated using Jamovi project.
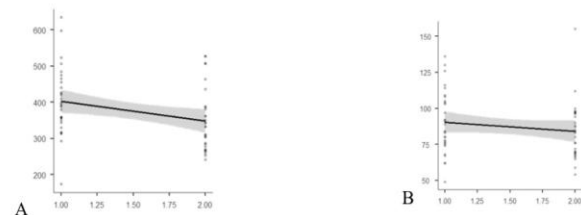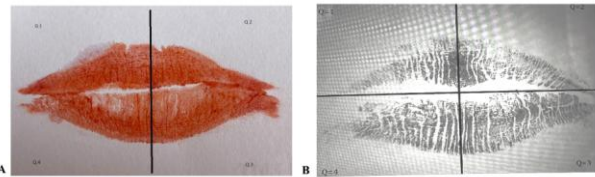


## Digitized Analysis

Adobe Photoshop CS6 Extended Version processed each picture. Clicking the mouse from the lip midline activated rulers and put guidelines. Editing the picture to grayscale and setting the resolution to 300 dpi improved visualization. The upper and lower lips have four quadrants. The Klein Zone, the lip area's oral sphincter formed by wrinkles and grooves, was used for interpretation for convenience.

Suzuki and Tsushihashi categorization was used in our investigation. Score numbers were assigned to each category.

Type I, Type I', Type II, Type III, Type IV, and Type V were assigned score numbers 1, 2, 3, 4, 5, and 6. The result of the Suzuki and Tsushihashi categorization of lip grooves plus a specified score number (TS) based on the observed lip type yielded the Total Lip Score (TLS). All quadrant lip grooves (Q1, Q2, Q3, and Q4) were calculated separately, and the sum of these values generated each participant's Total Groove Score (TGS).

Quadrant-specific lip groove measurement and aggregation occurs in maxillary and mandibular arches. A complete lip score system examination allows men and women to be compared. Statistical analysis was performed on raw data.

**Results:** The mean value for TLS for males (n = 402; SD ±92.1) is higher than that for females (n = 348; SD ± 86.1). The correlation matrix applying a non-parametric test for non-continuous data using Spearman's ratio inferred a statistically significant correlation (-0.354) with a p value of 0.005 for TLS, whereas a correlation (-0.162) of TGS with gender was not so significant with a p value of 0.217.

**Conclusion:** Our study proved the uniqueness of applying TLS as a novel approach to gender identification. The study revealed that males had a statistically higher lip score compared to females. Clinical Significance/Future Implications: Being unique, our study inferred the importance of TLS, which needs to be explored in detail for applying, evaluating, and validating its accuracy in forensic research that can help for errorless investigations as full proof evidence in court.

**Future perspectives:** More studies can be conducted for analyzing the effectiveness and accuracy of the digital method by applying digital tools like Adobe, GIMP Software, etc. for recording the lip prints and on geographic variation and diversity among different populations, as well as on the role of genetics in the formation of the total number of lip prints in different quadrants.
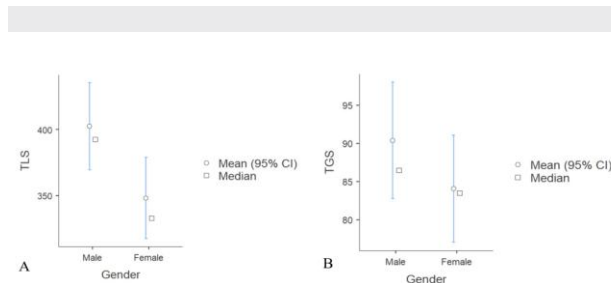
**References:**





Scatter plot shows correlation matrix (Non-Parametric Test for non-continuous data) using Spearman's Correlation difference in score in males and females for Total Lip Score (TLS) [A] & Total Groove Score (TGS) [B] (x axis =1.00 – males ; x axis 2.00 – females; y axis = score)



Binomial regression plot for Total Lip Score (TLS) [A] & Total Groove Score (TGS) [B]