
Determination and Correlation of Finger Print Pattern and Blood Grouping in Diabetes Mellitus: An Analytical Study

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Abstract

Background: To Determine and correlate between fingerprint patterns and blood group in type II diabetes mellitus.

Results: One hundred individuals with type II diabetes mellitus and One hundred normal individuals as controls were selected for study. Fingerprints were obtained by dactyloscopy. Various fingerprint patterns like arches, whorls, loops were studied and correlated with the respective blood group based on ABO system among the volunteer controls and diabetics. After obtaining results, the analysis was made using Chi square test and One way ANOVA which showed, the most predominant fingerprint pattern among the 100 diabetic volunteers is "Arch pattern" and the most predominant blood group was "O" positive among the diabetic volunteers. Also correlating both finger print and blood group "Whorl pattern" with "B" blood group showed higher predominance among the healthy volunteers.

Conclusions: This is the first study correlating finger print pattern with blood grouping in subjects of Diabetes mellitus. Our study findings showed that O positive blood group with arch pattern type of finger print was the most common findings among diabetes. Thus correlating fingerprint pattern and blood grouping act as a early predictor tool for diagnosing Type II Diabetes mellitus.

Keywords: Fingerprint, Diabetes mellitus, Blood grouping, Dermatoglyphics, ABO system, Forensic

Introduction

Dermatoglyphics serves as analytical tool since prime valages which aids in forensic diagnosis⁽¹⁾. The term Dermatoglyphics can be split into derma and glyph where derma means skin and glyph means carving⁽²⁾. Finger print formation occurs at palm, soles, fingers and toes commences at 12th to 16th week of IUL and completed at 14th week or 6th month of

fetal life. They remain unchanged throughout the course of life until the skin gets destroyed by the process of decomposition⁽³⁾. Two individuals taking identical finger prints are about one in 64 thousand millions⁽⁴⁾ The discharges contained by the thumb prints comprise residues, copious chemicals and their metabolites which may be identified and used for the forensic determination.

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Blood group system is discovered by Karl Landsteiner. Total 19 major groups have been identified which vary in their frequency of spreading various races of mankind. Clinically, 'ABO' and 'Rhesus' groups are of major importance. 'ABO' system is further differentiated as A, B, AB, O blood group types according to presence of corresponding antigen in plasma⁽⁵⁾. Yet another biological record that remains unchanged throughout the life time of an individual is the blood group. Determining the blood group of a person from the samples obtained at the site of crime, helps identify a person. Landsteiner classified blood groups under the ABO blood group system. 'ABO' system is further Fingerprints and Blood groups classified as A, B, AB, and O people types according to presence of corresponding antigen in plasma. 'Rhesus' system is classified into 'Rh-positive' and 'Rh-negative' according to the presence or absence of 'D' antigen⁽⁶⁾

Diabetes mellitus (DM) is a worldwide ailment, and the pervasiveness is growing predominantly in developing nations. This is a key risk of the public health condition universally. Current appraisals specify that there were anticipated to increase to 366 million by 2030^[7] DM can be broadly classified into- type I DM (T1DM) and (T2DM). Evidently, T2DM is now becoming epidemic in the 21st century where India leads the world with the largest number of diabetic patients. Converging points of evidence from population-based studies suggest that Indians are apparently genetically more prone to diabetes and insulin resistance.^[8]

The aim of our research study is to determine as well as correlate finger print pattern, gender, blood grouping in subjects of diabetes mellitus.

Material and Methodology

The sample size was calculated using G*power software and decided to be around 100. All the participants those who are involved in the study were included after obtaining signed informed consent forms; approval of the ethics committee (IHEC/ I/ 0270/ 21) was obtained. The present cross-sectional study was carried at the out-patient department of

oral and maxillofacial pathology, in our institution. Total of 200(50 male controls&50female controls; 46 diabetic males & 54 diabetic females) belonging to the age group of range 35-75 years were randomly chosen for the study. Performa was kept ready which included diabetic history, demographic data and also column for entering finger print pattern and blood grouping. The fingerprints were obtained from left thumb finger by using stamp ink method. After proper hygiene measures to thoroughly remove the dirt from the hands, fingerprints are taken. The finger prints were obtained in their respective Performa. The different patterns of fingerprints which include loops, whorls, and arches were dogged with the help of a hand lens. They were asked to wash their hands after the sample collection using hand wash. (Figure-1)



