

ORIGINAL RESEARCH

Role of C-Reactive Protein and Neutrophil Lymphocyte Ratio in Predicting Severity of Acute Appendicitis

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ABSTRACT

Background:The aim of this study is to analyse the role of c- reactive protein and neutrophil lymphocyte ratio accuracy in diagnosis of acute appendicitis and perforated appendicitis.

Materials and Methods: The present study is **ROLE OF C-REACTIVE PROTEIN AND NEUTROPHIL LYMPHOCYTE RATIO IN PREDICTING SEVERITY OF ACUTE APPENDICITIS** done at Kamineni Institute of Medical Sciences, Narketpally from October 2018 to September 2020.

Results: 100 cases of acute appendicitis which were admitted in kamineni institute of medical sciences were studied. The statistical data and analysis of the cases studied during this period are presented in this study out of 100 cases 14 were managed conservatively and 86 were subjected to surgery, 4 had no inflammatory changes on histopathology and 82 had histopathological features confirming acute appendicitis. Acute appendicitis more common in males than females with a ratio of 2.22:1 with complications also being more common in males. Incidence of acute appendicitis was highest in age group ranging from 20-30 years , with complicated appendicitis being more common in the age distribution of 35.87 +/-18.31 years. Most patients present with pain predominantly in right iliac fossa (100%) followed by nausea/vomiting in 82% and fever in 78% cases. Total leucocyte count was found to be elevated in 86% of individuals with elevations in range of 15825+/-4575 in patients with complicated appendicitis. Neutrophil lymphocyte ratio was found to be elevated in 86% of individuals with elevation in range of 10.6+/-5.49 in patients with complicated appendicitis. CRP values were found to be elevated in 68% of cases. In patients with uncomplicated appendicitis 52% showed elevation of CRP levels whereas in patients with complicated appendicitis 87% showed elevation of CRP levels.

Conclusion: CRP and neutrophil lymphocyte ratio were found to be elevated in cases of acute appendicitis with complications. Elevation in neutrophil lymphocyte ration and c - reactive protein levels can be used to anticipate severity and complications in patients of acute appendicitis.

Keywords: CRP, Neutrophil, Lymphocytes, Accute appendicitis, Severity.

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INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies and the most common source of infection in community acquired intra-abdominalinfections.^[1-3]Its diagnosis is usually made depending on presenting history, clinical evaluation and physical

examination.^[1,2,4]It has been estimated that the accuracy of clinical diagnosis of acute appendicitis is only between 76 to 92 percent.^[5,6]Thus accurate diagnosis of acute appendicitis is still difficult.^[1,7,8]

Distinguishing acute appendicitis with perforation(local peritonitis)based on clinical findings is often difficult especially in elderly patients unless it has developed into generalised peritonitis.

Investigations such as ultrasound or CT can help establish a diagnosis of perforated appendicitis and assist a surgeon to determine the approach of surgical technique.However these are not available in health institutions or emergency units in developing country hospitals especially in remote areas and costs are also relatively expensive.^[9-11]

Negative appendicectomies are one of the burdens facing not only the general surgeon but also the patient her/himself and society as a whole since appendectomy as any other operation results in socio economic impacts in form of lost working days and declined productivity.^[1]

Diagnostic scoring systems have been developed in an attempt to improve the diagnostic accuracy of acute appendicitis.The most prominent of those scores is that developed by Alavarado.^[12,13]

Subsequent prospective studies have suggested that Alavarado score alone is inadequate as a diagnostic test.^[12,13]

There has been a growing interest in including laboratory studies like c reactive protein (CRP) and neutrophil – lymphocyte ratio (N/L ratio) to support the diagnosis of conditions such as malignancy, heart disease and inflammation process like appendicitis.

This examination is feasible especially in peripheral areas where radiologist is not always available and cost is relatively cheaper.^[14]

CRP is a nonspecific inflammatory marker that is used routinely in many hospitals as an aid in diagnosis of patients with an acute abdomen, an acute phase protein produced in the liver.^[15]

CRP rises within two hours of the onset of inflammation, up to a 50,000-fold, and peaks at 48 hours. Its half-life of 18 hours is constant, and therefore its level is determined by the rate of production and hence the severity of the precipitating cause. CRP is thus a screen for inflammation.Thus CRP level can be used as an aid in diagnostic tools for Acute Appendicitis.

Normal serum concentration is 0 to 0.6 mg/dl,values above 0.6mg/dl is considered as positive, the increase of acute phase protein in liver the CRP is more important in clinical practice. Production of CRP is controlled by interleukin 6 and in a few minutes increases from 10 to 1000 times. CRP is increased in infections, inflammatory arthritis, auto immune disorders, neoplasia, pregnancy and aging.

