Section: Physiology

Original Research Article

CORRELATION AMONG LIP PRINT PATTERN, FINGER PRINT PATTERN AND ABO BLOOD GROUP: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: For proper law enforcement to provide sufficient physical evidence that links a perpetrator to a crime or at a site of must distraction, it is important to utilise any type of physical characteristics to identify a suspect of an offence. Forensic science refers to the areas of endeavour that can be used in a judicial setting and accepted by the court of law and the general scientific community to separate truth from untruth. Some methods of personal identification such as, Chelioscopy, dactyloscopy and differentiation of blood groups is commonly used. The aim & objective are (1) Determination of the predominant fingerprint, lip print and blood group of the study population. (2) Correlation of fingerprint pattern, lip print and blood group for personal identification. (3) Find out the possible correlation between blood group and fingerprint pattern within the measured population. (4) Establish the possible association between fingerprint and leaf print pattern using obtained data. **Materials and Methods:** The samples are collected from 200 individuals which includes 100 male and 100 female participants. **Result:** Among 200 individuals, the percentage distribution of various lip prints, type-II lip print is predominant among other lip prints. In the percentage distribution of various fingerprints, loop is predominant and the composite pattern is least observed. The last parameter of the study, blood group shows dominant O+ve blood group followed by B+ve blood groups in individuals. Lip prints along with fingerprints to study genetic susceptibility to diseases, lip prints, fingerprints and blood group although have their specificities, but the correlation of the three parameters does not show any significance. **Conclusion:** The correlation of the above three parameters in our study do not show any significant relationship among them. But these combinations can be solely be used in individual identification. The recorded predominance order can be matched with the reported results by other researchers.

INTRODUCTION

'Identity' is a set of physical characteristics, functional or psychic normal or psychological, that define an individual. Identification is vital as that every individual has a unique set of features.[1] Personal identification is a very important part during the investigation of an unidentified body in a mass disaster, or for distinguishing missing person and also during criminal suspects.[2] Some scientific methods like DNA profiling, osteology, odontology, anthropometry, palatal rugae pattern, Chelioscopy, fingerprinting, sex determination, estimation of age, measurement of height, postmortem reports, handwriting, and bite marks have an important role to identify the culprit of the crime investigation. Lip print, fingerprint and ABO blood group study are the most commonly used methods for identification. These methods are very important because they remain unchanged throughout life.

Individual elements of vermilion ozone patterns contribute to the uniqueness of lip prints and help in individual identification.[3] Sulci labiorum are the wrinkles and grooves on labial mucosa and it forms a characteristic pattern, called lip prints.[4] The study of those wrinkles or grooves presents on the red part or the vermilion border of the human lip is known as Chelioscopy.

The wrinkles and grooves which are visible on lips have been named by Tsuchihashi as 'sulci labiorum

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rubrorum.[4] According to a French doctoral thesis, lip print patterns appear to be genotypically determined, unchanged from birth to death.[5] Even the lip pattern of twins is unique to each individual.[6] So, lip print analysis is considered as a vital tool for personal identification.

Fingerprints are the friction ridges and furrows impression pattern of papillary ridges of fingertips such ridges are also referred to as 'dermal ridges' or 'dermal papilla'.[7] The fingerprint patterns start to appear during 3rd or 4th month of embryonic life and the formation of ridge patterns completes by 24 weeks of intrauterine life.[6] The combined effect of the heredity and environment influence produces stress and tension on the patterns of growth during foetal life.[8] The study of fingerprint analysis is known as Dactylography or Dactyloscopy. Fingerprints is one of the widely used reliable, oldest, cheapest method to identify victims, witnesses or suspects at a crime scene. Fingerprints follow the Locard's principle of exchange. The secretions in the fingerprints contain residues of various chemicals and their metabolites which can be detected and used for forensic investigations.[8]

The blood group system is another biological record that remains unchanged throughout the life. The blood group system is an important entity in medicolegal cases. The 'ABO' blood group system involves to antigens (antigen A and antigen B) and two antibodies (antibody A and antibody B). The 'Rh or Rhesus' blood group system is the second most important blood group system. 'Rhesus' system is classified into 'Rh +ve' and 'Rh -ve' based on the presence or absence of Rh antigen. The present study work has been carried out regarding chelioscopy, dactyloscopy and blood group systems independently to find the association and correlation of fingerprint pattern, lip print and blood group for personal identification.

