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# ANALYZING THE RELATIONSHIP BETWEEN MEAN PLATELET VOLUME AND LIPID PROFILE INCLUDING TRIGLYCERIDES, VLDL, HDL, LDL AND TOTAL CHOLESTEROL TO MEAN PLATELET VOLUME

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## ABSTRACT

**Background:** The average platelet size is evaluated by Mean Platelet Volume (MPV), which is a crucial component in the evaluation of atherosclerosis. Clot retraction, procoagulant activity, secretion, aggregation, shape change and spreading, and adhesion are among the activities of platelets. Electrical impedance can be used by the ABX Pentra automated analyzer to assess MPV. Atherosclerosis is predicted by cholesterol levels.

**Aim**: The goal of the current study was to determine how mean platelet volume and lipid profile markers, such as triglycerides, VLDL, HDL, LDL, and total cholesterol, correlated.

**Methods**: The link between lipid profile indicators, such as triglycerides, VLDL, HDL, LDL, and total cholesterol, and mean platelet volume was examined in 48 research participants who had no history of platelet dysfunction, alcohol use, or medication-induced platelet decline

**Results:** The study's findings indicate that mean platelet volume and HDL had an unfavourable relationship. Therefore, the techniques used to raise HDL will result in a lower MPV and a lower risk of atherosclerosis. Additionally, there was a positive but statistically insignificant connection between VLDL and MPV and triglycerides. There was an observed negative and non-significant association between MPV and total cholesterol and LDL.

**Key Words:** HDL, Lipid profile, MPV, platelets, triglycerides, VLDL.

## INTRODUCTION

Platelet aggregation, platelet activity, thromboxane A2 release, β-thromboglobulin, and platelet factor 4 all positively correlate with MPV, a measure of platelet functions. Where near-constant levels of platelet mass are observed, mean platelet volume in normal people is negatively correlated with platelet count. Thrombocytes, also known as platelets, are tiny, transparent cells with an irregular shape and width of 2-3 μm. They are produced by the fragmentation of precursor megakaryocytes, which are formed from pluripotent stem cells. Thrombopoietin is the major factor that regulates thrombopoiesis and aids in preserving a steady platelet mass. Thrombopoietin functions in tandem with interleukins, such as IL-6, IL-3, and IL-11. These cytokines are not necessary for megakaryocyte development, though. Sialic acid levels in platelets drop as people age, and a rise in IgG accumulation helps to flush out the older platelets.[1]

The spleen's macrophages are mainly responsible for eliminating ageing platelets. Because the liver has a greater blood flow than other organs, hepatic macrophages are also essential in the elimination of aged platelets. Protein synthesis

cannot occur on its own in platelets. However, when traumatised or injured in the vascular system, these platelets undergo a variety of processes, including adhesion, aggregation, shape change, and granule content release, which result in the production of fibrin plug.[2]

Megakaryocytes are formed from platelets fragments in the bone marrow. The ecosystem that produces platelets determines the size and volume of each one, or mean platelet volume. The mean platelet volume is unaffected by the ageing of platelets during circulation. In most patients, platelet-related parameters are quite constant. Nonetheless, MPV is elevated in patients with underlying diseases that cause increased platelet production, such as immunological thrombocytopenia, pre-eclampsia, myeloproliferative disorders, disseminated intravascular coagulation, and/or temporary hypoplasia recovery (cytotoxic treatment). Reduced MPV is observed in diseases such as bone marrow aplasia that lower platelet production.[3]

There is a correlation between MPV and platelet functioning, which is a significant atherosclerosis risk factor. It is widely known that acute ischemic stroke is associated with increased platelet function. High platelet reactivity and mean platelet volume are also linked to an increased risk of myocardial infarction. Additionally, it has been proposed that MPV is a biomarker and a factor in platelet function. Studies conducted in vitro have revealed that tiny platelets are more reactive than big platelets.[4] The goal of the current study was to determine how mean platelet volume and lipid profile markers, such as triglycerides, VLDL, HDL, LDL, and total cholesterol, correlated.

## MATERIAL AND METHODS

In order to determine the relationship between mean platelet volume and lipid profile measures such as triglycerides, total cholesterol, HDL, LDL, and VLDL, a descriptive cross-sectional clinical investigation was carried out. The individuals who visited the institute's outpatient department of medicine made up the study population. 148 participants of both genders were chosen at random for the study using a straightforward random selection technique.

