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A statistical study of lip print, finger print and ABO blood grouping and their significance in personal identification

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Abstract

The identification of an entity is the recognition of any person based on his/her physical peculiarities. Individualization is necessary often in a multitude of conditions such as social recognition, criminal identification, and mass catastrophe. The suggested study hereby investigates the preponderance in the pattern of lip print, fingerprint and blood grouping and to strike out if there is any interaction between the three variables. The study was directed on 200 individuals, of which 100 were males and 100 were females, originally belonging to the Bundelkhand region of Uttar Pradesh. The sample for lip prints was solicited and later interpreted on the assumption of classification of lip prints given by Suzuki and Tsuchihashi. Karl Landsteiner classification approach was retained for blood grouping and thumb impression was drawn to inspect the fingerprint pattern which was further scrutinized according to Henry Fingerprint Classification System. For the statistical analysis, frequency distribution and percentage method were used for descriptive statistics, whereas for inferential statistics chi-square and Pearson correlation coefficient were applied. The present study concludes that the type II lip print pattern was common in both males and females. Type III is the second most predominant pattern in male whereas in females it is type I. Considering the second variable of the study that is blood group, B+ is common in entire sample size while O+ shows predominance in males wherein females B+ is common. Loop pattern in both the sexes is common among the individuals of Bundelkhand region. The statistical result for chi-square shows that there is no significant association between the variable gender with that of lip print, blood group, and fingerprints. The result of correlation coefficient exhibits that there is a statistically significant relationship between blood groups and fingerprints. There is a substantial correlation coefficient between blood groups and fingerprints patterns of the individuals of an enumerated state.

Keywords: Blood groups, finger print, lip print pattern, personal identification.

Introduction

According to the Merriam-Webster dictionary, 'distinctiveness' can be characterized as the perceived character or identity of a human being whereas the 'identity' is an array of personal, utilitarian and psychic normal or pathological tendencies that determine an entity. Individual recognition is an imperative and an exigent task in forensic analysis and in forensic science[1]. The positive recognition of the living or deceased using distinct attributes is a linchpin of forensic discipline. According to Locard's Exchange Rule, when two articles fall into reach, there is invariably a change of evidence from one to the alternative. Traces from the site may be driven elsewhere by an individual and at the same hour may be left behind at the location[2]. We undertook the present study to envisage the correlation among lip print pattern, fingerprint pattern and ABO blood group. The consideration of grooves and furrows present on the red part or the cardinal border of the human lips is perceived as Cheiloscopy or lip prints, which is relevant for forensic identification[3]. While 'Fingerprints' or 'Dermatoglyphics' can be explained as the scientific investigation of epidermal ridges and their composition on the volar aspect of the palmar and plantar regions[4]. The existence of antigen in plasma, ABO system is classified as A, B, AB, and O blood groups. The existence of D antigen in plasma called as Rhesus technique is segregated into Rh +ve and Rh –ve[5]. The implication of the suggested study is that it will alleviate in the investigation of crime and identification of a miscreant on the basis of above considerations, like if the individual's lip print or fingerprint is identified, we can determine the blood group of that person, if only there turned up to be an interrelationship between the three i.e. lip print, fingerprint and blood groups.

Materials and methods

Inclusion criteria: The suggested investigation was organized amongst the scholars learning in Bundelkhand University Jhansi, India. Among the 200 subjects, 100 were males and 100 were females, who were aged between 18-25 years.

Exclusion criteria: Subjects undergoing orthodontic therapy, congenital lip deformities, irritation or damage to lips, hypersensitivity to lipsticks were ruled out for the lip print samples while the cases with ailments and permanent scars on their fingers or thumbs, with any hand deformities created by injuries, were omitted for the fingerprint samples.

Study material: Red colored lipstick, cellophane tape, white hard bond paper, black fingerprint ink, glass plate, ink roller, tissue paper, acetone, cotton, and magnifying glass were the elements employed for picking up the lip prints and fingerprints from the cases.

Method of an assemblage of lip prints: Each participant was made to rest in a relaxed position. Dark red tinted, non-persistent, non-lustrous, non-metallic lipstick was applied to obtain clear lip prints. The lips were perfected by moisturizer and cotton. A delicate film of lipstick was later spread onto cleaned and dried lips, left for 3min., and again the patterns of the lips were drawn by undulating the pasted part of cellophane tape on the lips and thus a pressure was implemented by using index finger over the area of lips. The cellophane tape was thus tenderly raised and spread on specified papers. Care was taken to ward off any creases and air bubbles. The tape system was adopted for hoisting the lip prints as to solicit specific frame of the lips without minimal smudging of the lipstick.

