

# Association of Lip Print, Thumb Print, ABO Blood Group with Palatal Rugae in Population of Uttar Pradesh, India

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## ABSTRACT

**Background:** Individual identification is a crucial and exigent task in forensic investigation and in forensic science. Rugae pattern is unique to a human and it retains its shape throughout life. Like palatal rugae, lip groove patterns rarely change, resisting numerous types of external factors. Fingerprints stay the same from birth until death and no two fingerprints are identical. Blood group also plays an important role in forensic investigation and remains unchanged throughout the life time. Personal identification by other means such as DNA analysis is a sensitive and costly technique and therefore difficult to use for each and every case.

**Aim:** To find out the association of lip print, thumb print, ABO blood group with palatal rugae in population of Uttar Pradesh, India

**Methodology:** A total of 200 dental students between the age group 18 to 27 years were included in the study. Lip print, thumb print, ABO blood group with palatal rugae pattern was collected and compared. The data was analysed using SPSS version 21.

**Results:** Statistically significant correlation existed between lip print, thumb print with palatal rugae pattern ( $\chi^2$  statistic = 0.001 and 0.033, p value <0.05) respectively and no association was found between palatal rugae with ABO blood groups ( $\chi^2$  statistic = 0.229, p value >0.05).

**Conclusion:** Present study showed a statistically significant association of lip and thumb print with palatal rugae

**Keywords:** lip print, thumb print, ABO blood group, palatal rugae

## INTRODUCTION

Human identification is the basis of civilization and the identification of unknown individuals has always been of chief importance to society. Identification of a person is of paramount importance in a medico-legal investigation. It is based on scientific principles, largely involving dental records (palatal rugae patterns), lip prints, fingerprints and blood DNA comparisons.<sup>[1]</sup>

Scientific methods using DNA are considered to be expensive and time-consuming approach, thus initiating the need for using less expensive and faster methods of identification. The methods using palatal rugae, lip print, finger print and blood are considered to be unique to individuals and have gained

tremendous importance in forensic odontology these days and dentist also has a pivotal role in the identification of person as mouth provides with infinite evidence because of the distinctive features of teeth, lips and palate.

It is a well-established fact that the rugae pattern is as unique to a human as are his or her fingerprints and it retains its shape throughout life. The scientific examination of palatal rugae is termed as "Palatoscopy" or "Rugoscopy". Studies have demonstrated that no two individuals rugae patterns are alike in their arrangement and the characteristic rugae pattern of the palate does not change as a result of growth. Ritter. R (1943) in his study had stated that even between twins, patterns are similar but not identical. The length of palatal rugae increases during normal growth, but their orientation remains the same throughout the lifetime of a person. Palatal rugae can be used as a parameter in forensic identification as they are difficult to falsify, resistant to trauma by protection of surrounding anatomical structures, resistant to decomposition for up to seven days after death, resistant to high-temperature combustion, and distinguishable in different races. Rugae are highly protected configurations because of their internal positions and largely remain insulated by tongue and buccal fat pads. The method is fast, simple, inexpensive and produces no trauma during recordings. Rugae patterns can be analysed very quickly using standardized procedure.

The study of lip prints termed as 'Cheiloscopy' is derived from the Greek words '*CHELIOS*' (lips) and '*SKOPEIN*' (see). Mc Donnell reported in 1972 that two identical twins, who seem to be indistinguishable by any other means, can be distinguished by their lip prints.<sup>[2]</sup> Lip groove patterns rarely change, resisting numerous types of external factors including physical injury, pressure and exposure to hot or cold stimuli. It has been verified that they recover after undergoing alterations like trauma, inflammation and diseases like herpes and that the disposition and form of the furrows does not vary with environmental factors. Its permanence enables it to be a reliable tool in forensic field investigations.<sup>[3]</sup> The lip prints on a drinking glass, clothing or cigarette butt found at crime scenes may be a link to a suspect and can be obtained for up to 30 days after being produced. Moreover, in the case of a deceased person, the lip prints have to be obtained within 24 hours to prevent them from undergoing post-mortem changes.

Like lip prints, finger prints have also been recognised and accepted as standard for personal identification worldwide. Most important, person's fingerprints stay the same from birth until death that no two fingerprints are identical, that prints cannot be altered. The fingerprint patterns are unique in each individual that even identical twins originating from one fertilized egg, sharing the same DNA profile have distinct fingerprint patterns.

