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Significance of Mean Platelet Volume and Platelet Count in Ischemic Heart Disease

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ABSTRACT

Background: Ischemic heart disease (IHD) is one of the main causes of death and illness, and platelet indices play a key part in how it works. **Objective:** To determine the frequency of IHD in patients presenting with chest pain and compare Mean Platelet Volume (MPV) and Platelet Count between IHD and non-IHD patients. **Methodology:** This descriptive case series was conducted at the Department of Cardiology & Internal Medicine, Mayo Hospital, Lahore, for the duration of three months from December 6, 2024 to March 5, 2025. Total 145 people between the ages of 18 and 65 who came in with chest pain were included. People with blood diseases, who were pregnant, or who were taking blood thinners were not allowed to participate. Blood samples were tested for MPV and PC, and an independent t-test and chi-square test were used to compare the results statistically. A p-value less than 0.05 was thought to be significant. **Results:** The average MPV was higher in people with IHD (10.7 ± 1.1 fl) than in people without IHD (9.5 ± 1.2 fl, $p < 0.001$). The platelet count was much lower in people with IHD (212.4 ± 53.8 × 10^9/L) than in people without IHD (244.1 ± 49.2 × 10^9/L, $p = 0.003$). Diabetes mellitus, high blood pressure, and smoking were all strongly linked to IHD ($p = 0.002$, $p = 0.017$, and $p = 0.009$, respectively). **Conclusion:** Elevated MPV and reduced platelet count are significantly associated with IHD, suggesting their potential role as biomarkers for cardiovascular risk assessment.

INTRODUCTION

Worldwide, ischemic heart disease (IHD) continues to rank high among the leading causes of illness and death, placing a heavy burden on healthcare systems [1]. It stays among the primary causes of death and handicap. The main reason is atherosclerosis, a disorder limiting cardiac blood flow. This can cause cardiac problems like myocardial infarction and angina as well as other conditions [2]. Many studies have looked at how well some blood components could help to diagnose IHD. Regarding platelet indicators, two of the most investigated are mean platelet volume (MPV) [3,4] and platelet count (PC).

Development of atherosclerosis and thrombus depends on plaque formation [5, 6]. Large platelets are more likely to clot since their higher metabolic and enzymatic activities. Should this occur, acute coronary events and arterial plaques may get worse [7]. Increasing data relate MPV which measures platelet size and activity to an increased risk of IHD [8]. High MPV is connected to greater platelet adhesion and the synthesis of molecules that support blood clotting, which might be significant considerations when evaluating cardiovascular risk [9]. However, there is conflicting evidence linking platelet count another critical blood factor to IHD. Because more platelets are being used up in ischemia episodes, several investigations have discovered a reduced platelet count [10].

Various groups of patients have reported various outcomes, despite the fact that MPV and platelet count are becoming more recognized as possible indicators of IHD. Although some studies find no significant difference between those with and without IHD in terms of MPV, others find that it is substantially larger in the former group. It is also unclear whether there are changes in platelet count between IHD patients [11,12]. Additional investigation into the causes of these variations is necessary to clarify the role of these platelet variables in the development of IHD.

Objective

To determine the frequency of IHD in patients presenting with chest pain and compare Mean Platelet Volume and Platelet Count in patients with and without IHD.

MATERIALS AND METHODS

Study Design and Setting

This descriptive case series was conducted at the

Department of Cardiology & Internal Medicine, Mayo Hospital, Lahore, over a period of three months, from December 6, 2024 to March 5 2025.

Inclusion and Exclusion Criteria

People with chest pain between the ages of 18 and 65, of both sexes, were included in the study. People who were pregnant, had problems with their liver or kidneys, had a weak immune system, had viral hemorrhagic fever, were taking oral anticoagulation treatment, or had myeloproliferative disorders or blood cancers were not allowed to participate.

Sample Size

The study looked at 145 people with chest pain. The number was chosen with a 95% confidence interval, a 7.5% margin of error, and a predicted IHD frequency of 30.46% among those with chest pain. Non-probability straight sampling was used as the method of selection.

Data Collection and Ethical Approval

The data were collected from KEMU/Mayo Hospital in Lahore after the approval of synopsis from College of Physicians and Surgeons Pakistan. Data collection was completed in three months' time due to high influx of patients who met the conditions and went to the Cardiology or Medicine Departments were registered after giving their full consent. All of the subjects' medical and demographic information was written down. A clean 5ml blood sample was taken from the left cubital vein within 24 hours of the appearance and was used to check the Complete Blood Count (CBC), Mean Platelet Volume, and Platelet Count. An organized proforma was used to collect the data.

Statistical Analysis

The data were examined with SPSS version 25. For number factors (age, BMI, MPV, and platelet count), descriptive statistics like mean and standard deviation were calculated. For qualitative variables (like gender, IHD prevalence, and risk factors like diabetes mellitus, high blood pressure, and smoking), frequency and percentage were found. t-tests were used to compare MPV and platelet count between groups with and without IHD. We used post-stratification chi-square tests for category factors and independent sample t-tests to see how they changed the platelet count and platelet volume. A p-value of less than 0.05 was thought to be statistically significant.

RESULTS

The study group, which included 75 IHD patients and 70 non-IHD patients, is shown in Table 1. It includes information about their demographics and clinical traits. In people with IHD, the mean age was higher (55.8 ± 8.9 years) than in people without IHD (51.2 ± 8.5 years). In both groups, most of the people were men (69.33% in IHD and 64.29% in non-IHD). In the IHD group, the mean BMI was a little higher (27.3 ± 3.6 kg/m² vs. 26.1 ± 3.2 kg/m²). IHD patients were much more likely to have diabetes (61.33% vs. 35.71%), high blood pressure (66.67% vs. 45.71%), and smoking (56.00% vs. 34.29%).

