Sri Lanka Journal of Forensic Medicine, Science & Law — 2023; 14(2):3-9
DOI: https://doi.org/10.4038/sljfmsl.v14i2.7934

RESEARCH ARTICLE

AN ASSOCIATION BETWEEN LANDSTEINER-RHESUS TYPING OF BLOOD AND CHEILOSCOPY AMONG FEMALE STUDENTS IN BENGALURU RURAL: FORENSIC MEDICINE PERSPECTIVE

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ABSTRACT

Introduction: Cheiloscopy is the term used for the study and analysis of lip impressions. In the field of forensics, identification is of utmost importance.
Objective: To study the relationship between lip prints and blood groups in female students in rural Bengaluru, Karnataka, India.
Materials: Lip prints and blood groups were obtained and recorded using cotton swabs, lipstick, antisera for slide agglutination test, slides, lancelets, sanitizer, and hand towels.
Methods: 189 students from the MVJ Medical College and Research Hospital participated after giving informed written consent. By applying cello tape to lips that had been painted with lipstick and then affixing the tape to the proforma sheet, the lip prints were collected. Suzuki and Tsuchihashi classification was used to categorize the same. The slide agglutination method was used to determine the blood group. Statistical analysis was done using the chi-square test. P value of 0.05 was considered of statistical significance.
Results: Type II or branching type was the most common lip print in our study. Most individuals (181 out of 189 participants) belonged to the Rh-positive blood group. The study participants with blood type O were the most commonly seen. Association between type II lip print and blood group O were found to be the most common.
Conclusions: This research shows the relationship between cheiloscopy and blood groups. These are frequently discovered evidence at a scene of the crime and are crucial for identification.

Keywords: *ABO typing; Blood grouping; cheiloscopy; Landsteiner grouping; Rhesus typing*

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ARTICLE HISTORY
Received: 04.02.2023 Received in revised form: 21.07.2023
Accepted: 17.09.2023 Available online: 22.12.2023

INTRODUCTION

Cheiloscopy is the term used for the study and analysis of lip impressions. In the field of forensics, identification is of utmost importance. Residual and noticeable lip impressions may be found at scenes of crime, from homicides to larceny. Lip imprints are the distinctive patterning made by fissures (*sulci labiorum*) on the mucosa of the lips that are found at the area of transition between the skin and the labial mucosa[1]. Even though R. Fischer first characterized these patterns created by grooves on the lips back in 1902, two scientists from Japan, Tsuchihashi, and Suzuki, later provided more thorough investigations on the distinctiveness of cheiloscopy in 1970[2]. As early as the sixth week of foetal development, these lip patterns can be identified. Despite climate changes, diseases, mild trauma, inflammatory reactions, and infectious diseases, the lip prints remain unchanged[3]. For personnel identification, cheiloscopy is just as dependable as dactylography. Interestingly, homozygous twins' lip prints resemble each other a great deal more than their fingerprints[4]. According to numerous studies, the architecture of lip prints does not alter with advancement in the age of the individual[5].

Landois initiated the investigation on blood types in the late 1800s[6]. Karl Landsteiner's discovery of the ABO grouping of blood in the early 1900s, followed by the Rhesus typing, marked a major turning point in the development of blood transfusion[8].

ABO or Landsteiner blood grouping is determined by a solitary gene with alleles that are situated on chromosome 9. Rhesus blood group inheritance is determined by the existence of either the R or r alleles[7]. All red blood cells (RBCs) contain a crucial "H" antigen that is home to a specific antigen type and sugar. These antigens may be antigens A or B, and the sugar they contain could either be galactose or N-acetyl galactosamine (NAG) (G). Almost all RBCs share the "H" antigen, and the presence of both antigen "A" and N-acetyl galactosamine identifies it as belonging to the A blood group. It is blood group B if antigen "H" is present together with antigen "B" and galactose; blood group 'O' does not contain sugar and can only contain antigen "H". There are several incredibly rare circumstances where all three "H," "A," and "B" antigens are absent. These are referred to as Bombay blood types. Additionally, other antigens on RBCs include C, D, and E, with D being the most crucial in clinical settings. Blood types are classified as Rh negative or Rh positive depending on whether the D antigen is present. This method of classification of blood-based on D antigen is known as rhesus typing[9].

