Original Article

PLATELET COUNT TO SPLEEN DIAMETER RATIO AS A PREDICTOR OF ESOPHAGEAL VARICES IN PATIENTS OF LIVER CIRRHOSIS DUE TO HEPATITIS C VIRUS

Khalid Amin[1], Dilshad Muhammad[2], Amin Anjum[3], Kashif Jamil[4], Ali Hassan[5]
[1]*Associate Professor of Medicine, Punjab Medical College, Faisalabad.*
[2]*Senior Registrar, DHQ Hospital, Faisalabad.*
[3]*Senior Registrar MU-IV, DHQ Hospital, Faisalabad.*
[4]*Registrar MU-IV, DHQ Hospital, Faisalabad.*
[5]*Registrar MU-IV, DHQ Hospital, Faisalabad.*

ABSTRACT

Objective:

This study was carried out to find diagnostic accuracy of platelet count to spleen diameter ratio as a predictor of esophageal varices in patients of liver cirrhosis due to Hepatitis C virus taking upper gastrointestinal tract endoscopy as gold standard.

Design:

Cross-sectional study.

Setting:

DHQ Hospital, Faisalabad.

Duration of study:

Six (6) months from staring from April 01, 2009 to September 30, 2009.

Subjects and methods:

95 patients of either sex having cirrhosis of liver secondary to Hepatitis C virus (diagnosed by coarse echo texture with reduced liver span on abdominal ultrasonography and positive polymerase chain reaction for Hepatitis C virus were considered as cirrhotic) were included in the study. All relevant investigations were carried out including upper gastrointestinal tract endoscopy, abdominal ultrasound scan, complete blood count, serum albumin level, serum billirubin level, prothrombin time (PT) and other clinical sign were recorded.

Results:

Forty seven (49.5%) patients were male and 48 (50.5%) patients were females. Mean platelet count was $133.22\pm22.83\times10^3/mm^3$ of patients who have not developed varices yet and mean platelet count was $97.29\pm13.47\times10^3/mm^3$ of patients who developed varices. Patients with varices had mean spleen diameter of 13.941±1.33 (centimeters) cms and without varices had 11.70±1.23 cms mean spleen diameter. The mean platelet count to spleen diameter ratio of patients without varices was 1162.41±242.43 and that of with varices was 704.28±142.11.

Conclusion:

Platelet count to spleen diameter ratio (considering >909 as normal) has good diagnostic accuracy in identifying cases with esophageal varices.

Keywords:

Platelet count, spleen diameter, esophageal varices, platelet count to spleen diameter ratio, diagnostic accuracy

Corresponding Author:
Dr. Khalid Amin,
Associate Professor,
Punjab Medical College, Faisalabad.
Email: drkamin2002@yahoo.com

INTRODUCTION

Cirrhosis is end-stage liver disease due to many causes which disrupts normal liver architecture. Cirrhosis results from necrosis of liver cells followed by fibrosis and nodule

formation.[1] Clinically most patients are asymptomatic or have mild fatigue, and liver synthetic function is usually preserved, others present with advanced liver disease complicated by variceal bleeding, ascites, coagulopathy, or encephalopathy.[2] WHO has estimated that cirrhosis is responsible for 1.1% of all deaths. Cirrhosis is 10th most common cause of death in USA.[3] In cirrhotic patients development of portal hypertension leads to ascites and its complication, spontaneous bacterial peritonitis and esophageal varices.[4]

In portal hypertension if pressure rises above 20 mmHg, collaterals develop. Portal hypertension is caused by a combination of two simultaneously occurring hemodynamic processes: (1) increased intrahepatic resistance to the passage of blood flow through the liver, and (2) increased splanchnic blood flow. Portal hypertension is directly responsible for variceal hemorrhage and ascites. Variceal hemorrhage is an immediate life-threatening problem with a 20–30% mortality.[5]

