

Importance of Interrelation between ABO Blood Group and Platelet Indices in Young Healthy Adults

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ABSTRACT

Objective: To highlight the importance of the interrelation between the ABO blood group system and platelet indices in healthy young adults.

Study Design: Cross-sectional study

Place and Duration of Study: Pathology Department, PNS Shifa Hospital, Karachi Pakistan, from Jan to Jun 2020.

Methodology: Comprised 399 blood donors who visited the transfusion department of the hospital without any comorbidities. All the donors were requested for their informed consent before their enrolment in the study. Blood groups were determined by a simple conventional tile method. Platelet indices (Platelet count, mean platelet volume and Platelet distribution width) were studied by auto-analyzer. Blood pressures were estimated by manual auscultator technique with a mercury sphygmomanometer.

Results: Males and females were equal in number, with a mean BMI of 19.89(1.24%). The majority of the donors, 143(35.8%), had B-Blood Group, while 140(35.1%) donors had O-Blood group, 93(23.3%) had A-Blood group, and only 23(5.8%) had AB group. Rh positivity was noted in 378(94.7%) of the donors. Different blood groups were responsible for the changes in the platelet parameters, especially MPV and PDW, as there was a significant difference in MPV and PDW values (p -value<0.05).

Conclusion: While determining the presence of a relationship between the ABO blood group system and platelet indices, it is observed that there is a high frequency of cardiovascular diseases among B and AB blood groups in young, healthy adults.

Keywords: Blood groups, Body mass index, Mean platelet volume, Platelet count, Platelet distribution width.

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INTRODUCTION

The ABO and Rh blood groups are important in accommodating clinical assessments, people genetic examinations, and investigating masses in settings of certain medicolegal issues, particularly addressing paternity cases.^{1,2} Thus, data on the ABO and Rh blood group assignment in unequivocal masses has basic noteworthiness for transfusion medicine. Past assessments in sub-Saharan Africa show that (O) and (Rh) positive are the most common prevailing blood groups independent of social circumstances & their relation to clinical diseases, but it still needs to be decided.^{3,4}

Both ABO and Rh groups have pulled in tremendous thought concerning the trend of their relationship with genetic and overpowering ailments.⁵ Past assessments of patients with different diseases like tumours, heart morbidities, and parasitic and viral infections exhibited a relationship with these blood groups.^{6,7}

In different studies, many biological markers of cardiovascular diseases are being identified; for ins-

tance, platelet indices like PDW and MPV are suggestive in these studies. These parameters appraise us about the sizes and limitations of platelets. During the evaluation, the platelet size shows variations in platelet parameters in different conditions. For example, the platelet size is mainly reflected as MPV, and it defines the limitation and characteristics of platelets.^{7,8} In previous studies, it was observed that atherosclerotic coronary artery disease and thromboembolism patterns showed an increase in the MPV parameter. Unpredictability in platelet size is measured by platelet distribution width (PDW). Regardless of the way that MPV is now a comprehensively practised marker of platelet establishment, PDW has recently been considered a marker of platelet indicator. Platelet indices also play a vital role in the monitoring of disease progression of various diseases.^{9,10}

There is a nonappearance of conveyed data in Pakistan portraying the noteworthiness of the issues concerning ABO and Platelets. Sadly, there is no assessment to report the allocation of ABO, Rh and its association with Platelets. This way, the current examination is the primary undertaking to depict the course of ABO and Rh blood group and the relationship of Platelet indices with CVDs.

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METHODOLOGY

The cross-sectional study was conducted at the Department of Pathology, PNS Shifa Karachi, Pakistan, from January to June 2020. The study was started after obtaining approval from the Ethical Committee of the Hospital (ERC/2020/HEM/ 04). The total sample size of this study was calculated using the WHO calculator, taking 95% confidence level and an expected percentage of cases with the B blood group as 38%.⁸ The data of healthy adults who presented to donate blood during the study period were analyzed. The donors were selected through convenient consecutive sampling. Firstly, the donors were asked to register by filling out the donation proforma.

Inclusion Criteria: All the healthy donors were included in the study.

Exclusion Criteria: Subjects with any ailments like fever, HCV, HBV or respiratory issues were excluded from the study.

Venous blood samples were taken from different participants in tubes containing *ethylenediaminetetraacetic* acid. A blood group was performed by conventional tile along with platelet indices determined by an automated analyzer. The cut-off value of haemoglobin for donors was taken as 12.5g/dl.¹¹ Quality control measures were considered and performed before the usage of all reagents. Blood group systems were determined for all individuals, and frequency was calculated for all blood groups and compared to different studies.

SPSS-23 was used for the data analysis. Quantitative variables were summarized as Mean±SD and qualitative variables were summarized as frequency and percentages. One-way analysis of variance (ANOVA) was applied to gauge the mean differences among the groups. The group differences were calculated using Post Hoc test (Tukey HSD). The *p*-value ≤0.05 was considered as significant.

RESULTS

This study covered an almost equal number of male and female patients, with a frequency of male 199(49.9%) and females, with a frequency of 200 (50.1%). The mean platelet count was 221.92±53.98 (x10⁹/L), MPV was 7.00±1.49 (fL) and PDW 19.89±1.25 (fL). The mean Body mass index was 24.67±1.99 kg/m² (Table-I).

