ORIGINAL RESEARCH PAPER

Pathology

STUDY OF PLATELETS PARAMETERS IN PATIENTS WITH METABOLIC SYNDROME

KEY WORDS: Platelet, Metabolic Syndrome, Dyslipidemia, Haematocrit

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ABSTRACT

Metabolic syndrome is a combination of unfavorable health factors including abdominal obesity, dyslipidemia and hypertension and glucose intolerance and is strongly associated with increased risk of cardiovascular disease and type2 diabetes. A total of 104 subjects included in this study with metabolic syndrome and 20 healthy individuals who came for routine health check-up have been recruited for this study as control subjects with no history of metabolic syndrome and didn't come under the criteria of metabolic syndrome we also excluded individuals with chronic diseases like carcinoma, tuberculosis, HIV. Association of platelets and haematological parameters in metabolic syndrome evaluated that platelet parameters is a competent indicator of metabolic syndrome. Investigations showed significant relationship between platelet count and metabolic syndrome in Indian subjects and the platelet count in patients were lower when compared with normal group. We also observed a decreased platelets count in the cases as compared to normal.

Introduction

Metabolic syndrome is a combination of unfavorable health factors including abdominal obesity, dyslipidemia, hypertension and glucose intolerance and is strongly associated with increased risk of cardiovascular disease and type2 diabetes [1-2]. One of the key factors in the development of metabolic syndrome is obesity [3]. In recent years the global prevalence of obesity has increased at alarming rates and its consequences have become a major public health [4-5].A variety of data indicate high risk of developing cardiovascular morbidity and mortality[6-7]. Platelets play an important role in the pathogenesis of thrombosis and atherosclerosis. It interact with endothelium and other inflammatory cells by the action of different molecules present on the surface or stored in platelets granules as P-selectin and its volume reflects reactivity and has been suggested as an independent risk factor for ischemic events in cardiovascular disease.[8-10] Larger are metabolically and enzymatically more active than smaller and produce more thromboxane A [11-12]. Individuals with dyslipidemia have more tendencies to form atherosclerosis plaques with a consequent increasing consumption of platelets. We have shown preliminary results on production of larger platelets by P-LCR determination in a group of patients with lipid profile abnormalities[13].Our aim was to evaluate the platelet parameters in the spectrum of metabolic disease. However, there is scope to make better use of the parameters generated. The MPV can reflect changes in the level or the rate of its production which is an indicator of activation and also shows a close relationship with cardiovascular risk factors such as diabetes mellitus, hypertension, hypercholesterolemia, obesity, metabolic syndrome [14]. Elevated WBC is a classical inflammatory marker and is associated with several cardiovascular risk factors [15].

Material & Methods

Subjects for study were collected from Department of Medicine and Cardiology OPD, King's George Medical University, Lucknow. A total of 104 subjects included in this study with metabolic syndrome and 20 healthy individuals who came for routine health checkup with no history of metabolic syndrome and chronic diseases like carcinoma, tuberculosis, HIV.

Sample collection

Blood sample collected in plain vial after overnight fasting and serum was separated for lipid profile analysis. Blood sample in EDTA vial for automated counts, and platelet parameters under standard aseptic procedure.

Biochemical Investigations

Serum total cholesterol, High Density Lipoprotein Cholesterol, Triglyceride and Low Density Lipoprotein Cholesterol was estimated by using fully automated analyzer with proper control and calibrators. Blood glucose was estimated by Enzymatic-colorimetric, Trinder-kinetic. All haematological parameters evaluation was done by automated cell counter using Sysmex KX-21 with EDTA fresh blood sample of the patients. All quality measures were taken according to NABL. Proper quality measures like internal (IQC) and external quality (EQAS) were done throughout the study. Blood Pressure measured in upper arm in sitting position. The waist circumference was measured at a level midway between the lowest rib and iliac crest. Study was approved by institutional ethical committee.

Statistical Analysis

The obtained parameters were evaluated using descriptive statistical analysis and were performed using SPSS (statistical Package for the Social Sciences v 20.0).The p value <0.05 was taken as significant.

Results

Body mass index (BMI), Waist Circumference (WC), Hip Circumference (HP), Waist-Hip ratio was significantly higher in patients with metabolic syndrome as compared to control significant correlations among these variables was found in both groups ($p<0.0001$, table 1).whereas systolic blood Pressure and Diastolic blood Pressure was significantly higher in patients with metabolic syndrome as compared to control group. Significant correlations between these variables were found in both the groups ($p<0.001$, Table 2). In metabolic syndrome patients significant increase in TC, LDL, HDL and TG was found when compared to control group. The correlations between these variables were significant in both the groups ($p<0.006$, $p<0.0001$).

No significant association was found in LDL, TC. (p=0.88, p=0.65, Table 3). FBS was significantly different in patients as compared to control (p<0.0001, Table 4). Hemoglobin and hemocrit level were also significantly decreased in patients as compared to control (table 5 and 6). In patients with metabolic syndrome RDW and TLC were non significantly (p=0.16, p=0.58) increased as compared to control group (Table7 & 8). MPV as well as PDW and P-LCR were significantly higher (p=0.02, p=0.005, p=0.02, Table 9) in patients as compared controls.

