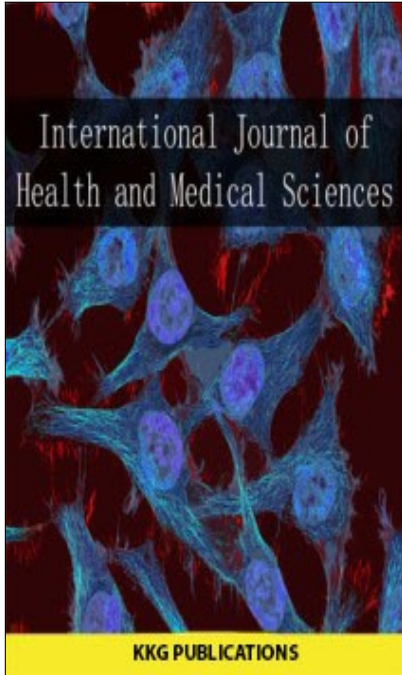


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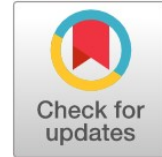
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ROLE OF TOTAL LEUKOCYTE COUNT IN DIAGNOSIS OF ACUTE APPENDICITIS

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Abstract. Acute appendicitis is one of the common surgical emergencies. It usually presents with acute migrating pain in right iliac fossa with anorexia and nausea or vomiting. Usually clinical features are augmented with Total Leukocyte Count (TLC), urine routine examination, and abdominal ultrasound to arrive at diagnosis. Study was conducted at DHG teaching hospital, Haripur from 1st July 2016 to 31st December 2016. It was an observational study and 100 patients with clinical features of acute appendicitis were included. Laboratory tests and post-operative histopathology were performed. Most of the patients were belonging to age group 21-50 years with mean age of 26.4 ± 8.8 . TLC was raised to more than $9000/\text{cm}^3$ in 80% cases. Statistics showed that TLC was 83.3% sensitive, 44.4% specific with PPV of 94.1% and NPV of 20% with accuracy of 80% in diagnosis of acute appendicitis. TLC is a very useful marker in diagnosing acute appendicitis especially when combined with typical clinical features and experience of surgeon. CRP and abdominal ultrasound should also be considered to further add to diagnostic accuracy.

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INTRODUCTION

Appendix is considered to be a vestigial organ [1]. Its importance lies in the fact that it commonly gets inflamed [2], [3]. In initial half of twentieth century, its incidence was 16%, which now has decreased to life time risk of 8.6% in males and 6.7% among females [4].

The diagnosis of appendicitis is mostly made clinically by typical history of generalized abdominal pain which later shifts to right iliac fossa. It is associated with nausea, vomiting, and anorexia. Patient is usually tender in right iliac fossa with rebound tenderness. There is usually guarding and rigidity in right iliac fossa, but all these clinical features may be presented in other diseases [5].

This typical presentation is present in nearly half of the patients and symptoms may vary in individuals especially knowing the different locations of appendix in different patients [1].

Hence, overall accuracy of diagnosing acute appendicitis clinically is around 80% and in 10-30% cases of appendectomies, there is no histopathological evidence of acute appendicitis [6], [7].

The more experienced is the surgeon, the more accurate is the diagnosis. Nowadays, many investigative techniques are used to add diagnostic accuracy [8], [9]. Blood's complete picture especially TLC, differential leukocyte count, and shift to left (evidence of increased number of immature neutrophils) are being used increasingly [10], [11].

Ultrasound abdomen, urine routine examination, helical CT scan, and MRI scan further help in diagnosis.

In this study, TLC has been studied in relation to acute appendicitis as it helps a lot especially when combined with clinical symptoms and signs. Many studies suggested that TLC is less specific as it is raised in other conditions also but its sensitivity is high as it has two points in Alvarado Scoring System of diagnosing acute appendicitis. This study will evaluate the sensitivity and specificity of TLC in diagnosis of acute appendicitis.

MATERIALS AND METHOD

This study was conducted in department of surgery, DHQ teaching hospital, Haripur from 1st July 2016 to 31st December 2016. DHQ hospital is receiving patients from widespread area of district Haripur and around. It was an observational study including clinical features, laboratory, and histopathological findings.

Study included 100 patients above 10 years of age, both males and females with clinical symptoms and signs of acute appendicitis. All patients, who were presented with right iliac fossa pain or abdominal pain which shifted to right iliac fossa, anorexia, having tenderness or rebound tenderness in the same region, were included in this study. Exclusion criteria included patients of age less than 10 years and more than 60 years, those having generalized abdominal pain, gynecological con-

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dition, respiratory tract illnesses, myocardial infarction, and septicemia. All cases were examined by surgical specialist and assessed clinically to have acute appendicitis. Blood samples for CP, especially TLC, hepatitis B and C, urea, and sugar were taken. Urine RE was done and ultrasound abdomen was done for all patients. Informed consent was taken from all patients and first degree relatives. Pre-operative preparations were done with IV antibiotic i.e., inj ceftriaxone 1g, in these cases, infusion metronidazole and IV fluids.

