

## Analysis of Coagulation Profiles and Blood Groups Among Healthy Blood Donors

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### ABSTRACT

The cross-sectional study is done on healthy volunteer blood donors from Lady Reading Hospital (LRH), Al-Khidmat Hospital (AKH), and Blood Donation Center. A total of 300 individuals of male different ages were included in the study in which most of them 23-28 years old. The aim of the study is to find variations O blood group and Coagulation Profiles in healthy blood donors. To better understand the post bleeding complication in blood donors. The most common blood group were B+ (34%,  $n=106$ ), A+(21%,  $n=65$ ), O+(20%,  $n=60$ ). The minimum value for prothrombin time (PT) is 14S and the maximum value is 40S with mean and standard deviation of  $17.11\pm 5.54$ S, activated partial thromboplastin time (APPT) minimum value is 25S and the maximum is 44S with mean and standard deviation is  $35.54\pm 2.39$ . Correlation shows that blood groups, AB- had the lowest APPT (34.00S) and PT (14.75 S), while O- had the highest APPT (36.75S) and PT (18.75 S) after donation. The other blood groups, including AB+, B+, A-, O+, A+, and B-, had intermediate values for both APPT and PT. On the basis of blood group there is no fluctuation record in coagulation profile.

Keywords: coagulation profile, screening, blood grouping, Khyber Pakhtunkhwa, Peshawar, Pakistan

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## Introduction:

The volunteer donors give blood voluntarily for the purpose of saving life others for humanity. Need Volunteers donors in case of traumatic injury, surgeries, and most needed for genetic diseases like thalassemia patients (1). According to the World health organization (WHO), The minimum time between blood donations should be three months. The donor must be in good health, mentally alert, and physically fit, and cannot be a prison guard, have not several sexual partners, or not a drug addict. Only accept unpaid, voluntary blood donations if donors fulfill the following criteria. The donor's temperature and pulse rate must be normal, without anticoagulant medication, have normal blood pressures within acceptable ranges and hemoglobin must be at least 12.5 g/dl. The donor must not have any acute respiratory illnesses or skin disease at the time of the phlebotomy. The donor must be screened before blood donation. The most common coagulation test method used to diagnose DIC (Disseminated Intravascular Coagulation), liver disease, vitamin K insufficiency, and hemophilia is doing the coagulation profile, including Prothrombin Time (PT), Activated Partial Thromboplastin Time (APTT), which is commonly measured in laboratories, is effective at determining the possibility of bleeding. Some medications, including blood thinners and antibiotics, might affect PT and APTT results. The test is often used to identify quantitative and qualitative anomalies in the intrinsic (factors VIII, IX, and XI) and common (factors II, V, and X) coagulation pathways (2).

According to one study, the PT test uses to detect liver function, coagulation problems, and the potential for intraoperative bleeding. The most used test for determining "extrinsic route" coagulation factors is the PT. Testing for the lack of intrinsic or common route factors do and using the time to produce partial thromboplastin (APTT). Inequitable PT results between laboratories led to the creation of the International Normalized Ratio (INR) (3).

A wide range of infrequent but complex conditions that might increase the risk of bleeding for nonblood donors is together referred to as Inherited Bleeding Disorders (IBDs). The most prevalent IBDs are Von Willebrand disease, hemophilia A, and hemophilia B. IBDs must be diagnosed with a comprehensive history of bleeding and specialized coagulation tests. Patients with IBD who experience bleeding episodes may benefit from the use of antifibrinolytics such as tranexamic acid, desmopressin, and coagulation factor concentrate (4).

A thorough history, including the location and intensity of bleeding, is crucial for determining if a patient may have a bleeding disease. For instance, mucocutaneous bleeding is frequently observed in diseases of primary hemostasis including platelet abnormalities and von Willebrand disease (VWD), which might provide a clue as to the potential underlying cause. More frequently, coagulation factor deficits are associated with bleeding into joints and muscles. Prior hemostatic system difficulties require special consideration (5).