Fig. 1 Finger print patterns

Blood groups for all these persons were also evaluated after finger print collection using SPANCLONE (Anti A+ Anti B+ Anti D(Rh₀) Monoclonal antibody) using standard procedure and it was recorded in the proforma. (Figure-2)

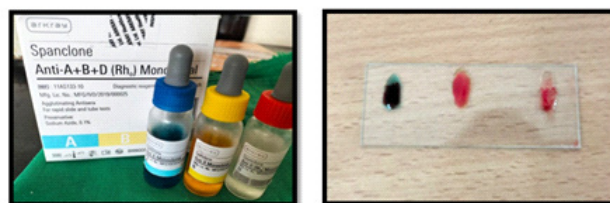


Fig. 2 Blood grouping

All the data were entered in the excel sheet and it was further analyzed and compared using appropriate statistical test.

Results

The finger print patterns and blood groups were evaluated. The results were tabulated for controls and diabetics separately.

Table 1: Prevalence of blood groups among Control males and females (n=100)

Males - 50; Females - 50

BLOOD GROUPS	MALES		FEMALES		TOTAL %	AVERAGE
	NO	FREQUENCY	NO	FREQUENCY		
A+	9	18	10	20	38	19
A-	0	0	1	2	2	1
AB+	3	6	2	4	10	5
AB-	0	0	0	0	0	0
B+	19	38	20	40	78	39
B-	2	4	0	0	4	2
O+	16	32	16	32	64	32
O-	1	2	1	2	4	2

Table 2 Prevalence of finger print among Control males and females (n=100)

Males - 50; Females - 50

GENDER	WHORLS NO FREQUENCY		ARCH NO FREQUENCY		LOOP NO FREQUENCY	
	MALES	23	46	6	50	21
FEMALES	22	44	9	50	19	38
TOTAL	45		15		40	

Table 3 Prevalence of blood groups among diabetic males and females (n=100)

Males- 54; Females- 46;

BLOOD GROUPS	MALES		FEMALES		TOTAL %	AVERAGE
	NO	FREQUENCY	NO	FREQUENCY		
A +	15	28	5	11	39	20
A-	0	0	0	0	0	0
AB+	3	5	3	7	12	7
AB-	2	4	0	0	4	2
B+	10	19	11	23	42	21
B-	2	4	2	4	8	4
O+	21	35	23	50	85	43
O-	1	2	2	4	5	3

Table 4 Prevalence of finger print among diabetic males and females (n=100)

Males- 54; Females- 46;

GENDER	WHORLS NO FREQUENCY		ARCH NO FREQUENCY		LOOP NO FREQUENCY	
	MALES	13	24	13	24	29
FEMALES	13	28	14	30	18	39
TOTAL	26		27		47	

The graphical representation of the results obtained were presented for controls and diabetics individually (Fig-3 & Fig-4)

