

**Original Article****Study of Palmar Dermatoglyphics Patterns in ABO Blood Group and Gender**

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**Abstract**

**Context:** Study of dermatoglyphics is considered as the one of the reliable tools for personal identification because of the uniqueness of the dermatoglyphic patterns. ABO blood groups are also proved to be a dependable source of identification. Both dermatoglyphics and ABO blood groups are genetically determined. The observations of this study may provide some baseline data for future studies in this regard.

**Objective:** The objective of the present study is to find out the relationship of palmar dermatoglyphic patterns with ABO blood groups and gender.

**Materials and methods:** It was a cross-sectional, observational and analytic type of study conducted in the Department of Anatomy of Chittagong Medical College. 100 male and 100 female MBBS students of Chittagong Medical College were selected by convenient purposive sampling technique for the study. Finger prints were obtained by ink method and detailed analysis was done by using SPSS-20.

**Results:** The result shows in all blood groups A,B,O & AB. Loops was the most commonly observed pattern in all groups. In males frequencies of loops were high in blood group AB, whorls were high in blood group B and arches were high in blood group O. In case of females loops were high in blood group O, whorls and arches were high in blood group AB. Percentages of loops and arches were significantly higher, and whorls were significantly lower in females than that in males.

**Conclusion:** This study suggested a relationship of dermatoglyphic patterns with blood group and gender.

**Keywords:** Dermatoglyphics, ABO blood groups, gender, identification.

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## Introduction

Dermatoglyphics is the study of epidermal ridges and their configuration on the volar aspect of the palmar and plantar regions<sup>1</sup>. Epidermis and dermis are the 2 layers of human skin. The dermal-epidermal interdigitation forms ridge and grooves in the thick skin of palms and soles. These ridges are called the epidermal ridges. The patterns of these ridges are unique for each human being<sup>2</sup>. Primary ridge development starts along the basement membrane and differentiation starts between 12–16 weeks of intra uterine life. The process of ridge development is brought to an end by the 20th week of fetal life<sup>3</sup>. In 1892 Sir Francis Galton categorized human fingerprint patterns into Loop, Whorl and Arch<sup>4</sup>. There is immense possibility to use dermatoglyphics as the one of the dependable method for identification as it is constant and unique for a particular person. Fingerprints may be altered in superficial injuries like cuts, bruises and superficial burns involving epidermis only but the change is temporary and it reappears after healing<sup>5</sup>. A blood type or blood group is a classification of blood based on the existence of antigenic substances on the RBC surface. Austrian scientist Karl Landsteiner discovered the ABO blood group system in 1900. He observed three different blood types (A, B and O) from serological differences in blood called the Landsteiner Law<sup>6</sup>. The fourth type, AB was discovered in 1902 by Decastello and Sturli. About 19 blood groups have been identified so far. Among which ABO and Rh blood group systems are of major importance clinically<sup>7</sup>. Studies by different researches suggested a strong association between fingerprint patterns and blood groups. Prompt detection of crime is a challenge in crime investigation. Sometimes, no other evidence but fingerprints and some blood stains are left at the crime scene which help to identify the criminal or the victim. The present study aims to find out any significant association between fingerprint patterns and blood group as well as gender. This study will be of great help in determination of gender and blood group and vice versa from the fingerprints.