(Mahir & Technology, 2023) reported Activated partial thromboplastin time [APTT], platelet count, fibrinogen level, the international normalized ratio [INR], and TEG whole blood coagulation assays. To assess the efficiency of TEG and SLTs for spotting bleeding, receiver operating characteristic (ROC) curves were created. By using Spearman rank-order analysis, the associations between SLTs and TEG parameters with comparable coagulation profiles evaluate (6). Thromboelastographic is also used to study coagulation status just before and after blood donation. During blood donation, citrate is used for anticoagulation. However, a couple of things should be considered when performing thromboelastographic from donated blood. Thromboelastographic is a technique to evaluate the overall coagulation behavior of blood and blood components. First, we evaluate the literature concerning the use of thromboelastographic for characterizing coagulation behaviors of healthy volunteers, such as blood donors. Overall coagulation is sensitive to gender, most likely caused by the difference in hematocrit and plasma content of male versus female blood (7). Following thorough evaluation of plasmatic coagulation and platelet function, a recognized bleeding problem can only be found in a small minority of patients with a mild-to-moderate bleeding tendency. Patients with bleeding of unknown origin are those who do not have abnormalities in plasmatic coagulation or platelet function (8).

People who are willing to donate blood must meet certain requirements set forth by blood donation organizations, including having excellent health. The causal link between blood donation and health status should follow as only healthy people are allowed to donate blood. A lot of attention has also been paid to the opposing causal impact. For example, blood donors believe that donating blood improves their actual and perceived health status (9).

An large proportion of the coagulopathy people consisted of patients with polytrauma. The initial coagulation profile is especially significant in determining outcome for patients with substantial polytrauma (10).

Choosing when donors are suitable is the most crucial step. Pre-screening of prospective blood donors is essential to look for factors including a person's medical history, past behaviors, physical evaluation, blood pressure monitoring, and blood tests that could increase their risk of donating. to select appropriate blood donors (11). Because male and female blood have different hematocrit and plasma contents, overall coagulation is sensitive to gender. Different fibrinogen levels or the use of contraceptive pills have less and less noticeable impact on the thromboelastographic response. Following a donation of blood or smoking, short-term hypercoagulable effects are seen (7).

## **METHOD AND METERIAL**

### **Study design:**

A Cross-sectional study is conducted on healthy voluntary blood donors.

### **Study setting:**

The study is conducted at Lady reading hospital-MTI (LRH), Al-khidmat hospital (AKH) & blood donation center and as well as department of MLT skill Lab in Abasy university

### **Study duration:**

The study duration is six-Month.

### **Sample selection:**

#### **Inclusion Criteria:**

- I. Volunteer blood donors of only male
- II. Ages between of 18 and 60
- III. No history of bleeding or clotting disorders
- IV. Not currently taking any anticoagulant medication
- V. No recent significant operations, blood transfusions, or coagulation-related diseases.

#### **Exclusion Criteria:**

- I. Those who have pervious medical anticoagulation drugs intake.
- II. History of bleeding disorders

- III. History of thrombotic events
- IV. Use of blood thinners: Participants using blood thinners or antiplatelet medications

#### **SAMPLE TECHNIQUE:**

##### **a) Sample Collections:**

Samples was collected from healthy volunteer blood donors. A total of 300 individuals of different ages were included in this study.

##### **b) Assessment of Blood Group:**

with whole ABO blood group is determined by using TILE method. We use antisera A, B, and D and mix blood of donor and wait for a maximum 2 minutes for agglutination.

##### **c) Assessment of Prothrombin Time (PT):**

Prothrombin time is analyzed manually in laboratory by using Winner Lab Kit. For PT 100  $\mu$ l of plasma is mix with 200  $\mu$ l of reagent after incubation in water bath at 37°C for 2 minutes, start a stopwatch to record result, and wait for clotting.

