

Evaluating the Role of Platelet Parameters in Predicting Complicated Appendicitis: A Prospective Cross-sectional Study

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ABSTRACT

Introduction: Acute appendicitis is largely a clinical diagnosis, but has a high negative appendectomy rate of 10-30%. If diagnosis is delayed, it can lead to serious complications like abscess formation, perforation and gangrene. Currently, there is a lack of quick and easy to use ancillary tests to predict complicated cases. Platelet parameters are a promising tool to predict complications and support clinical decision making. Hence, they should be evaluated for the same.

Aim: To evaluate platelet parameters namely Platelet Count (PC), Mean Platelet Volume (MPV), Plateletcrit (PCT) and Platelet Distribution Width (PDW) as a tool to predict complications in appendicitis patients.

Materials and Methods: A prospective, observational, cross-sectional study was conducted at the Department of Pathology, ESI-Post Graduate Institute of Medical Sciences and Research (ESI-PGIMSR), Basaidarapur, New Delhi, India, from April 2024 to July 2025 where blood samples were taken from all patients planned for emergency appendectomy prior to the surgery. Platelet parameters such as PC, MPV, PCT and PDW were observed. These parameters were then correlated with histologic features of the removed appendix. Pearson's

correlation coefficients (r) were calculated for the same. Cases with histologic features like gangrene and thrombosed vessels were taken as complicated appendicitis. The mean of the platelet parameters in these cases were compared with the rest of the cases (uncomplicated) using unpaired t-test to see if significant differences existed. Multivariate regression analysis to predict gangrene was also done.

Results: Seventy-two patients were included in the present study with a male to female ratio of 1.8:1. Among these, 25 cases showed both features, ensuring no duplication in total count. Statistically significant reduced MPV (7.7 ± 0.8 fL) and elevated PC ($338.4 \pm 79.6 \times 10^3/\mu\text{L}$), PCT ($0.26 \pm 0.07\%$) and PDW ($17.7 \pm 3.0\%$) were observed in complicated cases (i.e., with gangrene and thrombosed vessels) versus uncomplicated ($n=47$) ones. Additionally, multivariate regression analysis identified PC $>300 \times 10^3/\mu\text{L}$, MPV <8.0 fL, PDW $>16\%$, and PCT $>0.25\%$ as significant predictors for gangrene development.

Conclusion: These findings highlight the potential role of platelet indices in predicting the complications in clinical settings, contributing to quicker decision for patients with complicated appendicitis.

Keywords: Appendix, Complications, Diagnosis

INTRODUCTION

Acute appendicitis remains one of the most common causes of acute abdominal pain and surgical emergencies across the globe. The global age-standardised incidence rate of appendicitis in 2021 was 214 per 100000, corresponding to 17 million new cases [1]. The incidence is rising especially in newly industrialised nations due to changes in dietary and environmental factors. The mainstay of treatment is emergency appendectomy, ideally within 24 hours of diagnosis, to prevent complications such as perforation, abscess formation, and peritonitis. Diagnosis of acute appendicitis is primarily clinical, supported by laboratory and imaging findings. However, the clinical presentation can be variable, particularly in children, elderly, and pregnant women, making diagnosis challenging. Delay in diagnosis or intervention for acute appendicitis may lead to perforation, generalised peritonitis, sepsis, prolonged hospitalisation, and increased morbidity. Conversely, misdiagnosis may lead to negative appendectomies, exposing patients to unnecessary surgery and its risks [2].

Despite global advancements, the diagnostic accuracy of acute appendicitis remains suboptimal, particularly in equivocal cases. Hence, there is a growing need for reliable, quick, and cost-effective biomarkers to support clinical decision-making, particularly in resource-constrained settings. While imaging (e.g., ultrasonography, CT scan) plays a role, its availability, cost, and operator dependence

may limit routine use in emergency settings. Clinical scoring systems such as the Alvarado Score and the Appendicitis Inflammatory Response (AIR) Score are widely used, their accuracy varies [3-5]. These tools incorporate signs, symptoms, leukocyte count, and in some cases, C-Reactive Protein (CRP) to increase diagnostic precision [6].

However, even with imaging and scoring tools, the rate of negative appendectomies (removal of non inflamed appendices) ranges between 10% and 30%, especially among females and paediatric populations. This has fueled the search for easily available, non invasive, and cost-effective biomarkers to enhance early detection and triage of patients presenting with suspected appendicitis [7-9].