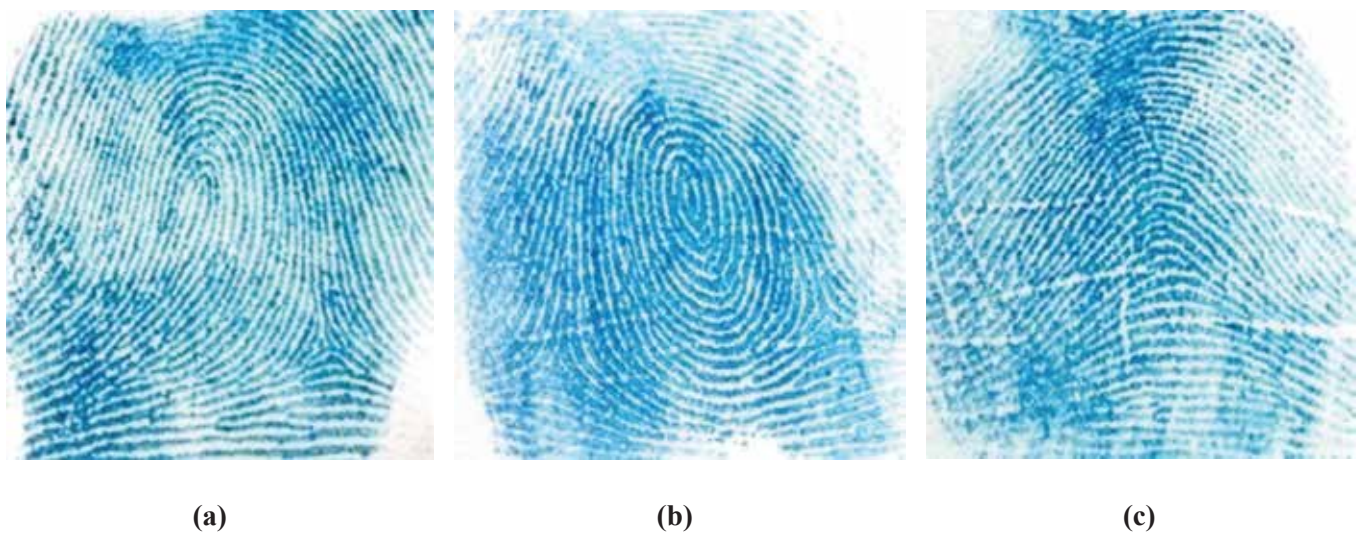
## Materials and methods

The present study was cross sectional and observational in nature with analytical components. It was carried out at Chittagong Medical College, Chittagong from July 2017 to June 2018. 200 MBBS students with known blood group were selected as study subjects by convenience sampling. Written consent of all the participants was obtained after explaining them about the aims and objectives of the study. A data sheet of personal information was provided to the study subjects and filled up to avoid any duplication. Basic details such as name, age and blood group of each subject was recorded from the student's ID card. The subjects were asked to clean their hands with a liquid soap to remove any dirt and grease to obtain clean and legible fingerprints. Dermatoglyphics prints were taken by using Ink Method as described by Cummins and Midlo (1926)<sup>8</sup>. Ink was applied over fingers with the roller soaked with ink and smeared thoroughly and uniformly, then printed on paper by rolling them from radial to ulnar side to include all the patterns. Then the individual were asked to clean both hands with turpin oil, liquid soap under running tap water and dried with paper towel. A magnifying glass was used to identify the finger ridge patterns on the distal phalanges. In this study dermatoglyphics pattern were recorded separately for five digits of both hands in data sheet. Patterns were identified as Loop, Whorl and Arch. Study subjects with permanent scars on fingers and thumbs, deformities of hand or fingers due to injury or diseases, and those with extra, webbed fingers were excluded from the study. A computer based software program - Statistical Package for Social Science (SPSS version 20.0) was used for analyzing the data. As dermatoglyphic patterns are qualitative data, they were compared by Chi-square test. Data were analyzed keeping in view the objectives of the study. The respective probability (p) values were also determined. A p value  $\leq 0.05$  was set as being statistical significant.

