

# Inheritance Pattern of Lip Prints and Blood Group among Parents and their Offspring in Javanese Population, Indonesia for Assisting Forensic Identification

Agung Sosiawan<sup>1</sup>, Cahyo Pulunggono<sup>1</sup>, Arofi Kurniawan<sup>1</sup>, Haryono Utomo<sup>1</sup>, Maria Istiqomah Marini<sup>1</sup>, Beta Novia Rizky<sup>1</sup>, Mieke Sylvia Margaretha Amiatun Ruth<sup>1</sup>

<sup>1</sup>Department of Forensic Odontology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

## Abstract

Lip prints and bloodstains may be left behind in many crime scenes and may reveal the identity of the victim and the suspected person. This study was aimed to investigate the inheritance pattern of lip prints and blood groups among parents and their offspring in the Javanese population. 105 subjects from 25 Javanese family frames participated in this study. Lips print pattern was recorded and analyzed according to Suzuki and Tsuchihashi classification. A blood group test was also performed for each subject. The statistical analysis carried out using IBM® SPSS® Statistics version 23.0 (IBM, Armonk, New York, USA). The results of this study revealed that type II was the predominant pattern of lip prints among the Javanese population (34.3%). Blood group A was the predominant type in subjects with lip prints type II (15%). The result also shows that the lip prints pattern in girls tends to be inherited from the mother. However, the inheritance of lip prints pattern in boys couldn't be determined precisely. The heritability of lip prints pattern was observed between parents and their offspring. Also, there was a tendency of blood groups to have a certain pattern of lip prints.

**Keywords:** *blood group, forensic odontology, heritability, lip prints, personal identification*

## Introduction

Establishing the individual identity is a primary importance at the beginning of the criminal cases investigation. According to Interpol DVI Guide, 2018, teeth, DNA, and fingerprints are the primary and the most reliable means in human identification. Besides, several biological evidence such as lip prints, bloodstains, and saliva may support the process of human identification<sup>1-8</sup>.

Many studies have been developed to explore the usefulness of lip prints pattern in personal identification based on its uniqueness and permanence. Amongst the

established methods, the classification by Suzuki and Tsuchihashi is the most commonly used and simple method for lip prints analysis<sup>9</sup>. Suzuki-Tsuchihashi classified the lip prints pattern as: complete straight grooves (type I), half-straight grooves (type I'), branched grooves (type II), intersected grooves (type III), reticulated grooves (type IV), and undifferentiated grooves (type V)<sup>10</sup>.

A study by Patel et al, 2010, in Malaysia, involved 20 sampling frames (10 families with siblings and 10 families with twins) reveals that the lip prints pattern was inherited from parents to their offspring in 2 out of 5 families with twins' children. It was also found that most subjects with type II of lip prints tend to have the blood group type A<sup>11</sup>.

In the actual cases, correlating lip prints with blood groups may help the forensic team to establish the human identity accurately. *The objective of this study was to investigate the inheritance pattern of lip prints and blood groups among parents and their offspring in the Javanese*

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### Corresponding author:

**Dr. Agung Sosiawan, DDS.**

Department of Forensic Odontology Faculty of Dental Medicine, Universitas Airlangga

Jalan Mayjend. Prof. Dr. Moestopo 47 Surabaya, Indonesia, 60132, Tel. +62-31-5030255

e-mail: agung-s@fkg.unair.ac.id

population. The Javanese population is the largest ethnic group in Indonesia who predominantly located in the central and eastern parts of Java Island, Indonesia.

### Methods

#### Data acquisition

This study was conducted under the approval from the Ethical Committee of Faculty of Dental Medicine Universitas Airlangga, Surabaya (number: 302/HRECC.FODM/V/2019). 105 subjects from 2 generations (parents and children) in 25 family frames who met the inclusion criteria participated in this study. The inclusion criteria of this study are:

- Javanese family consisting of father, mother, and one or more biological children.
- Without cross-marriage history in the family.
- Agreed to participate in this study

The exclusion criteria of this study are:

- Subjects with a history of aesthetic surgery on

the lips.