In recent years, blood-based biomarkers have gained attention due to their low cost, non invasive nature, and ease of accessibility. Among these, platelet indices have emerged as potential inflammatory markers in various acute and chronic diseases [2,10]. Traditionally known for their role in haemostasis, platelets are now recognised as active participants in the inflammatory process. Platelet activation leads to measurable changes in platelet morphology and function, which are reflected in Platelet Indices (PI), including PC, MPV, PDW and PCT [11].

Although several international studies have explored the role of platelet indices in appendicitis, there is a paucity of Indian literature addressing this topic, especially in relation to histopathological correlation. Understanding whether platelet parameters can help

predict the severity of inflammation or differentiate uncomplicated from complicated appendicitis could help tailor management and reduce negative appendectomy rates [12].

Hence, the present study aimed to evaluate platelet parameters namely PC, MPV, PCT and PDW as a tool to predict complications in appendicitis patients. The primary objective was to measure the platelet parameters including PC, MPV, PCT and PDW in emergency appendectomy patients. Secondary objective was to correlate the platelet parameters with histopathological features of appendectomy specimens.

MATERIALS AND METHODS

A prospective, observational, cross-sectional study was conducted at the Department of Pathology, ESI-Post Graduate Institute of Medical Sciences and Research (ESI-PGIMSR), Basaidarapur, New Delhi, India from April 2024 to July 2025 over a span of 15 months after approval of Institutional Ethics Committee (IEC/2024044).

Inclusion criteria: Patients who presented to the casualty department and/or were diagnosed as acute appendicitis clinically and/or radiologically and planned for emergency appendectomy were included in the study. A brief clinical data of the patient such as age, gender, clinical diagnosis, and surgical procedure was collected on the preformed proforma.

Exclusion criteria: Known patients of chronic inflammatory disorders, any known cause of platelet abnormality in the patient and patients receiving Oral Contraceptive Pills (OCPs), Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), and anticoagulants were excluded from the study.

Study Procedure

A 3 mL Di-Potassium Ethylene Diamine Tetra-Acetic Acid (K2-EDTA) venous blood samples were collected before surgery and platelet parameters (PC - Ref range: $150-400 \times 10^3/\mu\text{L}$, MPV - Ref range: 7.2-11.1 fL, PDW- Ref range: 9.0-17.0 %, and PCT- Ref range: 0.18-0.24%) were measured and assessed in the fully automated haematology analyser (Horiba Yumizen 2500). Histopathological examination of appendectomy specimens was done as per standard protocol. Initial thorough gross examination was done noting presence of congestion/ perforation/gangrenous changes. The major histologic parameters noted were presence of neutrophils in muscularis propria, suppurative abscess i.e., presence of sheets of neutrophils involving all the layers of appendiceal wall, presence of eosinophils, ulceration of lining mucosa, presence of gangrene and thrombosed vessels. The values of above mentioned platelet parameters were observed separately in each of the histologic feature and any statistically significant association was looked for. Correlation of platelet parameters with histopathological features was done, looking for positive or negative association. Cases were subdivided into acute appendicitis, suppurative appendicitis and gangrenous appendicitis. The mean values of all the platelet parameters were noted in the three groups and compared to see if the differences were statistically significant. To evaluate the platelet parameters as a tool to predict complications, the cases with gangrene and thrombosed vessels were grouped together under the complicated category and compared with the uncomplicated ones to note statistically significant differences amongst them.

STATISTICAL ANALYSIS

The Statistical Package for Social Sciences (SPSS) 20.0 version and MS Excel were used for statistical analysis of the data. Continuous variables conforming to a normal distribution were expressed as mean \pm standard deviation. Counting data were expressed as numbers and percentages. The unpaired t-test or non-parametric equivalent was used for inter-group analysis. The Chi-square and Fisher's-exact test were used to compare the proportion data between the groups. In all of the statistical analyses, $p < 0.05$ was

considered to be statistically significant. Pearson's correlation coefficients (r) were calculated to correlate the platelet parameters with the histopathological features.