**Ethical Clearance:** The study was approved by Ethical Review Committee of Chittagong Medical College.



**Figure 1: Showing steps of taking fingerprint (Thumb being rolled)**



**Figure 2: Different dermatoglyphics patterns on fingertips (a) Loop, (b) Whorl, (c) Arch**

### Results

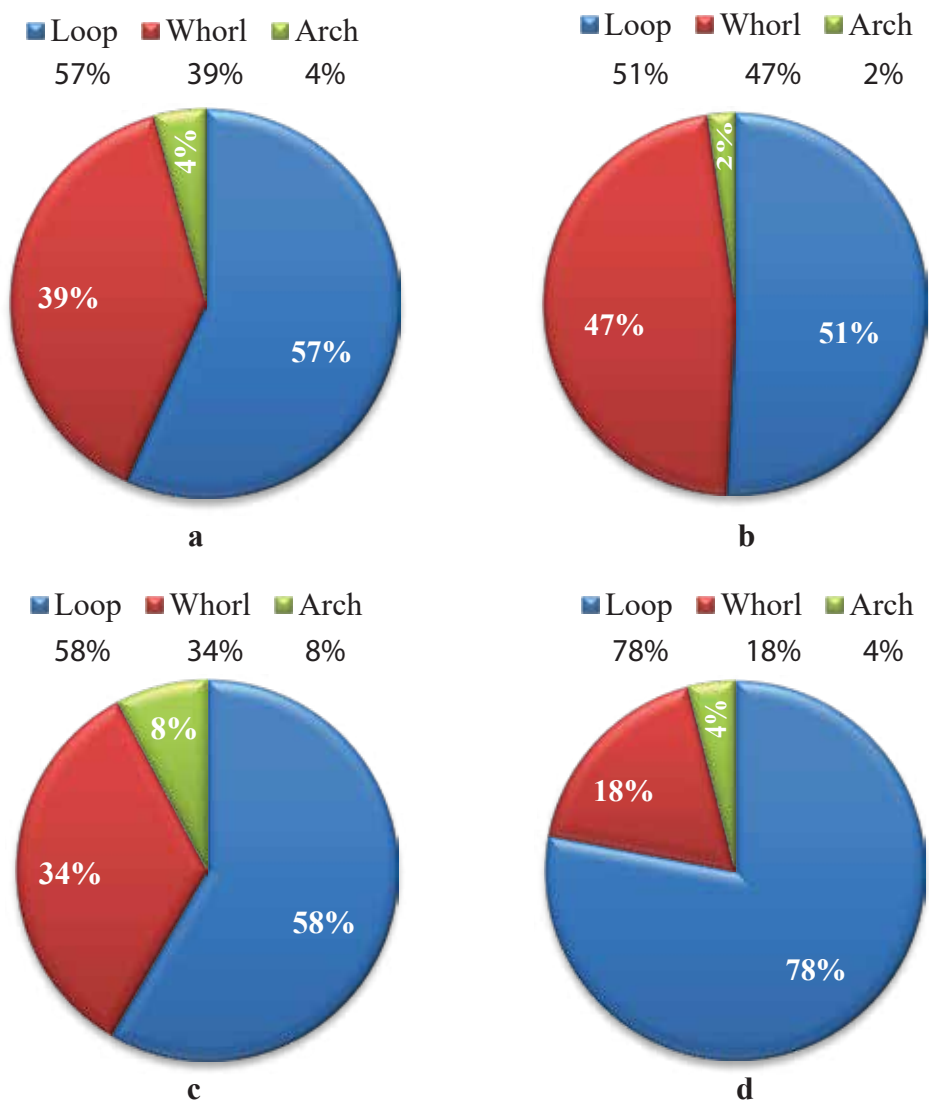
Table 1 shows frequency and percentage wise distribution of various finger ridge patterns in males according to ‘ABO’ blood groups. It was observed that in males percentage of loops was highest in blood group

AB (78.00%) and lowest in blood group B (50.69%). Also, percentage of whorls in blood group B was highest (46.97%) as compared to lowest in blood group AB (18.00%). Similarly, percentage of arches was highest in blood group O (7.75%) and lowest in blood group B (2.33%).

**Table 1: Distribution of Finger Ridge Patterns in males according to ABO blood group (n=100)**

Blood Group	Loop		Whorl		Arch	
	Number	Percentage	Number	Percentage	Number	Percentage
<b>A</b>	119	56.66%	82	39.05%	9	4.28%
<b>B</b>	218	50.69%	202	46.97%	10	2.33%
<b>O</b>	181	58.39%	105	33.87%	24	7.75%
<b>AB</b>	39	78.00%	9	18.00%	2	4.00%

Chi square test for finger ridge patterns in ABO blood groups in males was done by counting  $X^2$  value (32.602) >  $X^2$  0.95 (12.592), these analysis shows highly significant difference ( $P < 0.001$ ) among ABO blood groups.



