

 <p>ISSN NO. 2320-5407</p>	<p>Journal Homepage: -www.journalijar.com</p> <h2 style="text-align: center;">INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</h2> <p style="text-align: center;">Article DOI:10.21474/IJAR01/8884 DOI URL: http://dx.doi.org/10.21474/IJAR01/8884</p>	 <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) ISSN 2320-5407 Journal Homepage: http://www.journalijar.com Journal DOI:10.21474/IJAR01</p>
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RESEARCH ARTICLE

ACUTE APPENDICITIS WITH NORMAL TOTAL WBC COUNTS, A SINGLE CENTRE EXPERIENCE.

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Manuscript Info

Manuscript History

Received: 11 February 2019

Final Accepted: 13 March 2019

Published: April 2019

Abstract

Background: Acute appendicitis is the most common general surgery emergency. Prompt diagnosis minimizes morbidity and mortality. Historically the diagnosis would be clinical. One of the most frequently used laboratory investigation especially in developing regions is the WBC count. Although the total WBC count is elevated in the majority of the patients, normal total WBC count does not rule out acute appendicitis.

Materials and methods: A prospective study of patients who underwent emergency appendectomy at our hospital for suspected acute appendicitis between January 2018 and December 2018 was carried out. Patients were studied with respect to preoperative complaints, clinical examination findings, laboratory and imaging results. Patients were specifically analyzed with respect to total and differential WBC counts. Patients with histopathologically confirmed appendicitis were divided into two groups, one with normal and the other with elevated total WBC counts. Results were analyzed and statistical significance determined.

Results: A total of 386 patients underwent an emergency appendectomy for presumed appendicitis between January 2018 and December 2018. 377 patients were found to have acute appendicitis, simple or complicated on exploration, subsequently verified on histopathology. The total WBC count was found to be normal in 55 patients (14.58%) as compared to elevated total WBC counts found in 322 patients (85.41%). Polymorphonuclear leucocytes were more than 75% in 52 of the patients (94.54 %) with normal total WBC counts. The same was found in 306 (95.03 %) patients with elevated total WBC counts.

Conclusion: A normal total WBC count does not rule out the diagnosis of acute appendicitis straightaway. The differential WBC count seems to be a more important predictor of acute appendicitis than the total WBC count alone.

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Introduction:-

The most common surgical emergency, a general surgeon comes across, is acute appendicitis.¹ Most of the times it presents with typical clinical features and laboratory findings. Historically the diagnosis of appendicitis would rest on clinical evaluation. A combination of clinical evaluation, laboratory investigations and imaging is often used.^{2,3} However at times the condition presents with atypical symptoms and signs. Also there may be variations in the laboratory parameters. That is when the diagnosis becomes difficult and the role of radiological investigations sets in. Despite the widespread use of USG and of late CT as well, it can still be quite an exercise to elicit the diagnosis. There are numerous scoring systems in use as of today. One of the features that is common to most of the scoring systems is the WBC count, absolute and differential. The total WBC count is increased in almost 70% of the patients with acute appendicitis.⁴ A normal total WBC count however does not rule out the diagnosis of acute appendicitis. However the differential WBC count depicting polymorphonuclear leucocytosis is more consistent. The consequences of delayed diagnosis are well documented. Thus it becomes imperative to clinch the diagnosis of acute appendicitis early, especially when confounding features are present.

Materials and Methods:-

A prospective study of patients who underwent emergency appendectomy at our hospital for suspected acute appendicitis between January 2018 and December 2018 was carried out. Patients who underwent elective interval or negative appendectomy were excluded from the study. Patients were studied with respect to preoperative complaints, clinical examination findings, laboratory and imaging results. The presence of typical clinical features of migratory RIF pain, anorexia, nausea, vomiting, RIF tenderness, rebound tenderness and elevated temperature was noted. Elevated temperature was defined as more than 37.5 °C. Imaging features suggestive of the diagnosis of acute appendicitis included Appendiceal diameter more than 6mm, periappendiceal fat stranding and fluid in the RIF. Patients were specifically analyzed with respect to total and differential WBC counts. A total WBC count of 11,000/uL or less was considered normal. Wherever possible Alvarado score was determined. Intraoperative findings were recorded and correlated with the histopathological examination. Results were tabulated and analyzed. Patients with histopathologically confirmed appendicitis were divided into two groups. Group A included patients with acute appendicitis and elevated total WBC counts. Group B included patients with acute appendicitis and normal total WBC counts. The two groups were analyzed with respect to clinical, laboratory and imaging characteristics for statistical significance by determining the p-value.