Table 1

Baseline Characteristics of Study Population

Variable		IHD Patients (n=75)	Non-IHD Patients (n=70)
Age (years)		55.8 ± 8.9	51.2 ± 8.5
Gender	Male	52 (69.33%)	45 (64.29%)
	Female	23 (30.67%)	25 (35.71%)
BMI (kg/m²)		27.3 ± 3.6	26.1 ± 3.2
Diabetes Mellitus		46 (61.33%)	25 (35.71%)
Hypertension		50 (66.67%)	32 (45.71%)
Smoking		42 (56.00%)	24 (34.29%)

The table 2 shows how the MPV and Platelet Count are different in people with and without IHD. The mean MPV was higher in people with IHD (10.7 ± 1.1 fl) than in people without IHD (9.5 ± 1.2 fl), with a difference of 1.2 and a p-value of less than 0.001, which means the difference is statistically significant. On the other hand, the platelet count was much lower in people with IHD (212.4 ± 53.8 $\times 10^9$/L) than in people without IHD (244.1 ± 49.2 $\times 10^9$/L), with a mean difference of -31.7 and a p-value of 0.003, which means the difference was statistically significant.

Table 2

Independent Sample t-Test for MPV and Platelet Count between IHD and Non-IHD Groups

Parameter	Mean ± SD (IHD, n=75)	Mean ± SD (Non-IHD, n=70)	Mean Difference	t-value	p-value
Mean Platelet Volume (fl)	10.7 ± 1.1	9.5 ± 1.2	1.2	5.210	<0.001*
Platelet Count ($\times 10^9$/L)	212.4 ± 53.8	244.1 ± 49.2	-31.7	-2.954	0.003*

The chi-square test was used to show the relationship between category factors and IHD in Table 3. The number of men and women in each group was about the same (p = 0.432). However, diabetes mellitus (61.33% in IHD vs. 35.71% in non-IHD, p = 0.002), high blood pressure (66.67% vs. 45.71%, p = 0.017), and smoking (56.00% vs. 34.29%, p = 0.009) were all significantly linked to IHD, showing that these conditions make the risk of getting the disease higher.

Table 3

Post-Stratification Chi-Square Test for Categorical Variables

Variable	IHD Patients (n=75)	Non-IHD Patients (n=70)	Chi-Square Value	p-value
Gender (Male/Female)	52/23	45/25	0.617	0.432
Diabetes Mellitus	46 (61.33%)	25 (35.71%)	10.043	0.002*
Hypertension	50 (66.67%)	32 (45.71%)	5.699	0.017*
Smoking	42 (56.00%)	24 (34.29%)	6.834	0.009*

DISCUSSION

Our work shows that in people with IHD, MPV is significantly higher compared to people who don't have IHD, while platelet count is significantly lower. There was a big difference between the mean MPV of people with IHD (10.7 ± 1.1 fl) and people without IHD (9.5 ± 1.2 fl) ($p < 0.001$). This supports the idea that bigger, more aggressive platelets play a part in the pathophysiology of IHD. This is in line with earlier research that showed how higher MPV raises the risk of heart disease [13]. According to a study by Fang et al., people with coronary artery disease had a significantly higher MPV than healthy controls. This supports the idea that platelet size is related to thrombotic potential [14].

On the other hand, the platelet count was much lower in people with IHD (212.4 ± 53.8 × 10!?/L) than in people without IHD (244.1 ± 49.2 × 10!?/L), with a mean difference of -31.7 ($p = 0.003$). This drop in platelet count fits with what other research has found: that people with IHD use more platelets because they clump together and make clots more easily [15]. Cassano et al. found a similar trend and pointed out that while MPV rises, platelet count often falls because platelets are activated and then used to form thrombi [13].

A study of risk factors showed a close link between IHD and diabetes mellitus, high blood pressure, and smoking. In our study, diabetes was much more common in people with IHD (61.33%) than in people without IHD (35.71%) ($p = 0.002$). This is similar to what other researchers have found, who found that the frequency of diabetes in people with coronary artery disease was about the same [16,17]. Also, high blood pressure was significantly linked to IHD (66.67% vs. 45.71%, $p = 0.017$), which is in line with earlier research that found high blood pressure to be a major cause of arterial plaque formation [18]. A strong link was found between smoking and both of these factors (56.00% vs. 34.29%, $p = 0.009$), which supports the well-known effect that smoking has on vascular failure and platelet activity [19].

Overall, our results support the use of MPV as a possible biomarker for IHD and show how complicated the relationship is between platelet measures and cardiovascular risk factors. More large-scale, multi-center studies are needed to confirm these links and set clinical standards for using platelet indices to measure cardiovascular risk.

Study Strengths and Limitations

Our study has a lot of good points, like a clear sample size, strict guidelines for who to include and who to leave out, and the use of standard laboratory measures for platelet markers, all of which make our results more reliable. Our results support the increasing corpus of data connecting MPV and platelet count to IHD risk. The study is not without problems, however though. For instance, its generalizability is dubious as it was restricted to one site. Furthermore, lacking was follow-up over a long length of time to ascertain if the platelet parameters changed. Many elements that may have influenced the results, such as food, drug use, and inflammatory diseases were not well managed.

CONCLUSION

Our results imply that low platelet count and higher degrees of MPV are strongly correlated with Ischemic heart disease. This raises the notion that blood tests based on these criteria might assess cardiovascular disease risk. Research linking Ischemic heart disease (IHD) to diabetes, hypertension, and smoking is very extensive and points to several likely causes of IHD. To validate these results and improve risk categorization techniques, greater study with larger and more varied groups of people is essential as well as long-term follow-up.

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