- Subjects with hypersensitivity to lipstick.
- Subjects with congenital abnormalities appear on the lips.

All subjects were asked to complete the informed consent after a brief explanation of their participation in this study. All of the individual lip prints and blood group were analyzed.

The subject was asked to set up straight with relaxed position of their lips. The research personnel cleaned up the lip's surfaces using a wet cotton swab and gently applied one layer of lipstick (Purbasari No. 83, PT Gloria Origita Cosmetics, Indonesia). After 2 minutes, a scotch tape (5 x 12 cm) was gently stacked on the lips surfaces and removed smoothly with a single motion from left to right (Fig. 1). The imprinted lip prints were then pasted on a white paper (Fig. 2) and analyzed using Suzuki and Tsuchihashi classification (Fig. 3). The blood groups (ABO) test was performed for each subject using antigen serum (Glory Widal Serology Test Kit, PT. Medika Farma Alkesindo, Indonesia).



**Figure 1** A scotch tape (5 x 12 cm) was gently stacked on the lips surfaces and removed smoothly with a single motion from left to right.



Figure 2 Recorded lip prints pattern obtained from one family frame.

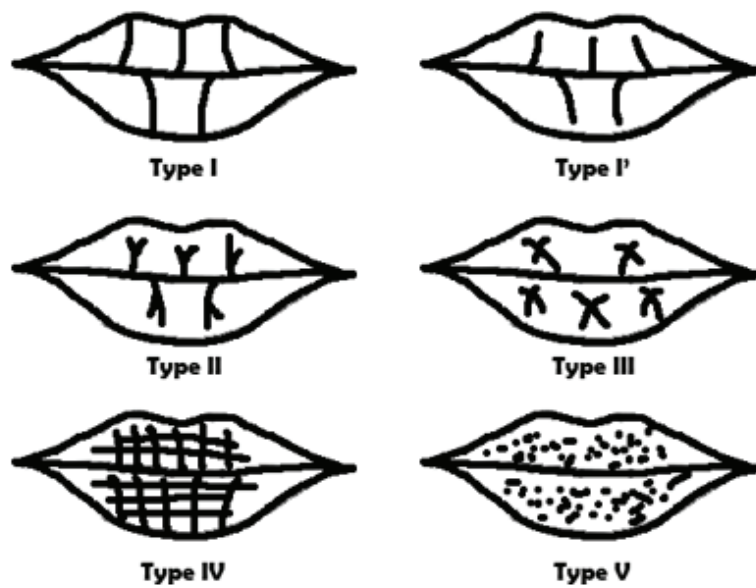


Figure 3 Lip prints classification according to Suzuki and Tsuchihashi, 1971.

## Statistical analysis

The classification of lip prints pattern and the blood type were tabulated and analyzed using Spearman and Pearson test to investigate the correlation of its inheritance pattern from parents to their offspring. The Fisher Exact test was used to observe the significance of the tendency of lip print patterns towards the blood type. The statistical analysis of this study was carried out using IBM® SPSS® Statistics version 23.0 (IBM, Armonk, New York, USA).

## Results

Table 1 shows the overall appearance of lip prints pattern in all subjects of this study. These results indicate that type II is the most dominant lip prints pattern among the Javanese population, with 36 appearances out of a total 105 subjects (34.3%), while type V was not visible in all subjects.

**Table 1 The percentage of lip prints pattern in all subjects (total of 105 subjects)**

Lip Print Type	N (%)
Type I	22 (21.0 %)
Type I'	16 (15.2%)
Type II	36 (34.3%)
Type III	17 (16.2%)
Type IV	14 (13.2%)
Type V	0 (0.0%)
Total	105 (100%)

Table 2 shows that the lip prints pattern in boys' subjects, 16.7 % were inherited from their father, 38.9% from mother, and 44.4% of the inheritance pattern couldn't be determined precisely. The Spearman correlation test showed that there was no significant correlation of the lip prints pattern between boys and their parents,  $p > 0.05$ . On the other hand, the inheritance pattern of lip prints was observed in girls' subjects, with 38.5% were inherited from their father, 46.2% from mother, and 15.4% tends to have a different type from their parents. The Spearman correlation test shows a significant correlation of lip prints pattern between girls and their parents,  $p < 0.05$ .