##### **d) Assessment of Activated Partial Thromboplastin Time (APTT):**

Activated Partial thromboplastin is also analyzed manually in laboratory by using Winner Lab Kit. For APTT 100  $\mu$ l of plasma is mix with 100  $\mu$ l of reagent after incubation add Calcium chloride ( $\text{CaCl}_2$ ) in water bath at 37°C for 2 minutes, start a stopwatch to record result, and wait for clotting.

##### **e) INTERNATIONAL NORMALISED RATIO (INR):**

The INR is derived from prothrombin time (PT) which is calculated as a ratio of the patient's PT to a control PT standardized for the potency of the thromboplastin reagent, using the following formula:

$$\text{INR} = \text{Patient PT} \div \text{Control PT}.$$

$$\text{INR} = 15 \div 14 = 1.07$$

$$\text{INR} = 1.07$$

#### **Statistical Analysis:**

SPSS version 25 was used for the analysis of the data.

#### **RESULT**

The statistical finding of Our Study is that a total of 300 healthy individual volunteer blood donors are included in most of the age groups were 23-28 years shown in the figure (1). The most common

blood group found is B+ (34%,  $n=106$ ), the second common is A+(21%,  $n=65$ ), the third one is O+(20%,  $n=60$ ), and so on shown in the table (1).

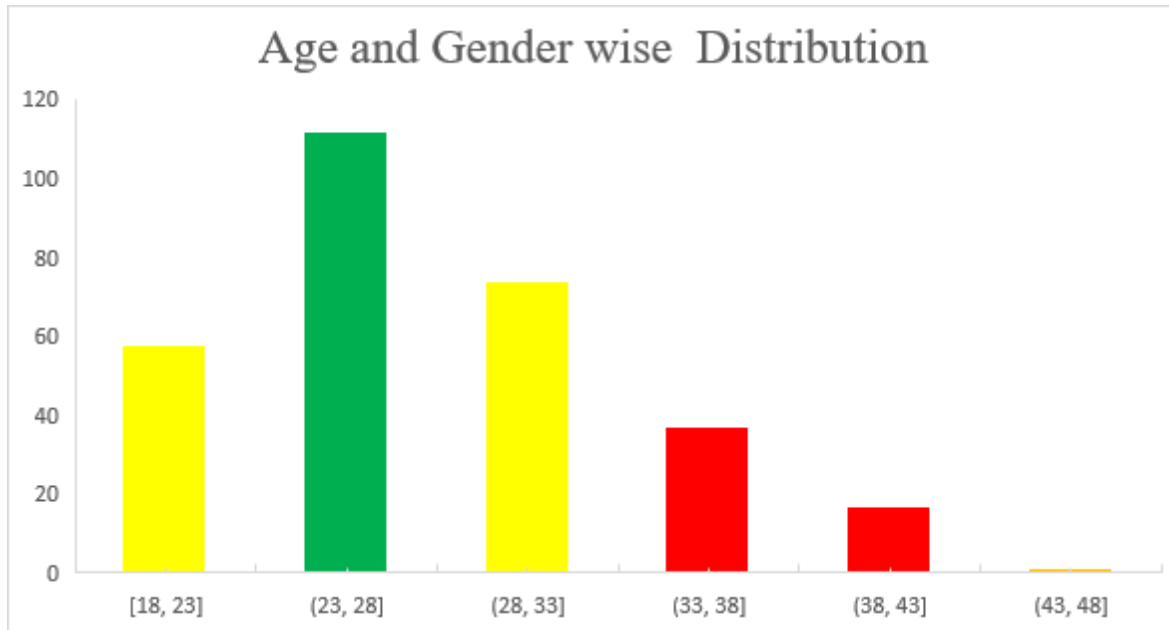


FIGURE: 1 AGE AND A GENDER DISTRIBUTION

TABLE: 1 BLOOD DONOR

Blood Group	Frequency	Percent
A-	14	4%
A+	65	21%
AB-	4	1%
AB+	35	11%
B-	13	4%
B+	104	34%
O-	4	1%
O+	60	20%
Total	300	100