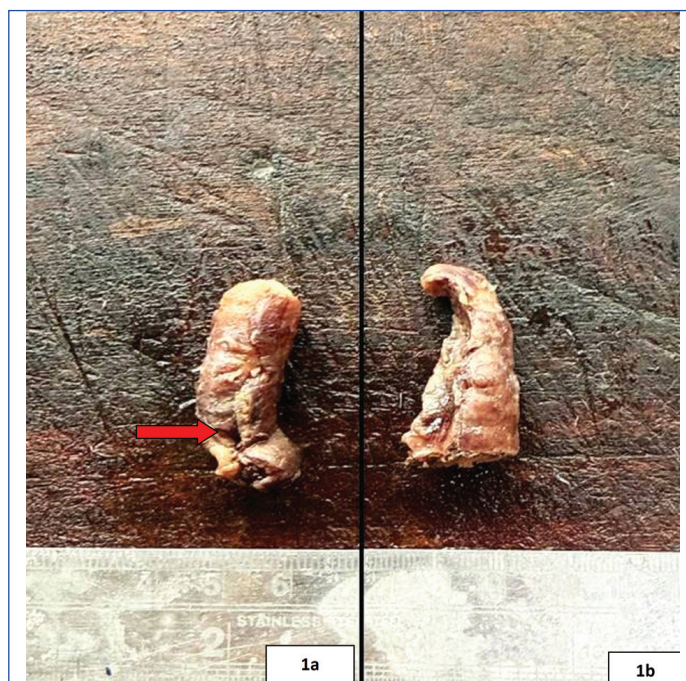
RESULTS

Out of the total 72 study participants, 46 (63.9%) were males and 26 (36.1%) were females. The mean age of the study population was 32.7 ± 12.4 years. Among them, 18 participants (25.0%) were aged 10-20 years, 25 (34.7%) were 21-30 years, 17 (23.6%) were 31-40 years, and 12 (16.7%) were older than 40 years.

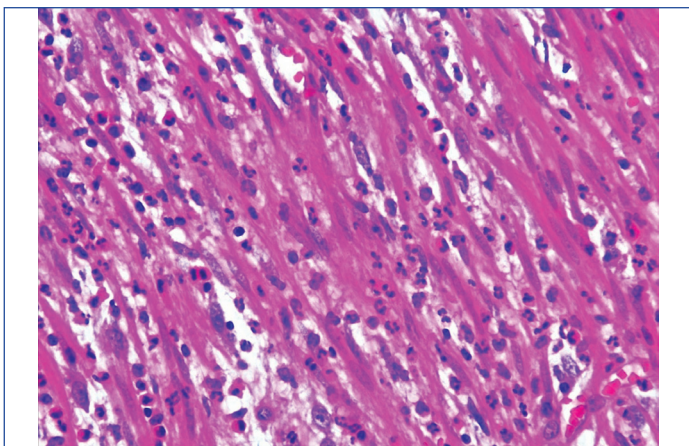
The platelet parameters evaluated included PC, MPV, PCT, and PDW. The overall mean values among all cases (n=72) were as follows: PC - $278.4 \pm 68.3 \times 10^3/\mu\text{L}$, MPV- 8.7 ± 1.4 fL, PCT- $0.22 \pm 0.05\%$ and PDW - $15.6 \pm 2.7\%$. Males had a mean PC of $270.5 \pm 65.8 \times 10^3/\mu\text{L}$, MPV of 8.9 ± 1.3 fL, PCT of $0.21 \pm 0.04\%$, PDW of $15.3 \pm 2.6\%$, whereas females had a mean PC of $292.1 \pm 71.2 \times 10^3/\mu\text{L}$, MPV of 8.3 ± 1.5 fL, PCT of $0.23 \pm 0.06\%$, PDW of $16.1 \pm 2.9\%$. However, no statistically significant difference was observed between males and females for any of the platelet parameters ($p=0.178$ for PC, 0.062 for MPV, 0.087 for PCT, and 0.204 for PDW).

For age-wise analysis, participants were categorised into four groups: 10-20 years, 21-30 years, 31-40 years, and >40 years. The mean PC and MPV were $295.2 \pm 72.4 \times 10^3/\mu\text{L}$ and 8.4 ± 1.2 fL in the 10-20 year group; $265.8 \pm 63.7 \times 10^3/\mu\text{L}$ and 8.8 ± 1.3 fL in the 21-30 year group; $283.1 \pm 70.2 \times 10^3/\mu\text{L}$ and 8.9 ± 1.5 fL in the 31-40 year group; and $272.5 \pm 67.9 \times 10^3/\mu\text{L}$ and 8.6 ± 1.4 fL in those older than 40 years. No statistically significant differences were noted across age groups for PC (p -value=0.421) or MPV (p -value=0.537).

