

# A Prospective Study to Analyze the Accuracy of Ultrasonography in the Diagnosis of Acute Right Lower Quadrant Pain in a Tertiary Care Hospital.

Pankaj Ajit Kumar Badjate

Associate Professor, Department of Radiodiagnosis, Lord Buddha Medical College, Saharsa.

## ABSTRACT

**Background:** To assess the sensitivity and specificity of ultrasonography in differentiating causes of acute right lower quadrant pain in women of childbearing age by taking surgical outcome as the gold standard. **Methods:** The descriptive, analytical study was conducted at the Lord Buddha Medical College, Saharsa, from July to November 2014 to April 2015, and comprised female patients of childbearing age who presented with acute right lower quadrant pain and underwent surgery after ultrasonography. **Results:** Of the 50 patients enrolled in our study on the basis of inclusion and exclusion criteria, 35 (70%) patients were symptomatically and sonographically positive to have either acutely inflamed non-compressible appendix or focal fluid collection in right lower quadrant with normal pelvic viscera. Sensitivity of 94% and specificity of 84% were calculated. **Conclusion:** Ultrasound had a sensitivity and specificity justifying its usage as a good diagnostic tool in emergency situations to avoid undue surgical interventions.

**Keywords:** Ultrasonography, Specificity, Sensitivity, Right lower quadrant pain.

## INTRODUCTION

It is an established fact that appropriate treatment of any pathological condition is dependent on appropriate diagnosis made on the basis of history, clinical examination and laboratory/radiological investigations. Cost-effectiveness is an important factor in our country and, hence, targeted investigations should be ordered.

Unfortunately, one-third of all cases of abdominal pain and a quarter of cases of right iliac fossa pain urgently admitted to hospital leave hospital with no precise diagnosis.<sup>[1]</sup> In such cases, imaging studies play a significant role in pre-operative diagnosis and determination of proper treatment.<sup>[2]</sup> Among the imaging studies, ultrasonography (USG) has become an important tool which can efficiently recognize patients with possible life-threatening conditions of different origins.<sup>[3]</sup>

### Name & Address of Corresponding Author

Dr. Pankaj Ajit Kumar Badjate,  
Associate Professor, Department of Radiodiagnosis,  
Lord Buddha Medical College, Saharsa  
E-mail: drpankajbarjatya23@gmail.com

Most patients presenting with right lower quadrant (RLQ) pain are clinically suspected to have acute appendicitis and ultrasonography is useful in making alternative diagnoses.<sup>[4]</sup> Similarly, ultrasound is an established imaging tool not only for gynaecological diseases but it is also a useful modality for diagnosing non-gynaecological disorders that cause acute RLQ pain.<sup>[5]</sup>

Such pain may be the manifestation of various disorders from less alarming rupture of the follicular cyst to life-threatening rupture of ectopic pregnancy.<sup>[6,7]</sup>

Ultrasonography is a non-invasive and cost-

effective technique carrying no risk to the patient. After thorough literature and Medline search, it was found that very little work has been done in our country on the subject. The current study was planned to assess the sensitivity and specificity of ultrasonography in differentiating causes of acute RLQ pain in women of childbearing age by taking surgical outcome as the gold standard.

## MATERIALS AND METHODS

The descriptive, analytical study was conducted at the Lord Buddha Medical College, Saharsa, from July to November 2014 to April 2015, and comprised female patients of childbearing age who presented with acute right lower quadrant pain and underwent surgery after ultrasonography. After approval from the institutional ethical review committee, non-probability purposive sampling was used to build the study sample. Those included were women between 20 and 40 years of age, regardless of their marital status who presented with acute RLQ pain and underwent surgery after ultrasonography. Those who refused surgery or did not come back with postoperative or histopathological findings were excluded, and so were those who were morbidly obese with poor echo window. Informed consent was obtained from all those who volunteered to participate.

Detailed history was taken from all patients, especially regarding the marital status, duration of pain and associated symptoms. Menstrual cycle regularity and last menstrual period (LMP) were also documented.