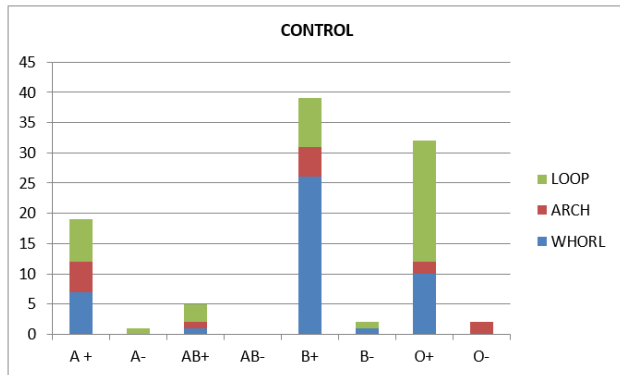


Fig 3: Co-relation of finger print patterns with blood grouping of Controls

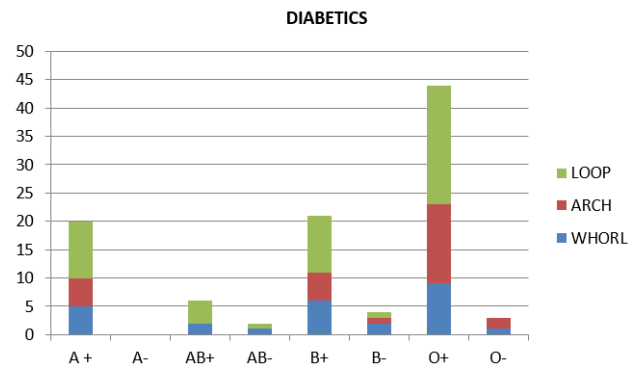


Fig 4: Correlation of Finger Print pattern with Blood grouping in Diabetics

BLOOD GROUP	CONTROL				DIABETIC			
	WHORL	LOOP	ARCH	TOTAL	WHORL	LOOP	ARCH	TOTAL
A+	7	5	7	19	5	5	10	20
A-	0	0	1	1	0	0	0	0
AB+	1	1	3	5	2	0	4	6
AB-	0	0	0	0	1	0	1	2
B+	26	5	8	39	6	5	10	21
B-	1	0	1	2	2	1	1	4
O+	10	2	20	32	9	14	21	44
O-	0	2	0	2	1	2	0	3

Fig 5: Correlation of Finger Print pattern with Blood grouping in Diabetics

Fingerprint pattern:

The fingerprint patterns were assessed for thumb finger of both the hands. We analyzed the finger print patterns according to Henry's system of classification in 1900 which classifies the fingerprint pattern broadly into loops, whorls, & arches. The percentage distribution and different pattern of distribution of these cases was calculated and tabulated. Predominantly Whorl pattern was noted in control subjects and Arch pattern of finger prints were noted in diabetic subjects with a percentage frequency of 44% and 42% respectively.

Chi-square analysis was done between the controls and diabetics finger print pattern and it showed p value of 0.143 which is non-significant.

Blood group:

From the distribution of blood groups among the subjects, maximum percentage of B+ was seen in control subjects and O+ blood group was noted in diabetic subjects.

Chi-square analysis was done between the controls and diabetics' blood grouping and it showed p value of 0.301 which is also non-significant.

The Correlation of blood group with finger print pattern in our study was done one way ANOVA statistical analysis and it showed value of p value of 0.070 for finger print patterns and 0.358 for blood grouping among the groups.

Discussion

Ameer et al (2014), collected finger prints from hundred diabetic subjects and found that majority of the patients were belonging to whorl pattern followed by patients belonging to Loop pattern and the least pattern was composite⁽⁹⁾. Our study was contradictory with this study showing predominantly Arch pattern of finger prints followed by whorl pattern & loop pattern.

Mehta et al (2015) conducted a study correlating finger print pattern with diabetic subjects, on one hundred diabetic subjects and concluded that there was significant difference between the subjects for the three fingerprint pattern and found that Whorl pattern was the dominant pattern found mostly in

diabetic subjects. Loop pattern was significantly decreased while Arch patterns were significantly reduced in right and left hands of male and left hand of female diabetics⁽¹⁰⁾. This study was consistent with our study showing decreased pattern for loop pattern.

Meo et al (2016) did a systematic review with forty seven research documents extracting from search engines of ISI -Web of Science, EMBASE and PubMed. They also suggested from their findings that subjects with blood group "B" should be closely monitored by physicians as these subjects have an increased risk of type 2 diabetes⁽¹¹⁾. In contrary, our study showed a predominant 'O' positive blood group among the diabetics and 'B' positive blood group among the control group.

Manjusha et al (2017) performed a study correlating finger print and lip print pattern with 100 uncontrolled T2DM patients and 50 healthy controls. Type IV pattern of lip prints was found significantly more in the diabetic patients. Their study analysis showed that fingerprint analysis did not reveal any significant association with diabetes.⁽¹²⁾

Azhagiri et al (2018) did a study correlating finger print patterns with blood grouping of both the gender among 150 subjects. Total number of loops found in both gender in the left thumb print were 60 (40%), followed by whorls 40 (27%), Mixed 34 (23%) while Arches were present in a low frequency 16 (11%). Most of subjects in our study belonged to blood group "O" followed by "B", "A" and "AB" blood groups. Blood group O positive was the most common, whereas O negative and AB negative were the rarest. Highest numbers of Loops were found in blood groups O, B compared to A and AB. Frequency of all finger print patterns was found to be more in females.⁽¹³⁾ Consistent to this study, 'O' positive blood group was predominant in type II diabetes mellitus.