When the cut off value of platelet count/spleen diameter ratio of 909 was used by Giannini E *et al.*[6] in Genova Italy, to predict the presence of esophageal varices the sensitivity was 100% specificity was 93%. Positive and negative predictive values for a platelet count/spleen diameter ratio <909 were 96% and 100%, respectively. Diagnostic accuracy of this platelet count/spleen diameter ratio with a cut off value of 909 was 98%. Sarwar S *et al.*[7] at Shaikh Zayed Medical Complex Lahore, found sensitivity and specificity of platelet count/splenic diameter in centimeters ratio to predict esophageal varices with a cut off value of 909 to be 13 and 77%, respectively, which is far from significant. The results of Sarwar S *et al.*[7] differ from this present study as well as with Giannini E *et al.*[6].

MATERIALS AND METHODS

Study design:

Cross-sectional study.

Study setting:

Study was carried out at medical wards of DHQ Hospital, Faisalabad.

Duration of study:

Six (6) months from April 2009 to September 2009.

Data collection procedure:

Ninety five patients coming through OPD/ emergency department admitted in medical wards of DHQ Hospital Faisalabad diagnosed as patients of liver cirrhosis due to hepatitis C virus were included in this study. Informed consent was obtained. The variables were taken like age, sex, duration of symptoms, B.P., pulse, Respiratory rate, Temperature, Spleen size, Platelet count, Spleen Diameter in centimeters, Clubbing, Cyanosis, Flapping tremors, palmar erythema and presence of Ascites.

- The purpose of research was explained to each patient.
- Each patient underwent ultrasonography (by a radiologist) of abdomen to measure the spleen diameter in centimeters.
- Each patient underwent endoscopy of upper gastrointestinal tract to find out whether he/she have developed esophageal varices or not.
- Platelet count of each patient was determined.

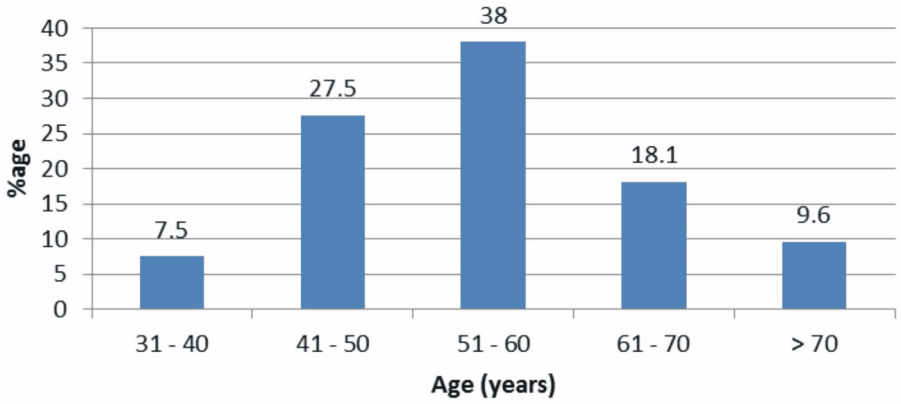
Data analysis procedure:

The data was entered in SPSS version 12 computer program. The descriptive statistics were calculated. The quantitative variables of the study were age, duration of symptoms, B.P., pulse rate, respiratory rate, temperature, spleen size, platelet count, spleen diameter in centimeters and portal vein size. These variables are presented as Mean $\pm$ SD. The qualitative Variables were sex of the patient, Edema, Clubbing, Cyanosis, Flapping tremors, palmar erythema and presence of Ascites. These variables are presented as percentage. The diagnostic accuracy of platelet count to spleen diameter ratio is determined by applying screening tests i.e. Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and diagnostic accuracy as shown in the following tables. Endoscopic findings have been taken as Gold Standard.

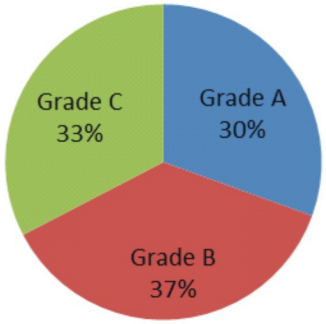
RESULTS OF STUDY

Ninety five patients diagnosed to have cirrhosis of liver due to hepatitis C virus were included in this study. The mean age of the patients was 57.61$\pm$11.161 years. The maximum patients were 36(38%) in the age range of 51-60 year (Fig. 1).

