

# Comparison of Platelet Distribution width and Total Leucocyte Count in Diagnosis of Acute Appendicitis: A Retrospective Study

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**Abstract:** ***Introduction:** Platelet distribution width (PDW) is a marker of platelet activation. Total leucocyte count (TLC) and platelet distribution width (PDW) are present in the complete blood cell count, which is routinely used in emergency department. PDW is an indicator of variation in platelet size, which can be a sign of active platelet release. Normal range of (PDW) is 9.0–17.0 fl. Normal range of total leucocyte count is 4000–11000 cells/mm<sup>3</sup> in our laboratory. Recent studies have shown association of total leucocyte count and PDW in diagnosing acute appendicitis. This study aims at investigating the accuracy of PDW in Acute Appendicitis and also compare it with Total leucocyte counts. **Materials and Methods:** This is a retrospective study. All Patients presenting with right iliac fossa pain and suspected to have appendicitis admitted and operated at Justice K S Hegde Charitable Hospital, Mangalore were considered. A total of 130 patients were included in this study. The study looked into patients admitted and operated from January 2015 to February 2017. Patients between age group of 10 and 70 years were included in the study. Data analysis was done by calculating the mean, standard deviation, sensitivity, specificity, positive predictive value and negative predictive value. **Results:** In this study total leucocyte count and PDW of 130 patients were evaluated. The mean cut off score for TOTAL LEUCOCYTE COUNT was 10011 cells/mm<sup>3</sup> and for PDW was 15.4 fl. A confidence interval of 95% was considered. We found that TLC has a sensitivity of 80.7%; specificity 61.38%; PPV of 63.89% and Negative predictive value (NPV) of 81.03% in our study. It was also found that PDW has a sensitivity of 59.62%, specificity 64.54%, PPV of 86.11% and NPV of 27.59%. The specificity and PPV of PDW (64.54% and 86.11% respectively) was found to be better when compared to specificity and PPV of TLC (61.38% and 63.89%). **Conclusion:** The ability of platelet distribution width to confirm acute appendicitis was found to be better than total leucocyte count, while Total leucocyte count alone was specific to rule out non-acute appendicitis. Thus we conclude elevated platelet distribution width can be used as a marker for diagnosing acute appendicitis.*

**Keywords:** Acute Appendicitis (AA), Total Leucocyte Count (TLC), Platelet Distribution Width (PDW), Positive Predictive Value (PPV), Negative Predictive Value (NPV).

## 1. Introduction

Acute appendicitis is a common surgical condition encountered in general surgery. Reginald Heber Fitz described appendicitis 1<sup>st</sup> time in the year 1886, and later, Mc Burney described the clinical features, findings of appendicitis, and surgical techniques in appendicitis [1]. Acute appendicitis requires urgent diagnosis and surgery. Prompt diagnosis is mainly based on the history, clinical examination, and simple laboratory tests. Appendicitis can occur in all age group [2]. Although, the value of careful clinical history, physical examination and blood investigations (total leucocyte count, neutrophil percentage and C-reactive protein) are utmost important, a more reliable biomarker could aid the physician to make a clear final decision, hasty and accurate diagnosis of acute appendicitis. As often the delay in diagnosis and surgical intervention increases the risk of appendicular perforation and there by potentially resulting in peritonitis, sepsis and even death [3]. In addition, the ratio of patients undergoing appendectomy with a normal histopathology and blood investigation result (negative appendectomy) ranges between 5% and 42% [4]. The morbidity of these patients who are operated on the basis of clinical suspicion despite absence of acute appendicitis on final histopathology result is thus increased [5, 6].

The rate of clinical diagnosis of acute appendicitis is approximately 85% [7]. Radiological methods, including computed tomography and ultrasonography, are highly sensitive and specific for identifying acute appendicitis.

However, in developing countries do not always have access to these technologies [8, 9]. Thus, inexpensive, rapid, and easily available laboratory methods with high sensitivity and specificity for identifying acute appendicitis are needed. Up to date, a lot of markers have been proposed, but none are commonly used, so we still need easily applicable, cheap and cost effective biomarker for helping in the diagnosis and evaluation of acute appendicitis [10, 11]. Recent studies have investigated the diagnostic accuracy of inflammatory markers [12, 13]. Total leucocyte count and platelet distribution width (PDW) are present in complete blood cell count, which is routinely used in emergency departments. The size of platelet is associated with activity and the function of platelet; larger platelets are more active than smaller ones. Platelet distribution width is an indicator of variation in platelet size, which can be a sign of active platelet release. PDW is also altered compared to healthy subjects in several conditions [14, 15]. There are very few studies investigating the diagnostic accuracy of platelet functional parameters in acute appendicitis. We present a retrospective study investigating the diagnostic significance of platelet parameters, PDW in acute appendicitis and comparing it with Total leucocyte count.

## 2. Materials and Methods

This is a retrospective study. All the Patient presenting with right iliac fossa pain and suspected to have appendicitis were admitted and operated at Justice K S Hegde Charitable Hospital, Mangalore were considered. A total of 130 patients

were included in this study. They were divided into 2 groups. Acute appendicitis (group-I); Non-acute appendicitis (group-II). The groups were divided based on histopathological diagnosis. Non-acute appendicitis group included (acute on chronic appendicitis, recurrent appendicitis and chronic appendicitis). The study period was from January 2015 to February 2017. Patients between age group of 10 and 70 years were included into the study. Patients on anti-coagulants, anti-platelets, pre-existing haematological disorder and those who received blood transfusion prior to surgery were excluded. Total leucocyte count and platelet distribution width values from blood samples were compared among the groups.

