Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2017/49

Original Article

Dermatoglyphic Pattern in Relation to ABO, Rh Blood Group and Gender among the Population of Chhattisgarh

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Abstract

Introduction: Dermatoglyphics provides a scientific method for identification of an individual and it is constant and idiosyncratic till demise. It might play an important role during identification of criminals, biometric, aadhar card, etc.

Objectives: This study was conducted to conclude relation between dermatoglyphics, ABO, Rh blood group, and gender among the population of Chhattisgarh.

Materials and Methods: In this study, total 260 subjects selected (130 male and 130 female) within age group of 18-35 years. All subjects were belongs to central region of India, i.e., Chhattisgarh. Fingerprint was taken using the INK method as illustrate by Cummins and Mildo. Fingerprint patterns (loops, whorls, and arches) and blood data were collected.

Results: In this study, 38.46% of subjects belong to O blood group followed by A, B and AB were 95.77% subject having Rh-positive and 4.23% having Rh-negative. Loops higher (female, B blood group and Rh-positive), Whorls higher (male, A blood group and Rh-negative) and arches higher (male, AB blood group, Rh-positive). Where loops lowest (male, AB blood group and Rh-negative), whorls lowest (female, B blood group and Rh-positive) and arches lowest (female, B blood group, Rh-negative).

Conclusions: This study shows association between distribution of dermatoglyphic, ABO, Rh blood group, and gender.

Key words: ABO blood group, Arches, Dermatoglyphic, Fingerprint, Gender, Loops, Rh blood group, Whorls

INTRODUCTION

Dermatoglyphics (fingerprint/dactylography) is derived from the Greek word "Derma = Skin, Glyphe = Carve." Dermatoglyphics defined as the scientific study of natural occurring epidermal ridges and their configuration on the volar region of digits, palms, and soles apart from flexion crease and secondary folds. The term dermatoglyphics was 1st coined by Anatomist Harold Cummins in 1926, and he found that the design of ridges on the sole and foot are gritty by heredity and accidental or environmental influence in their intrauterine life.[1] The development of dermatoglyphic initiate from 12th-16th week of intrauterine life and accomplished by the 20th week of intrauterine life.[2] Dermatoglyphics are constant and idiosyncratic even in monozygotic twins from birth till demise. Fingerprint is personal identification of a human being.[3,4] Fingerprint are helpful in medico-legal case for recognition of suspect, victims and another person who touches the surface and for the diagnosis of inheritable disease. Fingerprint scans also used in digital mission of India, biometric, validate electronic registration, cashless, library access, and forensic purpose.[5] Sir Francis Galton in 1892 published a book known as fingerprint and classified fingerprint primary pattern as loop (60-65%), whorl (30-35%), and arches (5%).[6]

ABO blood group system was discovered at University of Vierina by Austrian Scientist Karl Landsteiner. Till

Access this article online

www.ijss-sn.com

Month of Submission : 12-2016
Month of Peer Review : 01-2017
Month of Acceptance : 01-2017
Month of Publishing : 02-2017

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dated, 19 groups have been identified which vary in their frequency of distribution. ABO and Rh blood group system are of major important.[7] In 1930, he belatedly received the Nobel Prize for his discovery. ABO further classified into 4 principal types: A, B, AB, O. There are two antigens and two antibodies responsible for ABO type. Rh blood group is one of the most complex blood groups in human and it is further classified into Rh-positive and Rh-negative due to the presence of absence of D antigen.[8] Various disease are usually influence particular blood group like duodenal ulcer in O and gastric ulcer in A blood group.[9,10] The aim of this study to find correlation between gender, ABO and Rh blood group with dermatoglyphic pattern in human beings.

Table 1: Distribution of subjects according to blood group and gender

Blood group	Male *n*=130 (%)	Female *n*=130 (%)	Total *n*=260 (%)
A	40 (30.76)	45 (34.61)	85 (32.69)
B	25 (19.23)	20 (15.38)	45 (17.30)
AB	17 (13.07)	13 (10.00)	30 (11.53)
O	48 (36.92)	52 (40.00)	100 (38.46)
Total	130	130	260

Table 2: Distribution of subjects according to blood group and Rh factors

Blood group	Rh-positive (%)	Rh-negative (%)
A	82 (31.53)	3 (1.15)
B	44 (16.92)	1 (0.38)
AB	28 (10.77)	2 (0.77)
O	95 (36.53)	5 (1.92)
Total	249 (95.77)	11 (4.23)

Table 3: Distribution of fingertip pattern in the digit of both hands

Pattern of finger print	Total (%)
Loops	1364 (52.46)
Whorls	820 (31.540
Arches	416 (16.00)
Total	2600 (100)