Method of an assortment of fingerprints: For the assemblage of fingerprints, the right hand of the subjects was considered as this is the surface that most state agencies legally secure. The patterns of thumb were collected by requesting the subjects to roll the right-hand thumb across the flare-up of the smudged glass plate and again to transfer the fingerprint impressions onto A4-proportioned white bond paper. The fingerprint patterns were interpreted following Henry's classification using a magnifying glass.

Method of collection of blood groups: The subjects "blood group" was singled out by placing a drop of blood on a slide and treating it with anti-A, anti-B and again anti-Rh serum and were well studied by Landsteiner's classification.

The participants held a construct containing information about them such as name, Father's name, age, sex, blood group, address, date, and signature. The data was interpreted employing the statistical tools like chi-square analysis and Pearson correlation coefficient.

Results and discussion

The result obtained after the assemblage of the samples is illustrated in the Table-1. The types of lip print pattern which marks the peak frequency of 87 is type II (43.5%) accompanied by type I (16%), type III (15.5%), type IV (12.5%), type V (9%) and the pattern which evinces the least frequency is type I' (7%).

Type II lip pattern shows the most predominance of 44% followed by type III (15%), among the males whereas in females, type II (43%) pattern followed by type I (20%) as shown in Table-2.

The chi-square test for independence, also called Pearson's chi-square analysis of association, to determine if there is a relation between two categorical variables i.e. gender and lip prints. As illustrated in Table-3, the value of test statistics is 5.975 and p-value is 0.309 and since it is higher than the chosen significance level of 0.05, do not reject the null hypothesis. Therefore there is not ample evidence to advocate an association between gender and lip print.

Table-1: Frequency of Lip print Patterns among the Population.

Lip Print Pattern	Frequency	Percentage (%)	Valid Percent	Cumulative Percent
Type I	32	16.0	16.0	16.0
Type I'	7	3.5	3.5	19.5
Type II	87	43.5	43.5	63.0
Type III	31	15.5	15.5	78.5
Type IV	25	12.5	12.5	91.0
Type V	18	9.0	9.0	100.0
Total	200	100.0	100.0	

The types of blood grouping which determines the maximum prevalence of 65 is B positive (32.5%) supported by O positive (32.5%), A positive (21%), AB positive (9%), O negative (2.5%), B negative (2.0%) and the pattern which manifests the least frequency is A negative (0.5%) as illustrated in Table-4.

O positive blood group presents the most predominance of 32% followed by B positive (29%) among the males whereas in females, B positive (36%) pattern followed by O positive (33%) as shown in Table-5.

As indicated in Table-6 the value of test statistics is 7.769 and p-value is 0.256 and since the p-value is greater than the designated significance level of 0.05, accepts the null hypothesis. Thus there is not sufficient evidence to propose an association between gender and blood grouping.

The types of fingerprint pattern which establishes the maximum frequency of 131 are a loop (65.5%) accompanied by whorl (66%), and the pattern which exhibits the least frequency is arch (1.5%) as shown in Table-7.

The Loop pattern illustrates the most predominance of 65% followed by whorl (33%) among the males whereas in females, loop pattern (66%) followed by whorl pattern (33%) as shown in Table-8. Thus there is no discrimination of fingerprint pattern is discovered among the gender of the populace.

As shown in Table-9 the value of test statistics is 0.341 and p-value is 0.843 and since the p-value is greater than the chosen significance level of 0.05, accepts the null hypothesis. Thus, there are not sufficient evidences to indicate an association between gender and blood grouping.

Table-2: Gender and Lip print Patterns Cross Tabulation among the Population.

