



Original Article

Analyzing the Interaction Between ABO Blood Types, Fingerprints, and Lip Prints among the Individuals of Lahore Region-A Research Article

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ABSTRACT

Each person has a distinct lip printing and finger print, which are both utilized for personal identification and criminal investigations. **Objective:** To investigate the interaction between ABO blood group, lip prints and finger prints among both male and female participants. **Methods:** The study was conducted on 750 females and 550 males aged 18-50 from Lahore. Lip prints were classified using Tsuchihashi or Suzuki classification, while finger prints were classified using Kucken's or Michael's classification. Results were analyzed statistically using Microsoft Excel and SPSS version-21. **Results:** The pattern of loop was most common among the study group n = 1300 males (278 (50.55%), followed by Loop finger prints in 325 (43.30%) females. The most common blood type was AB+V 420(30%) among both groups. Both genders contain Type I lip pattern. The most common group of blood with fingerprint combination was AB+ve-Loop. AB+ve-Type I was the most common blood group versus lip print combination, with 104 individuals. Among the combination of lip prints or finger prints, Composite Type V had a smaller number of individuals. Both males and females scored 72. The composite type V-composite consists of A-ve, B-ve, AB-ve, or O-ve which showed the least common occurrence among the study group. **Conclusions:** Although blood typing, fingerprints, and lip prints each had unique characteristics. The correlation plays important role in identifying a certain person.

INTRODUCTION

Every single person has distinct characteristics that set them apart from others [1]. In connection to the forensic inquiry, identifying a person is a crucial and difficult task. However, the most frequently used methods for ensuring secure and speedy identification are fingerprinting and DNA testing. Other techniques, such as identification of age or sex, height or weight measurement, post-mortem reports, anthropometry, rugae patterns, are also occasionally used [2-4]. Since DNA testing is not frequently available in developing nations, fingerprints and

lip prints are useful in identifying a person. The recent research was applied on undergraduate, graduate students or faculty members. The current research was conducted on faculty, graduate and undergraduate students of University of Education Township Lahore and MPhil scholars of Center for Applied Molecular Biology (CAMB), Punjab University Lahore. It is very cheap and simple way to identify people. Since fingerprints are frequently used for personal identification around the world [5]. Friction ridges are small, thin ridges that appear on the plantar and

palmar surfaces of the skin, and the imprint they leave is described to as a fingerprint [6-8]. The study of finger prints pattern is described by dermatoglyphics. Furthermore, these fingerprint patterns are encoded on the surface of the dermis in a way that prevents them from being obliterated even in situations of skin damage [9]. One of the most widely used systems, Henry's classification groups fingerprints into three fundamental patterns: the Whorl pattern, the Loop type or the Arch type. Research has proved that finger prints was a dermatoglyphics trustworthy approach to establish a person's identity and are used in biometric identification on a large scale across the world [10-12]. Lip prints have acknowledged or regarded for the identification of individuals, much like finger prints [5]. Lip prints are made up of a unique pattern called Sulci labiorum, which are essentially the creases and ridges seen on labial mucosa. Cheiloscopy is the process of examining these prints [13]. Yasuo Tsuchihashi further divided lip prints into six categories based on their form, shape, and grooved pathways [14, 15]. Lip prints are a reliable form of identification, much like fingerprints. According to research done on identical twins, lip prints were used to identify the twins who could not be distinguished from one another in any other way. As a result, they can be used to identify people [3, 16]. Lip prints that are visible on a surface can be read for up to 30 days. Invisible lip prints can be removed using a variety of techniques, including the use of indigo dyes, aluminum powder, and silver nitrate powder. The various blood group systems were first recognized by Karl Landsteiner in 1901 [17]. Rh+ or Rh- are the two major class of rhesus system depending on either the D antigen is present or not [18]. Depending on the matching antigen, these blood group were defined into A, B, AB or O blood groups. There aren't many studies examining the relationship between finger prints, blood group or lip prints. However, several studies [19, 20] showed a strong correlation between the three factors. There was no published research on Pakistan that has examined the relationship between these three factors. The main purpose of this study was to identify the interaction between different patterns like lip print, finger prints or blood group which provide very useful data for the identification in forensics.