Table 4: Distribution of fingertip pattern according to gender

Pattern of finger print	Male (%)	Female (%)	Percentage
Loops	644 (49.54)	720 (55.38)	1364 (52.46)
Whorls	445 (34.23)	375 (28.85)	820 (31.54)
Arches	211 (16.23)	205 (15.77)	416 (16.00)
Total	1300 (100)	1300 (100)	2600 (100)

MATERIALS AND METHODS

This study was conducted in the Department of Anatomy and surgery at Government Medical College, Ambikapur, Surguja, Chhattisgarh, India. Total 260 subjects of equal number of male and female were selected randomly for this study. All Subjects were belongs to central region of India, i.e., Chhattisgarh and their age ranged between 18 and 35 years. All the subjects were healthy and excluded the subject having hand or finger deformities and blood group disease. Subjects have to fill the consent form. Fingerprints were taken using the INK method as illustrate by Cummins and Mildo in 1961.

The material used for this study is Faber-Castell blue color INK pad, A4 size white paper, cardboard, gauze pads, magnifying lens, pencil, and pen. Each white paper filled with basic detail of subject such as name, sex, age, date, blood group, right palm finger, and left palm finger.

Methods

Each subject asked to wash their hands and dry with the help of towel. After that, press each right and left-hand fingertip separately in the stamp pad. Prints of all the 10 digits were taken in 10 separate blocks on a white A4 size paper. Finally, fingerprint patterns (loops, whorls, and arches) observed with the help of magnifying lens and blood group data were collected.

RESULTS

A total of 260 subjects were selected randomly from the central region of India, i.e., Chhattisgarh. Among 260 subjects 130 were male and 130 were female.

Table 1 shows the distribution of subjects according to blood group and gender and was recorded as that

Table 5: Distribution of fingertip pattern of right and left hand in 260 subjects according to ABO and Rh blood group in 2600 fingers digits

Pattern of finger print	Blood group A (%)		Blood group B (%)		Blood group AB (%)		Blood group O (%)		Total (%)
	Rh-positive	Rh-negative	Rh-positive	Rh-negative	Rh-positive	Rh-negative	Rh-positive	Rh-negative	
Loops	430 (52.44)	18 (60)	250 (56.82)	7 (70)	130 (46.43)	10 (50)	506 (53.26)	13 (26)	1364 (52.46)
Whorls	270 (32.93)	11 (36.66)	130 (29.55)	2 (20)	90 (32.14)	8 (40)	282 (29.68)	27 (54)	820 (31.54)
Arches	120 (14.63)	1 (3.33)	60 (13.64)	1 (10)	60 (21.43)	2 (10)	162 (17.05)	10 (20)	416 (16)
Total	820	30	440	10	280	20	950	50	2600 (100)

mainstream of subjects 100 (38.46%) go to blood Group "O" and followed by Group A 85 (32.69%), B 45 (17.30%), and AB 30 (11.53%).

Table 2 shows the distribution of subjects according to Blood group and Rh factors and it shows that maximum 249 (95.77%) subjects go to Rh-positive factors of blood group and 11 (4.23%) go to Rh-negative factors of blood group.

Table 3 shows the distribution of fingertip pattern in the digit of both hands and it shows that the maximum percentage, i.e., 52.46% (1364 digits) observed loops and followed by whorls i.e., 31.54% (820 digits) and arches, i.e., 16.00% (416 digits).

Table 4 shows the distribution of fingertip pattern according to gender and we observed that out of 1300 male finger digits 644 (49.54%) digits having loops, 445 (34.23%) digits having whorls and 211 (16.23%) digits having arches and in 1300 female finger + digits 720 (55.38%) digits having loops, 375 (28.85%) digits having whorls and 205 (15.77%) digits having arches.

Table 5 shows the distribution of fingertip pattern of Right and left hand in 260 subjects according to ABO and Rh blood group in 2600 finger digits. Incidence of loops was maximum in Rh-positive and Rh-negative subjects of ABO blood group followed by fingertip pattern of whorls and arches excluding blood group O-negative of whorls where the occurrence of whorls was 54%.

Table 6 shows distribution of fingertip pattern according to Rh blood group and Table 7 shows distribution of fingertip pattern of right and left hand in 260 subjects according to ABO and Rh blood group in 2600 fingers digits.

DISCUSSION

This study reveals the relation between distribution of dermatoglyphic (dactylography, fingerprint), blood group and gender. This study was done on 260 subjects (equal no. of male and female), and we got maximum of subjects belongs to O blood group, i.e., (38.46%) followed by blood Group A (32%), B (17.30%), and AB (11.53%). Greater

Table 6: Distribution of fingertip pattern according Rh blood group

Pattern of finger print	Rh-positive (%)	Rh-negative (%)
Loops	1316 (52.85)	48 (43.63)
Whorls	772 (31)	48 (43.63)
Arches	402 (16.14)	14 (12.72)
Total	2490 (95.77)	110 (4.23)

Table 7: Distribution of fingertip pattern of right and left hand in 260 subjects according to ABO and Rh blood group in 2600 fingers digits