USG examination was performed under the supervision of consultant radiologist. All possible causes were evaluated by thoroughly examining all organs of RLQ. Ultrasonographic findings with

possible diagnosis were recorded in every patient proforma containing relevant information. Postoperative findings were checked and recorded from the operating surgeon/from patient follow-up proforma by contacting the patient on the telephone. Data was analyzed using SPSS 10.

Frequency and percentages were computed for calculating sensitivity and specificity of USG by taking surgery as the gold standard. The positive predictive values (PPVs) and negative predictive values (NPVs) were also calculated using the formulae:

$$PPV = TP/TP+FP$$

$$NPV = TN/FN+TN$$

For the purpose of the study, true positive (TP) was 'positive both sonographically and surgically'; false positive (FP) was 'positive sonographically and surgically negative'; false negative (FN) was 'negative sonographically and surgically positive'; and true negative (TN) was 'negative both sonographically and surgically' [Table1].

Frequency and percentages were computed for calculating sensitivity and specificity of USG by taking surgery as the gold standard. The positive predictive value (PPV) and negative predictive value (NPV) were also calculated using the formulae given below:

$$PPV = TP/TP+FP$$

$$NPV = TN/FN+TN$$

**Table 1:**Positive and negative predictive values

Group	Surgically +ive	Surgically -ive
Ultrasonographically +ive	TP (35)	FP (3)
Ultrasonographically -ive	FN (2)	TN (10)

TP: True positive  
 FP: False positive  
 TN: True negative  
 FN: False negative

## RESULTS

Of the 50 patients enrolled in our study, 35 (70%) were True Positive, and 24 (48%) of them showed either acutely inflamed non-compressible thickened blind ending appendix or had a focal fluid collection along with probe tenderness in RLQ with sonographically normal pelvic viscera, and 18 (37%) were unmarried. In the remaining 12 (24.8%) patients, 2 (4 %) had an ectopic pregnancy with a typical history of missed cycle along with a positive pregnancy test, and 8 (16%) had ovarian cysts. Two (4%) of these 12 had torsion surgically not picked up sonographically, 3 (7%) had ruptured ovarian cysts, and 2 (4%) had simple ovarian cysts.

Besides, 2 (4%) of the total 50 patients were on treatment for infertility, had lower abdominal discomfort, sonographically had cystic lesion right adnexal region with small pockets of free fluid in right iliac fossa (RIF)/pelvis. On USG, they only proved to be an ovarian hyper-stimulation syndrome and no ectopic evidence was found at surgery.

Three (6%) of the total patients were unmarried and sonographically normal, but were found to have acute appendicitis on surgery.

Finally, 10 (20%) of the total 50 patients did not have any positive finding on USG, but underwent surgery due to strong clinical indication. There were no positive findings on surgery as well [Table2].

**Table 2:**Diagnosis Distribution.

No. of cases	U/S findings
21	Acute Appendicitis
2	Ectopic Pregnancy
8	Ovarian cyst
3	Endometrioma
2	Dermoid
4	OHSS
10	Normal Study

## DISCUSSION

RLQ pain is one of the commonest presentations in surgical and gynaecological emergencies. When one considers the organs located in the pelvis and abdomen whose pain may be referred to the pelvis, one has to consider the diseases originating from certain viscera. Given such a vast differential diagnosis, the key investigative tool is ultrasound. In the emergency department setting, ultrasound is the best initial imaging modality for evaluation of pelvic pathology due to its low cost, easy accessibility, widespread availability and lack of ionising radiation.<sup>[8]</sup> Acute appendicitis, though a common cause of acute RLQ pain, may be mimicked by a range of gynaecological pathologies in women of reproductive age. The most commonly encountered are ovarian cyst rupture or torsion, haemorrhage into an ovarian cyst, hydrosalpinx or pyosalpinx, endometriosis and ectopic pregnancy. Thus, ultrasound evaluation of this subgroup of patients presenting with RLQ pain is very important as faulty diagnosis results in undue surgical intervention, negative surgeries and at times a number of complications such as adhesions. These can be one of the causes of infertility. This reduces possible physical and mental trauma to the patient and surgical complications. The data augments other studies suggesting the same that undue surgeries are associated with an increased risk of infertility, perinatal mortality and morbidity.<sup>[9-12]</sup>