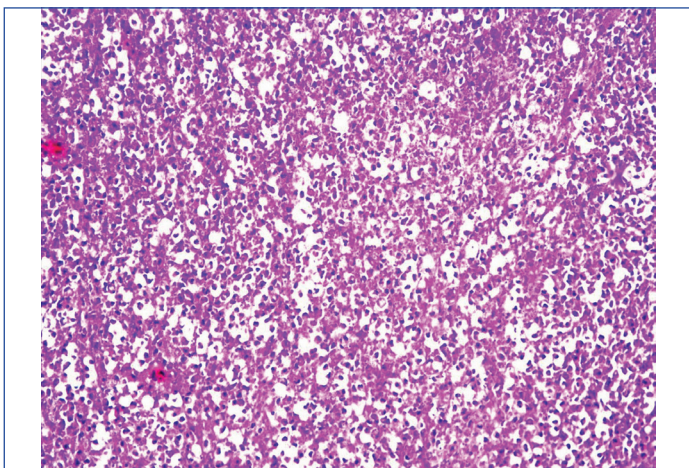
The major histopathologic features observed were neutrophilic infiltration of the muscularis propria (found in 90.27%, n=65 cases), ulceration of lining mucosa found in 31 cases (43.06%) presence of suppurative abscess in the appendiceal wall (found in 24 cases (33.33%), presence of eosinophils found in 19 cases (26.39%) thrombosed vessels (found in 11 (15.28%), and gangrene (found in 14 cases (19.44%), [Table/Fig-1-6]. The various platelet parameters in cases with and without these histologic features along with the corresponding p-values are illustrated in [Table/Fig-7]. A consistent trend of significantly reduced MPV and significantly elevated PC, PCT, and PDW was observed in cases showing neutrophilic infiltration, ulceration, suppurative abscess, gangrene, and thrombosed vessels. This pattern was not observed in cases with eosinophilic infiltration,



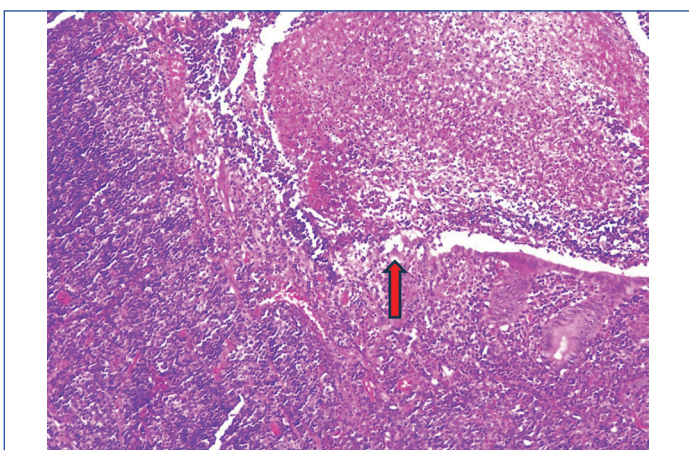
[Table/Fig-1]: a) Gross image of perforation labelled with arrow; b) Gross image from a dilated appendix of suppurative appendicitis.



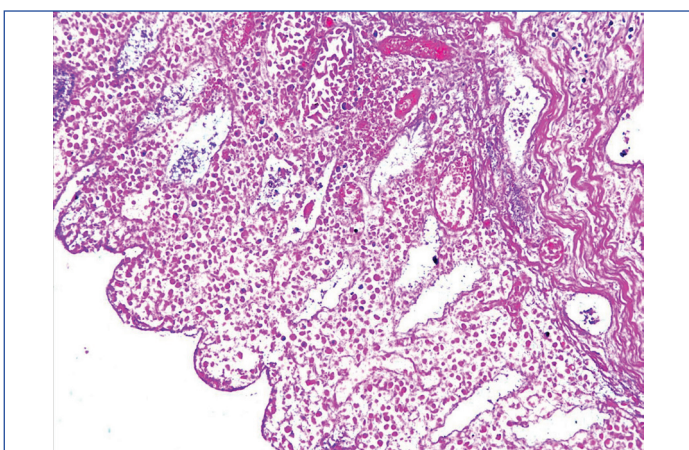
[Table/Fig-2]: Neutrophils and eosinophils in muscularis propria (H&E, 400X).