Many reports have investigated the value of the raised serum CRP measurement in improving diagnosis of appendicitis.This examination is feasible especially in peripheral areas where radiologist support is not always available and cost relatively cheaper.

In this study, we suggest that c reactive protein may provide a sensitive parameter in the preoperative prediction of Acute Appendicitis and may help preoperatively to differentiate complicated and non complicated appendicitis.

In this study, we suggest that calculation of NLR may provide a sensitive parameter in the preoperative prediction of Acute Appendicitis and may help preoperatively to differentiate complicated and non complicated appendicitis.Normal value of Neutrophil lymphocyte Ratio is around 3:1.

Aim

The aim of this study is to analyse the role of c- reactive protein and neutrophil lymphocyte ratio accuracy in diagnosis of acute appendicitis and perforated appendicitis.

To study the clinical findings in acute appendicitis.

To evaluate role of c - reactive protein in diagnosis of acute appendicitis and its association with severity of appendicitis.

To evaluate role of neutrophil lymphocyte ratio in diagnosis of acute appendicitis and its association with severity of appendicitis.

To confirm with the intraoperative findings of the surgeon.

MATERIALS & METHODS

Place of study: Department of General Surgery, KIMS, Narketpally.

Type of study: Prospective observational study.

Duration of study: October 2018 – September 2020.

Study subject: 100 study subjects.

Inclusion Criteria

All Patients who were diagnosed clinically as acute appendicitis.

Exclusion Criteria

Patients with other acute infectious diseases Patients with previous liver diseases.

Patients with comorbidity (heart diseases, malignancy, diabetes mellitus, tuberculosis, AIDS and autoimmune diseases).

Patients with severe sepsis or septic shock.

Methodology

Clinical examination of patient was done and duration of the symptoms are documented. Blood samples for routine laboratory investigations, complete blood picture and c reactive protein were collected. Values of Neutrophils and lymphocytes are taken, neutrophil lymphocyte ratio is calculated.

Intra operative findings are noted if appendicectomy is done.

Grouping and data analysis done using SPSS software version 19. Results are obtained using chi – square test and ANOVA test.

Post operatively histopathological features of removed appendix are noted.

Study population is divided into three groups,

Group A: includes patients with clinical findings of doubtful acute appendicitis observed clinically and managed conservatively.

Group B: Includes simple appendicitis subjected to appendicectomy with inflamed appendix.

Group C: includes complicated appendicitis subjected to appendicectomy with perforated or gangrenous appendix.

RESULTS

Table 1: Distribution of Cases According to Age Group in Different Groups(N=100)

Age group (years)	Group A No of cases (n= 14)	Group B No of cases (n=70)	Group C No of cases (n=16)
0-19	1	20	4
20-29	5	17	2
30-39	4	12	3
40-49	3	13	3

>50	1	8	4
Total	14	70	16

Out Of three groups in present study

The Mean +/- Standard deviation of age distribution of Group A is 32.92 +/- 9.65 years

The Mean +/- Standard deviation of age distribution of GroupB is 29.57+/- 14.85 years

The Mean +/- Standard deviation of age distribution of Group C is 35.87+/- 18.31 years

Table 2: distribution of cases according to gender in different groups(N=100)

Gender	Group A No of cases (n-14)	Group B No of cases (n-70)	Group C No of cases (n-16)
Male	10	49	10
Female	4	21	6
Total	14	70	16

Out of three groups in present study

Of 14 cases in Group A, 10 cases(71.5%) were males and cases(28.5%)were females

Of 70 cases in Group B, 49 cases(70%) were males and 21 cases (30%) were females.

Of 16 cases in Group C, 10 cases(62.5%) were males and 6 cases (37.5%) were females

Table 3: Table Showing Clinical Presentation in Different Groups(N=100)

Clinical Presentation	Group A No of cases (n-14)	Group B No of cases (n-70)	Group C No of cases (n-16)
Pain	14	70	16
Nausea/vomiting	4	62	16
Fever	1	61	16

In this study,

Out of 14 cases in Group A, 14 cases (100%) had pain, 4 cases (29%) had nausea / vomiting, 1case(7.14%) had fever.

Out of 70 cases in Group B, 70 cases (100%) had pain, 62 cases (88%) had nausea / vomiting, 61 case(87%) had fever

Out of 16 cases in Group C, 16 cases (100%) had pain, 16 cases (100%) had nausea / vomiting, 16 case(100%) had fever.

