

Mean Platelet Volume in Non-Alcoholic Fatty Liver Disease in Type 2 Diabetes Mellitus - A Marker of Cardiovascular Risk

Arundhathi S.^{*1}, Sunitha S.², Rajeev Gandham³

¹Department of Pathology, Sanjay Gandhi Institute of Trauma and Orthopaedics, Byrasandra, Jayanagar east, Bangalore-560011 India

²Department of Pathology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore, India

³Department of Biochemistry, Akash institute of medical sciences and research centre, Devanahalli, Bangalore, India

*Correspondence Info:

Dr. Arundhathi. S.

Lecturer in Pathology,

Sanjay Gandhi Institute of Trauma and Orthopaedics, Byrasandra,

Jayanagar east, Bangalore-560011.

E-mail: arundhathi19@yahoo.co.in

Abstract

Background: Non- alcoholic fatty liver disease (NAFLD) is a common liver disease associated with diabetes and cardiovascular risk. Platelets play a vital role in hemostasis and mean platelet volume (MPV) is a measure of average size and platelet activity. Larger platelets are highly thrombogenic. Increase in MPV is well documented in diabetes mellitus (DM). Hence, MPV can be used as simple and cost-effective hematological parameter for predicting cardiovascular events in metabolic syndrome. The present study was conducted to study significance of MPV in NAFLD in type 2 DM (T2 DM).

Materials & Methods: A case- control study was conducted on 97 T2 DM patients. They were divided into: group 1 which included T2 DM patients without NAFLD and group 2 with T2 DM patients with NAFLD. Healthy 78 individuals were taken as controls. Serum was used for estimation of fasting and post-prandial blood sugar (FBS & PPBS) and liver function test (LFT). EDTA anticoagulated blood was used for estimation of mean platelet volume (MPV).

Results: Among 97 T2 DM patients, 62 were males (63.9%) and 35 were females (36%). Liver size, liver enzymes such as aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP) and gamma- glutamyl transferase (GGT) were significantly increased in T2DM patients compared to controls and same were significantly increased in T2DM patients with NAFLD compared to those without NAFLD. MPV was found to be increased in T2 DM patients compared to controls. It was also noted to be increased in T2 DM patients with NAFLD compared to T2 DM patients without NAFLD but there was no statistical significance.

Conclusion: MPV should be included as screening test to predict cardiovascular events in T2 DM patients with NAFLD.

Keywords: Mean platelet volume, non- alcoholic fatty liver disease, type 2 diabetes mellitus.

1. Introduction

Non- alcoholic fatty liver disease (NAFLD) is a common liver disease associated with obesity, diabetes mellitus and metabolic syndrome.[1] NAFLD accounts for 30% of population in developed countries [2] and is associated with enhanced cardiovascular risk.[1] Platelets play a vital role in hemostasis and mean platelet volume (MPV) is a measure of average size and platelet activity.[3] Larger platelets are more thrombogenic and contribute to atherosclerosis. Increase in MPV is well documented in metabolic syndrome, stroke and diabetes mellitus (DM). Hence, MPV can be used as simple and cost-effective hematological parameter for predicting cardiovascular events in metabolic syndrome. [4] The present study was conducted to evaluate significance of MPV in NAFLD in type 2 DM (T2 DM) which is a component of metabolic syndrome.

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2. Materials and Methods

A case- control study was conducted on 97 type 2 DM patients. They were included in study based on American Diabetic Association criteria. They were divided into two groups based on liver size and echo texture into group 1 which included T2 DM patients without NAFLD and group 2 included T2 DM patients with NAFLD. Healthy 78 individuals were taken as controls. Patients with type 1 DM, chronic liver disease, on hepatotoxic drugs, alcohol intake, autoimmune diseases, congestive cardiac failure, renal diseases and T2 DM patients on insulin therapy were excluded from study. Informed consent was obtained from the patients.

After strict aseptic precautions, 5 ml and 2ml of venous blood was collected in plain vacutainers and in EDTA

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vaccutainers respectively. Serum was used for estimation of fasting and post-prandial blood sugar (FBS & PPBS) and liver function test (LFT) by automated chemistry analyser Cobas c111. EDTA anticoagulated blood was used for estimation of mean platelet volume (MPV) by Sysmex XS-800i.

2.1 Statistical analysis

Results were expressed as mean \pm standard deviation (SD). $p < 0.05$ is considered statistically significant. Statistical analysis was performed using SPSS 20.0.

3. Results

In present study, among 97 T2 DM patients, 62 were males (63.9%) and 35 were females (36%). The age range

was between 27 and 75 years. The control group comprised of age matched 78 healthy individuals. In our study, liver size, liver enzymes such as aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP) and gamma- glutamyl transferase (GGT) were increased in T2DM patients compared to controls and it was statistically significant ($p < 0.05$) and the same parameters were significantly increased in T2DM patients with NAFLD compared to those without NAFLD.