Table-I: Basic Observations of the Biochemical Parameters (n=399)

Study Parameters	Mean±SD
Platelet count (x 10 ⁹ /L)	221.92±53.98
Plateletcrit, PCT (%)	0.16±0.09
Mean Platelet Volume, MPV (fL)	7.00±1.49
Platelet Distribution Width, PDW (fL)	19.89±1.25
Body Mass Index, BMI (Kg/m ²)	24.67±1.99

Most of the cases presented with Blood Group B, i.e., 143(35.8%) and only a few presented with AB Blood Group, i.e., 23(5.8%) (Table-II).

Table-II: Demographic Frequency Distribution of Blood Groups (n=399)

Blood Group	Frequency (%)
A	93(23.3%)
B	143(35.8%)
AB	23(5.8%)
O	140(35.1%)
Rh, Positive	378(94.7%)
Rh, Negative	21(5.3%)

Different blood groups were responsible for the changes in the Platelet parameters especially MPV and PDW as there was significant difference of MPV and PDW value (*p*-value<0.05) (Table-III).

DISCUSSION

Platelet parameters especially mean platelet volume (MPV) and platelet distribution width (PDW), play an important role in the incidence and advancement of cardiovascular disease in the recent era.^{11,12} This shows the important interrelation between blood

Table-III: Statistical analysis of Platelet Indices in ABO Blood Group Individuals (n=399)

Platelet Indices	ABO Blood Group System				<i>p</i> -value
	A Blood Group (n=93)	B Blood Group (n=143)	AB Blood Group (n=23)	O Blood Group (n=140)	
Platelet count (x 10 ³ /μL)	226.26±54.50	217.59±49.39	240.78±84.00	220.37±51.74	0.056
Plateletcrit (%)	0.16±0.115	0.16±0.099	0.15±0.054	0.14±0.039	0.251
Mean Platelet Volume (fL)	6.84±1.34	7.05±1.63	7.11±1.20	6.67±1.47	0.016
Platelet Distribution Width (fL)	19.85±1.25	19.88±1.21	19.67±1.25	19.97±1.27	0.003
Inter-group comparison table (Post Hoc analysis)					
Platelet indices	Group-A Vs. Group-B	Group-A Vs. Group-AB	Group-B Vs. Group-O	Group-AB Vs. Group-O	
Mean platelet volume (fL)	0.044	0.006	0.003	0.002	
Platelet distribution width (fL)	0.020	0.034	0.007	0.04	

group systems and cardiovascular disease. Still, despite the usual dependence of CVDs on ABO blood group systems, we only come across a handful of studies in this regard. An overview from a previous study in 2010 indicated that the pathogenesis resulting in increased frequency of CVD in (RA) patients also directs probing of platelet indices which shows raised MPV and PDW values.⁹

Wu *et al.* conducted a study to establish the relationship of non-O blood groups with different vascular diseases.¹³ The meta-analysis suggested an odd ratio (OR) of 1.25 confidence interval (CI) of 95% ranging from 1.14-1.36. The study confirmed the compatible relationship between ABO blood groups and increasing coronary heart diseases. ABO blood group system is not only the basic pillar of transfusion practices like cross-matching but also plays a pivotal role in developing cardiovascular, neoplastic and infectious disorders. Genome-wide association studies (GWAS) were considered as the screening tool to establish statistical relevance between different disease and blood group systems in a new era. Some studies conducted by researchers have shown interdependence between coronary heart diseases and blood group systems by conventional genetic techniques before the implementation of new genetic procedures like GWAS.^{14,15}

Keep in view these studies, and our study suggests that O and A blood group individuals show extensively diminished MPV values compared to B and AB ($p < 0.05$). Overall, the examination suggests O blood group system have low MPV value than non-O blood group ($p = 0.006$). In any case, several examinations have announced no connection between MPV and blood groups.

We additionally saw that PDW, an indicator of hypercoagulability status,^{13,15} was observed elevated in B blood groups subjects as compared to A and O type individuals ($p = 0.020$ and $p = 0.007$, respectively), which affirms our study is similar to other studies with higher value of PDW in these blood groups.^{16,17} But, in this investigation, no huge contrast was noted for the platelet boundaries with Platelet counts, MPV and PDW. In another investigation mean platelet volume was significantly lower in O and A-type individuals than in AB and B individuals. Correspondingly, Platelet distribution width was lower in O- and A-type individuals than in B-type blood individuals. Furthermore, MPV in the O-type individuals was fundamentally low compared to the non-O blood

type individuals.^{18,19} Even the platelet level was similar, as noted in our study. No significant difference was noted in the platelet counts and MPV for blood groups which strengthened the previous study. This study has a limitation as the patients are not screened for any underlying conditions.

CONCLUSION

While determining the presence of a relationship between the ABO blood group system and platelet indices, it is observed that there is a high frequency of cardiovascular diseases (CVDs) among B and AB blood groups in young, healthy adults.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

NS & MI: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

ZS & MH: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

II & UC: Conception, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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