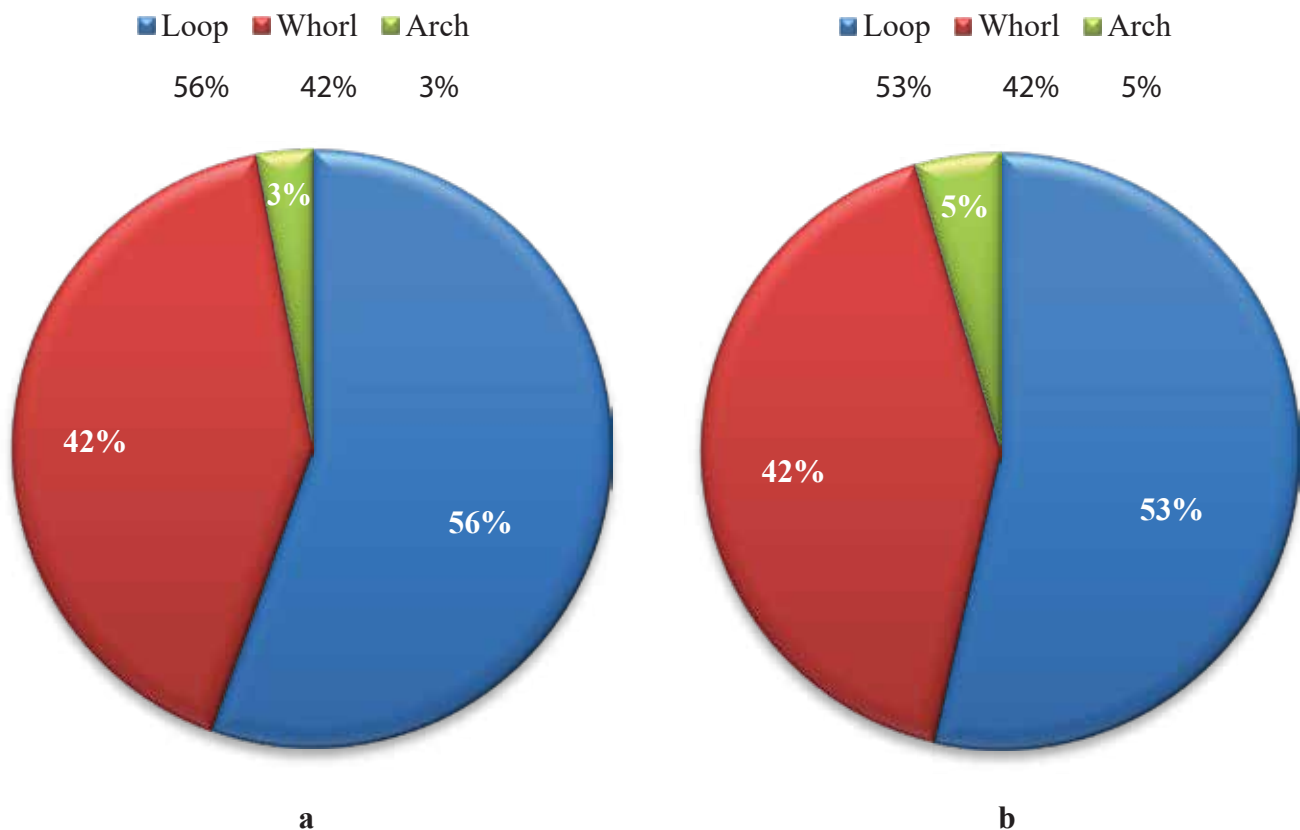
**Figure 3: Distribution of Finger Ridge Pattern in males of (a) blood group A, (b) blood group B, (c) blood group O, (d) blood group AB**