METHODS

This study was conducted among the sample of adults and middle-aged individuals in the University of Education, Lahore and Centre for Applied Molecular Biology, Punjab University Lahore. It started from 20 Jan 2022 till 15 July 2022. The total number of participants included 1300, including 750 females and 550 males. Both universities granted authorization for the study's conduct. This means

1318 or more measurements/surveys are needed to have a confidence level of 95% that the real value is within $\pm 2.7\%$ of the measured/surveyed value. In order to collect data from the chosen demographic, the study's strategy for selecting potential participants is a convenient sampling technique. The sampling was survey based including the questionnaire, finger print impressions on paper and lips impressions on transparent scotch tape. This is specific and comprises closed, common questions with a predetermined selection of possible responses and is analyzed in a certain way. Individuals with either microbial, fungal, or viral diseases of the lips, fingers, fingerprints, additional, grooved, or strapped finger, as well as those who had lasting mark on their lips or fingers from operation, infection, or injury, were eliminated from the study. The survey only included adults and middle-aged male and female participants who gave consent forms and were eager to participate. This investigation used a glass plate, black ink printer, lens, pin, washroom scale, roller, or measuring tape to collect fingerprints. The individuals were informed of the study's aims and their agreement was obtained. To eliminate grime and oil, hands were washed or dried. A basic glass plate measuring 12x12 inches was cleaned and covered with a minor coating of black ink printer. Participants were instructed to place their bulb finger on the coated plate or bring their fingerprints onto the properly generated finger print card. Michael Kuchen's finger print categorization was used to examine the fingerprint patterns consisting of Composite, Arch, Whorl and Loop []. The material used was a magnifying lens, A3 white sized paper, cellophane tape, red lipstick or stamp pad. Members were advised to clean their lips first, apply lipstick, and massage their lips together to evenly distribute the lipstick. For a stable record, the cellophane strip was removed and laid on white bond paper (A4) without creases. Lip prints were evaluated by magnifying glass or using Tsuchihashi or Suzuki categorization.

Suzuki and Tsuchihashi Lip prints Classification Method [22]

- a) Type I (Vertical grooves)
- b) Type I' Incomplete vertical fissures
- c) Type II Branching groove
- d) Type III Intersecting, crisscross pattern
- e) Type IV Reticular grooves, typical chequered pattern
- f) Type V Irregular, undetermined pattern

Figure 1 demonstrates the collection of different fingerprints from individuals exhibiting pattern according to Michael and Kunken classification of finger prints.



Figure 1: Shows fingerprints according to Michael and Kunken classification method

Figure 2 shows patterns of lip printing obtained from the participating individuals depending on Tsuchihashi or Suzuki lip prints classification Method. Significant patterns include Type I, I', II, III, IV, V.

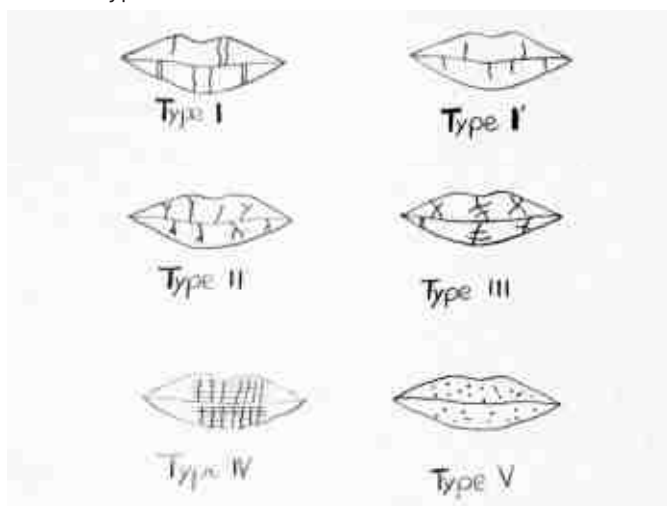


Figure 2: Shows Suzuki and Tsuchihashi Lip prints Classification Method

Collection of blood from participants was done based on consent and authorization from both universities concerned departments. Participants were properly ensured for their privacy and safety usage of blood sample. Traditional method of collecting blood samples from participants was followed. Index finger was pricked with pin or blood drop taken on glass slide. Blood sample was collected or deal with anti-A, anti-B or anti-Rh sera. When the test of blood group came back positive, it was labelled A, B, AB or O are the different types of blood, classified by Rh+ or Rh-, Table 1 shows different type of blood groups with Rh-ve, Rh+ve factors.