Much valuable information can be obtained from only a single drop of blood by analyzing its chemical compounds as well as measurable morphological characteristics of the resulting bloodstains. Thorough research of bloodstains can provide crucial information about what has truly happened during the commission of a violent crime which resulted with different shapes of blood pattern on various kinds of surfaces. Hence, blood itself is an extremely important entity in the medico legal practice, which alone or along with lip prints can play an important role to unfold different criminal problems.

The aim of this study was to find an association of lip print, thumb print, ABO blood group with palatal rugae in population of Uttar Pradesh, India.

## METHODOLOGY

The present study was conducted to find the association of lip print, thumb print, ABO blood group with

palatal rugae. This study was conducted in 200 subject aged 18 to 27 years and blood group of each subject was also analysed. After taking Institutional Ethical clearance (**Registration number: IERB/12/2020/01**) and informed written consent, the demographic data of the subjects was recorded. Before conducting the examination, the examiner was trained and calibrated on 10 subjects to record the palatal rugae pattern, lip print pattern and thumb print.

**Inclusion criteria:**

- Age group between 18 to 27 years.
- Healthy males and females with no systemic disease.
- Those who give the written informed consent.

**Exclusion criteria:**

- Orthodontic treatment.
- Trauma.
- Congenital abnormalities.
- History of allergy.

**Recording the palatal rugae:**

The subject was asked to rinse the oral cavity with chlorhexidine mouthwash. Maxillary arch impression of the study subjects was recorded using alginate on perforated metal trays. The metal trays were selected according to arch size and shape. All the manufacturer protocols were followed while mixing water powder ratio. Casts was poured using dental stone. The rugae patterns were traced on the casts using a sharp graphite pencil below sufficient light. Analysis of palatal rugae was done using Thomas and Kotze classification (1983).<sup>[4]</sup>

**Recording of lip print:**

Individuals were asked to sit comfortably in an erect position. Lips of the individuals were cleaned with tissue paper before the procedure. Darked coloured lipstick was applied evenly using the application brush. Transparent cellophane about 15cm neat strip and the sticky portion of strip was placed over the lips. The lip impression will be recorded in the normal position by pressing it evenly from center to the corners of the lips. The cellophane strip was sticked to the white bond paper for a permanent record. The lip prints was analyzed using a magnifying glass and classified based on Suzuki and Tsuchihashi classification.<sup>[5]</sup>

**Recording of thumb print:**

The subjects were asked to wash their hands thoroughly with soap to remove dirt and grease. Then they were asked to press their left thumb tip on the stamp pad and then the impressions of thumb were obtained in the white sheet. Care was taken to prevent smudging of the print. The subjects were asked to keep their arm relaxed and not to try to help in rolling the thumb as this may cause smearing. The thumbprint so obtained were studied with the help of a magnifying lens and classified according to Henry's System of Classification.<sup>[6]</sup>

### Recording the blood group:

The blood group of the subjects was identified by placing a drop of blood on a slide and treating it with anti A and anti B sera and Landsteiner classification was followed. The positive agglutination of the blood upon treatment with anti- A was considered as blood group A, a positive reaction with anti-B was considered as blood group B, if no agglutination was produced it was blood group O and if agglutination was seen with both antisera, then blood group AB was considered. [7]

### Statistical analysis

Data was entered into Microsoft Excel Spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analyzed by SPSS 21 using Chi square test. The level of significance was set at  $P \leq 0.05$

## RESULTS

This study was done to find the association of lip print, thumb print, ABO blood group with palatal rugae in 200 subjects of Uttar Pradesh, India.

**Table 1 and Graph 1** shows the distribution of different types of palatal rugae patterns among population.

Among the 200 individuals it was found that the major rugae shape was curved pattern (37%) followed by wavy (32.5%) straight (13.5%), circular (11%), diverging (2.5%), converging (2%) and less commonly was backwardly directed (0.5%) and forwardly directed (1%).

**Table 2 and Graph 2** shows the distribution of different types of lip print pattern among study population.

Among the total of 200 individuals it was found that Type I lip pattern was the most predominant pattern among all population (42%) followed by type I' (38%), type II (16%) and type III (3%) and the least common was and type IV (1%) lip pattern which was rarely seen in the present study.