### Data Analysis

Descriptive statistics of the data was collected and documented. Data analysis was done by calculating the mean, Sensitivity, Specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV). The results were tabulated.

### 3. Results

The mean age of patient was 25 years (range: 10-70 years). Total number of male patients in the study were found to be 80 and total number of female patients were found to be 50. In this study the total leucocyte count and PDW of 130 patient were evaluated. The mean cut-off score of 10011 cells/mm<sup>3</sup> for total leucocyte count and 15.4 fl for PDW was considered in our study. A confidence interval of 95% was considered. The comparison of Total leucocyte count between group 1 and 2 is illustrated in table 'a' while that of PDW between group 1 and 2 in table 'b'. It was found that PDW is a more important diagnostic marker compared to total leucocyte count in diagnosing acute appendicitis. Total leucocyte counts between group 1 and 2 was compared and it was found that TLC has a sensitivity of 80.7%; specificity 61.38%; PPV 63.89% and Negative predictive value (NPV) 81.03%. PDW between group 1 and 2 was compared and it was found that PDW has a sensitivity of 59.62%, specificity 64.54%, PPV 86.11% and NPV 27.59%. It was found that the specificity and PPV of PDW (64.54% and 86.11% respectively) was better when compared to specificity and PPV of TLC (61.38% and 63.89%).

**Table (a)**

Parameter:(Total Leucocyte Count)	Acute Appendicitis(72)	Non-Acute Appendicitis(58)
>10011	46	11
<10011	26	47

SENSITIVITY: 80.70%

SPECIFICITY: 61.38%

PPV: 63.89% NPV: 81.03%

**Table (b)**

Parameter:(PDW)	Acute Appendicitis(72)	Non-Acute Appendicitis(58)
>15.4	62	42
<15.4	10	16

SENSITIVITY: 59.62%

SPECIFICITY: 64.54%

PPV: 86.11%

NPV: 27.59%

### 4. Discussion

Acute appendicitis is most common cause of "acute abdomen" in all age groups. Although classical symptomatology, signs and the examination findings of acute appendicitis are well known in clinical practise but still it is difficult to the diagnose it from other causes of acute abdominal pain<sup>[11]</sup>. It is important to make a quick and precise diagnosis before its complications develop<sup>[8]</sup>. As acute appendicitis is an inflammatory process, many authors consider using biomarkers for its diagnosis. Among these, TLC is the one most commonly used. Many studies also support that TLC is the first indicator to be elevated in appendix inflammation<sup>[16]</sup>. Despite, the improvements in imaging methods such as ultrasonography and computed tomography, it adds to the cost of patient care and is often not available in rural hospitals. Due to this reasons and inflammatory process of acute appendicitis, many authors consider using biomarkers for diagnosis<sup>[3, 17]</sup>. Total leucocyte count and PDW is an expensive diagnostic test which can be performed in a smaller laboratories. There is a limited number of studies in literature showing PDW changes in acute appendicitis. TLC is most frequently used laboratory test for diagnosing acute appendicitis. Many studies support that TLC is the 1<sup>st</sup> indicator to be elevated in appendicular inflammation<sup>[16]</sup>. We found that TLC was significantly higher in acute appendicitis. Narci et al found cut off value of TLC  $10.4 \times 10^3/\text{mm}^3$  with a 91% sensitivity and 74% specificity<sup>[3]</sup>. Bulent Dinc et al found cut off value TLC  $10.6 \times 10^9/\mu\text{L}$  with a 73.1% sensitivity and 94% specificity<sup>[4]</sup>. Similar to the literature, the present study found that the sensitivity and specificity of total leukocyte count level were 80.70%-and 61.38%, respectively with cut off level  $10011/\mu\text{L}$  whereas the PPV and NPV was found to be PPV:63.89% and NPV:81.03% respectively. Platelet distribution width (PDW) is present in complete blood cell count, which is routinely used in emergency departments. They are indicators of platelet activation. In a case study by Aydogan et al patients were divided into groups as perforated and non-perforated. In this study with no control group, PDW values were significantly higher in the perforated group<sup>[1]</sup>. Bulent Dinc et al found PDW is higher than TLC and neutrophil percentage in diagnosing accurately acute appendicitis with 97.1% sensitivity and 93% specificity<sup>[4]</sup>. In the present study, the sensitivity and specificity of PDW is found to be 59.62% and 64.54% with PPV: 86.11% and NPV: 27.59%, respectively is lower from Bulent Dinc et al study.

### 5. Conclusion

In conclusion, Total leucocyte count (TLC) seems to be a better inflammatory marker in acute appendicitis. Higher PDW levels important parameter in diagnosing acute appendicitis. The ability of platelet distribution width to confirm acute appendicitis was found to be better than total leucocyte count, while Total leucocyte count alone was specific to rule out non-acute appendicitis. Thus we conclude elevated platelet distribution width (PDW) can be used as a marker for diagnosing acute appendicitis. We believe that further prospective high volume research is needed to find more specific and more reliable biomarkers in diagnosing acute appendicitis, which can minimize the rate

of negative appendectomy and can aid to the diagnosis of acute appendicitis, lowering the cost of the surgery which can be a benefit to the patients.

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