MATERIALS AND METHODS

The present study was conducted at the Department of Physiology, Index Medical College, Indore, Madhya Pradesh. This study was conducted in compliance with the protocol of the Institutional Ethical Research Committee (IERC) and initiated after the approval taken from IERC.

Informed Consent

All participants have been explained the study procedure in detail. The participant's informed consent has been taken in the proforma.

Selection of Participants

The subjects of this cross-sectional study selected from the out-patient's department, Index Medical College, 200 subjects with the age between 18 to 40 years were selected of which 100 were males and 100 were females. for the study. Individuals have any disease related lips, lacerations, scars, any congenital deformities of the lip (i.e., cleft lip, lip pits etc), Permanent scar on fingers or hand deformity due to injuring, birth defect or disease of the hand were excluded.

Methodology

Method for recording the lip prints

Lipstick cello tape method: For the recording of lip prints, individuals were asked sit on a chair comfortably in a relaxed position. The upper and lower lips of the individual were cleaned with tissue paper before the procedure. Dark brown or a dark red coloured, non-glossy, non-metallic lipstick was applied over lip using the application brush. A sticky portion of the transparent cello tape (15cm strip) was placed over lips. After that, the imprinted strip was removed in a single stroke from the lips and placed on white chart paper for permanent record as shown in [Figure 1] The recorded print was examined by using a magnifying lens to confirm whether the print has been properly reproduced or not.

The lower lip was divided into 3 equal parts or components. The middle 3rd section of the lower lip was selected and all the patterns were counted.

Each lip pattern was determined as per the following classification given by Suzuki and Tsuchihashi (1971).

Type-I: Clear cut grooves vertically across the lip.

Type-I': The grooves are straight but the disappear halfway, do not cover the whole lip.

Type-II: The grooves forked in their way (branched), Y-shaped pattern.

Type-III: The grooves intersect (intersecting), crisscross pattern.

Type-IV: The grooves are reticular, typical checked pattern, and fence like.

Type-V: The grooves do not fall in any of the types from I to IV (undetermined).

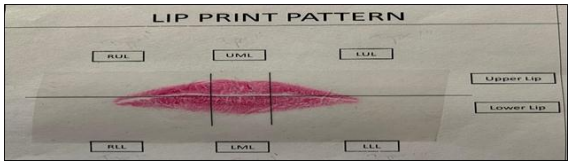

Figure 1. Lip print on cellophane tape along with segmentation into six quadrants.

Method of recording of fingerprints

Before taking the fingerprints, the hands were washed, cleaned and dried. The fingerprints were recorded on a clean white paper using an ink pad by rolled print method where each finger was rolled from outward to inward to obtain a complete print of ridged area of the distal phalanges. Thus, fingerprints of both hands were obtained and recorded. Fingerprints were examined using a magnifying glass.

Sir Henry Galton (1892) classified the fingerprints into four major types as:

Loop- Loops usually begin on one side of the finger and end on the same side.

Whorl- The pattern could be having multiple circular/oval ridge.[9]

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Arches- The ridges run from one side to the other side in an arch-like fashion. There are two types arches pattern; plain and tented.[9]

Composite - It is a combination of more than one pattern either a combination of the arch.[9]

Method of recording of blood group: Determination of ABO blood groups depend upon the immunological reaction between antigen and antibody. Karl Landsteiner in 1901 found two antigens on the RBC surface and named them as A-antigen and B-antigen and corresponding antibodies or agglutinins are present in the plasma as anti-A antibody and anti-B antibody.