**Table 3 and Graph 3** shows the distribution of different types of thumb print patterns among study population.

Among the total 200 individuals it was found that the loop fingerprint patterns (47%) were the most predominantly noted followed by whorl fingerprint patterns (32.5%) and arches (20.5%).

**Table 4 and Graph 4** shows the distribution of different types of blood group among study population.

Among the total 200 individuals it was found that group B (35%) was found to be most common followed by blood group A (25%) and blood group AB (21%) while O (19%) was the least noted blood group.

**Table 5:** On comparison between different palatal rugae patterns and lip print pattern among study population, statistically significant difference was found ( $\chi^2$  statistic = 0.001, P value < 0.05).

**Table 6:** On comparison between different palatal rugae patterns and ABO blood group among study population, statistically significant difference was not found ( $\chi^2$  statistic = 0.229, P value < 0.05).

**Table 7:** On comparison between different palatal rugae patterns and thumb print pattern among study population, statistically significant difference was found ( $\chi^2$  statistic = 0.033, P value < 0.05).

## DISCUSSION

“Identity” is a set of physical characteristics, functional or psychic, normal or pathological, that defines an individual. [8] Human identification has become fundamental in all aspects of human relationships, at

both social and legal levels and is of paramount importance. It is indeed challenging considering the fact that every individual has distinctive trait. This requires a combination of different procedures to individualize a person or an object. The identification is characterized by the utilization of proper techniques and means to find the identity.<sup>[9]</sup>

### **Palatal rugae pattern**

The present study evaluated the different shapes of rugae and the level of predominance and it was found that the major rugae shape was curved pattern (37%) followed by wavy (32.5%) straight (13.5%), circular (11%), diverging (2.5%), converging (2%) and less commonly was backwardly directed (0.5%) and forwardly directed (1%). Mohammed Asdullah et. al conducted a study to analyse the prevalence of different palatal rugae patterns and it was found that the curved-shape rugae were found to be maximum in numbers followed by wavy, straight, diverging, nonspecific, converging and circular types. Similar results were declared by Kapali et al, Kamala et al. and Mahabalesh et al. They concluded that the most common shapes of palatal rugae were curved, wavy and straight forms, whereas converging and circular were least in numbers.<sup>[10]</sup>

### **Lip print and palatal rugae pattern**

The present study considered the basic pattern of lip prints given by Suzuki K and Tsuchihashi Y in 1971 as type I, I', II, III, IV, V.<sup>[11]</sup> Type I lip pattern was the most predominant pattern among all population (42%) followed by type I' (38%) and type II (16%) and the least common was type III (3%) and type IV (1%) lip pattern.

The most predominant lip print pattern observed was type I and our findings matched with the study conducted by Patel S et al.<sup>[12]</sup> Another study conducted by Rachna kaul et.al to study the most prevalent lip print pattern in different ethno-racial groups of India, namely, Caucasoids, Australoids, Mongoloids, and Negritos and it was observed that Type I was the most prevalent and Type IV was the least prevalent lip print pattern in all the ethno-racial groups – Caucasoids, Australoids, and Mongoloids. The high frequency of Type I lip print pattern in the present study contrasts with previous results – in a study conducted by Prasad *et al.* on Aryan-Dravidian and Mongoloid groups, Type III was found to be most prevalent lip print pattern in both females and males. However, Type IV was the least prevalent lip print pattern in males, whereas, in females, Type I' was the least prevalent lip print pattern. In another study on North Indian population, in females, Type I was the most prevalent and, in males, Type III was the most prevalent lip print pattern. These variations could be attributed to the geographic disparities that may exist in lip print with respect to the most common pattern.<sup>[13]</sup>

### **Blood group and palatal rugae pattern**

In India, O+ is the most common blood group type followed by B+,<sup>[14]</sup> but in our study blood group B (35%) was found to be most common followed by blood group A (25%) and blood group AB (21%) while O was the least noted blood group and there was no association between lip print and palatal rugae pattern. A study by Hunagsi et.al in Karnataka and kerala population showed there was correlation between palatal rugae and blood groups. Another study conducted by Puranik Srikala et.al in 50 males and 50 females from Kalaburgi concluded that there is correlation between palatal rugae and blood groups in both males and females which was not similar to the results obtained in the present study.<sup>[15,16]</sup>



### Thumb print and palatal rugae pattern

The loop fingerprint patterns (47%) were the most predominantly noted followed by whorl fingerprint patterns (32.5%) and arches (20.5%). A study conducted by Iju Shrestha et.al to observe the distribution of various fingerprints patterns in the population of a community, together with the most prevalent pattern and the study showed the highest frequency of loops followed by whorls and arches which was similar to our study.<sup>[17]</sup> Study done by Desyani Setiadi et.al found a significant association between the direction patterns of palatal rugae and thumbprints.<sup>[18]</sup> In our study it was also found that there was association between thumb print and palatal rugae pattern.

