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PLATELET INDICES VARIATIONS IN CHRONIC LIVER DISEASE: INSIGHTS INTO HEMATOLOGICAL CHANGES AND DISEASE PROGRESSION: A CASE-CONTROL STUDY

General Medicine

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ABSTRACT

Introduction: Chronic liver disease (CLD) is a significant cause of morbidity and mortality, particularly in developing countries. CLD leads to progressive liver dysfunction, culminating in fibrosis and cirrhosis. Hematological abnormalities, especially thrombocytopenia, are common in CLD. Platelet indices, including platelet count (PC), platelet distribution width (PDW), mean platelet volume (MPV), and plateletcrit (PCT), are emerging as non-invasive markers for assessing liver disease severity. **Material and Methods:** This case-control study was conducted at MGM Medical Hospital, Navi Mumbai, over one year. A total of 50 participants were included, with 25 CLD patients and 25 healthy controls. Data collection involved demographic information and hematological parameters, including platelet indices. Platelet count, PDW, MPV, PLCR, and PCT were measured using automated hematology analyzers. Comparative analyses were performed using SPSS to assess statistical differences between the groups. **Results:** The case group had a significantly lower platelet count (1.1 lakhs/mm³) compared to the controls (2.19 lakhs/mm³, $p < 0.001$). PLCR (%) was also significantly reduced in cases (22.1%) versus controls (28.04%, $p < 0.001$). However, other parameters like hemoglobin, total leukocyte count, MPV, and PCT showed no statistically significant differences between cases and controls. **Conclusion:** Platelet indices, particularly PLCR and platelet count, are significantly altered in CLD patients, highlighting their potential as non-invasive markers for disease severity. Larger studies are warranted to further explore the clinical utility of these indices in diagnosing and managing CLD.

KEYWORDS

Chronic liver disease, Platelet count, Mean platelet volume, Platelet distribution width, Plateletcrit.

INTRODUCTION

Chronic liver disease (CLD) is one of the leading causes of morbidity and mortality worldwide, particularly in underdeveloped countries. It is characterized by a gradual and sustained loss of liver function, often over a period of more than six months, leading to fibrosis and cirrhosis, which are often irreversible in their later stages. Major causes of CLD include alcoholic liver disease (ALD), non-alcoholic fatty liver disease (NAFLD), chronic viral hepatitis, autoimmune diseases, and genetic disorders like Wilson's disease and hereditary hemochromatosis (1,2). The burden of CLD is especially significant in India, where liver-related mortality rates are on the rise due to various lifestyle changes, including increased alcohol consumption and the adoption of Western dietary habits (3,4).

A key hematological manifestation of CLD is thrombocytopenia, a condition characterized by a decrease in platelet count, which can result in prolonged bleeding times and increase the risk of bleeding complications. Thrombocytopenia in CLD is multifactorial, often caused by decreased platelet production, increased platelet destruction, and splenic sequestration due to portal hypertension (5). Studies have also shown that platelet indices, including platelet count (PLT), platelet distribution width (PDW), mean platelet volume (MPV), and plateletcrit (PCT), are valuable in understanding the severity and progression of liver diseases. These indices can provide insights into the underlying pathology and help clinicians in assessing the risk of complications, including fibrosis and cirrhosis (6).

In recent years, there has been growing interest in the role of platelet indices as potential non-invasive biomarkers for diagnosing and monitoring liver disease progression. Given their easy availability and cost-effectiveness, platelet indices can be particularly useful in resource-limited settings. Several studies have demonstrated the relationship between chronic liver disease and variations in platelet indices, suggesting that these hematological parameters may serve as markers of disease severity (5,7). However, the diagnostic and prognostic value of these indices remains underexplored, especially in the Indian population.

This study aims to evaluate the variation in platelet indices in patients with chronic liver disease compared to healthy controls. By examining platelet count, PDW, MPV, PLCR (platelet large cell ratio), and PCT, this research seeks to establish a correlation between these hematological parameters and the severity of chronic liver disease. Understanding these variations could offer new avenues for the early detection and management of CLD, ultimately improving patient outcomes.