Any possible correlation between these three parameters (gender, blood group, and lip prints) must be explored and examined as they are of prime importance in a crime scene[25]. Since using other complicated methods for identification, such as analysing DNA, is sophisticated and inconvenient in rural and impoverished nations, the utilization of these parameters is of exceptional relevance[26].

OBJECTIVE

To analyse the relationship between Landsteiner-Rhesus typing of blood and cheiloscopy among female students in rural Bengaluru Rural district in India.

MATERIALS AND METHODS

The target demographic for this study were female students from Bengaluru Rural between the ages of 18 and 25 years. Students were informed in detail about the study in their classrooms and those willing to participate in the study were selected if they satisfied the criteria mentioned below. The research participants provided their written informed consent.

1. Inclusion Criteria
   a. Pupils over 18 years of age who consented to take part in the research.
2. Exclusion Criteria
   a. Pupils with lip injuries, ulceration, wounds, or smoking habits.
   b. Pupils who have cleft lips or any sort of anatomical abnormalities of the lips.

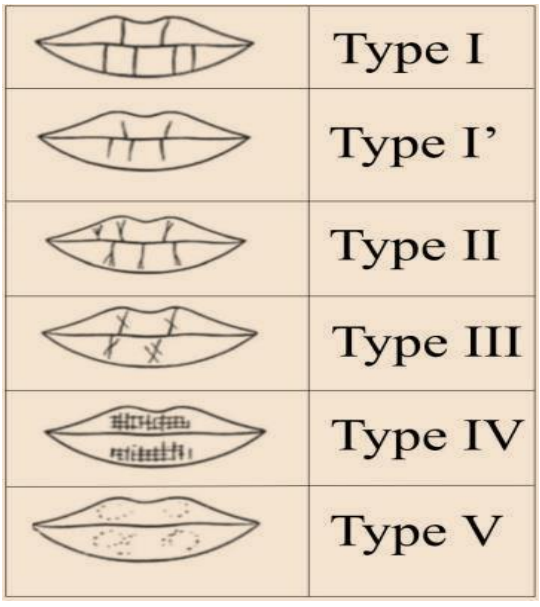
Proforma papers with questions on the study participants' age, sex, and blood type were provided. The proforma had slots for collecting the lip print.

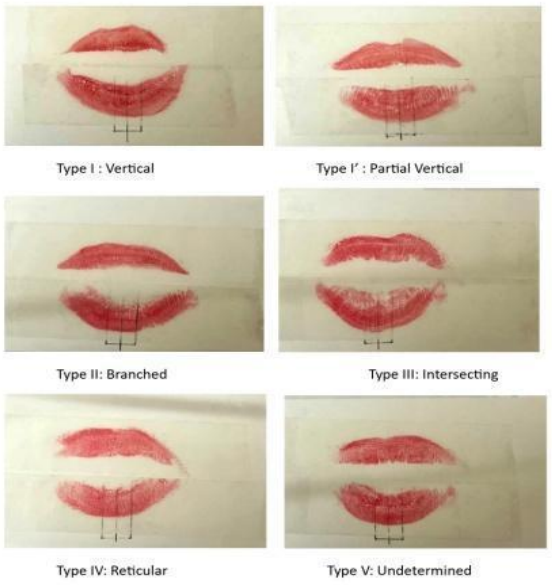
Collection and examination of lip prints

Under the supervision of the staff, the subjects were asked to thoroughly clean their lips using soap and water. Lip impressions were taken by using a cotton swab to apply lipstick over the labial mucosa. Using clear cellophane tape, these imprints were then transferred onto the proforma sheet by taping the cello tape to the lips and then attaching the tape to the proforma. After scanning, this data was then digitally evaluated. It was categorized using the system used by Suzuki and Tsuchihashi.

Type I - Vertical
Type I' - Incomplete vertical
Type II - Branched
Type III - Intersecting
Type IV - Reticular
Type V - Undetermined

Suzuki and Tsuchihashi Classification[10]





Identification of blood group

Slides, the appropriate antisera, and a sterile lancelet were used in the slide agglutination procedure to determine blood groups. Using a microscope, agglutination was examined to identify the blood group. Using antisera A and antisera B, a drop of blood from the participant was used to determine the blood type. An agglutination reaction to antisera A implied that the blood sample belonged to Landsteiner group A. Similarly, an agglutination reaction to antisera B implied that the blood sample belonged to Landsteiner group B. The sample was grouped under Landsteiner group O when neither A nor B antisera showed agglutination. When agglutination was achieved with both the antisera, it was coined as blood group AB. Similarly, the Rh status was determined based on the ability or inability of the Rh antigen to agglutinate the blood sample[27].