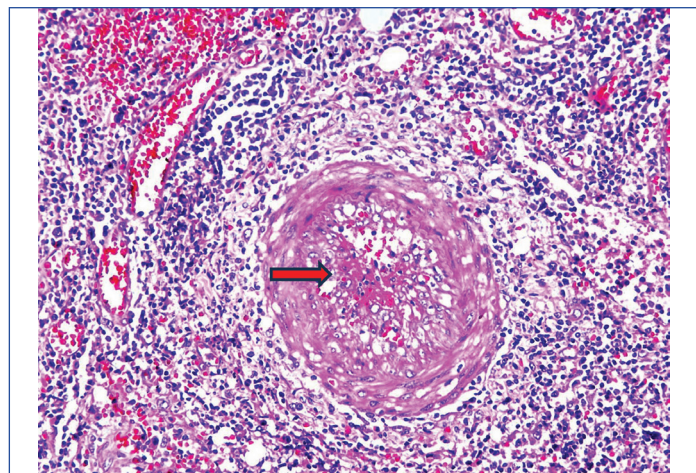
[Table/Fig-3]: Sheets of neutrophils within the wall of appendix depicting suppurative abscess (H&E, 200X).



[Table/Fig-4]: Ulceration of the lining epithelium depicted by the arrow (H&E, 100X).



[Table/Fig-5]: Gangrene showing necrosis of the mucosa, submucosa and muscular layer (H&E, 200X).



[Table/Fig-6]: Presence of a thrombosed vessel in serosal layer (H&E, 200X).

Neutrophils in muscularis propria	Present (n=65)	Absent (n=7)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	283.5 \pm 66.8	221.3 \pm 71.4	0.017
MPV (fL)	8.5 \pm 1.3	10.1 \pm 1.6	0.003
PCT (%)	0.23 \pm 0.05	0.18 \pm 0.04	0.026
PDW (%)	15.9 \pm 2.5	13.2 \pm 2.9	0.011
Eosinophils in muscularis propria	Present (n=19)	Absent (n=53)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	262.3 \pm 61.7	284.1 \pm 70.2	0.214
MPV (fL)	8.9 \pm 1.4	8.6 \pm 1.4	0.398
PCT (%)	0.21 \pm 0.05	0.22 \pm 0.05	0.462
PDW (%)	16.2 \pm 2.8	15.4 \pm 2.6	0.257
Ulceration	Present (n=31)	Absent (n=41)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	298.7 \pm 73.5	263.2 \pm 61.8	0.019
MPV (fL)	8.3 \pm 1.2	9.0 \pm 1.5	0.038
PCT (%)	0.24 \pm 0.06	0.21 \pm 0.04	0.012
PDW (%)	16.4 \pm 2.9	15.0 \pm 2.4	0.022
Neutrophilic abscess/Suppuration	Present (n=24)	Absent (n=48)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	305.8 \pm 75.1	265.3 \pm 62.4	0.009
MPV (fL)	8.1 \pm 1.1	8.9 \pm 1.5	0.014
PCT (%)	0.25 \pm 0.06	0.20 \pm 0.04	<0.001
PDW (%)	17.0 \pm 2.7	14.9 \pm 2.3	0.001
Gangrene	Present (n=14)	Absent (n=58)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	332.6 \pm 81.3	265.4 \pm 60.2	<0.001
MPV (fL)	7.9 \pm 0.9	8.9 \pm 1.4	0.006
PCT (%)	0.26 \pm 0.07	0.21 \pm 0.04	0.002
PDW (%)	17.5 \pm 3.1	15.1 \pm 2.3	0.003
Thrombosed vessels	Present (n=11)	Absent (n=61)	p-value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	346.2 \pm 87.5	268.3 \pm 61.7	<0.001
MPV (fL)	7.5 \pm 0.8	8.8 \pm 1.4	0.001
PCT (%)	0.27 \pm 0.08	0.21 \pm 0.04	<0.001
PDW (%)	18.1 \pm 3.3	15.2 \pm 2.2	<0.001

[Table/Fig-7]: Platelet parameters observed in various histopathologic features (Statistical test used- t-test)

where the differences in platelet parameters were not statistically significant. Notably, cases with gangrene and thrombosed vessels demonstrated significantly higher PCs ($338.4 \pm 79.6 \times 10^3/\mu\text{L}$) and PDW ($17.7 \pm 3.0\%$) compared to cases without these features (PC $252.3 \pm 56.7 \times 10^3/\mu\text{L}$ and PDW $14.8 \pm 2.1\%$), with $p < 0.001$. Correlation analysis between platelet parameters and histological features ([Table/Fig-8] showing r-values), showed a positive association for PC, PCT, and PDW, and a negative association for MPV across all histological features except eosinophilic infiltration. In cases with eosinophils, PC and PCT showed a negative correlation, while MPV and PDW showed

a positive correlation; however, these associations were not statistically significant ($p=0.214, 0.398, 0.462, \text{ and } 0.257$, for mean PC, MPV, PCT and PDW, respectively) [Table/Fig-7].