As in many studies, cut off value for TLC was taken as $9000/\text{mm}^3$. All the data obtained so far were entered on a well-prepared proforma which included particulars of patients and lab findings. All patients were operated by surgical

specialist through standard Lanz Incision, operative findings were recorded and after appendectomy, specimen was sent for histopathology. Later on receiving the reports, histopathologic findings were also entered into proforma.

All the data were entered and processed on SPSS version 20. Statistical analysis of results was done using same program. Specificity and sensitivity of TLC were checked in acute appendicitis using inflammatory histopathological findings as gold standard. *p* value of less than 0.05 was taken as significant.

RESULTS

TABLE 1
DEMOGRAPHIC STUDY OF PATIENTS [n=100] A

Age Distribution	
Age Group	No of Patients and Percentages
11 to 20 years	35 (35%)
21 to 50 years	61 (61%)
Above 50 years	04 (04%)
Gender Distribution	
Male	60 (60%)
Female	40 (40%)
Mean age[SD]	26.4 years +8.8
Median age	35 years
Age range	10-60 years

TABLE 2
OPERATIVE FINDINGS OF PATIENTS [n=100]

Operative Condition of Appendix	Number of Patients and Ppercentages
Markedly inflamed	(72 72%)
mildly inflamed	(22 22%)
Normal looking	6 (6%)
Reactionary Fluid in Appendiceal area	
No fluid	45 (45%)
Purulent fluid	30 (30%)
Serosanguinous fluid	25 (25%)

TABLE 3
COMPARISON OF HISTOPATHOLOGY OF APPENDIX AND VALUE OF TLC

Condition of Appendix	TLC Value Above $9000/\text{mm}^3$ N=80	TLC value below $9000/\text{mm}^3$ N=20	<i>p</i> value
Normal appendix	5(6.25%)	4(20%)	0.001
Mildly inflamed appendix	35(43.75%)	5(25%)	0.001
Markedly inflamed appendix	40(50%)	11(55%)	

TABLE 4
CHI-SQUARE COMPARISON OF HISTOPATHOLOGY AND TLC

TLC Value	Histopathological Inflamed	Finding Not inflamed
Raised above 9000/cm ³	True Positive(TP) 80	False Positive(FP) 5
Below 9000/cm ³	False Negative(FN) 16	True Negative(TN) 4
Outcome value for TLC		
Sensitivity	83.3%	
Specificity	44.4%	
Positive Predictive value	94.1%	
Negative Predictive value	20%	
Accuracy	80%	

It is observational study performed on 100 patients among whom, most of them were young as 61% patients belonged to age group 21-50 years. Mean age of patients was 26.4±8.8 with median age of 35 years. Age range was from 10 to 60 years. Among patients, 60% were males and 40% females (Table 1).

Regarding clinical presentation, 88% patients presented with pain right iliac fossa, 20% presented with pain around umbilicus, and 10% presented with epigastrium pain, which eventually shifted to R.I.F. 90% patients had either nausea or vomiting. 95% patients were tender in R.I.F significantly and 80% had rebound tenderness.

TLC was raised above 9000/cm³ in 80% cases and below 9000/cm³ in 20% cases. Mean TLC value was 10500/mm³. Operative findings included 72% of appendices which were markedly inflamed while 30% having purulent fluid around. Histopathologic findings were taken as true proof of inflammation. It showed that in 90% cases, appendix was inflamed and in 9% cases, there was no histopathology evidence of inflammation.

Results were put to statistical analysis including CHI-SQUARE TEST, which showed PL 0.001, which was significant. Results revealed that TLC value was 83.3% sensitive, 44.4% specific with positive predictive value of 94.1%, and negative predictive value of 20% with accuracy of 80% in diagnosing acute appendicitis.

DISCUSSION

In present study, it was found that acute appendicitis is more common in males 60% as compared to females 40%, which is nearly similar to many studies. Although one study showed that 50% females of child-bearing age have in-

creased risk of getting acute appendicitis [12]. Another study showed that in addition to clinical examination TLC, CRP and BILIRUBIN can be helpful in diagnosing and decision-making in cases of acute appendicitis with high sensitivity 96.25% and specificity 83.3% [13]. This is comparable to present study in terms of sensitivity 83.3% as it is only using TLC. Khan MN also indicated TLC and CRP effective in diagnosing acute appendicitis [14]. Some other studies show similar results [15], [16].

In one study, results were tilted towards less specificity and sensitivity of TLC as predictor of acute appendicitis [17]. In another study, sensitivity, specificity, PPV, and TLC were 80.5%, 62.5%, and 91.8%, respectively [18].

In another study, TLC was 76.5% sensitive and 73.5% specific, with PPV of 92.5%, which is comparable to present study 94.1% [13], [19]. As appendicitis has variable clinical features, some studies used ultrasound as diagnostic tool and found it effective in many patients [20]. In this study, negative appendectomy rate is 9% while it has been reported to be about 17.5% in another study [21]. In another study, this rate is 16% [22]. Removing normal appendix in too many patients can have many risks to patients from general anesthesia to post-appendectomy complications. That's why many researchers are advocating CRP as more sensitive in diagnosing acute appendicitis [23].

CONCLUSION

After interpreting results and comparing with different researches, it is found that TLC is a very useful marker in diagnosing acute appendicitis but modern investigations like CRP and ultrasound should also be routinely done in best patient interest.

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