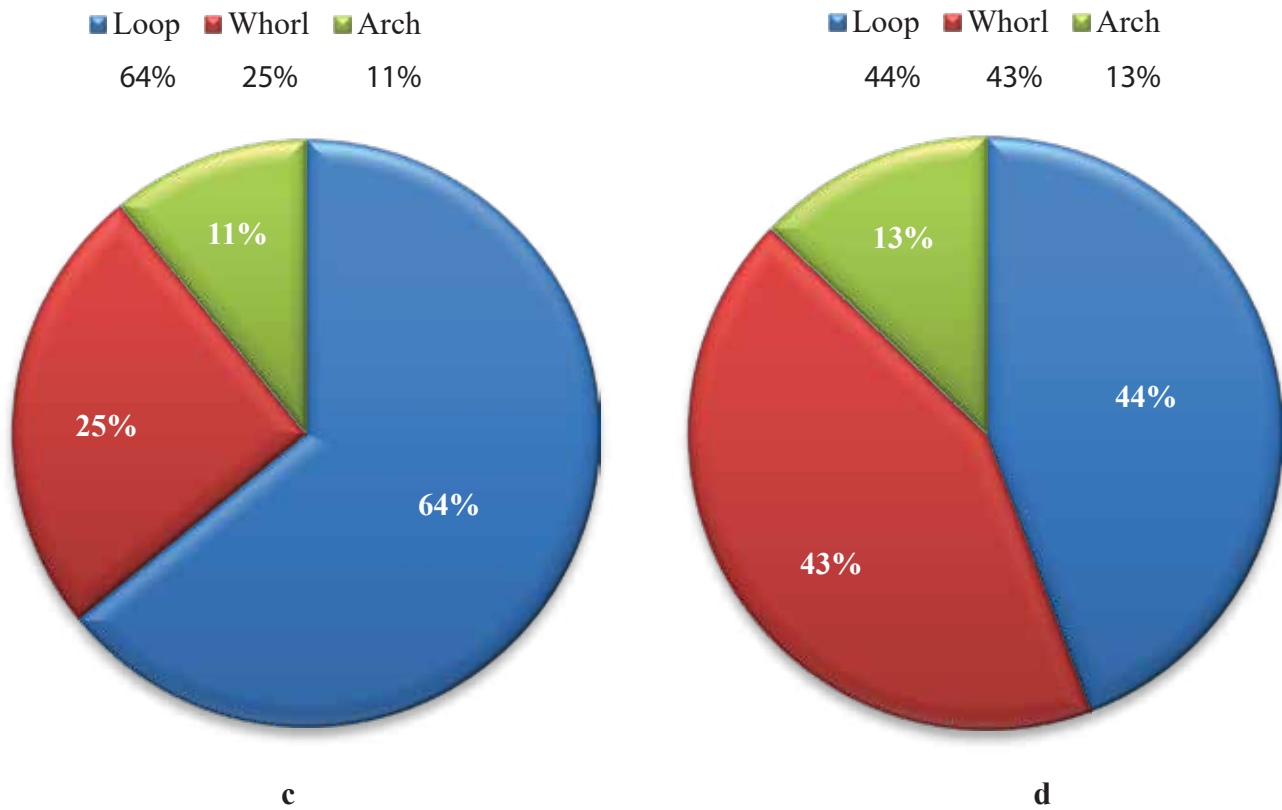
Table 2 shows frequency and percentage wise distribution of various finger ridge patterns in females according to ‘ABO’ blood groups. It was observed that in females percentage of loops was highest in blood group O (64.12%) and lowest in blood group AB (44.29%). Percentage of whorls in blood group AB was highest (42.86%) as compared to lowest in blood group O (25.00%). Similarly, percentage of arches was highest in blood group AB (12.86%) and lowest in bloods group A (3.00%).