Pattern of finger print	Blood group A (%)			Blood group B (%)			Blood group AB (%)			Blood group O (%)			Total
	Rh-positive	Rh-negative	Total	Rh-positive	Rh-negative	Total	Rh-positive	Rh-negative	Total	Rh-positive	Rh-negative	Total	
Loops	430 (52.44)	18 (60)	448 (52.70)	250 (56.82)	7 (70)	257 (57.11)	130 (46.43)	10 (50)	140 (46.67)	506 (53.26)	13 (26)	519 (51.9)	1364 (52.46)
Whorls	270 (32.93)	11 (36.66)	281 (33.05)	130 (29.55)	2 (20)	132 (29.33)	90 (32.14)	8 (40)	98 (32.67)	282 (29.68)	27 (54)	309 (30.9)	820 (31.54)
Arches	120 (14.63)	1 (3.33)	121 (14.23)	60 (13.64)	1 (10)	61 (13.55)	60 (21.43)	2 (10)	62 (20.67)	162 (17.05)	10 (20)	172 (17.2)	416 (16)
Total	820	30	850	440	10	450	280	20	300	950	50	1000	2600 (100)

Table 8: Comparative and chronological studies of dermatoglyphic according to ABO blood group among the various study of world

Studied by	year	Loops		Whorls		Arches	
		Highest in blood group	Lowest in blood group	Highest in blood group	Lowest in blood group	Highest in blood group	Lowest in blood group
Mahajan[12]	1986	B	O	O	AB	AB	B
Kshirsagar *et al*.[11]	2003	B	O	O	AB	AB	B
Bharadwaja *et al*.[14]	2004	A	O	AB	A	B	AB
Mehta and Mehta[7]	2011	O	AB	B	O	AB	B
Deopa *et al*.[16]	2014	O	A	AB	B	A	AB
Singh *et al*.[13]	2016	B	AB	O	AB	AB	O
Present study	2017	B	AB	A	B	AB	B

part of the subjects, i.e., 95.77% were Rh-positive and few, i.e., 4.23% were Rh-negative.

The universal distribution of pattern of fingerprint was of the order in individual with A, B, AB and O blood group, i.e., higher frequency of loops, moderate of whorls and low of arches. The same finding was seen in Rh-positive and Rh-negative individuals.[11,12]

In this study, loops were higher in B blood group (57.11%) followed by A (52.70%), O (51.9%) blood group and lowest in AB blood group (46.67%) which correlates with the study of Singh *et al*.,[13] Mahajan[12] and while Kshirsagar *et al*.[11] found the highest percentage of loops in AB blood group. Comparative and chronological studies of dermatoglyphic according to ABO Blood group among the various study of the world showed in Table 8.

In this study, the percentage of loop was highest in Rh-positive (52.85%) and lowest in Rh-negative (43.63%), which correlated with Mehta and Mehta,[7] Kshirsagar *et al*.,[11] and Bharadwaj *et al*.[14] were whorls highest in Rh-negative (43.63%) and lowest in Rh-positive (31%), which correlated with Kshirsagar *et al*.[11] and Bharadwaj *et al*.[14] and contrary Mehta and Mehta.[7] The percentage of arches were highest in Rh-positive (16.14%) and lowest in Rh-negative (12.72%) which contrary Mehta and Mehta,[7] Kshirsagar *et al*.[11] and Bharadwaj *et al*.[14]

In our study, the percentage of loops higher in female (55.38%) and lowest in male (49.54%) which correlated Rastogi and Pillai,[15] where the percentage of whorls highest in male (34.23%) and lowest in female (28.85%)which correlated Rastogi and Pillai[15] and percentage of arches highest in male (16.23%) and lowest in female (15.77%) which contrary Rastogi and Pillai.[15]

CONCLUSION

This study revealed association between dermatoglyphic, blood group and sex:

- Majority of subjects belongs to Rh-positive and O blood group.
- Loops are the frequently and arches are uncommon fingerprint.
- Loops were highest in B blood group and lowest in AB blood group. Whorls highest in A and lowest in B blood group. Arches were highest in AB and lowest in B.
- Loops higher in female and lowest in male, whorls highest in male and lowest in female and arches highest in male and lowest in female.
- Loops were highest in Rh-positive and lowest in Rh-negative. Whorls highest in Rh-negative and lowest in Rh-positive. Arches were highest in Rh-positive and lowest in Rh-negative.

ACKNOWLEDGMENTS

We would like to thanks all the staffs, faculty of department of anatomy and surgery who supported us during this study.

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How to cite this article: Shivhare PR, Sharma SK, Ray SK, Minj A, Saha K. Dermatoglyphic Pattern in Relation to ABO, Rh Blood Group and Gender among the Population of Chhattisgarh. Int J Sci Stud 2017;4(11):61-65.

Source of Support: Nil, **Conflict of Interest:** None declared.