First, we cleaned the fingertip of subject with spirit and then pricked the fingertip with a needle prick. Three droplets of blood were placed on the slide for testing. A drop of specific antisera marked anti-A, anti-B and anti-D was added to the blood and blood droplets were mixed with the help of a mixing stick. After 1 minute we observed the agglutination reaction.

If agglutination occurs with antisera A, show the blood group is A. If agglutination occurs with antisera B, the blood group is B. If agglutination occurs with both antisera A and B, so blood group will be AB. If no agglutination occurs either with antisera A or B, the blood group will be O.

RESULTS

Statistical analysis: Frequency, percentage, mean, standard deviation (SD), median, minimum and maximum values of variables are calculated. Chi-squire of proportion was used to compare the statistical significance of the difference between the various proportions in this cross-sectional study. P values <0.05, <0.01, and <0.001 were considered statistically significant, highly significant and very highly significant respectively.

Gender wise distribution of total study subjects illustrates 50% males and 50% females among lip print, fingerprint and blood group respectively shows the equitable distribution of the male and female proportions in this study.

Percentage distribution of study variables with respect to lip print pattern Table 1 represents the subjects belong to lip print are divided into different types and these are distributed into six categories, such as Type -I, Type-I', Type-II, Type -III, Type-IV, Type-V. Type-II (40.50%) is the most predominant lip print pattern among subjects followed by Type-IV, Type-III, Type-I, Type-V and Type-I'. The calculated mean value between lip print type is around 33.3 and the standard deviation between the categories is about 23.0482.

[Figure 1] exhibits the distribution of study subjects with respect to their types of fingerprints. In the study, most of the subjects belong to a loop, i.e., 63%, 26.50% belong to whorl, 7.5% individuals belong to arch and 3% belongs to composite. The mean value between fingerprint types is obtained of about 50 and considering the standard deviation between the categories is about 47.2916.

Blood group type-wise distribution of study subjects in illustrates that most of the study subjects are from O positive (i.e., 84) and O positive is more prone to as compared to the other blood group. The percentage of O positive is about 42% followed by B positive with 28% of the study subjects. Whereas, the distribution of A positive and AB positive blood groups are 22.5% and 6% respectively. The mean value between blood groups is obtained around 25 which is the standard deviation of 30.3521.

Table 1: Percentage distribution of the study variable with respect to lip print

Lip print pattern	Number of Subjects	Percentage (%)
Type – I	21	10.5
Type – I’	12	6
Type – II	81	40.5
Type – III	34	17
Type – IV	36	18
Type – V	16	8
Total	200	100

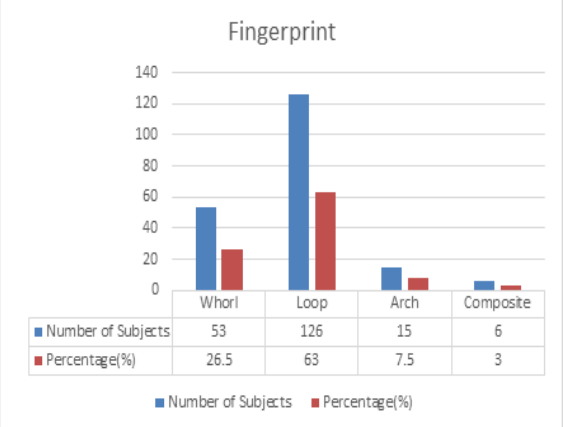

Figure 1: Distribution of study variables with respect to fingerprint

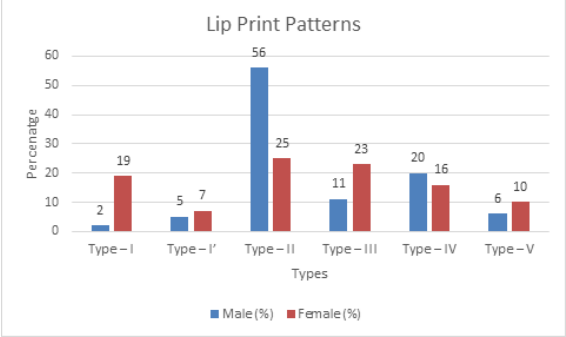

Figure 2: Gender wise Distribution of the study variables with respect to lip print.