Histopathological features	Platelet Count (PC)	MPV	PCT	PDW
Neutrophils in muscularis	0.35*	-0.42*	0.38*	0.39*
Eosinophils	-0.15	0.10	-0.08	0.14
Ulceration	0.28*	-0.24*	0.32*	0.27*
Neutrophilic abscess	0.33*	-0.31*	0.46*	0.44*
Gangrene	0.52*	-0.36*	0.40*	0.41*
Thrombosed vessel	0.49*	-0.41*	0.43*	0.48*

[Table/Fig-8]: Correlation coefficients (r -values) of platelet parameters with histopathological features.
*with significant p -values

Based on histological severity, cases were further classified into acute appendicitis ($n=34$), acute suppurative appendicitis ($n=24$, included cases showing suppurative abscess formation with inflammation extending in all the layers), and gangrenous appendicitis ($n=14$). The mean platelet parameters for each group are shown in [Table/Fig-9] and demonstrate a progressive decrease in MPV and increase in PC, PDW, and PCT from acute to suppurative to gangrenous appendicitis. Multivariate regression analysis for differentiating these severity groups is presented in [Table/Fig-10]. Presence of perforation was observed in 20 cases whereas periappendicitis was found in 45 cases.

Parameters	Acute Appendicitis (AA) ($n=34$)	Acute Suppurative Appendicitis (ASA) ($n=24$)	Gangrenous Appendicitis (GA) ($n=14$)
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	260	305.8	338.4
MPV (fL)	8.8	8.1	7.7
PCT (%)	0.21	0.25	0.26
PDW (%)	15.0	17.0	17.7

[Table/Fig-9]: Mean values for histologic groups.

Predictor variables	Acute Suppurative Appendicitis (ASA) vs Acute Appendicitis (AA)		Gangrenous Appendicitis (GA) vs Acute Appendicitis (AA)	
	Adjusted odds ratio (95% Confidence interval)	p -value	Adjusted odds ratio (95% Confidence interval)	p -value
Platelet Count (PC) (per 50 $\times 10^3/\mu\text{L}$ increase)	2.10 (1.20-3.68)	0.009	3.95 (2.05-7.61)	<0.001
MPV (per 1 fL decrease)	1.85 (1.15-2.98)	0.011	4.12 (2.21-7.68)	<0.001
PCT (per 0.05% increase)	2.45 (1.32-4.55)	0.004	3.88 (1.92-7.84)	<0.001
PDW (per 5% increase)	2.30 (1.25-4.22)	0.007	3.60 (1.85-7.00)	<0.001
Model Statistics	Nagelkerke R^2 : 0.42		Overall p -value: <0.001	

[Table/Fig-10]: Multivariate regression analysis of platelet parameters for differentiating appendicitis severity groups (Multivariate logistic regression).

For further assessment of histological severity, cases were dichotomised into those with gangrene and those without. All platelet parameters showed statistically significant differences between the two groups [Table/Fig-7]. Multivariate regression analysis for gangrene prediction was as shown in [Table/Fig-11]. It shows that PC $>300 \times 10^3/\mu\text{L}$, MPV <8 fl, PDW $>16\%$ and PCT $>0.25\%$ all predicted gangrene significantly with the adjusted odds ratio and confidence interval as shown in [Table/Fig-11].

Predictors	Adjusted odds ratio	95% Confidence interval	p -value
Platelet Count (PC) $>300 \times 10^3/\mu\text{L}$	4.82	1.56-14.91	0.006
MPV <8.0 fL	5.17	1.78-15.02	0.002
PDW $>16\%$	3.95	1.32-11.84	0.014
PCT $>0.25\%$	4.21	1.41-12.61	0.010

[Table/Fig-11]: Multivariate regression for gangrene prediction (Statistical test used- t -test).