Participants who were willing to participate in the study, those who were older than eighteen, participants of both genders, and those from various socioeconomic backgrounds met the study's inclusion requirements. Alcoholics, patients on antiplatelet medicines, and those with genetic diseases impacting platelets were excluded from the study. All subjects gave their written and verbal informed permission after being fully briefed about the study. Following their final enrolment in the research, each participant had a thorough medical examination and a comprehensive history collected. Demographic factors such as diet, lifestyle, employment, religion, rural/urban status, gender, and age were evaluated in this study. Hematologic measures such as Mean Platelet Volume (MPV), Platelet Count, Differential leukocyte count (DLC), Total leukocyte count (TLC), and mean haemoglobin were evaluated, along with waist:hip ratio, BMI, and blood pressure. Complete lipid profile, serum electrolytes, glucose (postprandial and fasting), SGOT, SGPT, albumin, total protein, bilirubin, creatinine, and mean serum urea were the biochemical markers evaluated.

In order to determine the average platelet volume, 5 millilitres of intravenous blood were drawn from the antecubital vein in a sterile and aseptic manner. The blood was then placed in a test tube containing an anticoagulant and examined using an electrical impedance-based ABX Pentra automated analyzer. The samples were removed if platelet aggregates were seen. When the platelet volume was between 7.8 and 11 fl, it was taken into consideration. Values over 11.1fl were deemed abnormally high.

Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were expressed in percentage and number, and mean and standard deviation. The level of significance was kept at $p<0.05$.

## RESULTS

In order to determine the relationship between mean platelet volume and lipid profile measures such as triglycerides, total cholesterol, HDL, LDL, and VLDL, a descriptive cross-sectional clinical investigation was carried out. The age range of the 148 research participants was 45–66 years old. The correlation between the mean platelet volume and haemoglobin was evaluated, and the results showed that the person correlation value was -0,52 and the 2-tailed value was -0.512. The correlation value between haemoglobin and MPV was -0.52, with a 2-tailed significance value of -0.512 (Table 1). There was a non-significant negative connection found between MPV and haemoglobin.

When comparing MPV to total leucocyte counts, the person correlation was 0.751, and the 2-tailed significance value was -0.24. This demonstrates that MPV and total leucocyte count have a negative and insignificant connection as shown in Table 1.

Between mean platelet volume and HDL, which had person coefficient and sig. 2-tailed values of -0.179 and 0.24, respectively, a negative and statistically significant association was observed. It was shown that the person coefficient and sig. 2-tailed values for mean platelet volume and VLDL were, respectively, 0.097 and 0.224, indicating a

nonsignificant positive connection. The results showed a negative and statistically non-significant association between MPV and LDL, with corresponding 2-tailed and Pearson correlation values of -0.011 and 0.874. With Pearson correlation and sig. 2-tailed values of.100 and.221 respectively, a positive but statistically non-significant connection was seen between MPV and triglycerides. In the current investigation, there was a negligible negative association between mean platelet volume and total cholesterol, with sig. 2-tailed values of 0.971 and -0.001 for the former and -0.001 for the latter (Table 2).

The link between the study individuals' mean platelet volume and platelet count was also evaluated in this investigation; the findings are shown in Table 3. The correlation's Pearson correlation and sig. 2-tailed values were found to be, respectively, -0.173 and -0.034. These findings demonstrate that there was a negative connection between platelet count and mean platelet volume. According to Table 3, this link was statistically significant.

## DISCUSSION

The current descriptive cross-sectional clinical investigation was carried out to evaluate the relationship between mean platelet volume and lipid profile data, such as triglycerides, total cholesterol, HDL, LDL, and VLDL. The 148 study subjects were within the age range of 45-66 years. The correlation between the mean platelet volume and haemoglobin was evaluated, and the results showed that the person correlation value was -0,52 and the 2-tailed value was -0.512. Haemoglobin had a -0.52 correlation value with MPV and a -0.512 2-tailed significance value. There was a non-significant negative connection found between MPV and haemoglobin.

The association between MPV and total leucocyte counts was found to be negative and non-significant, with an on-person correlation of.751 and a sig. 2-tailed correlation of -0.24. These findings aligned with the findings of Greisenegger S et al.[5] (2004) and Toryila JE et al.[6] (2009), which also showed a comparable association between leucocyte numbers and haemoglobin.

The study's findings indicated that mean platelet volume and HDL had a statistically significant negative association, with respective person coefficient and sig. 2-tailed values of -0.179 and 0.24. The results showed a non-significant positive association between mean platelet volume and VLDL (very low-density lipoprotein), with person coefficient and sig. 2-tailed values of 0.097 and 0.224, respectively. The association between LDL and MPV was found to be statistically non-significant and negative, with corresponding Pearson correlation and sig. 2-tailed values of -0.011 and 0.874 respectively. With Pearson correlation and sig. 2-tailed values of 0.100 and 0.221 respectively, a positive but statistically non-significant connection was seen between MPV and triglycerides. The mean platelet volume and total cholesterol showed a negligible negative association in the current investigation, with sig. 2-tailed values of -0.971 and -0.001 for the former, respectively, according to Pearson correlation analysis. These findings were consistent with those of studies conducted in 2014 by Li Jy et al[7] and Khemka R et al,[8] in which the authors observed a similar link between cholesterol and MPV to that found in the current investigation.