Mean platelet volume (MPV) was found to be increased in T2 DM patients compared to controls. It was also noted to be increased in T2 DM patients with NAFLD compared to T2 DM patients without NAFLD but there was no statistical significance (Table.1).

Table 1: Table showing radiological, biochemical and MPV values in controls, T2 DM patients with and without NAFLD

Parameters	Control (n=78) Mean & Std. deviation	T2 DM Without NAFLD (group 1) (n= 47) Mean & Std. deviation	T2 DM With NAFLD (group 2) (n=50) Mean & std. deviation
Age(years)	44.1 \pm 14.0	51.5 \pm 10.1 ^{a*}	49.5 \pm 12.2 ^{a*}
Liver size(cm)	12.9 \pm 1.0	16.75 \pm 0.9 ^{a*}	21.3 \pm 3.5 ^{a*, b*}
FBS(mg/dl)	93.9 \pm 9.2	159.0 \pm 68.5 ^{a*}	187.2 \pm 78.3 ^{a*}
PPBS(mg/dl)	114.6 \pm 24.4	234.8 \pm 96.4 ^{a*}	284.3 \pm 45.5 ^{a*}
AST (IU/L)	21.6 \pm 6.7	21.3 \pm 7.0	36.5 \pm 12.2 ^{a*, b*}
ALT(IU/L)	19.8 \pm 10.3	20.2 \pm 9.1	46.9 \pm 15.3 ^{a*, b*}
ALP(IU/L)	76.7 \pm 21.4	80.8 \pm 17.8	99.2 \pm 34.5 ^{a*, b*}
GGT(IU/L)	31.8 \pm 7.9	29.3 \pm 16.3	44.1 \pm 7.4 ^{b*}
MPV(fl)	9.9 \pm 0.9	10.2 \pm 0.9	12.1 \pm 3.0

Data expressed as mean and std. deviation, p value ≤ 0.05 considered as significant.

a*= control v/s T2 DM without NAFLD and T2 DM with NAFLD

b*= T2 DM without NAFLD v/s T2 DM with NAFLD

4. Discussion

Diabetes mellitus (DM) is a metabolic syndrome of several etiologies categorized by chronic hyperglycaemia with disorders of carbohydrate, protein and fat metabolism resulting from deficiencies in insulin secretion, insulin action, or both (WHO, 2004). It is an important health concern. Its prevalence in 2000 was 2.8% and is expected to increase to 4.4% in 2030.[5]

NAFLD is a major liver disease and is associated with T2 DM and with increased cardiovascular risk. [1] It is a cause for progressive and chronic liver injury.[6] Past studies of NAFLD were based on abdominal ultrasound, magnetic resonance spectroscopy and liver biopsies.[7] Screening of NAFLD is not recommended routinely due to lack of accurate non-invasive methods of diagnosis. [8] There is an association between NAFLD and increased mean platelet volume (MPV) which is a marker of platelet function. [2] We conducted the present study to assess liver size by ultrasound (USG), liver function tests and MPV in T2 DM patients with and without NAFLD.

There are many studies conducted regarding association of liver enzymes in T2 DM patients. A study by Hanley *et al.* suggested that ALT is strongly associated with metabolic syndrome. They also hypothesized that hepatic

inflammation may be a mechanism by which hepatic enzymes are elevated. [9] Zhang *et al* suggested that GGT and ALT can serve as hepatic biomarkers for metabolic syndrome and insulin resistance.[10] Our study revealed statistically significant increase in liver enzymes like AST, ALT, ALP and GGT in T2 DM patients with NAFLD compared to those without NAFLD. From this we can conclude that screening for elevated liver enzymes in T2 DM patients has to be done to identify early NAFLD.

Platelets play an important role in hemostasis and mean platelet volume (MPV) is an indicator of the average size and activity of platelets and thereby platelet functions. [11] Increased MPV has been documented in patients with metabolic syndrome, stroke and DM. [3] MPV is a simple marker of inflammation and was increased in NASH patients when compared with non- NASH patients (10.9 \pm 1.8 and 9.5 \pm 1.6 fl, respectively). [6] In our study, MPV was seen to be increased in T2 DM patients with NAFLD compared to T2 DM without NAFLD. A study by Abdel-Razik *et al* showed that MPV was elevated in NASH patients versus non-NASH cases and in patients with advanced fibrosis versus early fibrosis and can be used as noninvasive novel markers to predict advanced disease. [6] Activated platelets are larger in size compared to normal platelets which results in elevation

in MPV. Therefore, MPV is an indicator of platelet activation and literature search shows that it is elevated in inflammatory process.[12] Furthermore, large platelets are more thrombogenic and proved to be cardiovascular risk marker.[3] Thus, MPV should be included as a screening test to predict cardiovascular events in T2 DM patients with NAFLD.

5. Conclusion

To conclude, MPV is found to be increased in T2DM patients with NAFLD and can be used as a cardiovascular marker. But further studies have to be done on a larger scale and NAFLD has to be confirmed by biopsy.

Conflict of interest: None

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