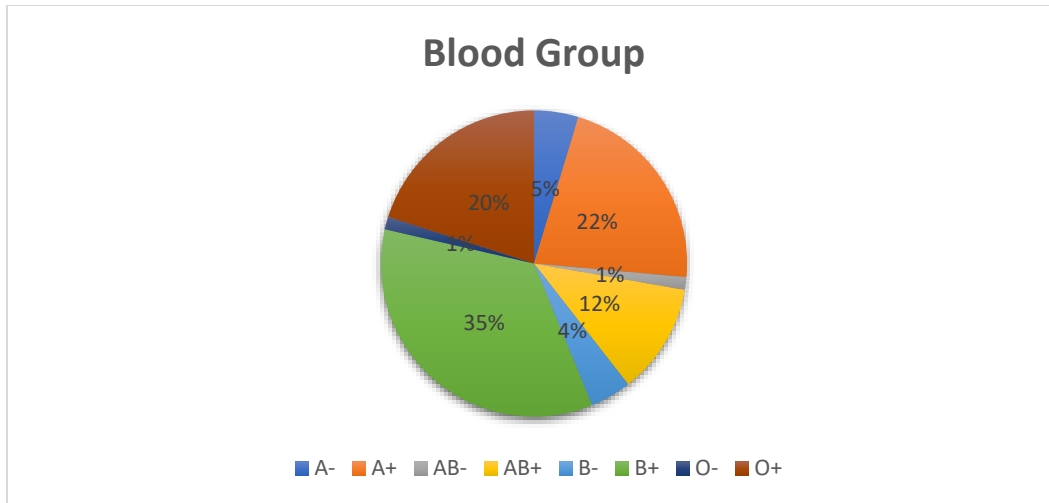


FIGURE: 2 BLOOD GROUP PERCENTAGE

In the coagulation Profile, the minimum value for prothrombin time (PT) is 14S and the maximum value is 40S with a mean and standard deviation of  $17.11 \pm 5.54$ S. The Activated partial thromboplastin time (APPT) minimum value is 25S and the maximum is 44S with a mean and standard deviation is  $35.54 \pm 2.39$  shown in the table (2).

TABLE: 2 DESCRIPTIVE STATISTIC OF PT AND APPT

	Minimum	Maximum	Mean	Std. Deviation
Age	18	45	28.40	5.54
Prothrombin time (PT)	14S	40S	17.11	4.14
Activated partial thromboplastin time (APPT)	25S	44S	35.54	2.39
international normalized (INR)	1.00	2.60	1.20	0.26

Variation in Activated Partial Thromboplastin Time (APPT) and Prothrombin Time (PT) for different blood groups shown in the table (3). Among the blood groups, AB- had the lowest APPT (34.00 seconds) and PT (14.75 seconds), while O- had the highest APPT (36.75 seconds) and PT (18.75 seconds). The other blood groups, including AB+, B+, A-, O+, A+, and B-, had intermediate values for both APPT and PT.

TABLE 3 VARIATION IN COAGULATION ON THE BASIS OF BLOOD GROUP

Blood group	APPT	PT
AB-	34.00 s	14.75 s
AB+	35.00 s	16.11 s
B+	35.38 s	16.84 s
A-	35.53 s	17.0 s
O+	35.73 s	17.45 s
A+	35.77 s	17.48 s
B-	36.23 s	18.53 s
O-	36.75 s	18.75 s

One-way Anova is applied between independent variables blood group and dependent variable coagulation show that blood group had no significant effect on the "Prothrombin Time (PT)" ( $p = 0.426$ ), which is favorable as  $p > 0.05$ . This implies that there were no statistically significant differences in the average Prothrombin Time across the various blood groups show in the figure (3).