[Figure 2] shows the distribution of the study variables with respect to lip print pattern in both male

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and female, the Chi-square and the p-value of the statistical analysis of the subjects is about 31.6391 and 0.000007003132 respectively. The result is significant at $p<0.05$. represents the types of lip prints of the study subjects. In this study the percentage allocation of fingerprint patterns of both males and females is not found significant as Chi-square value and the p-value of the study variable is about 7.2896 and 0.063218 respectively.

On distribution of study variables with respect to blood group by gender in present study, the value of R (correlation coefficient) of the current data set is about 0.922 and the value is representing strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa). On the other hand, the value of R^2 (coefficient of determination) and the p-value is 0.849 and 0.001118 respectively. However, the result is insignificant at $p<0.05$.

As shown in [Figure 3] highly significant correlation is found between lip print and fingerprint in both the genders in the present study. Besides, it is observed that type-II lip print patterns are most predominant in finger print loop patterns.

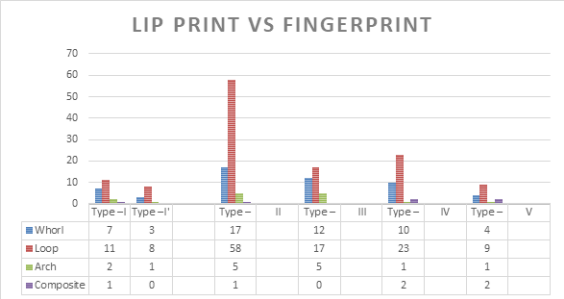

Figure 3: Distribution of lip print pattern with respect to finger prints

A significant correlation is noticed between lip print patterns and ABO blood groups in this present study as shown in [Figure 4]. This might be due to the fact that both lip prints and blood groups are genetically determined and developed during early fetal life.

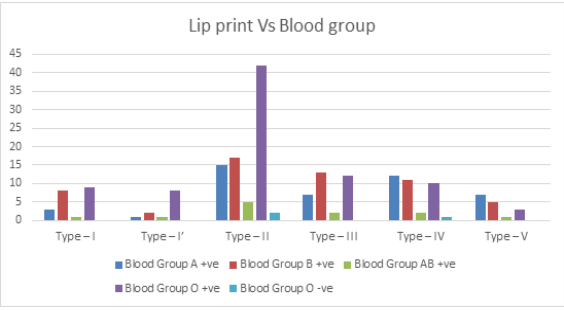

Figure 4: Distribution of lip print pattern with Blood group

DISCUSSION

Human identification is of paramount importance. Ranging from the precise molecular DNA types to the macroscopic structures all are unique, permanent and persistent from a birth to death of an individual. Medicolegal investigations permit questioning about potential witness, known associates of the deceased, criminal and civil legal processing. Whereas, lip print, fingerprint and ABO blood group system have the advantages of being unique, permanent and acceptable evidences in the court of law.[10] The correlation of lip print, fingerprint and ABO blood group maybe more useful in forensic science for the accurate identification of an individual then using individual parameter.[10]

This present cross-sectional study is an attempt to determine if there is any correlation between lip print, fingerprint and blood groups among the subjects of Indore, Madhya Pradesh. The study comprises of 200 subjects, 100 males and 100 females. We evaluated different lip print patterns among subjects. In this study, the distribution of type-II lip prints in both the gender group are more prevalent [Table 1]. The Chi-square statistics is 31.639 and the p-value is 0.000007. This result is distinct from the study reported by Annie et al,[11] Previously, reticular and intersecting were the predominant lip print types. However, this present study is not in accordance with the previous studies conducted by Vahanwala et al,[12] Sivapathasundaram et al,[13] and Saraswati et al,[14] they studied lip print patterns and found that type-III was the predominant lip print pattern in the Indo-Dravidian population. In another study conducted by Naik et al,[15] showed that the type-IV the turn was the most prevalent in males and type-I/I' but it was the most prevalent in females. These variations may be attributed to the ethnic and racial variations in lip prints. Various studies in India have shown population-wise dominance.