MATERIAL AND METHODS

This study was a case-control design conducted at the Department of Medicine, MGM Medical Hospital, Kamothe, Navi Mumbai. The study spanned over one year, from January 2022 to December 2022, and aimed to evaluate platelet indices in patients with chronic liver disease (CLD) compared to healthy individuals. The study was conducted in inpatient settings, specifically the General Medicine wards, Medical Intensive Care Unit (MICU), and Emergency Services ICU. Control participants were recruited from healthy individuals visiting the Pre-Anesthesia Checkup (PAC) clinic.

A total of 50 participants were recruited, comprising 25 patients diagnosed with chronic liver disease (cases) and 25 healthy individuals (controls). The cases included patients with established or newly diagnosed CLD, confirmed through radiological findings and liver function tests. The control group consisted of individuals with no history of liver disease, normal liver function tests, and a structurally normal liver as confirmed by imaging. The inclusion criteria for cases were adults aged 20 years and above, diagnosed with chronic liver disease, with a history of multiple admissions due to complications like ascites or hematemesis. Controls were selected based on their healthy liver function and normal imaging results. The study excluded patients on antiplatelet drugs (heparin, aspirin, clopidogrel), those with other causes of thrombocytopenia (e.g., dengue, Leptospira, malaria), immunosuppressed patients (e.g., tuberculosis, HIV, chemotherapy), those with autoimmune diseases like immune thrombocytopenic purpura (ITP), thrombotic thrombocytopenic purpura (TTP), or disseminated intravascular coagulation (DIC), and patients with leukemia, chronic kidney disease (CKD), or anemia.

The sample size was calculated using G*Power Software, with an alpha error probability of 0.05 and a power of 80%. The effect size was set at 0.72, and the required sample size was determined to be 50 participants, with equal numbers in both the case and control groups. Following ethical approval and informed consent, detailed clinical and demographic information was collected from all participants using a structured proforma. For the case group, platelet indices were measured during the hospital admission period. In the control group, platelet indices were measured at the time of their routine pre-

anesthesia checkup. The hematological parameters evaluated included platelet count (lakhs/mm³), platelet distribution width (PDW, fl), mean platelet volume (MPV, fl), plateletcrit (PCT, %), and platelet large cell ratio (PLCR, %). Blood samples were collected from both groups, and a complete blood count (CBC) was performed using an automated hematology analyzer. Platelet indices were recorded and compared between the case and control groups to assess any significant variations.

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics, such as mean and standard deviation, were calculated for the variables in both the case and control groups. Comparative analyses were performed to determine the statistical significance of differences in platelet indices between the two groups. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 indicates distribution of study subjects according to sex, age, and co-morbidities is shown in Table 1. In the case group, males predominated, accounting for 92% of the subjects, while females made up only 8%. In contrast, the control group had a more balanced distribution, with 64% males and 36% females. Regarding age, most of the cases (60%) were between 41-60 years, with 24% being over 60 years, and only 16% in the 20-40 age group. In the control group, the majority (88%) were also in the 41-60 age group, but a smaller proportion (8%) were above 60, and only 4% were aged 20-40 years. Comorbid conditions were more frequent in the case group, with 36% having hypertension compared to 28% in the control group, and 4% of cases had diabetes mellitus versus 16% of controls. However, the majority in both groups had no co-morbidities, with 64% of cases and 56% of controls reporting none.