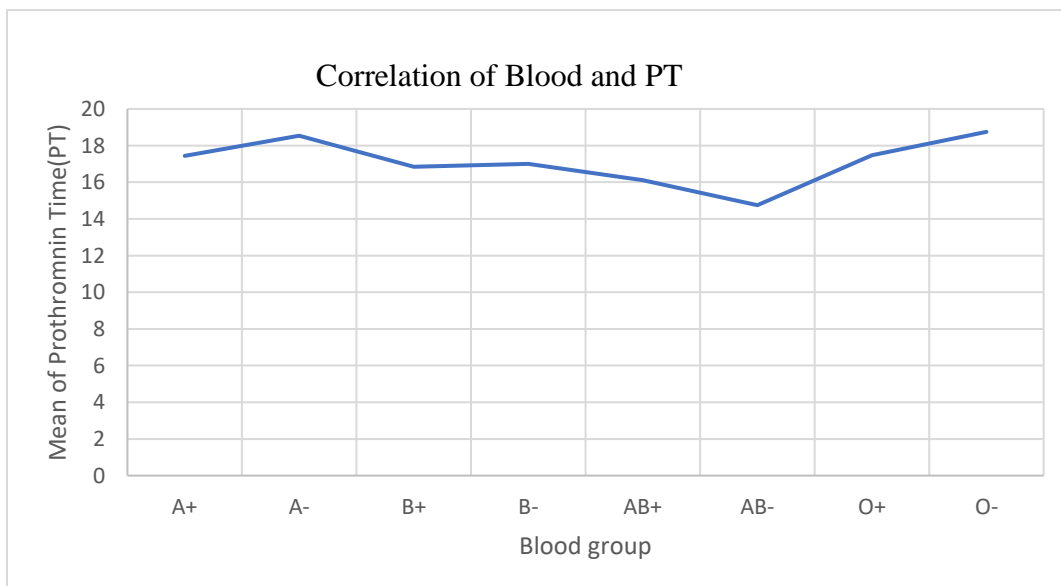


FIGURE: 3 CORRELATION OF BLOOD GROUP AND PT

Similarly, the analysis revealed that the between-groups effect on the mean APTT was not statistically significant ( $p = 0.430$ ), which is also desirable as  $p > 0.05$ . This suggests that there



were no notable differences in the average APTT among the different groups. Consequently, the variation in APTT values primarily arises from random fluctuations within the groups rather than variances between the groups show in the figure (4).