This procedure was carried out by designated health officers in the institution and was performed under the guidance of a medical laboratory technician (MLT) and medical officers of the haematology laboratory of MVJ Medical College and Research Hospital, Bengaluru, India.

Statistical analysis

The two assessors looked through the data gathered and entered the findings into Excel sheets. A Cohen kappa value of 0.8 was used to confirm the research's inter-examiner reliability. The chi-square test and Monte Carlo approach were done through Python for statistical analysis. For the Monte Carlo test, the cut-off p-value was 0.4, and for the chi-square test, it was 0.05.

RESULTS

Table 1: Age distribution among the study population

Age (in years)	No. of study participants
18-29	50 (26.4%)
20-21	86 (45.4%)
22-23	24 (12.6%)
24-25	21 (11%)
26-27	8 (4.1%)
-	Total: 189

Study subjects were selected from students from MVJ Medical College and Research Hospital, Bengaluru. Students were informed in detail about the study in their classrooms. Numbers were allotted to students who showed interest and fulfilled the above-mentioned criteria. Out of which 189 female students were selected using a random number generator. Ages of the subjects ranged from 18 to 27 (Table 1).

Table 2: Distribution of lip prints among the study population

Type I (Vertical)	**28 (14.8%)**
Type I' (Partial Vertical)	47 (24.8%)
Type II (Branched)	52 (27.5%)
Type III (Intersecting)	19 (10%)
Type IV (Reticular)	38 (20%)
Type V (Undetermined)	5 (2.6%)

The analysis of the cheiloscopy data revealed that Type II or branched type lip prints were the most frequent, followed by Type I (Partial Vertical). The undetermined type of lip pattern was the least prevalent in the current study (Type V). Rhesus typing revealed that, of the 189 individuals, 95.7% had the Rh-positive blood type (181 participants) and 4% had Rh-negative blood (Table IV). The O blood group, which included 85 out of the study population, was the most frequently observed in the study (44.9%). Blood group O was trailed by blood group B (25.9%) and blood group A (22.7%). blood group AB was least prevalent in the current study amounting to 6.3% of the total population (Table 3).

Table 3: Distribution of Landsteiner blood grouping among the study population

A	B	AB	O
43 (22.7%)	49 (25.9%)	12 (6.3%)	85 (44.9%)

Table 4: Distribution of Rhesus blood grouping among the study population

Rh – Positive	Rh-Negative
181 (95.7%)	8(4%)

Blood type O and Type II lip prints were most frequently associated with one another in the current study amounting to 13.2% of the total study population. The most common lip print seen in blood group A and AB was type I' (7.4% and 2.6% respectively), whereas most individuals of blood group B had type II lip print (5.8%).

Table 5: Blood group and lip print

	A	B	AB	O
Type I (Vertical)	6 (3.1%)	9 (4.7%)	1 (0.5%)	12 (6.3%)
Type I' (Partial Vertical)	14 (7.4%)	10 (5.2%)	5 (2.6%)	18 (9.5%)
Type II (Branched)	12 (6.3%)	11 (5.8%)	4 (2.1%)	25 (13.2%)
Type III (Intersecting)	1 (0.5%)	8 (4.2%)	0 (0%)	10 (5.2%)
Type IV (Reticular)	9 (4.7%)	9 (4.7%)	2 (1%)	18 (9.5%)
Type V (Undetermined)	1 (0.5%)	2 (1%)	0 (0%)	2 (1%)

Approximated p-value (Monte Carlo): 0.9822

Table 6: Rhesus typing and lip print

	Rh-Positive	Rh-Negative
Type I (Vertical)	28 (14.8%)	0 (0%)
Type I' (Partial Vertical)	44 (23.2%)	3 (1.5%)
Type II (Branched)	48 (25.3%)	4 (2.1%)
Type III (Intersecting)	18 (9.5%)	1 (0.5%)
Type IV (Reticular)	38 (20.1%)	0 (0%)
Type V (Undetermined)	5 (2.6%)	0 (0%)