**Table 2: Correlation test of the lip print pattern inheritance**

Boys					Girls				
N	Correlation test	Father	Mother	Non	N	Correlation test	Father	Mother	Non
18	Spearman test	16.7%	38.9%	44.4%	26	Spearman test	38.5%	46.2%	15.4%
	Sig.	0.2441	0.1306			Sig.	0.0162*	0.0388*	

*\*indicate the significant correlation*

The correlation between the lip prints pattern and the blood group type were also statistically analyzed, as described in Table 3. Most of the subject with type II of the lip print pattern tends to have the blood type A, 14.3%. However, the fisher exact test indicates that the correlation of the lip prints pattern and the blood group type was not statistically significant,  $p > 0.05$ .

**Table 3 The tendency of the lip prints pattern in having specific blood groups type**

Lip Print Type	Blood Group Type				Fisher Exact Test
	A (N = 30)	B (N = 31)	AB (N = 9)	O (N = 35)	
Type I (N = 22)	3 (2.9%)	7 (6.7%)	3 (2.9%)	9 (8.6%)	p = 0.1114
Type I' (N = 16)	7 (6.7%)	2 (1.9%)	1 (1.0%)	6 (5.7%)	
Type II (N = 36)	15 (14.3%)	9 (8.6%)	3 (2.9%)	9 (8.6%)	
Type III (N = 17)	3 (2.9%)	7 (6.7%)	2 (1.9%)	5 (4.8%)	
Type IV (N = 14)	2 (1.9%)	6 (5.7%)	0 (0.0%)	6 (5.7%)	
Type V (N = 0)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Total	105				

### Discussion

Individual identification is an essential proceeding to assist the process of recognizing the victim and the suspected person's identity in criminal cases. Many studies have shown that lip prints are unique and remain unchanged during a lifetime. In some cases, such as sexual abuse, the lipstick and bloodstains are often found in a crime scene and become a piece of evidence that correlated with the victim or the suspected person. Untraced lipstick stain on any objects may be easily lifted by aluminum and magnetic powder<sup>11-18</sup>.

In the present study, type II was found to be the most predominant lip prints pattern in males and females, and

type V has not appeared in all subjects. The result also indicates that the lip print patterns were inherited from parents to the offspring in the Javanese population. The lip prints pattern of girls tends to be inherited from their mother; however, these inheritance patterns couldn't be determined precisely in boys' subjects. These results are in agreement with the previous study conducted by George *et al* in 31 families of the Malaysian population<sup>18,19</sup>. Another study by Arisetiawan (2014) showed that the lip prints pattern of girls tends to be inherited from their father, and boys from their mother<sup>20</sup>.

The statistical analysis shows that there was no significant correlation between the lip prints pattern and



blood group type. These results correspond with the previous studies in India with the Ancestral North Indian population sample by Karim and Gupta (2013), which stated that there was no significant correlation between lip print patterns and blood type <sup>4</sup>.

Many aspects, such as the duplication technique and observer subjectivity, were considered as the influence factor in the study of lip prints pattern. There are several techniques of making a lips impression, such as conventional technique and photographic assistance <sup>21</sup>. This study used a simple conventional technique which has some limitation related to the problem during the lipstick application, hand pressure, and the variety of lipstick products.

### Conclusion

There is a resemblance of the lip print patterns between parents and their offspring. The lip prints pattern of girl subjects tends to be inherited from the mother, while for boys, the inheritance pattern couldn't be determined precisely. There is no significant correlation between the lip prints pattern and blood group type. Further studies with larger samples number are suggested to obtain more accurate results.

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