Discussion

In this study we investigated the association of platelets and hematological parameters with metabolic syndrome. It has been observed that relationships between platelet count and metabolic syndrome in Indian subjects patients with metabolic syndrome is lower as compared with control. We also observed low platelets count in the patient groups as compared to normal group. Which play an important role in haemostasis whereas, MPV is an indicator of the average size and activity of platelets which is simple marker of inflammation and was associated with the metabolic syndrome as well as type-2 diabetes patient. In the present study we observed that increased MPV in metabolic syndrome as compared to normal subjects and this observation consistent with the various previous studies. Arundhathi S et al (2014) showed that increased MPV has been documented in patients with metabolic syndrome, stroke and type-2 diabetes mellitus. Butterworth RJ et al (1996) observed that activated platelets are larger in size when compared to normal platelets which results in elevation and therefore is an indicator of platelet activation which is also elevated in inflammatory process. Furthermore, large platelets are more thrombogenic and proved to be a risk marker in metabolic syndrome and type-2 diabetes mellitus. Thus, we evaluate that MPV should be included as a screening test to predict in metabolic syndrome, diabetes mellitus and its components. PDW is quantitative measures of the variability in platelet size and can be used in the assessment of platelet function. Elevated PDW, PCT and P-LCR is an indicator which contribute to an increased risk of metabolic syndrome. Therefore elevated PDW, PCT and P-LCR were positively correlated to metabolic syndrome. So, these platelets parameters can be used as novel marker for evaluation in the diagnosis of metabolic syndrome. We observed that the mean PDW raised in the entire disease groups. In this present study we evaluated that Plateletcrit raised in all the disease groups as compared to the normal but not reaches up to the statistical significance and this observation consistent with the previous studies-LCR were significantly higher in metabolic syndrome as compared to normal.

Conclusion

Hematological and platelet parameters in subjects with metabolic syndrome have larger platelets because larger platelets are more reactive which causes increased risk for cardiovascular diseases as a complication of metabolic syndrome. it was also observed that platelets parameters are increased in metabolic syndrome. We also found that PDW and P-LCR is significantly associated with metabolic syndrome. Platelets parameters can be used as a better predictor of acute complication of metabolic syndrome.

Table-1: Comparison of anthropometric parameters between cases and controls

Anthropometric parameters	Cases	Control	p-value[1]
BMI in Kg/mtr2	32.24±2.06	22.89±1.21	0.0001*
WC	103.75±7.18	79.55±6.21	0.0001*
HC	109.52±7.13	89.15±6.12	0.0001*
WHR	0.94±0.02	0.88±0.02	0.0001*

* P<0.05 is considered as statistically significant.

Table-2: Comparison of Blood pressure between cases and controls

Blood pressure	Cases	Control	p-value[1]
SBP	142.14±7.54	135.30±4.79	0.001*
DBP	81.83±7.40	83.95±5.64	0.0001*

* P<0.05 is considered as statistically significant.

Table-3: Comparison of lipid levels between cases and controls

Lipid levels	Cases	Control	p-value[1]
TC	171.49±62.13	169.41±22.21	0.88
TG	215.09±171.93	107.54±37.76	0.006*
HDL	34.80±17.42	51.72±4.48	0.0001*
LDL	91.63±47.75	96.55±18.66	0.65

* P<0.05 is considered as statistically significant.

Table-4: Comparison of fasting glucose between cases and controls

	Fasting glucose (Mean±SD)
Cases	129.70±40.19
Controls	91.76±12.14
p-value[1]	0.0001*

* P<0.05 is considered as statistically significant.

Table-5: Comparison of Hemoglobin (Hb) between cases and controls

Study Subjects	Hb (Mean±SD)
Cases	12.40±2.05
Controls	13.35±1.03
p-value[1]	0.04*

* P<0.05 is considered as statistically significant.

Table-6: Comparison of hematocrit between cases and controls

Study subjects	hematocrit (Mean±SD)
Cases	35.98±6.65
Controls	38.13±3.23
p-value[1]	0.16

Data is represented as mean ± SD

Table-7: Comparison of RDW between cases and controls

	RDW (Mean±SD)
Cases	16.14±2.05
Controls	15.89±0.86
p-value[1]	0.16

Data is represented as mean ± SD

Table-8: Comparison of TLC between cases and controls

	TLC (Mean±SD)
Cases	11.57±4.96
Controls	6.98±1.36
p-value[1]	0.58

Data is represented as mean ± SD

Table-9: Comparison of platelet parameters between cases and controls.

Platelet parameters	Cases	Controls	p-value[1]
PC	184.46±72.89	208.00±51.02	0.17
MPV	10.46±1.46	9.69±1.20	0.02*
PDW	15.05±2.51	13.37±1.74	0.005*
PCT	0.19±0.06	0.20±0.04	0.47

* P<0.05 is considered as statistically significant.

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