The findings of the current investigation, which additionally evaluated the relationship between the study subjects, mean platelet volume and platelet count. The observed correlation's Pearson correlation and sig. 2-tailed values were -0.173 and -0.034, respectively. These findings demonstrate that there was a negative connection between platelet count and mean platelet volume. There was a statistically significant association. These findings were consistent with those of Tsiara S et al.[9] (2009) and Huo Y et al.[10] (2010), whose authors demonstrated a comparable association between mean platelet count and MPV to that found in the current investigation.

The results of the investigation showed a statistically significant negative correlation between mean platelet volume and HDL, with corresponding person coefficients and sig. 2-tailed values of -0.179 and 0.24. The findings revealed a positive, non-significant correlation between mean platelet volume and very low-density lipoprotein (VLDL), with respective person coefficient and sig. 2-tailed values of 0.097 and 0.224. Smith N et al[11] and Bath PMW et al[12] also showed similar findings.

## CONCLUSION

The current study comes to the conclusion that mean platelet volume and HDL showed an unfavourable relationship. Therefore, the techniques used to raise HDL will result in a lower MPV and a lower risk of atherosclerosis. Additionally, there was a positive but statistically insignificant connection between VLDL and MPV and triglycerides. There was an observed negative and non-significant association between MPV and total cholesterol and LDL. A few drawbacks of the current study were, nonetheless, a limited sample size, a brief monitoring period, and biases related to geographic areas. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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**TABLES**

| **Parameter (n=148)** | **Mean Platelet Volume** | **Values** |
|---|---|---|
| **Mean Platelet Volume** | | **Hemoglobin** |
| Pearson correlation | 1 | -0.52 |
| Sig. 2-tailed | | -0.512 |
| **Hemoglobin** | | |
| Pearson correlation | -0.52 | 1 |
| Sig. 2-tailed | -0512 | |
| **Mean Platelet Volume** | | **Total Leucocyte Count** |
| Pearson correlation | 1 | -0.24 |
| Sig. 2-tailed | | 0.751 |
| **Total Leucocyte Count** | | |
| Pearson correlation | 0.751 | 1 |
| Sig. 2-tailed | -0.24 | |

**Table 1: Correlation of MPV with hemoglobin and total leucocyte count in study subjects**

| **Parameter (n=148)** | **Mean Platelet Volume** | **Values** |
|---|---|---|
| **Mean Platelet Volume** | | **HDL** |
| Pearson correlation | 1 | -0.179 |
| Sig. 2-tailed | | 0.24 |
| **HDL** | | |
| Pearson correlation | -0.179 | 1 |
| Sig. 2-tailed | 0.24 | |
| **Mean Platelet Volume** | | **VLDL** |
| Pearson correlation | 1 | 0.097 |
| Sig. 2-tailed | | 0.224 |
| **VLDL** | | |
| Pearson correlation | 0.097 | 1 |
| Sig. 2-tailed | 0.224 | |
| **Mean Platelet Volume** | | **LDL** |
| Pearson correlation | 1 | -0.011 |
| Sig. 2-tailed | | 0.874 |
| **LDL** | | |
| Pearson correlation | -0.011 | 1 |

| | | |
|---|---|---|
| Sig. 2-tailed | 0.874 | |
| **Mean Platelet Volume** | | **Triglycerides** |
| Pearson correlation | 1 | 0.100 |
| Sig. 2-tailed | | 0.221 |
| **Triglycerides** | | |
| Pearson correlation | 0.100 | 1 |
| Sig. 2-tailed | 0.221 | |
| **Mean Platelet Volume** | | |
| Pearson correlation | 1 | -0.001 |
| Sig. 2-tailed | | 0.971 |
| **Total Cholesterol** | | |
| Pearson correlation | -0.001 | 1 |
| Sig. 2-tailed | 0.971 | |

**Table 2: Correlation of MPV with cholesterol and associated factors in study subjects**

| **Parameter (n=148)** | **Mean Platelet Volume** | **Values** |
|---|---|---|
| **Mean Platelet Volume** | | **Hemoglobin** |
| Pearson correlation | 1 | -0.173 |
| Sig. 2-tailed | | -0.034 |
| **Platelet Count** | | |
| Pearson correlation | -0.173 | 1 |
| Sig. 2-tailed | -0.034 | |

**Table 3: Correlation of MPV with Platelet count in the study subjects**