Population			Lip Print Pattern						Total
			Type I	Type I'	Type II	Type III	Type IV	Type V	
Gender	Male	Count	12	6	44	15	14	9	100
		% within gender	12.0%	6.0%	44.0%	15.0%	14.0%	9.0%	100.0%
		% within lip print pattern	37.5%	85.7%	50.6%	48.4%	56.0%	50.0%	50.0%
		% of total	6.0%	3.0%	22.0%	7.5%	7.0%	4.5%	50.0%
	Female	Count	20	1	43	16	11	9	100
		% within gender	20.0%	1.0%	43.0%	16.0%	11.0%	9.0%	100.0%
		% within lip print pattern	62.5%	14.3%	49.4%	51.6%	44.0%	50.0%	50.0%
		% of total	10.0%	0.5%	21.5%	8.0%	5.5%	4.5%	50.0%
Total		Count	32	7	87	31	25	18	200
		% within gender	16.0%	3.5%	43.5%	15.5%	12.5%	9.0%	100.0%
		% within lip print pattern	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of total	16.0%	3.5%	43.5%	15.5%	12.5%	9.0%	100.0%

Table-3: Chi-square Test on Gender and Lip print Patterns.

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	5.975[a]	5	0.309
Likelihood ratio	6.388	5	0.270
Linear-by-linear association	0.625	1	0.429
N of valid cases	200		

Table-4: Frequency of Blood Groups among the Population

Blood Groups	Frequency	Percent	Valid Percent	Cumulative Percent
A+	42	21.0	21.0	21.0
A-	1	0.5	0.5	21.5
B+	65	32.5	32.5	54.0
B-	4	2.0	2.0	56.0
AB+	18	9.0	9.0	65.0
AB-	0	0	0	65.0
O+	65	32.5	32.5	97.5
O-	5	2.5	2.5	100.0
Total	200	100.0	100.0	

Table-5: Gender and Blood Grouping Cross Tabulation among the Population.

Population			Rhesus Factor							Total
			A+	A-	B+	B-	AB+	O+	O-	
Gender	Male	Count	21	1	29	3	9	32	5	100
		% within gender	21.0%	1.0%	29.0%	3.0%	9.0%	32.0%	5.0%	100.0%
		% within blood grouping	50.0%	100.0%	44.6%	75.0%	50.0%	49.2%	100.0%	50.0%
		% of total	10.5%	0.5%	14.5%	1.5%	4.5%	16.0%	2.5%	50.0%
	Female	Count	21	0	36	1	9	33	0	100
		% within gender	21.0%	0.0%	36.0%	1.0%	9.0%	33.0%	0.0%	100.0%
		% within blood grouping	50.0%	0.0%	55.4%	25.0%	50.0%	50.8%	0.0%	50.0%
		% of total	10.5%	0.0%	18.0%	0.5%	4.5%	16.5%	0.0%	50.0%
Total		Count	42	1	65	4	18	65	5	200
		% within gender	21.0%	0.5%	32.5%	2.0%	9.0%	32.5%	2.5%	100.0%
		% within blood grouping	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of total	21.0%	0.5%	2.0%	2.0%	9.0%	32.5%	2.5%	100.0%

Table-6: Chi-square Test on Gender and Blood Groups.

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	7.769[a]	6	0.256
Likelihood ratio	10.135	6	0.119
Linear-by-linear association	0.429	1	0.512
N of valid cases	200		

Table-7: Frequency of Fingerprint Pattern among the Population.

Types of Fingerprint	Frequency	Percent	Valid Percent	Cumulative Percent
Arch	3	1.5	1.5	1.5
Loop	131	65.5	65.5	67.0
Whorl	66	33.0	33.0	100.0
Total	200	100.0	100.0	

Table-8: Gender and Fingerprint Patterns Cross Tabulation among the Population.

Population			Types of Finger Print Pattern			Total
			Arch	Loop	whorl	
Gender	Male	Count	2	65	33	100
		% within gender	2.0%	65.0%	33.0%	100.0%
		% within types of fingerprint	66.7%	49.6%	50.0%	50.0%
		% of total	1.0%	32.5%	16.5%	50.0%
	Female	Count	1	66	33	100
		% within gender	1.0%	66.0%	33.0%	100.0%
		% within types of fingerprint	33.3%	50.4%	50.0%	50.0%
		% of total	0.5%	33.0%	16.5%	50.0%
Total		Count	3	131	66	200
		% within gender	1.5%	65.5%	33.0%	100.0%
		% within types of fingerprint	100.0%	100.0%	100.0%	100.0%
		% of total	1.5%	65.5%	33.0%	100.0%

Table-9: Chi-square Test on Gender and Fingerprint.