Table 1: Shows blood groups types with Rh+ve or Rh-ve factors

Blood Type	A	B	O	AB
Rh+ve	A+	B+	O+	AB+
Rh-ve	A-	B-	O-	AB-

Sample size was calculated by the formula

$$\text{Sample Size } n = N * [Z^2 * p * (1-p) / e^2] / [N - 1 + (Z^2 * p * (1-p) / e^2)]$$

 N = Population size, Z = Critical value of the normal

distribution at the required confidence level, $p = \text{Sample proportion}$ and $e = \text{Margin of error}$. The sample size $n = 1300$ was calculated but using the data were input using Microsoft Excel, and SPSS version 21 was used for the statistical analysis. To examine the relationships between certain variables and indicators as well as the correlations between demographics and important research variables, the coefficient of Pearson correlation (Pearson r) was applied. The qualitative data consists of several factors, such as tables of frequencies and percentages for fingerprints, blood types, and lip prints. Variable distribution in graphics was also done.

RESULTS

The recent study was managed to find the tendency of gender wise finger print patterns, lip print patterns or different blood sample correlations to know the most familiar finger print or lip pattern and association of different blood samples for sex determination among adults and middle-aged people in Lahore, Pakistan. The total number of participants includes 1300, including 750(57.7%) females and 550(42.3 %) males. Out of 750 females, 521 (69.4%) were universities female students, age ranges from 18 to 27 years, 40 (5.3%) female faculty members age range from 28 to 50 years from both universities, and 189 (25.2%) female participants, age ranges from 18 to 30 years from nearby areas of Lahore. Out of 550 males 420(76.3%) were male students, age ranges from 18 to 27 years, 40(7.2%) were male faculty members age ranges from 28 to 50 years, and 90(16.3%) were male participants from nearby areas of Lahore. Finger print arch is prevalent among 163(29.60%) males, followed by the arch finger print pattern in 141 (18.80%) females. The Loop pattern most common among study group $n = 1300$ was observed among 278 (50.55%) males and followed by Loop finger prints in 325(43.30%) females. The total percentage of whorl in both genders involved 333 (25.61%). Male or female have composite pattern of finger print which was considered to be the least similar in both genders. The occurrence of different patterns of Lip prints among participants 750(57.7%) of quadrants in females and 550(42.3 %) of quadrants in males. Type I lip pattern showed 302(40.26%) of quadrants in females and 213(38.72%) of quadrants in males. 125 (16.66%) of quadrants in females and 98(17.81%) of quadrants in males had Lip prints type 1' pattern. 116 (15.46%) of quadrants in females and 86(15.63%) of quadrants in males had Type II lip prints. 87 (11.60%) of quadrants in females and 69 (12.54%) of quadrants in male had Type III lip pattern. Type IV lip pattern had 67(8.93%) of quadrants in female and 51(9.27%) of quadrants in male. Overall Type V lip pattern had existence among 53 (7.06%) in females and 33(6%) in male.

These results showed that Type I was considered to be the most common lip pattern in both genders which is accompanied by Type II, III, IV or V. Type V was included in least similar lip pattern in both genders, while overall comparison of quadrants was considered (Table 2).