Results:-

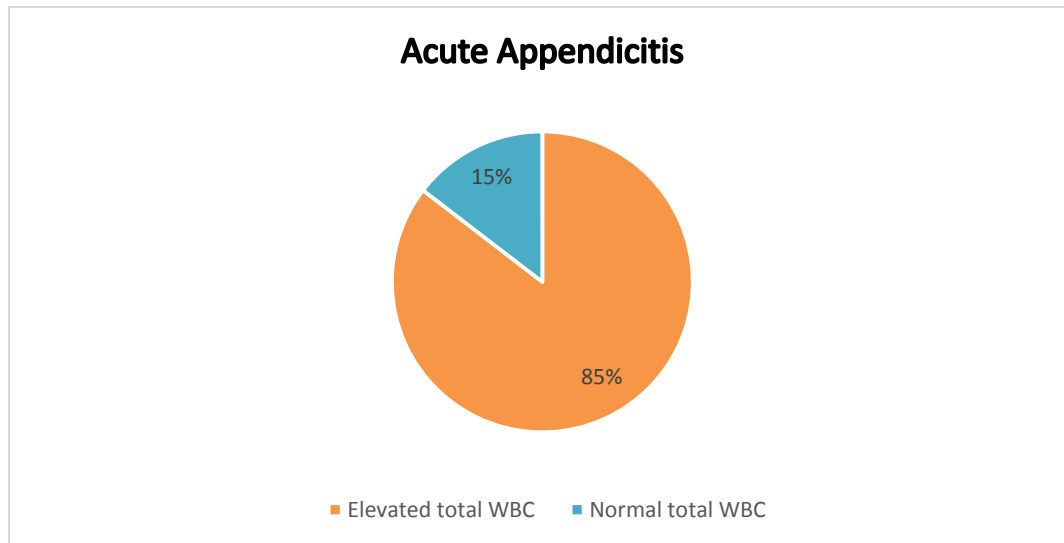
A total of 386 patients presented to our department and underwent an emergency appendectomy for presumed appendicitis between January 2018 and December 2018. 377 patients were found to have acute appendicitis, simple or complicated on exploration, subsequently verified on histopathology. Age of the patients varied from 4 to 65 years. The median age was 16 years. 228 were males and 149 females. Alvarado scores ranged from 5 to 10, with a median score of 8. Temperature at time of presentation ranged from 36.8°C to 38.33 °C. The duration of symptoms was less than 24 hours in 134 patients and more than 24 hours in 243 patients. All patients underwent imaging (either CT or ultrasonography or both). A white blood cell (WBC) count both total and differential was obtained in all patients who underwent appendectomies. Elevated total WBC count was defined as more than 11,000 per mL. For the purpose of statistical analysis, the two groups viz Group A and B were compared with respect to clinical features, laboratory and imaging findings, specifically WBC counts, as documented in table 1. The total WBC count was found to be normal in 55 patients (14.58%) as compared to elevated total WBC counts found in 322 patients (85.41%). Polymorphonuclear leucocytes were more than 75% in 52 of the Group B patients (94.54 %). The same was found in 306 (95.03 %) patients of Group A. Out of these 55 patients in Group B, 34 were males and 21 females. Age of these patients with normal WBC counts varied from 11 to 60 years and was comparable to Group A. The median age being 17 years. The duration of symptoms was more than 24 hours in 18 of these patients and less than 24 hours in 37. The temperature ranged from 37 to 38 °C. Alvarado score ranged from 7 to 8. Imaging was suggestive of acute appendicitis in 309 (95.96%) patients in Group A and 49 (89.09%) patients of Group B. Appendiceal diameter was more than 6 mm in 304 patients of Group A and 45 patients of Group B. In Group A, periappendiceal fat stranding was found in 309 (95.96%) patients as compared to 49 (89.09%) patients in Group B. 214 (66.45%) patients in Group A had fluid in RIF in comparison to 35 (63.63%) patients in Group B. P- value was determined for the characteristics analyzed. Statistical significance was determined thereof.

