A study of acute phase hyperglycemia and platelet-lymphocyte ratio as a predictor of in -patient mortality in acute coronary syndrome

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ABSTRACT

Introduction: In India, the prevalence of coronary artery disease is rising. Therefore, we require a technique to evaluate the acute coronary syndrome's severity and prognosis. It is already known that inflammation and plaque rupture play a part in acute coronary syndrome. The levels of platelet lymphocyte ratio and gross random blood glucose rise in direct proportion to the degree of inflammation. In patients with acute coronary syndrome, this study aims to evaluate the relationship between acute phase hyperglycemia and the platelet-lymphocyte ratio as a predictor of in-hospital death.

Material and methods: We studied 122 patients with acute coronary syndrome (STEMI and UA/NSTEMI). At admission, the platelet lymphocyte ratio and serum GRBS were assessed qualitatively. Hospitalised patients were monitored for mortality.

Results: In this study, among those who had mortality 74.3% had GRBS >140 mg/dl and 62.9% had GRBS >200 mg/dl and among subjects who survived, 51.7% had GRBS >140 mg/dl and 24.1% had >200 mg/dl. There was significant association between acute phase hyperglycemia and outcome. Among subjects who died, 100% had PLR >137 and among those who survived, 35.6% had PLR

Conclusion: Increased platelet lymphocyte ratio and GRBS levels are independent indicators of unfavourable outcomes. When acute coronary syndrome occurs, the platelet lymphocyte ratio and plasma GRBS levels at admission are used to identify high-risk patients. The efficient risk classification offered might be especially helpful for patient treatment and early therapeutic decision-making in the diverse group of patients who come with acute coronary syndrome.

Keywords: Coronary artery diseases; acute coronary syndrome; acute phase hyperglycemia, platelet lymphocyte ratio.

INTRODUCTION

CHD represents a continuum of disease pathologies and has been classified as chronic CHD, acute coronary syndromes, and sudden cardiac death.[5] The leading cause of death worldwide is cardio vascular disease.[1] 17.3 million people died from this disease in 2008; 7.3 million of those deaths were due to acute myocardial infarction (AMI).[1] A well-known risk factor for coronary artery disease is Diabetes mellitus (DM).[2] Poor glycemic control can lead to endothelial injury, and to coronary artery disease and myocardial infarction.[2]

The most common cause of death and disability in the United States is Coronary Heart Disease. It is estimated that 40million individuals live with Coronary Heart Disease (CHD in the world today).[3]According to the OASIS registry, Indian patients are 7 to 8 years younger than Western patients with a mean age of 57 years as against 65 years in Western population.[4]

The white blood cell count, along with its subtypes, is one of the many inflammatory markers that is linked to elevated cardiovascular risk factors.[5]Recent research have also demonstrated that the platelet-to-lymphocyte ratio (PLR) is a new inflammatory marker and that predictors of unfavourable outcomes in many cardiovascular illnesses, as elevated platelet-to-lymphocyte activation plays a crucial role in the onset and progression of atherosclerosis.[3] While preliminary data have shown that the platelet to lymphoyte ratio (PLR) is associated with significant adverse cardiovascular outcomes, insufficient data are available, particularly in cardiovascular disease.[5] Therefore, the aim of this study was to explore the association between acute phase hyperglycemia, PLR and in-hospital mortality in patients with acute coronary syndrome.

MATERIAL AND METHODS

Following ethics committee approval, a Single centre, cross sectional study was conducted in department of General medicine, KIMS hospital, Hubli. Using estimation technique, the sample size calculated was 122.

Patients with Acute Coronary Syndrome aged >18 years and provided informed consent for the study were included in our analysis. Patients treated with intravenous dextrose solution before admission, those with active infection, hematological malignancies and pregnant patients were excluded from this study.

The trial was thoroughly explained to the patients, and their informed written agreement to participate was obtained. 122 patients with ACS were be selected from cardiology department in-patient section and screened for acute hyperglycemia, platelet-lymphocyte ratio at the time of admission.