The present study was conducted to find the association between lip print, thumb print, ABO blood groups with palatal rugae. Statistically significant association of lip prints and finger prints with palatal rugae was found in the present study. A study was done by Srigriri Surath et.al to conduct a study to correlate and compare Cheiloscopy, Dactyloscopy and Palatoscopy with blood group and Rh factor and statistically significant association of lip prints and finger prints with ABO-Rh blood groups were found.<sup>[19]</sup> Another study done by Vimi S. Mutalik et. al to compare and correlate of the lip prints, palatal prints, and finger prints and did not yield any significant statistical significance.<sup>[20]</sup> Our attempt to correlate all the three parameters with palatal is to assess their usefulness in the forensic science.

### CONCLUSION

Identification of living or dead people is often a difficult, challenging and time-consuming process. The common forensic methods of identification is DNA profiling. Although DNA is accurate in identification but they still have many limitations. The DNA samples can be easily destroyed by heat, trauma and decomposition. It is also expensive, time-consuming and also more costly equipments are required. Furthermore, the DNA extraction and identification is a lengthy process. Thus the need of alternative method which had to be quick and cost efficient for identification is required. It is a well-established fact that the rugae pattern have been shown to be highly individualistic and consistent in shape throughout the life. Analysis of palatal rugae pattern is an important alternative and complementary technique for human identification, providing a significant contribution in cases of criminal investigation. Palatoscopy is rather simple technique not requiring any complex instrumentation and has been successfully used in necro identification. In view of forensic jurisprudence, detecting and identifying lip print at a site of calamity of any nature may prove to provide key evidence. As it is genotypically determined, the importance of using it for forensic investigations is justified as the pattern never undergoes changes from birth until the body undergoes decomposition. Like lip prints, finger prints have also been recognised and accepted as standard for personal identification worldwide. No two finger prints even in a given individual have been found to have the same ridge pattern and this remains unchanged throughout life. This uniqueness in its presentation is the very fact that the analysis of finger print offers an excellent means of forensic investigations. Yet another biological record that remains unchanged throughout the life time of a person is the blood group. Determining the blood group of a person from the samples obtained at the site of crime, helps identify a person. So, in this study association of lip print pattern and thumb print pattern with palatal rugae pattern was found.

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**TABLES**

**Table 1: Distribution of different types of palatal rugae patterns among population**

<b>PALATAL RUGAE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
CURVED	74	37%
WAVY	65	32.5%
STRAIGHT	27	13.5%
CIRCULAR	22	11%
FORWARDLY DIRECTED	1	0.5%
BACKWARDLY DIRECTED	2	1%
DIVERGING	5	2.5%
CONVERGING	4	2%

**Table 2: Distribution of different types of lip print pattern among population**

<b>LIP PRINT PATTERNS</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
I	84	42%
I'	76	38%
II	32	16%
III	6	3%
IV	2	1%

**Table 3: Distribution of different types of thumb print patterns among population**

<b>PATTERNS OF THUMB PRINT</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Arches	41	20.5%
Loops	94	47%
Whorls	65	32.5%

**Table 4: Distribution of different types of blood group among population**

<b>BLOOD GROUP</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
A	50	25%
B	70	35%
AB	42	21%
O	38	19%

**Table 5: Association between different palatal rugae patterns and lip print pattern**

<b>PALATAL RUGAE</b>		<b>LIP PRINT</b>					<b>X<sup>2</sup> VALUE</b>
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
	<b>1</b>	31	32	8	3	0	.001*
	<b>2</b>	28	26	8	3	0	



	3	12	9	5	0	1	
	4	9	5	8	0	0	
	5	0	0	0	0	1	
	6	0	2	0	0	0	
	7	2	1	2	0	0	
	8	2	1	1	0	0	