**Table 2: Distribution of Finger Ridge Patterns in females according to ABO blood group (n=100)**

Blood Group	Loop		Whorl		Arch	
	Number	Percentage	Number	Percentage	Number	Percentage
<b>A</b>	111	55.50%	83	41.50%	6	3.00%
<b>B</b>	209	53.58%	163	41.79%	18	4.62%
<b>O</b>	218	64.12%	85	25.00%	37	10.88%
<b>AB</b>	31	44.29%	30	42.86%	9	12.86%

Chi square test for finger ridge patterns in ABO blood groups in females was done by counting X<sup>2</sup> value (41.990) >X<sup>2</sup> 0.95 (12.592), this analysis shows highly significant difference (P<0.001) among ABO blood groups.





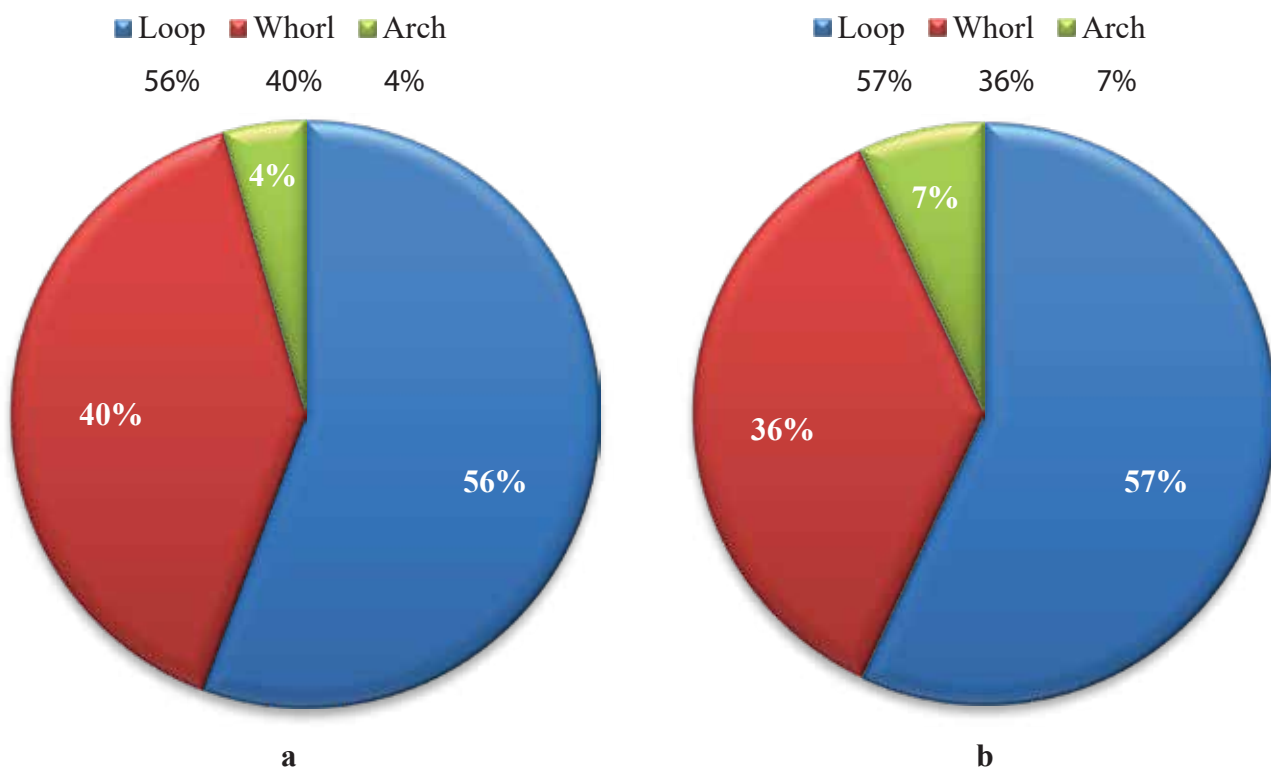
**Figure 4: Distribution of Finger Ridge Pattern in females of (a) blood group A, (b) blood group B, (c) blood group O, (d) blood group AB**

Table 3 shows frequency and percentage wise distribution of various finger ridge patterns according to gender. It was observed that in females percentage of loops was higher (56.90%) as compared to males (55.70%). Whereas percentage of whorls found to be higher in males (39.80%) compared to females (36.10%). Again, females (7.00%) showed higher percentage of arches than males (4.50%).