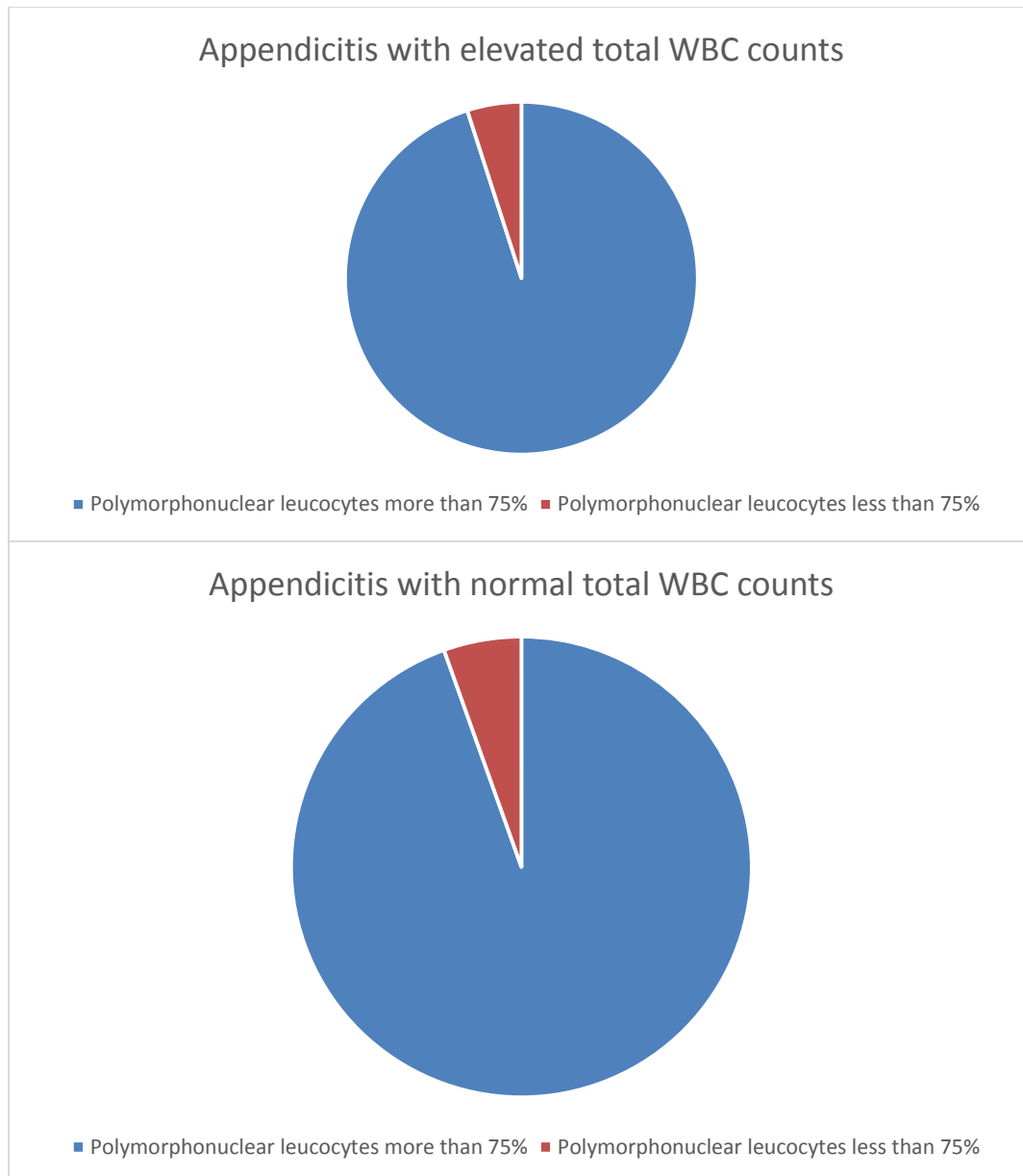
Table 1:-

Clinical features	Males		Females		P-value	Total			
	A	B	A	B		A	%age	B	%age
Migratory Pain in RIF	194	34	128	21	0.812	322	100	55	100
Anorexia	180	34	112	21	0.98	292	90.68	55	100
Nausea or Vomiting	173	34	120	21	0.70	293	90.99	55	100
Tenderness	183	34	126	21	0.71	309	95.96	55	100
Rebound pain	150	34	109	21	0.59	259	80.43	55	100
Elevated Temperature	137	8	98	6	0.93	235	72.98	14	25.45
Laboratory findings									
Total Leukocyte count >11000	194	0	128	0	1.00	322	100	0	0
Polymorphonuclear leukocytes more than 75%	188	32	118	20	0.98	306	95.03	52	94.54
USG or CT									
Appendiceal diameter more than 6mm	185	27	119	18	0.91	304	94.40	45	81.81
Periappendiceal fat stranding	189	30	120	19	0.99	309	95.96	49	89.09
Fluid in RIF	125	23	89	12	0.41	214	66.45	35	63.63

Group A : Acute appendicitis with elevated total WBC count ($\geq 11000/\mu\text{L}$)

Group B : Acute appendicitis with normal total WBC count ($< 11000/\mu\text{L}$)





Discussion and Conclusions:-

Acute appendicitis being the most common general surgical emergency is something that every general surgeon comes across almost on a daily basis. It typically presents with the characteristic symptoms of pain, anorexia, nausea or vomiting and fever.⁴ Pain typically starts in the periumbilical area and localizes to RIF after few hours. Apart from these typical presentations patients at times present with atypical features including atypical pain which is localized to RIF from the start, flank or diffuse.⁵ Other atypical presentations include tenesmus, diarrhoea, constipation, dysuria, increased frequency of micturition. Atypical presentations make the diagnosis challenging. The clinical examination reveals RIF tenderness and rebound pain in most patients, however can be variable.⁶ Laboratory tests are of limited value due to lack of specificity. With the widespread availability of USG and CT, the accuracy of diagnosis has increased.^{7,8} MRI is particularly useful in pregnant patients. The radiological features suggestive of appendicitis include maximum diameter more than 6 mm, non-compressibility, periappendiceal fat stranding and fluid in RIF. In addition, non visualization of appendix has been found to have a high negative predictive value.⁹ Even though acute appendicitis is so common, diagnosis is at times not easy. And often a scoring system is used, with the Alvarado score being the most widely used.¹⁰ The differential diagnoses of acute appendicitis comprises a huge list encompassing different systems. Although nowadays the diagnosis is made by considering clinical,