Fig. 1. Distribution of patients according to age



Distribution of patients by Child-Turcottle-Pugh Grade

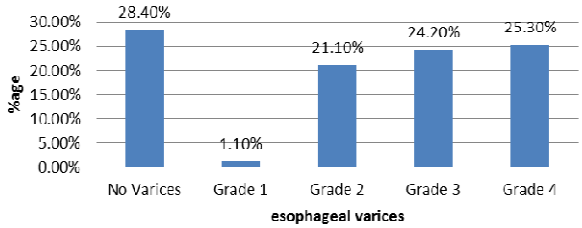


In this study 47 (49.5%) patients were male and 48(50.5%) patients were females. All patients were categorized according to Child-Turcotte-Pugh classification. 29 patients (30.52%) were in Child-Turcotte-Pugh grade A, 35 patients (36.84%) were in Child-Turcotte-Pugh grade B while 31 patients (32.63%) fell in the category named Child-Turcotte-Pugh grade C.

Esophageal endoscopy was performed and it was found that 27 (284%) patients did not develope varices yet. Remaining 68 (71.6%) patients developed varices. Of these sixty eight patients (1.1%) one patient had grade I varices. Grade II varices were found in 20 (21.1%) patients, grade III varices were found in 23 (24.2%) patients and 24 (25.3%) patients had developed grade IV varices (Fig. 2).

The mean platelet count to spleen diameter ratio of all the patients was 834.48±271.670.

Fig-2. Distribution of patients according to presence of esophageal varices on endoscopic findings



Mean platelet count to spleen diameter ratio of Child-Turcotte-Pugh Grade A category patients was 1137.66±47.797. Child-Turcotte-Pugh Grade B category patients had mean platelet count to spleen diameter ratio of 728.23±26.265. In case of Child-Turcotte-Pugh Grade C category patients mean platelet count to spleen diameter ratio of 670.84±19.970 was observed in the study (Table 1).

Table 1. Platelet count to spleen diameter ratio of different child-turcotte-pugh grades (n=95)

Child-turcotte-pugh grade	n	Mean ± SE
Grade A	29	1137.66 ± 47.797
Grade B	35	728.23 ± 26.265
Grade C	31	670.84 ± 19.970

The mean platelet count to spleen diameter ratio of patients without varices was 1162.41±46.657 and those of with varices was 704.28±17.234 (Table 2).

Considering platelet count/splenic diameter in centimeters ratio >909 as normal and keeping in view the endoscopic findings true positive cases (Table 3) were 61 (64.2%), true negative were 22 (23.2%), false positive were 5 (5.3%) and false negative cases were 7 (7.4%). These values were put in the 2×2 table (Table 4). Calculations were done and the results were that, the sensitivity (also known as true positive rate) of platelet count to spleen diameter ratio (considering >909 as normal) as a predictor of esophageal varices in patients of liver cirrhosis due to Hepatitis C virus taking upper gastrointestinal tract endoscopy as gold standard was found to be 89.70%. Calculated specificity (also known as true negative rate) is 81.48%. Positive predictive value is 92.42% and negative predictive value was found to be 75.86%.

Table 2. Platelet count to spleen diameter ratio according to presence of esophageal varices (n=95)

Esophageal varices	n	Mean ± SE
No	29	1162.41±46.657
Yes	66	704.28±17.234

Table 3. Distribution of patients according to 2 x 2 table status (n=95)

Parameter	True	False	*Percentage*
Positive	61	5	66
Negative	22	7	29
Total	83	12	95

Positive likelihood ratio found to be 4.84 and negative likelihood ratio was 0.12 in this study. Diagnostic Accuracy of platelet count to spleen diameter ratio as a predictor of esophageal varices in patients of liver cirrhosis due to Hepatitis C virus taking upper gastrointestinal tract endoscopy as gold standard is 87.36%.