**Table 6: Association between different palatal rugae patterns and blood group**

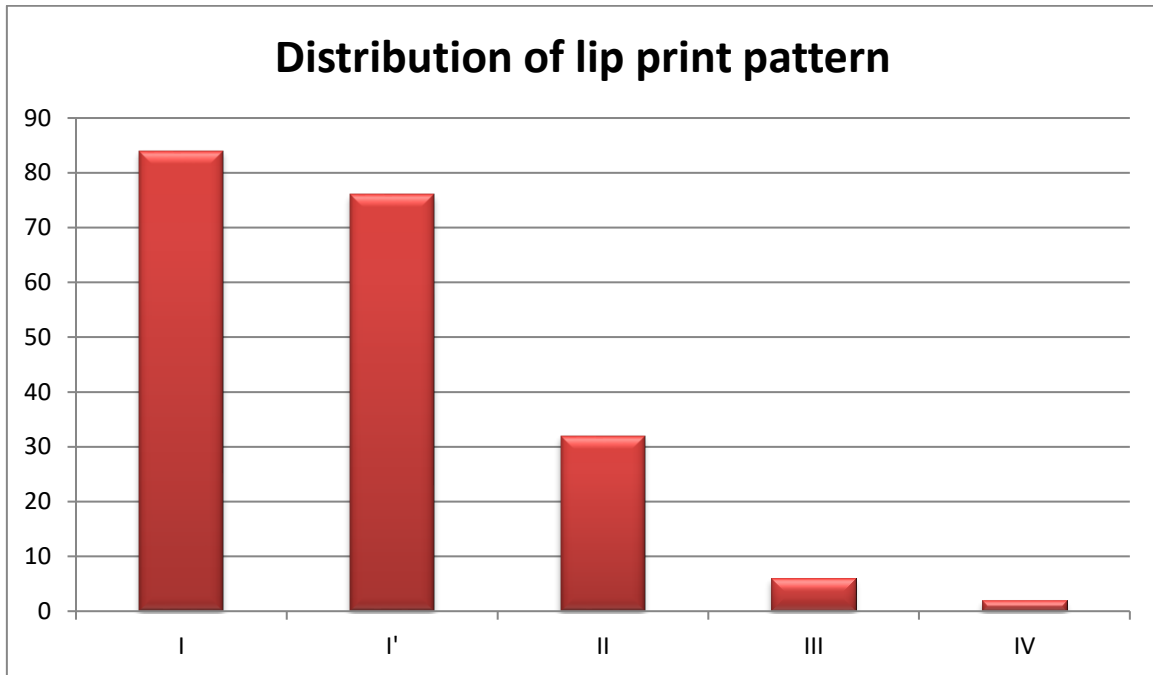
PALATAL RUGAE		BLOOD GROUP				X <sup>2</sup> VALUE
		1	2	3	4	
	1	18	24	21	11	.229
	2	16	21	17	11	
	3	10	9	1	7	
	4	5	11	1	5	
	5	0	0	0	1	
	6	1	1	0	0	
	7	0	3	1	1	
	8	0	1	1	2	