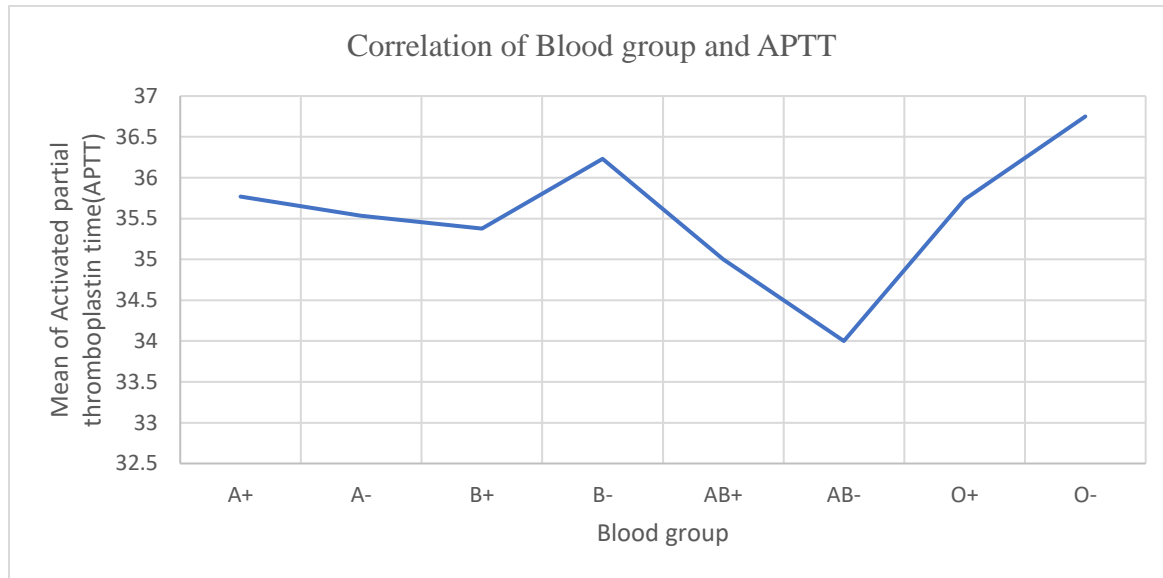


FIGURE: 4 CORRELATION OF BLOOD AND APPT

## DISCUSSION

The findings of our study Among the blood groups, B+ emerged as the most common (34%), followed by A+ (21%) and O+ (20%). Examining the coagulation profile, the minimum and maximum values for Prothrombin Time (PT) were 14s and 40s, respectively, with a mean of  $17.11 \pm 5.54$ s. For Activated Partial Thromboplastin Time (APPT), the minimum and maximum values were 25s and 44s, respectively, with a mean of  $35.54 \pm 2.39$ s. Upon comparing the variations between the various blood types, it was discovered that O- had the greatest APPT (36.75 seconds) and PT (18.75 seconds), whilst AB- had the lowest APPT (34.00 seconds) and PT (14.75 seconds). No significant differences in average values between the groups were found in the PT ( $p = 0.426$ ) and APPT ( $p = 0.430$ ) results of statistical testing. These findings imply that rather than differences across blood groups, changes in coagulation profiles are predominantly controlled by random oscillations within the groups.

Blood group A was associated with a higher rate of infection (33.5%) in the individuals under study, followed by blood group O (32%) and blood group B (25%), while blood type AB (9.5%) had the lowest rate of infection. According to laboratory tests and severity analyses, COVID-19

patients with blood types O and B had poor prognoses, while those with blood types A and AB had favorable outcomes(12).

The PT and INR values between men and women differ significantly. In comparison to individuals between the ages of 0 and 14, men and women between the ages of 15 and 50 were more likely to have elevated PT, INR, and APTT readings. The lowest APTT values were found in boys and girls between the ages of 0 and 14. Women and men had greater PT, INR, and APTT values between the ages of 15 and 50 than did women and males after that age. Reference values for PT, INR, and APTT based on a 95% confidence interval for both sexes as well as ages(3).

A considerable proportion of patients (42.8%) exhibited coagulation abnormalities, displaying disruptions in their hemostatic system. The most prevalent coagulation abnormality observed was a prolonged activated partial thromboplastin time (APTT), affecting 40.8% of the patients. This was followed by low fibrinogen levels (38.7%), elevated D-dimer levels (31.2%), increased international normalized ratio (INR) values (26.0%), and prolonged prothrombin time (PT) (19.2%).

## CONCLUSION

On the basis finding the most common volunteer donor is in the age between 23-28 year. Among them blood groups, B+ emerged as the most common, followed by A+ and O+. statistical tests indicated that blood group had no significant impact on PT and APPT, suggesting. that variations in coagulation profile are primarily influenced by other factors or random fluctuations within the groups.

## RECOMMENDATION

- I. Perform more studies with greater numbers of participants to deepen our knowledge of the connection between blood type and coagulation profile.
- II. Despite the fact that this study did not discover any appreciable variations in coagulation profiles according to blood group, it is nevertheless crucial for healthcare providers to take into account unique patient features, such as blood type, when evaluating coagulation status. For a thorough examination, other variables including medical history, drugs, and underlying health issues should be considered.

- III. To keep investigating the relationship between blood groups and coagulation profiles, encourage cooperation between hematologists, blood banks, and researchers.

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**Contributions:**

Mr. Aziz ur rehman supervised, wrote the manuscript and is guarantor. Also done basic amendment of the original copy for significant scholarly. And I would to extent the honors to lab assistant Mr. Aqib Khattak and Mr. Bilal for developed the original idea and the protocol for assessment of sample.

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**Conflict of interests:**

The authors declare no potential conflict of interests.

**Ethical Approval:**

All examinations were preceded as a piece of routine clinical consideration with no requirement for independent educated assent

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