Finally platelet indices were compared between complicated and uncomplicated appendicitis [Table/Fig-12]. Cases demonstrating gangrene and thrombosed vessels were categorised under the complicated cases ($n=25$) and compared with the other cases with uncomplicated histology ($n=47$). Thrombosed vessels, ranging from one to three in number, were identified in the serosal and submucosal layers. Complicated cases demonstrated significantly reduced MPV (7.7 ± 0.8 fl) and significantly elevated PC ($338.4 \pm 79.6 \times 10^3/\mu\text{L}$), PDW ($17.7 \pm 3.0\%$), and PCT ($0.26 \pm 0.07\%$) compared to uncomplicated cases, with all differences being statistically significant ($p < 0.001$) [Table/Fig-12].

Parameters	Complicated* ($n=25$)	Uncomplicated ($n=47$)	p -value
Platelet Count (PC) ($\times 10^3/\mu\text{L}$)	338.4 \pm 79.6	252.3 \pm 56.7	<0.001
MPV (fL)	7.7 \pm 0.8	9.1 \pm 1.4	<0.001
PCT (%)	0.26 \pm 0.07	0.20 \pm 0.04	<0.001
PDW (%)	17.7 \pm 3.0	14.8 \pm 2.1	<0.001

[Table/Fig-12]: Platelet indices in complicated versus uncomplicated appendicitis (Statistical test used- t -test)

*Complicated: Gangrene and thrombosed vessel present

DISCUSSION

The present study's demographic profile showed that 63.9% of participants were male and 36.1% were females, with a mean age of 32.7 ± 12.4 years. Ag C and Patil V et al reported similar gender distribution (58% males, 42% females) [13]. The mean age in their study was 36.5 ± 15.2 years, with the highest percentage (30.7%) in the 21-30 years group, comparable to the current study cohort (34.7% in the 21-30 years group).

In the current study, male participants had a mean PC of $270.5 \pm 65.8 \times 10^3/\mu\text{L}$, while females had $292.1 \pm 71.2 \times 10^3/\mu\text{L}$, though this difference was not statistically significant ($p=0.178$). This finding aligns with Ceylan B et al., who reported no significant gender-based differences in platelet parameters in their study of

362 individuals with appendicitis [14]. Additionally, Ag C and Patil V found no significant difference in MPV between male and female appendicitis patients, a result similar to ours where the difference in MPV (8.9 ± 1.3 fL in males and 8.3 ± 1.5 fL in females) was not significant ($p=0.062$) [13].

The present study found no significant differences in PC across the age groups ($p=0.421$). This result contrasts with Dinc B et al., who found a significant difference in PC between age groups in their study of appendicitis patients, with younger patients exhibiting lower PCs [15]. Boshnak N et al., also reported no significant differences in PC across age groups, suggesting that platelet parameters may not be age-dependent in appendicitis cases [16]. Similarly, Haghi AR et al., did not report significant variations in platelet parameters by age, which supports the consistency of the current findings [17].

In the present study, the mean PC was $278.4 \pm 68.3 \times 10^3/\mu\text{L}$, MPV was 8.7 ± 1.4 fL, and PDW was $15.6 \pm 2.7\%$. Haghi AR et al., found a mean PC of $300.1 \pm 75.6 \times 10^3/\mu\text{L}$, which is higher than the present findings, but this difference could be attributed to variations in the severity of

appendicitis and patient demographics [17]. Boshnak N et al., reported a lower mean PC ($257.6 \pm 70.2 \times 10^3/\mu\text{L}$) [16], while Dinc B et al., found a mean MPV of 8.4 ± 1.2 fL, which closely aligns with our study's findings of 8.7 ± 1.4 fL [15]. In the present study, PDW of $15.6 \pm 2.7\%$ is consistent with Nes G et al., who observed PDW levels of $16.2 \pm 3.4\%$ in appendicitis patients, confirming the validity of results [18].

When compared to the findings of other studies, both similarities and differences were found in the platelet parameters, with varied results across studies.

The current study observed a significant difference in PC (283.5 ± 66.8 vs 221.3 ± 71.4 , $p=0.017$) between patients with and without neutrophils in the muscularis propria [Table/Fig-7]. Ceylan B et al., found a similar correlation between PC and neutrophil presence, suggesting that platelet activation might be more prominent in inflammatory processes like appendicitis [14]. Ag C and Patil V also reported elevated platelet parameters in patients with neutrophils in the muscularis propria, confirming our results [13]. However, Boshnak N et al., did not find significant correlations between PC and neutrophil presence, indicating that the relationship may be more complex and dependent on other factors like disease severity [16].