Following their admission, the patients underwent extensive evaluations. The evaluation includes pertinent investigations, a comprehensive general physical examination, and a detailed clinical history. Following the diagnosis of ACS, individuals exhibiting symptoms and signs suggestive of haematological involvement had a thorough evaluation and regular examination. The haematological investigations that have been carried out and the alterations that have taken place there have been documented in all ACS instances.

Data was collected and entered into Microsoft excel spread sheet. IBM SPSS Version 22 was used for all of the analysis. The statistical analysis was done by using parametric test

and final interpretation by using "Z" test (standard normal variant) with 95% significance. For qualitative data, Chi square test or Fischer's exact probability test was used and for quantitative data, Student's t test was used to draw inference. P<0.05 was considered statistically significant.

RESULTS

In this study, the mean age of subjects in the study was 56.93 ± 13.35 years. Table 1 shows the distribution of demographic variables among outcome groups.The outcome was not associated with age, gender and co-morbidities (p>0.05)

Table 1: Association of demographic profile with outcome groups.

Demographic factors		Survived	Expired	P value
Age (years)	<30	1 (1.2%)	2 (5.9%)	0.235
	31 to 40	10 (11.5%)	2 (5.9%)	
	41 to 50	21 (24.1%)	4 (11.8%)	
	51 to 60	23 (26.4%)	10 (29.4%)	
	61 to 70	23 (26.4%)	9 (26.5%)	
	>70	9 (10.3%)	7 (20.6%)	
Gender	Males	53 (60.9%)	20 (57.1%)	0.700
	Females	34 (39.1%)	15 (42.9%)	
Comorbidities	Diabetes	24 (27.6%)	10 (28.6%)	0.913
	Hypertension	23 (26.4%)	12 (34.3%)	0.386
	Smoking	30 (34.5%)	15 (42.9%)	0.386
	Alcohol	26 (29.9%)	13 (37.1%)	0.437
	Tobacco	37 (42.5%)	15 (42.9%)	0.974

Table 2 shows the association of laboratory variables in outcome groups. We found that the admission GRBS, Total count, Platelet count and Platelet lymphocyte ratio was statistically higher in expired group compared to those who survived. (p<0.05)

Table 2: Association of laboratory profile among outcome groups

Laboratory profile	Survived	Expired	P value
Admission GRBS	165.7±82.9	251.3±120.3	**<0.001**
Hb%	15.8±33.01	12.1±2.8	0.507
TC	9336.7±3969.8	14757.4±5350.7	**<0.001**
Neutrophil	125.5±524.2	80.8±13.7	0.621
Lymphocytes	37.6±126.8	10.4±3.8	0.210
Platelet count	221733.5±116753.9	310371.4±77938.9	**<0.001**
Platelet lymphocyte ratio	110.3±69.6	310.5±108.9	**<0.001**
Ejection fraction %	45.7±9.7	44.7±8.1	0.580
Urea (mg/dl)	24.5±10.6	23.3±8.5	0.536
S. creatinine (mg/dl)	0.96±0.3	0.97±0.2	0.819

Figure 1 and 2 shows the ROC of GRBS and PLR in prediction of Mortality among Acute coronary syndrome. Table 3 shows the sensitivity analysis and AUC for these variables.