**Table 7: Association between different palatal rugae patterns and thumb print pattern**

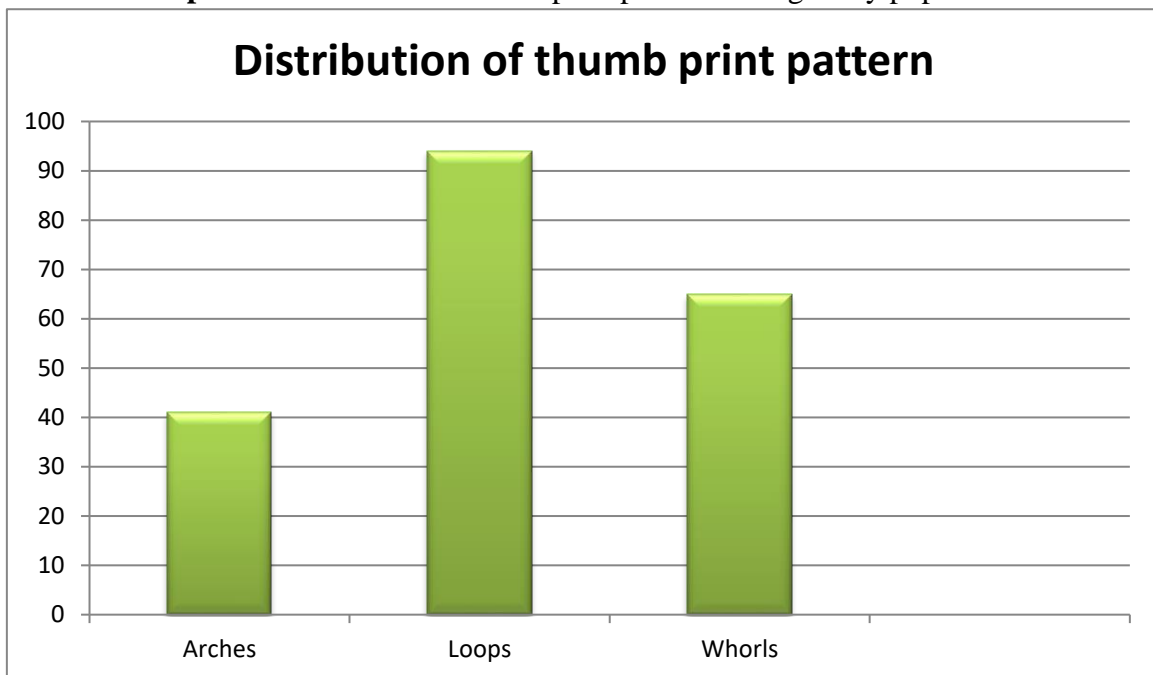
PALATAL RUGAE		THUMB PRINT			X <sup>2</sup> VALUE
		1	2	3	
	1	19	26	29	.033
	2	11	34	20	
	3	4	19	4	
	4	6	11	5	
	5	0	1	0	
	6	0	2	0	
	7	0	1	4	
	8	1	0	3	

**GRAPHS**

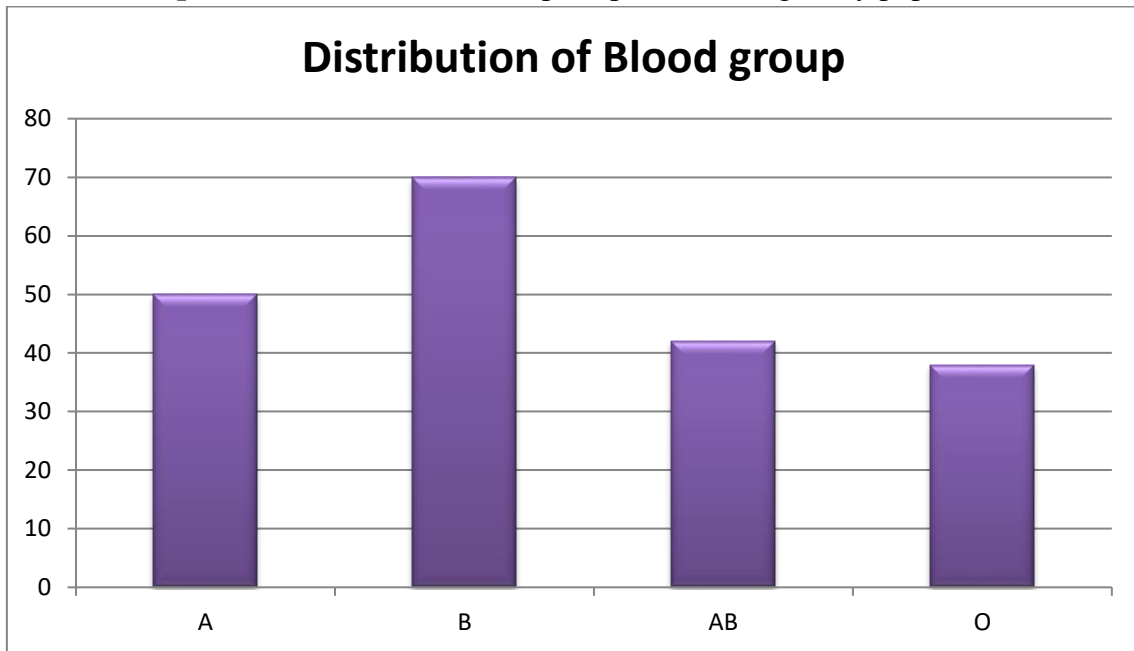
**Graph 1:** Distribution of lip print pattern among study population.



**Graph 2:** Distribution of thumb print pattern among study population.



**Graph 3:** Distribution of thumb print pattern among study population.



**Graph 4:** Distribution of palatal rugae pattern among study population.