Table 1. Distribution of study subjects according to Sex, Age, and co-morbidities

Variable		Cases (n=25)	Controls (n=25)
		n (%)	n (%)
Gender	Males	23 (92.0)	16 (64.0)
	Females	02 (8.0)	09 (36.0)
Age	20-40	04 (16.0)	01 (4.0)
	41-60	15 (60.0)	22 (88.0)
	>60	06 (24.0)	02 (8.0)
Co-morbidity	Hypertension	09 (36.0)	07 (28.0)
	Diabetes Mellitus	01 (4.0)	04 (16.0)
	None	16 (64.0)	14 (56.0)

Table 2 indicates comparison of different variables between the cases and controls, as shown in Table 2, highlights significant differences in platelet count and PLCR (%) between the two groups. The mean platelet count in cases was significantly lower (1.1 lakhs/mm³) compared to controls (2.19 lakhs/mm³), with a highly significant p-value (<.001). Similarly, the PLCR (%) was also significantly lower in the cases (22.1%) compared to controls (28.04%), with a p-value of <.001. Other variables, such as hemoglobin levels, total leukocyte count (TLC), platelet distribution width (PDW), mean platelet volume (MPV), and plateletcrit (PCT), did not show statistically significant differences between the groups, indicating comparable values for these parameters. While hemoglobin and TLC showed slight variations between cases and controls, these differences were not statistically significant (p = 0.15 and p = 0.52, respectively). This suggests that the most notable differences between cases and controls are related to platelet indices, specifically platelet count and PLCR.

Table 2. Comparison of different variables among Cases and Controls group

Variables	Cases		Controls		t-stat	p-value
	Mean	SD	Mean	SD		
Hemoglobin (g/dL)	9.02	2.21	9.79	1.5	-1.43	0.15, NS
TLC (per mm3)	9147	4827.4	8394	3240.1	0.64	0.52, NS
Platelets Count (lakhs/mm3)	1.1	0.56	2.19	0.76	-5.7	<.001**
Platelets distribution	12.06	3.41	11.71	2.8	0.4	0.68, NS
Mean Platelets Volume (MPV)	10.54	1.8	9.89	1.09	1.53	0.13, NS
PLCR (%)	22.1	6.9	28.04	4.31	-3.65	<.001**
PCT (%)	0.16	0.06	0.18	0.05	-0.7	0.48, NS

***:Significant at 1% level of significance, NS: Not significant*

DISCUSSION

In the present study, the distribution of gender among participants revealed that a significantly higher proportion of males were present in both the case and control groups, with 92% males in the case group and 64% males in the control group. This distribution aligns with previous findings by Srikar M et al., where males made up 53.5% of the cases and 51.2% of the controls. The male predominance in chronic liver disease is well-documented, suggesting that males may have a higher predisposition to the factors leading to chronic liver conditions compared to females (8).

The age distribution in this study showed that 60% of the participants in the case group were in the 41-60 age range, while in the control group, 88% belonged to the same age group. A significant proportion of cases (24%) were also found in the age group above 60 years, indicating that chronic liver disease is more prevalent in older individuals. This finding is consistent with the study by Srikar M et al., which reported mean ages of 45 ± 11.53 years for cases and 46 ± 12.05 years for controls, emphasizing the age-related risk of liver disease (8). Moreover, 36% of the cases in the present study had hypertension as co-morbidity, while diabetes was less common, found only in 4% of the cases. This is consistent with literature indicating that co-morbid conditions like hypertension and diabetes are common in patients with liver disease.

When comparing the hematological parameters between the case and control groups, significant differences were observed in platelet count and PLCR, with the case group showing a markedly lower platelet count and PLCR. The lower platelet count in the case group is in line with findings from other studies such as Mukker P et al., where patients with chronic liver disease had significantly lower platelet counts due to increased platelet destruction and sequestration in the spleen (9). Additionally, although other parameters such as hemoglobin and total leukocyte count were not significantly different, the overall reduction in platelet indices emphasizes the importance of these markers in chronic liver disease management.

CONCLUSION

In conclusion, PCT, PDW, and MPV values show significant increases in chronic liver disease patients, highlighting their potential as non-invasive markers for assessing steatosis and fibrosis. Further research is needed to validate the inclusion of platelet indices in diagnostic algorithms, as they offer a simple, cost-effective, and widely accessible tool for clinical practice.

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