**Table 3: Distribution of Finger Ridge Patterns according to gender (n=200)**

Gender	Loop		Whorl		Arch	
	Number	Percentage	Number	Percentage	Number	Percentage
Male	557	55.70%	398	39.80%	45	4.50%
Female	569	56.90%	361	36.10%	70	7.00%

Chi square test for finger ridge patterns according to gender was done by counting  $X^2$  value (7.366) >  $X^2$  0.95 (5.991), this analysis shows significant difference ( $P < 0.05$ ) among gender.



**Figure 5: Distribution of Finger Ridge Pattern (a) in males, (b) in females**

### Discussion

Various researches have been conducted many studies in different countries about the ability of fingerprints to determine sex and identity of individuals. Again many studies have been carried out regarding dermatoglyphics and blood group system. However, so far there is no published article regarding the relationship of dermatoglyphic patterns with gender and blood group in Bangladesh. So a comparison of results of the present study with the results of different authors and researchers from different countries was done.

The present study showed highly significant differences in dermatoglyphic patterns according to blood group in both sexes. Percentage of loops was highest in blood group AB (78%) and lowest in blood group B (50.69%) in males. And in females percentage of loops was highest in blood group O (64.12%) and lowest in blood group AB (44.29%) in the present study. Susmiarsihet al<sup>9</sup>, Patil et al<sup>10</sup>, KShirsagar et al<sup>11</sup> have found similar findings. But study of Manoranjithamet al<sup>12</sup> found that percentage of loops was highest in blood group O (64.2%) in males.

It was observed in the present study that females (56.9%) showed higher percentage of loops than males (55.7%), which coincides with the study of Butt et al<sup>13</sup>, Joshi et al<sup>14</sup>, Khadri et al<sup>15</sup> and Sangam et al<sup>16</sup>. However Ujaddugheet al<sup>17</sup> found higher percentage of loops in males than in females.

Present study showed percentage of whorls was highest and lowest in blood group B (46.97%) and blood group AB (18%) in males, in blood group AB (42.86%) and blood group O (25%) in females respectively. Studies of Butt et al<sup>13</sup>, Mehta et al<sup>7</sup> have showed similar findings, whereas study of Patil et al<sup>10</sup> have showed highest percentage of whorls was present in blood group A (42.39%) in males and blood group O (38.76%) in females.

It was observed in the present study that males (39.80%) showed higher percentage of whorls than females (36.10%). Butt et al<sup>13</sup>, Joshi et al<sup>14</sup>, Khadri et al<sup>15</sup>, Sangam et al<sup>16</sup> and Ujaddughe et al<sup>17</sup> have found similar findings where whorls were more frequent in males.

In the present study percentage of arches was highest in blood group O (7.75%) and lowest in blood group B

(2.33%) in males, highest in blood group AB (12.86%) and lowest in blood group A (3%) in females. This result is similar to the studies of KShirsagaret al<sup>11</sup>. But the study done by Patilet al<sup>10</sup> showed blood group AB (2.92%) has the highest percentage of arches in males and blood group O (3.26%) has the lowest percentage of arches in females.

Females (7%) showed higher percentage of arches than males (4.5%) in our study, which is similar to the study of Joshi et al<sup>14</sup>, Ujaddughe et al<sup>17</sup>, and Sangam et al<sup>16</sup>. But in contrast Butt et al<sup>13</sup> observed higher frequency of arches in males (13.8%) than in females (13%).

### Conclusion

The study revealed highly significant differences in distribution of dermatoglyphic patterns according to blood group in both genders. Again a significant difference was observed in distribution dermatoglyphic patterns according to gender.

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