Table 4: table showing values of total leucocyte count in different groups(N=100)

Total Leucocyte Count	Group A No of cases (n-14)	Group B No of cases (n-70)	Group C No of cases (n-16)
MEAN+/-SD	6600+/-669	12104+/- 3711	15825+/- 4575

MEAN +/-SD of total leucocyte count in Group A is 6600 +/-669 MEAN +/-SD of total leucocyte count in Group B is 12104 +/-3711 MEAN +/-SD of total leucocyte count in Group C is 15825 +/-4575.

Table 5: table showing neutrophil/lymphocyte ratio(n/l) in different groups

N/L Ratio	Group A No of cases (n=14)	Group B No of cases (n=70)	Group C No of cases (n=16)
≤3	10	12	0
>3	4	58	16

Out of 14 cases in Group A, 10 cases (71%) had N/L RATIO \leq 3, 4cases (29%) had N/LRATIO $>$ 3.

Out of 70 cases in Group B, 12 cases (17%) had N/L RATIO \leq 3, 58cases (83%) had N/LRATIO $>$ 3

Out of 16 cases in Group C, 0cases had N/L RATIO \leq 3, 16cases (100%) had N/LRATIO $>$ 3.

Table 6: table showing mean values of neutrophil/lymphocyte ratio (N/L) in different groups (N=100)

N/L Ratio	Group A No of cases(n=14)	Group B No of cases (n=70)	Group C No of cases (n=16)
MEAN +/- SD	2.68 +/- 2.36	7.03 +/- 5.55	10.64+/- 5.49

MEAN +/-SD of NEUTROPHIL/LYMPHOCYTE RATIO(N/L) in Group A is 2.68 +/- 2.36

MEAN +/-SD of NEUTROPHIL/LYMPHOCYTE RATIO(N/L) in Group B is 7.03+/-5.55

MEAN +/-SD of NEUTROPHIL/LYMPHOCYTE RATIO(N/L) in Group C is 10.64+/- 5.49

Table 7: Table Showing Values Of C- Reactive Protein in Different Groups (N=100)

C Reactive Protein	Group A No of CASES (n=14)	Group B No of CASES (n=70)	Group C No of CASES (n=16)
Negative (0-0.6mg/dl)	13	27	2
Positive(>0.6mg/dl)	1	43	14

Out of 14 cases in Group A, 13 cases (92%) had C- REACTIVE PROTEIN - NEGATIVE, 1 case (8%) had C- REACTIVE PROTEIN - POSITIVE

Out of 70 cases in Group B, 27 cases (38%) had C- REACTIVE PROTEIN - NEGATIVE, 43 cases (62%) had C- REACTIVE PROTEIN – POSITIVE

Out of 16 cases in Group C, 2 cases (13%) had C- REACTIVE PROTEIN - NEGATIVE, 14 cases (88%) had C- REACTIVE PROTEIN – POSITIVE

Table 8: Table Showing USG Abdomen Findings of Different Groups (N=100)

USG Abdomen	Group A No of cases (n-14)	Group B No of cases (n-70)	Group C NO of cases (n-16)
Inconclusive/Normal	11	0	0
Diameter 7-9mm	3	58	4
Diameter >9mm	0	12	5
Perforated appendix	0	0	7

In this study,

Out of 14 cases in Group A, 11 cases (79%) had USG abdomen inconclusive or normal, 3 cases (21%) had diameter of appendix between 7-9mm.

Out of 70 cases in Group B, 58 cases(83%) had diameter of appendix between 7- 9mm , 12 cases(17%) had diameter > 9mm

Out of 16 cases in Group C, 4 cases(25%) had diameter of appendix between 7- 9mm, 5 cases(31%) had diameter > 9mm , 7 cases had perforated appendix(44%).

Table 9: table showing intraoperative findings in different groups

Intra operative findings	Group B No of cases (n-70)	Group C (No of cases-16)
Inflammed appendix without complications	70	0

Inflammation With Complications (gangrene, perforation, abscess)	0	16
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In this study,

In Group B, out of 70 cases, in all cases inflammation is present intraoperatively. In Group C, out of 16 cases, in all cases inflammation is present along with complications like Gangrene, perforation and abscess.

Table 10: Table Showing Histopathological Report Of Different Groups

Histopathological Finding	Group B(No of cases – 70)	Group C(No of cases-16)
Positive	66	16
Negative	4	0

In this study,

In Group B, out of 70 cases in Group B, 66 cases(94%) show inflammation in Histopathology, 4 cases (6%) do not show inflammation in histopathology report In Group C, out of 16 cases, all cases show inflammation in histopathology report

DISCUSSION

Our study is to find role of c-reactive protein and neutrophil lymphocyte ratio in predicting severity of acute appendicitis. In our study, Study population is divided into three groups.

