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Research Paper

Regression equations for sex and population detection using the lip print pattern among Egyptian and Malaysian adult

Manal H. Abdel Aziz, Fatma M.M. Badr El Dine, Nourhan M.M. Saeed[*]

Forensic Medicine & Clinical Toxicology Department, Faculty of Medicine, Alexandria University, Egypt

A B S T R A C T

Introduction: Identification of sex and ethnicity has always been a challenge in the fields of forensic medicine and criminal investigations. Fingerprinting and DNA comparisons are probably the most common techniques used in this context. However, since they cannot always be used, it is necessary to apply different and less known techniques such as lip prints.
Aim of the work: Is to study the pattern of lip print in Egyptian and Malaysian populations and its relation to sex and populations difference. Also, to develop equations for sex and populations detection using lip print pattern by different populations (Egyptian and Malaysian).
Subjects and methods: The sample comprised of 120 adults volunteers divided into two ethnic groups; sixty adult Egyptians (30 males and 30 females) and sixty adult Malaysians (30 males and 30 females). The lip prints were collected on a white paper. Each lip print was divided into four compartments and were classified and scored according to Suzuki and Tsuchihashi classification. Data were statistically analyzed.
Results: The results showed that type III lip print pattern (intersected grooves) was the predominant type in both the Egyptian and Malaysian populations. Type II and III were the most frequent in Egyptian males (28.3% each), while in Egyptian females type III pattern was predominant (46.7%). As regards Malaysian males, type III lip print pattern was the predominant one (41.7%), while type II lip print pattern was predominant (30.8%) in Malaysian females. Statistical analysis of different quadrants showed significant differences between males and females in the Egyptian population in the third and fourth quadrants. On the other hand, significant differences were detected only in the second quadrant between Malaysian males and females. Also, a statistically significant difference was present in the second quadrant between Egyptian and Malaysian males. Using the regression analysis, four regression equations were obtained.

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1. Introduction

Human identification has always been a challenge in the fields of forensic medicine and criminal investigations.[1]

Various well known methods have already been implemented in human identification (face, retina, iris, dental evidence, blood groups, fingerprints, etc.).[2] Fingerprinting and DNA typing are probably the most common techniques used in this context. However, since they cannot always be used; by increasing the awareness of the advanced techniques in crime detection among the general public, significant proportion of offences are committed with deliberate attempts not to leave behind any fingerprints at the crime scene. This fact has raised the attention to apply different and less known techniques such as cheiloscopy.[3]

Cheiloscopy deals with the study of lip prints. Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and the outer skin. They are arranged in various shapes and drawings, which are individual for each person.[4] Lip prints are said to be unchangeable (even after inflammation, a tiny injury such as labial herpes) and unique. No two people have identical lip furrows arrangement. Those patterns are identifiable as early as the sixth week of intrauterine life.[5]

Depending upon the scenario of the crime scene, lip prints may be found on various physical evidences at the scene of crime; objects such as drinking glasses, paper napkins, cigarette butts,

* Corresponding author.
E-mail addresses: manalhassan55@yahoo.com (M.H. Abdel Aziz), fatmabadreldine@yahoo.com (F.M.M. Badr El Dine), nourhanaboshabana@gmail.com (N.M.M. Saeed).

tissues, CDs, DVDs and biological materials such as skin.[6] Lipstick stains on a suspect's clothing, can show a link between the subject and the scene of a crime. These prints are usually found as visible lipstick marks, even the latent lip prints can be used and can be lifted using aluminum and magnetic powder.[7]

A lip print at the scene of crime can be a clue for the character of the event, the number of the people involved, sexes, cosmetics used, habits, occupational traits, and the pathological changes of the lips themselves, which help in the reconstruction of the crime.[8]

The existence of different patterns of grooves between men and women in a single population, has great value for human identification. The same idea is valid for different arrangement patterns between different populations.[9]

Research and applications of lip prints are scanty, in spite of its role in forensic investigations. The present research was designed to study study the pattern of lip print in Egyptian and Malaysian populations and its relation to sex and populations difference. Also, to develop equations for sex and populations detection using lip print pattern by different populations (Egyptian and Malaysian).

2. Material and methods

2.1. Subjects

The present research was conducted in the Department of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Alexandria University. One hundred and twenty adults' volunteers divided into two racial groups; sixty adult Egyptians (30 males and 30 females) and sixty adult Malaysians (30 males and 30 females) participated in the study. All subjects were medical students for the academic year 2014/2015 and were informed about the purpose and nature of the study.

The Ethics Committee of Alexandria Faculty of Medicine approved the study.

Subjects with any known hypersensitivity to lipstick or evidence of any pathology such as inflammation, mucocele, cicatrization, and deformities such as cut marks or lesions of lips were excluded from the study.

2.2. Materials

The materials used included dark and non glossy lipstick, Whatman white filter papers grade no 1, pencil, ruler and magnifying lens.

2.3. Methods

2.3.1. Lip print collection

The subjects were asked to clean their lips, then the lipstick was applied on the lips, subsequently, with a single stroke, the subjects were asked to rub the lips in order to spread the lipstick uniformly. Lip prints were obtained in the normal resting position of the lips. Then with the help of a white filter paper, the center portion of lips was dabbed first and then left and right corners of lips were pressed, applying uniform pressure, taking care to avoid sliding of lips to prevent smudging of the lip print.[10]

Details from each individual participating in the study (sex, age and state of origin) were documented and each lip print was assigned a serial number.

2.3.2. Analysis of the lip prints

Each lip print obtained on filter paper was divided into four quadrants by drawing a horizontal line that demarcates the upper lip from the lower one and a second median vertical line (Medline) that divides lips into right and left halves. The four quadrants were:

right upper as the first quadrant, left upper as the second quadrant, left lower as the third quadrant, and right lower as the fourth quadrant, in a clockwise sequence starting from the upper right side of the lips. (Fig. 1).

The lip prints were observed using magnifying lens (with direct light focused on it) and were categorized into particular type depending on the predominant pattern.

According to Suzuki and Tsuchihashi classification, the determination of the pattern in each segment of the lip was based on the numerical superiority of properties of the lines on the fragment.[11–13]

(Table 1) (Fig. 2) Then, scoring the different types of the lip print in each quadrant follow; type I was given score 1, type I' score 2, type II score 3, type III score 4, type IV score 5 and type V score 6.

2.4. Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 for calculation of Arithmetic mean, standard deviation, chi square, correction for chi-square was conducted using Monte Carlo correction. The frequency of each type of lip print pattern was tabulated and the percentage of each type was calculated. Student's t-test was used to establish any significant difference existing between different groups. Liner regression analysis was performed in order to determine sex and ethnicity using the score of the lip print.

The level of significance was set at $p \leq 0.05$.

3. Results

The study included one hundred and twenty adults' volunteers divided into two racial groups; sixty adult Egyptians (30 males with a mean of age 22.37 ± 1.79 and 30 females with mean age 22.37 ± 1.79) and sixty adult Malaysians (30 males with mean age 22.0 ± 0.74 and 30 females with Mean age 22.30 ± 0.84) there were no significant difference between both sexes in the same population and even between the two populations regarding the age factor.

Type III (intersected grooves) and type II (branched grooves) represented the most common patterns of lip prints in the whole sample (36.5% and 26.9% respectively). Type V (Undetermined) was the least (2.9%). (Fig. 3)

As regards sex in both populations, Egyptian population showed that type II and III were the most frequent in males (28.3% each), while in females type III pattern was the predominant (46.7%).

Fig. 1. Lip division into four quadrants.