In order to improve the diagnostic accuracy,

different aids were introduced like computer-aided programmes, different scoring systems, gastrointestinal tract (GIT) contrast studies, computed tomography (CT) scan, USG, magnetic resonance imaging (MRI) and laparoscopy.

Among these modalities, USG is the simplest, easily available, non-invasive, convenient and cost-effective tool. USG in the diagnosis of acute appendicitis was first popularized in 1986, a hundred years after the publication of the first paper on acute appendicitis.<sup>[13,14]</sup> The study reported sensitivity of 89% and specificity of 100% in the diagnosis of acute appendicitis. Many other workers later on reproduced the same findings<sup>[15-20]</sup> and the results of the current study are also comparable. Overall, sensitivity of 94% and specificity of 84% were recorded in our study which is comparable to studies reporting sensitivity of 75-89%, specificity of 95%, PPV of 93% and NPV of 23%.<sup>[11,12]</sup>

The advantages of ultrasound in this patient population are well accepted. It is quick, readily available and non-invasive<sup>[21-24]</sup> and reduces the number and need of surgeries in patients with RLQ pain along with physical and psychological trauma that the patients go through.

Wound infection and delayed wound healing were among the most common postoperative complications. Mortality occurred in an ectopic pregnancy (16.66%) and pelvic inflammatory disease (PID) (5.55%). The study concluded that surgeons often fall in this un-wary trap because of the close resemblance of clinical features, less exposure to gynecological problems and non-availability of more sophisticated diagnostic tools in emergency.<sup>[25]</sup>

One study described the usefulness of colour Doppler also. Doppler signals disappear when gangrene or perforation occur.<sup>[26]</sup>

A cohort observational study was done that compared the adverse outcome in two different groups of patients admitted with suspected acute appendicitis at two different hospitals in two different countries.<sup>[27]</sup> The first group of 200 patients at Ayub Teaching Hospital, Abbottabad, Pakistan, was managed without preoperative USG. In the second group of 200 patients admitted at Najran General Hospital Najran, Saudi Arabia, graded compression abdominal USG was routinely performed preoperatively. The diagnostic accuracy of the protocol in each group was measured statistically and rates of negative appendectomy and perforation were determined.

Addition of routine USG in clinical assessment for acute appendicitis decreases the sensitivity, but significantly increases the specificity of the protocol, thereby reducing the FP rate translating into decreased negative appendectomy rate. Proper clinical assessment is the mainstay of diagnosis in acute appendicitis and addition of routine

ultrasound by graded compression technique can improve the diagnostic accuracy and reduce adverse outcome.<sup>[27,28]</sup> The similar results can be seen in our study.

Because of USG's sensitivity and specificity, its efficacy in diagnosing acute appendicitis in non-gravid patients has been reported as more than 90%.<sup>[29]</sup> One study in a similar setting concluded that use of graded compression USG as preoperative diagnostic technique has a good sensitivity (84.3% and 81.81%) but poor specificity, implying that value of USG may remain unclear in reducing the negative appendectomies.<sup>[30]</sup>

## CONCLUSION

With sensitivity and specificity of 94% and 84% respectively, USG justified its usage as a good diagnostic tool in emergency situations to avoid undue surgical interventions.

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**How to cite this article:** Badjate PAK. A Prospective Study to Analyze the Accuracy of Ultrasonography in the Diagnosis of Acute Right Lower Quadrant Pain in a Tertiary Care Hospital. *Ann. Int. Med. Den. Res.* 2016;2(2):83-6.

**Source of Support:** Nil, **Conflict of Interest:** None declared