Table 4. Table of 2 x 2 (n=95)

Platelet count to spleen diameter ratio (Considering>909 as normal) Test Result	Endoscopic Findings		Total
	Varices Present (Disease)	Varices Absent (No Disease)	
Varices Present Ratio<909	a(61) True Positive Endoscopically Varices Present Ratio<909	b(5) False Positive Endoscopically Varices Absent Ratio<909	a+b(66)
Varices Absent Ratio>909	c(7) False Negative Endoscopically Varices Present Ratio>909	d(22) True Negative Endoscopically Varices Absent Ratio>909	c+d(29)
Total	a+c(68)	b+d(27)	a+b+c+d(95)

DISCUSSION

In this study all the patients who have developed esophageal varices have lower value of platelet count to spleen diameter ratio than those who have not developed esophageal varices yet. Other studies show comparable results in this regard also. Giannini E, Botta, Borro *et al.*[6] (Genova, Italy) conducted a study in which average platelet

count to spleen diameter ratio in patients who have not developed esophageal varices was 1638 and average platelet count to spleen diameter ratio in patients who have developed esophageal varices was 533. Similarly average platelet count to spleen diameter ratio in patients who have not developed esophageal varices was 2408.7 and average platelet count to spleen diameter ratio in patients who have developed esophageal varices was 862.6 in the study by Legasto GMA *et al.*[8] (Philippines). Average platelet count to spleen diameter ratio in patients who have not developed esophageal varices was 1107 and average platelet count to spleen diameter ratio in patients who have developed esophageal varices was 558 in the study by Giannini EG *et al.*[9] (Padua, Italy). So these results are similar to present study.

When the cut off value of platelet count/spleen diameter ratio of 909 was used by Giannini E *et al.*[6] in Genova Italy, to predict the presence of esophageal varices the sensitivity was 100% specificity was 93%. Positive and negative predictive values for a platelet count/spleen diameter ratio <909 were 96% and 100%, respectively. Diagnostic accuracy of this platelet count/spleen diameter ratio with a cut off value of 909 was 98%. In the present study at medical wards of Allied Hospital, Faisalabad, sensitivity is 89.70%, specificity is 81.48%, positive predictive value is 92.42% and negative predictive value is 75.86%. In all these figures obtained from present study cut off value of platelet count/spleen diameter ratio for the presence of esophageal varices was 909. Platelet count/splenic diameter in centimeters ratio >909 was considered normal. Diagnostic accuracy of this platelet count/spleen diameter ratio with a cut off value of 909 is 87.36% in present study. All the results are slightly different from the study by Giannini E *et al.*[6] which may be due difference in sample size, human error in identifying esophageal varices during endoscopy, geographical difference and ethnicity difference of sample population studied and patients selected were only those who had cirrhosis secondary to hepatitis C virus as Giannini E *et al.*[6] selected patients for study who were affected by any virus. Sarwar S *et al.*[7] at Shaikh Zayed Medical Complex Lahore, found sensitivity and specificity of platelet count/splenic diameter in centimeters ratio to predict esophageal varices with a cut off value of 909 to be 13% and 77% respectively, which is far from significant. The results of Sarwar S *et al.*[7] differ from this present study as well as with Giannini E *et al.*[6].

If patients can be identified with this non-invasive means they can be provided with primary prophylaxis, so fewer patients bleed and financial resources can be saved. Platelet count to spleen diameter ratio (with a cut off level of 909 to separate two groups of patients on the basis of presence of varices) can be achieved with no additional cost as most physicians usually carry out complete blood count and abdominal ultrasonography of these patients.

CONCLUSION

- Platelet count to spleen diameter ratio (considering >909 as normal) has good diagnostic accuracy in identifying cases with esophageal varices.
- This test is cheap with no additional cost and can be done at a primary health care facility.

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