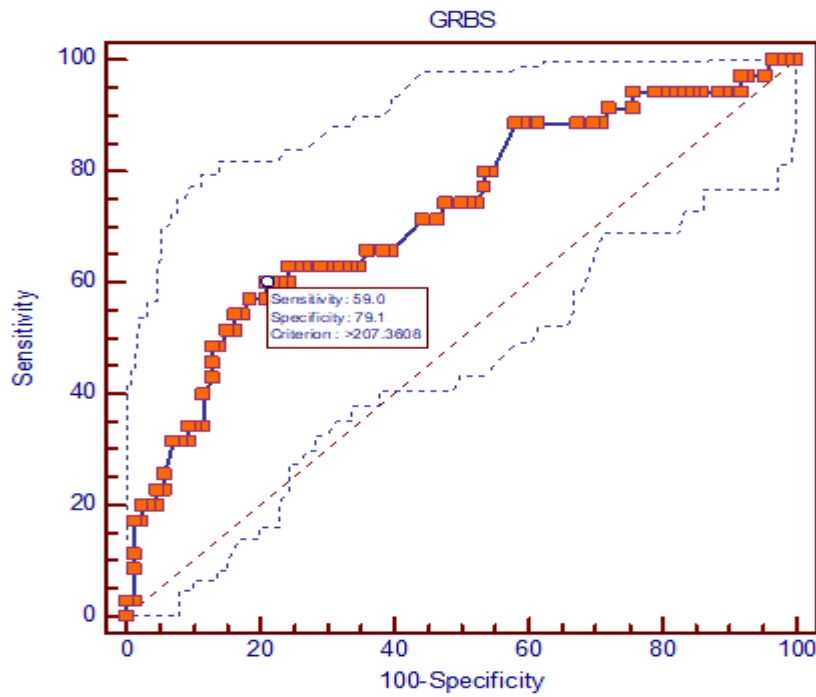**Figure 1: ROC of GRBS in prediction of Mortality among Acute coronary syndrome**

Figure 2: ROC of Platelet lymphocyte ratio in prediction of Mortality among Acute coronary syndrome
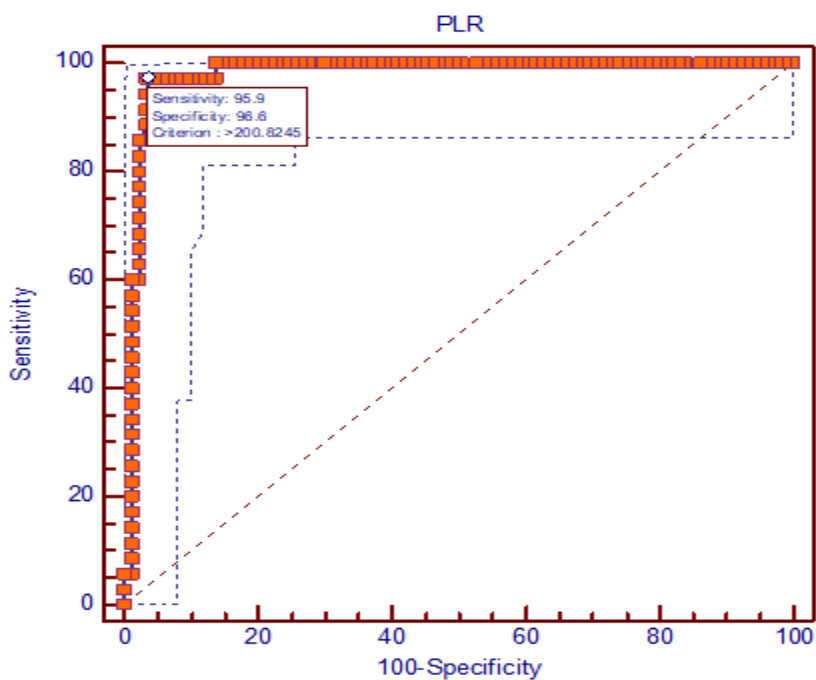
Table 3: Criterion values and coordinates of the ROC curve for GRBS and PLR

Percent (95%C.I)	Sensitivity	Specificity	PPV	NPV	AUC	P value
GRBS (>207)	60% (42.1-76.1)	79.1% (69-87.1)	53.8% (37.2-69.9)	82.9% (73-90.3)	0.722 (0.63-0.80)	**<0.001**
PLR (>200)	97.1% (85.1-99.9)	96.6% (90.3-99.3)	91.9% (78.1-98.3)	98.8 (93.6-100)	0.980 (0.94-0.99)	**<0.001**

DISCUSSION

Acute coronary syndrome is characterized by changes in ECG and 2D-ECHO.In the present study the hematological changes in 122 patients of Acute Coronary Syndrome were analysed. Similar to our study, the age and sex distribution among patients in Abbas Ali Mansour et.al.[6] study and Ischa Stranders et.al.[7]study no differences were found between both groups regarding mean age. In Benamer et.al.[8]study mean age was 59±10 62±11 years, Oylumlu et.al.[9] reported that the mean age among patients with higher mortality was 64.7±13.7 years. In Azab et.al.[10] patients with higher PLR had mean age of 68.3 ± 0.9 years which is within the range of our study.

