



## Original Research Article

# Platelet to Lymphocyte Ratio, Platelet and Lymphocyte Counts in Assessing the Severity of Disease in Valvular Heart Diseases

Authors

**Dr Yogita Devi<sup>1</sup>, Dr Kalaivani Selvi<sup>2\*</sup>**

<sup>1</sup>Post-graduate student, <sup>2</sup>Assistant Professor, Department of Pathology, Sri Manakula Vinayagar Medical College and Hospital, Kalitheerthalkuppam, Pondicherry, 605107, India

\*Corresponding Author

**Dr Kalaivani Selvi**

Email: [klvnselvi@yahoo.co.in](mailto:klvnselvi@yahoo.co.in)

## Abstract

**Background:** Valvular heart disease (VHD) is becoming a major public health concern in developing countries. Platelet-to-lymphocyte ratio (PLR) is a novel inflammatory marker used as a prognostic factor in VHD and various other diseases.

**Aims and Objectives:** To assess the utility of PLR, platelet and lymphocyte counts for assessing the severity of valvular heart disease.

**Materials and Methods:** The study was conducted in the Department of Pathology for a period of one and half years from November 2016 to May 2018 which included 40 cases of valvular heart disease who underwent surgery in the Cardio-Thoracic and Vascular Surgery Department of a tertiary care hospital and 40 healthy subjects with normal cardiovascular status as control. ECHO was used to classify the VHD patients as mild-to-moderate and severe cases. Platelet, lymphocyte counts and PLR ratio was compared between the cases and controls using unpaired t-test. A p value <0.05 was considered statistically significant.

**Observation and Results:** PLR was found to be significantly higher in patients with severe VHD (p value<0.05) than in controls but was not found to be significantly higher in mild-to-moderate cases. Platelet counts and lymphocyte counts were found to be statistically insignificant (p>0.05).

**Conclusion:** High PLR is found to be associated with severe valvular heart disease and can be used as a marker for assessing severity of valvular disease.

**Keywords:** Valvular heart diseases, platelet to lymphocyte ratio, platelet counts, lymphocyte counts.

## Introduction

Valvular heart disease (VHD) is caused by either defect or damage in any one of the four heart valves and is becoming a major public health concern in developing countries.<sup>1</sup> They may be congenital or acquired and rheumatic or non-

rheumatic in origin. Valvular heart diseases are basically of two types: valvular stenosis and insufficiency.<sup>2</sup> Risk factors for VHD are age, gender, hypertension, smoking and hypercholesterolemia.<sup>3</sup>

Rheumatic heart disease (RHD) accounts for most cases of VHD in the developing nations.<sup>4</sup> In a study conducted by Indian Council of Medical Research (ICMR) in 10 different centers in India, the prevalence of RHD was found to range from 0.1 to 1.2/1000 school children.<sup>5</sup>

Inflammation plays an important role in fibrosis formation and leaflet thickening, which results in severe stenosis of valve. During sustained inflammation, lymphocyte counts decrease as a result of increased lymphocyte apoptosis. Platelets play a role in transportation of leukocytes to the sites of inflammation and vascular injury and also in mobilizing anti-inflammatory, pro-inflammatory and angiogenic factors into peripheral circulation.<sup>6</sup> The resulting inflammatory conditions lead to increased proliferation in megakaryocytic series and relative thrombocytosis.

Treatments are available to decrease inflammation and reduce the acceleration of degenerative valve stenosis. It is, therefore crucial to use a biomarker to foresee the progression of valve stenosis.

Platelet-to-lymphocyte ratio (PLR) is a novel inflammatory marker used as a prognostic factor in various diseases like coronary artery disease.<sup>7</sup> It combines the predictive risk of platelet counts as well as lymphocyte counts into one entity which may be better than either counts alone for monitoring the inflammatory burden and also for assessing progression of valvular disease.

### Aims and Objective

The aim of this study was to assess the utility of PLR, platelet and lymphocyte counts for assessing the severity of valvular heart diseases.

**Table 1:** Demographic characteristics of the study population

	PATIENTS WITH VHD (N= 40) MEAN ± SD	CONTROL (N=40) MEAN ± SD
MEAN AGE (Years)	39.7 ± 13.2	39.53 ± 17.1
GENDER (%)	37.5%	67.5%
MALE		
FEMALE	62.5%	32.5%

Based on ECHO findings, out of the 40 patients of VHD, 6 cases had mild-to-moderate disease and 34 cases had severe disease.