Sathawane et al (2019), conducted a study correlating lip print and finger print pattern with the subjects of diabetes mellitus. The study was conducted on 50 control subjects and 50 uncontrolled type 2 diabetic subjects showed the results of type IV pattern of lip print and whorl pattern of finger print was predominant in diabetic subjects. They

concluded that fingerprint and lip print pattern can be used as an early diagnostic aid/ marker for type – II diabetes mellitus subjects.⁽¹⁴⁾

Legese et al (2020) conducted study in Ethiopian population, of 424 participants and found, blood group O was higher in frequency. ABO blood groups showed significant association with T2DM, a chi-square value of 12.163 and P value of 0.007. Blood group B was associated with an increased risk and O blood group with decreased risk of type 2 diabetes mellitus.⁽¹⁵⁾ In contrary to this study, Our study findings showed that O blood group was increased among type II diabetes and B blood group was increased among control group.

Ingle et al (2020), in their research study reviewed that it investigates the problem of blood group identification and analysis of disease those arises with aging or disease called as lifestyle-based like hypertension, type 2-diabetes and arthritis from fingerprint by analyzing their patterns correlation with blood group and age of an individual. It is observed that fingers of an individual are having multiple unique patterns those are need to be extracted with computerized method with fingerprints image captured using digital device which allow finding known association of fingerprints patterns which may enhance the authenticity of the fingerprints in blood group identification and early indication of lifestyle-based diseases of an individual. They also added that analysis and classification of community based on age, blood group, fingerprint patterns and lifestyle diseases help to tackle any pandemic in future like COVID-19 in which mankind may suffer a lot having lifestyle based diseases like hypertension, type 2-diabetes⁽¹⁶⁾

Sharjeel et al (2021), conducted case control study in two hundred subjects, and found a significant association between blood group B and type 2 diabetes mellitus ($p=0.006$), whereas a negative association was seen between the blood group O and type 2 diabetes mellitus ($p=0.001$). A significant association was found between blood group B and risk of type 2 diabetes mellitus (T2DM).⁽¹⁷⁾ This study findings were contrary to our study findings.

Ghafar et al (2022), conducted study on 484 diabetic subjects and 182 pre- diabetic subjects

correlating blood group with diabetes. The percentage values of blood Group-B are 32% in DM Vs. 31% in pre-diabetics, followed by blood Group-O as 18% in DM Vs. 11% in pre-diabetics. In addition, percentage distribution of Rh system was also calculated, in which Rh +ve Group was high and more common in DM patients as compared to pre-diabetics. The inference of their study was Diabetes mellitus has a positive correlation with ABO blood groups, and people with Group-O have increased susceptibility to DM disease.⁽¹⁸⁾ Our study findings were correlating with the findings of the above study in blood grouping.

Conclusion

Diabetes mellitus is becoming an epidemic alarm mainly for Indian sub- continent. We formulated this cross sectional study, correlating finger print pattern with blood grouping as a thought/ attempting of creating early diagnosis and early prevention from the analysis of previously conducted researches. This is the first study correlating finger print pattern with blood grouping in subjects of Diabetes mellitus. Our study findings showed that O positive blood group with arch pattern type of finger print was the most common findings among diabetes. From the results, highlights of our study were:

CONTROLS: The common findings in descending orders as follows:

B+ = Whorl Pattern

O + = Arch Pattern

O + = Whorl Pattern

DIABETICS: The common findings in descending orders as follows:

O + = Arch Pattern

O += Loop Pattern

B+= Arch Pattern.

Declaration

ETHICS APPROVAL AND CONSENT TO PARTICIPATE - All the participants those who are involved in the study were included after obtaining signed informed consent forms; approval of the ethics committee (**IHEC/ I/ 0270/ 21**) was obtained

AVAILABILITY OF DATA AND MATERIAL -

. The data and information for each individual novice and expert participant used to produce our results are available

CONFLICT OF INTEREST - Nil**CONSENT FOR PUBLICATION - Applicable**

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AUTHORS' CONTRIBUTIONS

- Dr. Mahalakshmi - Sample collection & data analysis
- Ms. Jincy - Sample collection
- Ms. Praveena - Sample collection
- Dr. Mahalingam Bhuvanewari - Data analysis
- Dr. Sathish Muthukumar - Critical review
- Dr. Merlin Jayaraj - Critical review

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