Table 2: Distribution of Lip Prints Pattern Among Study Group n=1300

Types of Lip Prints Pattern	Female N=750	Male N=550	Total N=1300
Type I Vertical grooves	302(40.26%)	213 (38.72%)	515 (39.61%)
Type I' Incomplete vertical fissures	125(16.66%)	98 (17.81%)	223 (17.15%)
Type II Branching groove	116(15.46%)	86 (15.63%)	202 (15.53%)
Type III Intersecting, crisscross pattern	87(11.60%)	69 (12.54%)	156 (12%)
Type IV Reticular grooves, typical chequered pattern	67(8.93%)	51(9.27%)	118 (9.07%)
Type V Irregular, undetermined pattern	53(7.06%)	33(6%)	86 (6.61%)

The most common prevalence of blood group was AB +ve in both males and females, 255(34%) and 165(30%) in females. Table 2 describes about division of different blood types. This research concluded that negative blood groups are correlated with lip patterns and finger prints among both genders. The least common blood group was O-ve in males (2.80%) and 13(2.36%) in females. The Rh-type was observed among both genders. The A-ve blood type was prevalent in 45(6%) of males and 21(3.81) of females. The AB-ve blood type is uncommon among all blood types. O-ve was 21(2.80%) in males and 13(2.36%) in females. The total number of participants in the research study was 1,300. Among them, both genders' Rh+ve blood groups along with fingerprint analysis were done. The total number of Rh+ve blood groups involved in A+ was 254(19.53%) in both males and females. 263(20.23%) were total B+ve blood types. The most common blood type was AB+ve 420(30%) among both groups. The O+ve blood type was ranked 157(12.07%). The total number of female participants in the research study was 750 and 550 males. Among them, both genders' Rh-ve blood groups along with fingerprint analysis were done. The total number of Rh-ve blood groups involved in A-ve 66(5.07%) both males and females. 35(2.69%) were total B-ve blood types. AB-ve 71(5.46%) among both groups. The O-ve blood type was ranked lowest 34(2.61%) (Table 3).

Table 3: Distribution of Different Blood Groups Among Study Group

Type of Blood Group	Male	Female	Total N=1300
	N (%)	N (%)	N (%)
A+	129(17.20)	125(22.72)	254(19.53)
A-	45(6)	21(3.81)	66(5.07)
B+	169(22.53)	94(17.09)	263(20.23)
B-	23(3.06)	12(2.18)	35(2.69)
AB+	255(34)	165(30)	420(32.30)
AB-	37(4.93)	34(6.18)	71(5.46)
O+	71(9.46)	86(15.63)	157(12.07)
O-	21(2.80)	13(2.63)	34(2.61)

The Analysis of Rh+ve or Rh-ve blood varieties and Fingerprints proportions in the research group. The comparison between ABO blood groups and lip prints showed significant results related to the variation of individuals. Table 4 showing Rh+ve blood groups include A+ve-Type I, 109 individuals, both male and female. A+ve-Type I includes 39 individuals; A+ve-Type II consists of 30 individuals. A+ve-Type III had 30 individuals, A+ve-Type IV had 23 members of the study group, and A+ve-Type V had 17 individuals. The most instructed blood types were the AB+ve Type I vs combination of lip print, with 104 individuals. AB+ve-Type V showed less numbers up to 28. O+ve-Type had the least combinations. The Rh-ve blood groups showed variable results. A-ve-Type I and A-ve-Type II had an equal number of individuals. B-ve-Type V had a lower number of individuals, consisting of 2. AB-ve-Type I includes 28 individuals. Both O-ve-Type I and O-ve-Type II had an equal number of members. The distribution amongst finger or lip impressions showed significant results. It had 120 people in total. The Arch-Type V had a number of 20 candidates. Loop-Type I had the highest number of individuals 22. A number of individuals had whorl-type V. Composite-Type V showed a smaller number of individuals among study group n=1300. Case Study n=1300 Comparison of Rh+ve, Rh-ve Blood Groups, Lip marks or Finger marks. During case studies n=1300, including Rh+ve or Rh-ve blood varieties, Lip Prints, and Finger Prints indicated the predominant interaction, Type I-Loop-AB+ve had a common occurrence with 72 in both males and females. Type V-Composite with A negative, B negative, O negative or AB negative cleared the least common occurrence among the study group (Table 4).