	Value	df	Asymp. Sig. (2-sided)
Pearson chi-square	0.341[a]	2	0.843
Likelihood ratio	0.347	2	0.841
Linear-by-linear association	0.020	1	0.887
N of valid cases	200		

The correlation coefficient for the two variables i.e. blood grouping and fingerprints is 0.172 and the p-value for this correlation coefficient is 0.015. The correlation is significant at 0.05 levels (2-tailed). The p-value is less than 0.05 thus reject the null hypothesis and accept alternate hypothesis. The alternate hypothesis states that there is a statistically significant relationship between blood grouping and fingerprints. The correlation between the alternative variables is found to be statistically insignificant as suggested in Table-10.

Discussion: Blood groups, Fingerprints, and lip prints are the biological tendencies that remain steady from dawn to death of an entity. The suggested investigation was an undertaking to resolve if there was any interaction between lip print, fingerprint and blood groups among the people in a Bundelkhand based population. Harsha L. and Jayaraj G.[6] investigated on Correlation of Lip Print, Finger Print and Blood Groups in a Tamil Nadu Based Population. The fragment range for the course was on 158 individuals including 83 males and 75 females. The lip print pattern which marks the maximum frequency was type II (branched) whereas the fingerprint pattern which reveals the predominance was a plain loop (42.4%) while the O positive blood was prevailing among the population. The juxtaposition of results using ANOVA revealed no statistically significant discrepancy between the groups[6]. Patel R. et al.[7] analyzed on Assessment of Correlation of Lip Print with Gender and Blood Group among Dental Students of Visnagar, Gujarat, India. Type II (A branched groove) pattern was to be raised further in both male (44.2%) and female (31.5%). Type II (A branched groove) pattern was to be found higher among research subjects with blood Group A (29.4%), B (37.3%), and O (37.1%) blood group. The suggested research did not show up any statistical interaction of lip print pattern with gender and ABO blood groups. No correlation was detected between lip print and blood group[7].

Table-10: Correlation between Gender, Lip Print, Blood Grouping and Types of Fingerprints.

	Correlation	Gender	Lip Print Pattern	Rhesus Factor	Finger Print Pattern
Gender	Pearson Correlation	1	-.056	-.046	.010
	Sig. (2-tailed)		.431	.514	.887
Lip Print Pattern	Pearson Correlation	-.056	1	-.017	-.051
	Sig. (2-tailed)	.431		.806	.477
Rhesus Factor	Pearson Correlation	-.046	-.017	1	.172*
	Sig. (2-tailed)	.514	.806		.015
Types of Finger Print Pattern	Pearson Correlation	.010	-.051	.172*	1
	Sig. (2-tailed)	.887	.477	.015	

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

The course on Frequency and correlation of lip prints, fingerprints and ABO blood groups in the population of Sriganganagar District, Rajasthan, Sandhu H. et al.[8] confirmed that B+ blood group was mentioned as most frequent in both genders while least popular were A− among males and AB− in females. Type II lip pattern was most potent while the least frequent was Type I' in males and Type I' and Type V in females. The Ulnar Loop fingerprint pattern was the most trivial, while Radial Loop was least noted in both genders. All the fingerprint patterns presented an interrelationship with different lip print patterns. An interaction was found between various blood groups and lip print patterns except for Type I (vertical) lip pattern. A positive correlation was noted between all the blood groups and fingerprint systems, except for Radial Loop pattern[8]. Whereas the present study concludes that the type II lip print pattern was typical in both males and female entities. Type III is the second most dominant pattern in male whereas in females it is type I. considering the second variable of the research that is blood group, B+ is common in entire sample size while O+ shows predominance in males wherein females B+ is common. Loop pattern in both the sexes in common among the individuals of Bundelkhand region. The statistical result for chi-square shows that there is no significant association between the variable gender with that of lip print, blood group, and fingerprints. The proceeding of the correlation coefficient demonstrates that there is a statistically significant relationship between blood groups and fingerprints.

Conclusion

In the staged research on the correlation between lip prints, blood groups and fingerprints among the population of Bundelkhand region confirmed that there is a substantial interrelationship coefficient between blood groups and fingerprints patterns of the entities whereas there is no notable correlation between lip prints and blood groups, or lip print and fingerprints. This consideration further rules that the association between the gender and the three variables viz. lip print, blood groups, and fingerprint, was turned up to be trivial.

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