Group A includes patients with clinical findings of doubtful acute appendicitis observed clinically and managed conservatively.

Group B includes simple appendicitis subjected to appendicectomy with inflamed appendix.

Group c includes complicated appendicitis subjected to appendicectomy with perforated or gangrenous appendix

In present study, mean age of presentation in group A is 32.92 +/- 9.6yrs, mean age of presentation in group B is 29.57 +/- 14.85 yrs, mean age of presentation in group C is 35.87 +/- 18.31yrs. In a study conducted by Rudiman et al,^[19] mean age of distribution was 33.7 3 +/- 17.10 yrs. In a study conducted by Kahramanca et al,^[21] mean age of distribution in positive appendicectomy group was 31.0 ± 11.61, in negative appendicectomy group was 32.3 ± 13.28. In a study by Mitsuru Ishizuka et al¹⁶, mean age of distribution is 40 yrs.

In present study, majority of cases were males in three groups with Group A - 71.5% Group B – 70%, Group C- 62.5% and females were in Group A -28.5%, Group B -30% Group C – 37.5%. In a study conducted by Reddy GSK et al,^[17] 56% were males, 44% were females. In a study conducted by Joel Mathew john et al,^[18] out of 60 cases, 25 were males and 35 were females. In a study conducted by Rudiman et al,^[19] 56.5% were males, 43.5% were females.

In present study, most common clinical presentation is pain in Right iliac fossa which was 100% in all three groups, nausea / vomiting is present in 29% of group A, 88% of group B and 100% in group C patients, fever is present in 7.14% of Group A, 87% of group B, 100% of group C patients. In complicated appendicitis group, all cases (100%) had pain in RIF, nausea/ vomiting and fever as clinical presentation. In a study by Reddy GSK et al¹⁹ 100% cases had fever, 60% cases had nausea/ vomitings, 34% had fever

In present study mean +/- SD of total WBC count in Group A was , in Group B was, in Group C was indicating that increase in total WBC count associated with severity of acute appendicitis with p value of.

In a study by Salman Y Guraya,^[20] mean +/- SD of total WBC count in acute group was 14.5 +/- 7.3 x 10(9)/L, in Group B was 17.1 +/- 3.9 x 10(9)/L, in Group C was 17.9 +/- 2.1 x 10(9)/L.

In present study, mean value of N/L ratio in group A is, in group B is, in group C is, indicating that N/L ratio increases with increase in severity of acute appendicitis.

In a study conducted by Rudiman et al mean value of N/L ratio in Group without perforation is 5.77 ± 4.466 , in perforated appendicitis group is 11.40 ± 5.693

In a study conducted by Kahramanca et al,^[21] mean value of N/L ratio in Negative appendicectomy group -5.89 ± 5.22 , in Positive appendicectomy group -8.10 ± 7.00 .

In present study, CRP is positive in 8% of Group A patients, 61.5% of Group B cases, 87.5% of Group C cases indicating that CRP is positive in a greater number of cases in complicated appendicitis group.

In a study by Reddy GSK et al,^[17] CRP is positive in 3 cases (out of 23) in normal appendix group, 75 cases (out of 77) of inflamed appendix group correlating with present study

In a study by Joel Mathew John et al,^[18] 42 cases have CRP positive, 18 cases have CRP negative

In this study, Out of 14 cases in Group A, 11 cases had USG abdomen inconclusive or normal, 3 cases had diameter of appendix between 7-9mm.

Out of 70 cases in Group B, 58 cases had diameter of appendix between 7-9mm, 12 cases had diameter > 9mm.

Out of 16 cases in Group C, 4 cases had diameter of appendix between 7-9mm, 5 cases had diameter > 9mm, 7 cases had perforated appendix

In this study, in Group B, out of 70 cases, in all cases inflammation is present intraoperatively.

In Group C, out of 16 cases, in all cases inflammation is present along with complications like Gangrene, perforation and abscess.

In this study, in Group B, out of 70 cases in Group B, 94% show inflammation in Histopathology, 6% do not show inflammation in histopathology report. In Group C, out of 16 cases, 100% cases show inflammation in histopathology report.

CONCLUSION

This study is done to predict the diagnosis of Acute appendicitis and complicated Acute Appendicitis using C - reactive protein levels and Neutrophil Lymphocyte Ratio. Total leucocyte count and neutrophil lymphocyte ratio were found to be significantly elevated in cases of acute appendicitis with complications. C- reactive protein levels were found to be elevated in cases of acute appendicitis with complications. Elevation in neutrophil lymphocyte ration and c - reactive protein levels can be used to anticipate severity and complications in patients of acute appendicitis.

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