The result of this study shows that the loop fingerprint pattern is predominant (i.e., 63%) among all subjects [Figure 1]. Standard deviation and mean value of the finger print pattern distribution is 47.2916 and 50 respectively. It is observed that a loop pattern is predominant in both male and female, which is not in accordance with a previous prospective study done by Rastogi at al,[16] which shows females with higher incidence of loops. It is observed from the statistical analysis that loops are the most common fingerprint pattern followed by whorl, arch and composite. However, there is an association between the distribution of fingerprint pattern and gender. The predilection of gender can be made based on fingerprint patterns. Nearly identical findings reported by Deepa at al.[17]

In present study large number of subjects belong to the blood group of O+ve (i.e., 42%) followed by B+ve (i.e.,28%), A+ve (i.e., 22.5%) and AB+ve (i.e., 6%). Nearly 1.5% of subjects belong to the O-ve blood group. The standard deviation and the mean value of the blood group distribution is 30.352 and 25 respectively. Akhtar et al,[6] found O+ve in maximum number followed by B+ve, A+ve, AB+ve and O-ve. Nearly identical findings were also reported by Harsha and Dr. Garfina Jayaraj.[10] Studies done Salmani D et al,[18] in Kerala population have found

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B+ve blood group predominance in both male and females. Studies done by Hunasgi S et al,[19] Radhika RH et al,[20] and Viveki et al,[21] have found O+ve blood group to be most prevalent which is similar to my present study

Lip Print and Fingerprint

The highly significant correlation is found between lip print and fingerprint in both the genders in the present study. Manal et al,[22] conducted a study on Egyptian population, it was found that in the second quadrant, significant relation was observed between the lip print pattern and fingerprint in Egyptian males. Adamu et al,[17] in their study on the Nigerian population reported statistically significant association between left thumb prints and lip prints, where loop was associated with type-III lip print pattern in first quadrant.

Fingerprint and Blood Group

Among the fingerprint patterns, the highest numbers of loops are found in blood groups O+ve and B+ve. Those are not in accordance with the previous study done by Desai Bhavana et al,[24] where A +ve and B +ve were predominant. In the present study, there is an association between distributions of a fingerprint patterns in relation to ABO blood groups. The occurrence of loop fingerprint in people with B+ve blood groups is seen in a previous study done by Srilekha et al,[25] where loop was the most commonly occurring fingerprint pattern in O+ve blood groups.[Table 2]

Table 2: Correlation between finger print and blood group

Finger Print	Blood Group					Total
	A +ve	B +ve	AB +ve	O +ve	O -ve	
Whorl	09	12	02	29	01	53
Loop	31	38	09	46	02	126
Arch	03	05	00	07	00	15
Composite	02	01	01	02	00	06
Total	45	56	12	84	03	200

LIP print and blood group

It is observed from the study conducted by Patel et al,[26] that the type-II lip print patterns were predominant among O+ve blood group subjects and A+ve and type- II were most prominent. Whereas, in the blood group of B+ve it was type-I and in blood group O+ve prominently print pattern was type-II. Hence, from the obtained data the conflicting results of previous studies, it is difficult to predict the blood group of an individual from the type of lip print pattern alone.[10]

CONCLUSION

It is known that individual parameters such as lip print patterns, fingerprint patterns and blood groups play important role in forensic identification. The correlation of the above three parameters in our study do not show any significant relationship among them. But these combinations can be solely be used in individual identification. The recorded predominance order can be matched with the reported results by other researchers. Though lip prints, fingerprints and blood groups have their specificities. Further studies have to be conducted with a large sample size to confirm the predominance of a specific pattern in a geographic location so that this becomes a great help for any criminal investigation. Future studies should also be conducted on applying the digitalized method of recording these prints and compare this method with a manual method to find out the easiest and efficient way for application in forensic odontology.

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