### Material and Methods

The study was conducted in the Department of Pathology for a period of one and half years from November 2016 to May 2018 which included 40 cases of valvular heart disease who underwent surgery in the Cardio-Thoracic and Vascular Surgery Department of a tertiary care hospital and 40 healthy subjects with normal cardiovascular status as control. ECHO was used to classify the VHD patients as mild-to-moderate and severe cases.

Hematological parameters such as lymphocyte count and platelet count were measured using autoanalyzer ABX Pentra DF 120L. PLR was defined as the absolute platelet count divided by the absolute lymphocyte count. Platelet, lymphocyte counts and PLR ratio was compared between the mild-to-moderate cases and severe cases with control using unpaired t-test. Data was analyzed using EpiData version 2.2.2.186 using unpaired t-test and p value <0.05 was considered statistically significant.

### Results

The age of the study participants ranged from 17-65 years in patients with VHD and 16-80 years in the control group. The patients were predominantly females in the group with VHD, whereas males were predominant in the control group (Table 1).

**Table 2:** Hematological parameters in patients with severe VHD and control group

	PATIENTS WITH SEVERE VHD	CONTROL	p VALUE
Lymphocyte count (cells/mm <sup>3</sup> )	2201.32 ± 785.1 Minimum- 801 Maximum- 4560	2421.40 ± 746.8 Minimum- 1288 Maximum- 4365	0.22
Platelet count (cells/mm <sup>3</sup> )	260240 ± 69860 Minimum- 112000 Maximum- 375000	257650 ± 51180 Minimum- 166000 Maximum- 381000	0.85
Platelet to lymphocyte ratio	132.06 ± 57.93 Minimum- 49 Maximum- 288	110.8 ± 27.83 Minimum- 68 Maximum- 176	0.043

**Table 3:** Hematological parameters in patients with mild-to-moderate VHD and control group

	PATIENTS WITH MILD-MODERATE VHD	CONTROL	p VALUE
Lymphocyte counts (cells/mm <sup>3</sup> )	1973.50 ± 654.72 Minimum- 1376 Maximum- 3172	2421.40 ± 746.8 Minimum- 1288 Maximum- 4365	0.17
Platelet count (cells/mm <sup>3</sup> )	251666 ± 51161 Minimum- 206000 Maximum- 341000	257650 ± 51180 Minimum- 166000 Maximum- 381000	0.79
Platelet to lymphocyte ratio	136.17 ± 36.00 Minimum- 101 Maximum- 205	110.85 ± 27.83 Minimum- 68 Maximum- 176	0.051

The present study demonstrated that platelet to lymphocyte ratio is found to be significantly higher in patients with severe VHD than in patients with normal cardiovascular status with a p value of 0.043 (Table 2). However, PLR did not vary significantly between the mild-to-moderate and control group (Table 3). Platelet count and lymphocyte count were found to be statistically insignificant ( $p > 0.05$ ).

### Discussion

Edem et al demonstrated that PLR was significantly higher in patients with aortic valve stenosis (197±49) when compared to the control group (144±40). They also found that PLR values over 188 predicted the severity of aortic stenosis with a sensitivity of 87% and a specificity of 70%.<sup>8</sup>

Akdag et al also found similar findings in AS patients with significantly higher PLR in severe and mild-to-moderate AS groups when compared to the control subjects (151±31.2,  $p < 0.001$ , 138±28.8 vs. 126±26.5,  $p = 0.008$ , respectively). Furthermore they also demonstrated PLR to be significantly higher in severe AS group compared to mild-to-moderate group.<sup>9</sup>

In the present study too, PLR was found to be significantly higher in patients with VHD as compared to patients with normal cardiovascular status. Platelet counts and lymphocyte counts were found to be statistically insignificant. Further studies with larger study populations are required for validating the utility of platelet and lymphocyte counts in assessing severity of VHD.

### Conclusion

Higher platelet to lymphocyte ratio is found to be associated with severe valvular disease and can be used as a marker for assessing severity of valvular disease.

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