The present study did not find a significant correlation between platelet parameters and eosinophils. In the case of neutrophilic abscess, ulceration and presence of thrombosed vessels, study showed a statistically significant increase in PC, PCT, and PDW as well as a statistically significant decrease in MPV, indicating the importance of platelet indices in identifying complications [Table/Fig-7].

Cases demonstrating gangrene and thrombosed vessels were kept under the complicated category ($n=25$) and compared with the other cases with uncomplicated histology. Similar findings i.e., lower MPV and elevated PC, PDW and PCT were observed with the difference being statistically significant between the two groups [Table/Fig-12]. The current study findings partly align with the study by Ag C and Patil V where MPV and PDW were significantly elevated in perforated appendicitis [13]. However, MPV was lower in the present study. Similarly, Boshnak N et al., highlighted the role of PDW in complicated appendicitis, a finding that resonates with the present results [16].

On doing multivariate regression analysis for differentiating acute vs suppurative vs gangrenous appendicitis, platelet parameters were found to be significant independent predictors as shown in [Table/Fig-10]. Increase in PC, PCT, PDW and decrease in MPV all showed a positive odds ratio to predict acute suppurative as well as gangrenous appendicitis with a higher odds ratio of predicting gangrene and overall p -value less than 0.001 [Table/Fig-10].

Antić J et al., examined platelet parameters in paediatric patients undergoing surgery for acute appendicitis, revealing that MPV did not show a significant diagnostic difference for acute or complicated appendicitis [19]. In contrast, the present study observed a lower mean MPV in the complicated cases versus uncomplicated ones and the p -value was also significant (p -value <0.001). Boshnak N et al., reported that MPV and PDW showed a significant association with confirmed appendicitis [16]. On the other hand, Haghi AR et al., found a high specificity for MPV (98.66%) in diagnosing appendicitis [17]. However, their study did not find significant differences in PC across appendicitis subtypes, which contrasts with our results where all the platelet parameters were showing significant association between the complicated versus uncomplicated groups (p -value <0.001). Gangrene was associated with significantly higher PC (332.6 ± 81.3) compared to non gangrene cases (265.4 ± 60.2 , $p<0.001$) in our study [Table/Fig-7]. Haghi AR et al., found a low MPV in complicated appendicitis, which aligns with our findings of a significantly lower MPV in gangrene cases (p -value-0.006) [17]. Additionally, the findings by Ceylan B et al., corroborate the current study results by highlighting the diagnostic value of lower MPV in complicated cases [14]. The study by Dinc B et al., showed that PDW demonstrated

the highest diagnostic accuracy for appendicitis, supporting our observation of elevated PDW in complicated appendicitis with thrombosed vessels [15]. Similarly, Ag C and Patil V observed elevated PDW in perforated appendicitis, which also supports the present study finding that platelet indices like PDW play a critical role in distinguishing complicated cases [13]. Also, multivariate regression analysis was done to predict gangrene as shown in [Table/Fig-11] where it was found that $\text{PC} > 300 \times 10^3/\mu\text{L}$, $\text{MPV} < 8.0$ fL, $\text{PDW} > 16\%$ and $\text{PCT} > 0.25\%$ all predicted gangrene significantly. These cut-off values can be used objectively by the surgeons to take immediate decisions in support of emergency surgery.

The current study's findings are consistent with many studies in the literature, including those from Indian authors. However, the detailed correlation with histology has not been done in the past. Platelet parameters like PC, MPV, PDW and PCT were significantly associated not only with the presence of neutrophils in the muscularis propria, but also with complications. These results suggest that platelet parameters can be useful diagnostic markers in emergency appendectomy, particularly in complicated cases but further studies are needed to refine their diagnostic utility. The highlight of the present study was the multivariate regression analysis for gangrene prediction which gave objective values of the platelet parameters for predicting gangrene. This can help surgeons in taking quick decisions of performing emergency appendectomy.

Limitation(s)

The sample size and time duration were limited in the current study.

CONCLUSION(S)

Significant differences were observed in the platelet parameters (PC, MPV, PCT, and PDW) between cases with complications like gangrene and thrombosed vessels vis a vis uncomplicated cases. These findings highlight the potential role of platelet indices in predicting complications in clinical settings.

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