Table 4: Analysis of Rh+ve or Rh-ve Blood sample and Fingerprints proportions in the research group

Rh+ve Blood Types n=1300	Finger Prints Types n=1300			
	Arch 304 23.38%	Loop 603 46.38%	Whorl 333 25.61%	Composite 60 4.61%
A+ve 254(19.53%)	59	118	65	13
B+ve 263(20.23%)	61	122	67	13
AB+ve 420(30%)	98	195	108	19
O+ve 157(12.07%)	37	73	40	7
A-ve 66(5.07%)	15	31	17	3
B-ve 35(2.69%)	8	16	9	2
AB-ve 71(5.46%)	17	33	18	3
O-ve 34(2.61%)	9	15	9	1

DISCUSSION

The current study was based on the interaction between Rh-ve, Rh+ve blood group, Lip marks or Finger marks in both sexes. Lip impressions are the distinct way to identify any individual. Lip printing is one of the most advance and emerging method used widely in forensics sciences [22]. According to Kautilya et al., lip print patterns are one efficient method to determine the gender [23]. Fissures or

groove categorized the lip imprints into six main types [24]. Healing process of lips are easy so they can't change the impressions. Lip marks leave the long-term impression. After the generation, it can pick up to 30 days on crime scene [25]. According to studies, main hurdle is to examine the pattern of lip imprints when pressure is built as it is uncomplicated to check the similarity because lip marks are different in every person [26]. Previous research shown that, Type 1 (32%) was the most frequent lip impression in males or Type I' (28%) indicated the ordinary lip marks in females [27]. According to study the lip-fingerprint relationship with the most frequent occurrence is the loop pattern. There was no correlation between finger and lip prints in males and females [28]. As research has shown that biometric system showed the distinctive finger marks of every person because it is unique to each other. Finger impressions are not change in whole life. It is unchallenging for the identification of criminal. Both sexes contain less whorl type or more loop type finger marks. Pakistan uploaded that the whorls or arches were the most regular in females. In contrast, their final result pictures showed the difference just because of small size of sample [28]. A study by Nishi suggested that when a patient seeks medical care, socio-cultural issues like gender norms have a significant impact on the interval between the beginning of symptoms. The behaviours, expectations, and roles that come with being male or female in a social, economic, and cultural context are referred to as gender. The research points to a significant influence of gender socialization on health behaviours [29]. Recent findings cleared the most similar O+ blood kind in females or A+ in males. But Khalid and Qureshi suggested the most common O+ blood type in males or B+ in females [30]. This study cleared the relationship of three variables. Data on the interaction between blood types, fingerprints, and lip prints is scarce [31]. In the present research, Type I' and Type I lip print patterns were shown to be statistically significantly correlated with blood group O+ group, whereas the loop type of finger print was the most frequent type and whorl was the least common [32]. The present study of Type 1 finger impression with interaction of loop, whorl or arch type finger impression was the main goal. Both male or female mostly recognized the pattern of loop but no relevant relation was seen in finger or lip impressions. There is restricted information was present to discuss the interaction of blood types, lip or finger imprints. Recent research cleared the bonding of Type 1 or Type I' lip pattern with O+ve blood kind. In the O+ blood variety, whorl type finger mark showed the less similarity or loop type finger marks showed the greater affinity. However, in A+ve blood type, arch type finger impression was considered to be the most frequent or showed interconnection with Type I' or

Type 1 lip imprints. These findings show the agreement as Type I is occurred one [33].

CONCLUSIONS

The latest study cleared the link of numerous variables which show their significance. In both male female, there is interaction between ABO blood groups, fingerprint patterns, and lip print patterns. In our study the most common group of blood with fingerprint combination was AB+ve-Loop. AB+ve-Type I was the most common blood group versus lip print combination, with 104 individuals. The composite type V-composite consists of A-ve, B-ve, AB-ve, or O-ve which showed the least common occurrence. Therefore, comparing the distinctiveness of these physical evidence can occasionally aid the forensic expert to accurate personal identification or at the very least help to focus their research for a person when there is no information that could possibly point to that person's identity.

Authors Contribution

Conceptualization: AI

Methodology: Z

Formal analysis: IN, MA, UM, MA

Writing-review and editing: AI, RF, Z, JRD, MI, QM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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