laboratory and imaging characteristics, clinical evaluation continues to be of paramount importance in eliciting the diagnosis. This becomes all the more important when there are confounding laboratory or imaging features. One of the basic diagnostic laboratory investigations is WBC count both total and differential. Although leucocytosis is common, a normal total WBC count is present in up to 50% of patients with acute appendicitis.¹¹⁻¹³ About 14.58 % patients had acute appendicitis with normal total WBC count in our study. Thus a normal total WBC count does not rule out the diagnosis of acute appendicitis straightaway. Interestingly, in our study, polymorphonuclear leucocytosis was found in 94.54 % patients with a normal total WBC count. This was also documented in 95.03% of patients who had elevated WBC counts. This implies that only 5.46% had both normal total and differential counts. This is in concordance with the available literature.¹⁴ Thus differential WBC count seems to be a more important predictor of acute appendicitis than the total WBC count alone. In our study it is evident that the typical clinical findings were present in almost all the patients with appendicitis and normal total WBC counts, thus emphasizing the importance of clinical evaluation and its precedence over the laboratory findings when these are at variance.¹⁴ In some recent studies a normal WBC count has been attributed as an independent factor predicting negative appendectomy.¹⁵ So a normal total WBC count necessitates a more aggressive clinical evaluation including the determination of differential WBC count and use of imaging modalities at times. In no circumstances should the diagnosis of acute appendicitis be excluded merely on the basis of confounding laboratory findings. Despite the recent advances, this teaching has not changed. However the availability of radiological techniques has made the evaluation and diagnosis somewhat easier, particularly when confounding laboratory parameters are encountered. But the availability of radiological equipment and more so a trained radiologist is still limited in the developing world. This leads to a curtailment of the diagnostic armamentarium at the disposal of a surgeon. Since WBC counts are one of the simplest laboratory tests performed, analysis of the differential WBC counts can often clinch the diagnosis even when the total WBC counts are normal and the surgeon has to be open to the possibility of the acute appendicitis in such scenarios.

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