In our study there was no significant association between outcome and comorbidities which is comparable with Abbas Ali Mansour et al.[6]

In our study there was significant difference in mean GRBS, mean Total count, Mean platelet count, mean Platelet Lymphocyte ratio between those who survived or were discharged and those who died. The above said parameters were significantly high in those subjects who had mortality, which is comparable with Mustafa Oylumlu et.al.[9] study.

In our study there was a significant difference in mean GRBS between those who survived or were discharged and those who died. The result was significantly high in those subjects who had mortality, which is comparable with Abbas Ali Mansour et.al.[6] study and Ischa Stranders et al.[7] study.

In our study there was a significant difference in platelet lymphocyte ratio between those who survived or were discharged and those who died. The result was significantly high in those subjects who had mortality which is comparable with Mustafa Oylumlu et.al.[9], and Basem Azab et al.[10], study.

CONCLUSION

When acute coronary syndrome is present, high risk individuals are identified using plasma acute phase hyperglycemia and platelet-lymphocyte ratio values at admission. The efficient risk classification offered might be especially helpful for patient treatment and early therapeutic decision-making in the diverse group of patients who come with acute coronary syndrome.

REFERENCES

1. Mendis S, Puska P, Norrving B, eds. Global Atlas on Cardiovascular Disease Prevention and Control. World Health Organization, Geneva 2011.
2. Hammoud T, Tanguay JF, Bourassa MG. Management of coronary artery disease: therapeutic options in patients with diabetes. J Am Coll Cardiol 2000 Aug;36(2):355-365.
3. Harrison's principles of internal medicine 20TH edition.Elliott M. Antman, Joseph Loscalzo.page 1850.
4. API Textbook of Medicine 10th edition.Gurpreet Singh Wander, Naveen Kumar Gupta.page no.673.
5. ChoKI, AnnSH, SinghGB, HerA-Y, Shin E-S(2015) Combined Usefulness of the Platelet-to Lymphocyte Ratio and the Neutrophil-to-Lymphocyte Ratio in Predicting the Long-Term Adverse Events in Patients Who Have Undergone Percutaneous Coronary Intervention with a Drug-Eluting Stent. PLoS ONE 10(7): e0133934.
6. Mansour AA, Wanoose HL. Acute Phase Hyperglycemia among Patients Hospitalized with Acute Coronary Syndrome: Prevalence and Prognostic Significance. Oman Med J. 2011 Mar;26(2):85-90. doi: 10.5001/omj.2011.22. PMID: 22043390; PMCID: PMC3191683.
7. Stranders I, Diamant M, van Gelder RE, Spruijt HJ, Twisk JW, Heine RJ, et al. Admission blood glucose level as risk indicator of death after myocardial infarction in patients with and without diabetes mellitus. *Arch Intern Med* 2004. May;164(9):982-988 10.1001/archinte.164.9.982.
8. Benamer, S., Eljazwi, I., Mohamed, R., Masoud, H., Tuwati, M., & Elbarsha, A. M. (2015). Association of Hyperglycemia with In-Hospital Mortality and Morbidity in Libyan Patients with Diabetes and Acute Coronary Syndromes. *Oman medical journal*, *30*(5), 326–330.
9. Oylumlu, M., Yıldız, A., Oylumlu, M., Yüksel, M., Polat, N., Bilik, M. Z., Akyüz, A., Aydın, M., Acet, H., & Soydinç, S. (2015). Platelet-to-lymphocyte ratio is a predictor of in-hospital mortality patients with acute coronary syndrome. *Anatolian journal of cardiology*, *15*(4), 277–283.
10. Azab, B., Shah, N., Akerman, M., & McGinn, J. T., Jr (2012). Value of platelet/lymphocyte ratio as a predictor of all-cause mortality after non-ST-elevation myocardial infarction. *Journal of thrombosis and thrombolysis*, *34*(3), 326–334. https://doi.org/10.1007/s11239-012-0718-6