Approximated p-value (Monte Carlo): 0.9438

Type II and type I' lip prints were the most prevalent in both Rh+ and Rh-blood groups. Type II lip print accounted for 27.4% of the total study population among which 25.3% was seen among Rh-positive individuals and 2.1% among Rh-negative individuals. Similarly, type I' lip prints made up 24.7% of the study's overall population, of which 23.2% were found in Rh-positive people and 1.5% in Rh-negative people. Type I, IV, and V were seen exclusively among Rh-positive individuals in the current study. (Table 6)

DISCUSSION

Sharma et al. found that Type I and Type I' lip prints were the most common among women in their study of dentistry students in Mathura, Uttar Pradesh[11]. Type I lip prints were common among Nigerian women, according to a study by Chukwumeka et al[12]. Another research by Obosi N et al. revealed that Type I' was the most prevalent among Nigerian women[13]. In the current study conducted among a female-only population in India, it was found that the most common lip print observed was Type II followed by Type I'.

According to research by Sandhu H et al among people of Srinagar, a district in Rajasthan, B positive was the most common blood type among women, whereas AB- was the least common[14]. Similar findings were found in a study undertaken by Kukadiya U et al, with B positive blood group being most common in female participants[15]. However, a study by Lakshmi Narayana B et al. showed the highest frequency of O-positive blood groups among women[16]. In the current study, the most observed blood group was O followed by B.

A study conducted by Nazli R et al. on pregnant women revealed that 92.5% of the study population belonged to Rh-positive blood group[17]. Similarly, in a study conducted in Pakistan among 8327 women from Faisalabad and 6652 women from Safdarabad, it was found that Rh-positive blood groups were seen most frequently (81. 09% in Faisalabad and 89.9% in Safdarabad)[18]. The current research study population consisted of women from rural Bengaluru, of which 95.8% were Rh-positive.

Blood type O was shown to be most frequently associated with Type II lip prints according to the present study. The same was found to be the case among females in the study conducted by Kesarwani P et al. and Verma P et al. with blood type O showing the most association with Type II

lip print[19,20]. However study conducted by Kaul N et al. shows the prevalence of type B blood group among individuals with type II lip print. Here, the O blood group was most associated with type I lip print, and vertical lip print- blood group B association was most frequently identified[21].

Karim B. et al. state that due to their distinctiveness, lip prints are extremely important for identification, and such a study is significant because it shows that, like fingerprints, lip impressions might be very helpful in criminal investigations[23]. In their research, Khanapure S et al. mention that the examination of unidentified bodies in mass disasters or identification of criminal suspects, as well as missing persons, depends heavily on personnel identification. These biological records, which remain unaltered throughout a person's lifespan, are of utmost significance. Blood is a vital component of medicolegal practice that, either by itself or in conjunction with lip prints, may help to reveal various criminal issues[24].

The current study was conducted in a gender-specific manner to achieve a more concentrated approach to the matter. While various studies are available on this topic, the number of gender-specific studies was limited. Even though the current investigation has several shortcomings including limited sample size, low number of Rh-negative individuals, and limited age groups, the findings nevertheless provide an opening for further extensive research on this topic.

CONCLUSION

In the current study, the commonest lip print observed among women is the branched type followed by partial vertical. The most frequent blood group among the study participants is O. However, the correlation between blood group and cheiloscopy established here was not of statistical significance. Therefore, studies conducted on a more diverse ethnic group and larger population may help establish a correlation between blood group and lip prints.

ACKNOWLEDGEMENTS

None

CONFLICTS OF INTEREST

The author declared no conflicts of interest.

ETHICAL ISSUES

Ethical approval was obtained from the Institutional Ethics Committee, MVJ Medical College & Research Hospital, Bengaluru, India.

SOURCES OF SUPPORT

This research did not receive any specific grant from funding agencies in the public, commercial, or not for-profit sectors.

AUTHOR CONTRIBUTIONS

AS: Conception or design of the work; acquisition, analysis, and interpretation of data for the work; drafting the work and revising it critically for important intellectual content; and final approval of the version to be published.

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