*Original Article*

# Role of Plain X-ray Abdomen and Ultrasonography in Diagnosis of Non-Traumatic Acute Abdomen Compared with Operative Findings

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***ABSTRACT:***

***Introduction:*** *Following history taking and clinical examination, plain x-ray abdomen and ultrasound have traditionally been the first line and most useful methods of further investigations for acute abdomen. Though sometimes it needs expert clinical eye and modern machineries to prove it and compare with operative findings.* ***Objective:*** *This study was conducted to assess the usefulness of ultrasonography (USG) and plain x-ray abdomen in the evaluation of non-traumatic acute abdomen.* ***Methodology:*** *This cross-sectional study was conducted among purposively selected 72 clinically diagnosed non-traumatic acute abdomen patients attending in emergency department of Dhaka Medical College and Hospital (DMCH) who went for surgery, during the period of 15 months from June 2012 to September 2013* ***Results:*** *Among the subjects' majority 52(72.2%) were male and 36(50.0%) were 21 to 30 years' age group. Plain x-ray abdomen showed, 18(25.0%) had intestinal perforation, 12(16.66%) had gall stone, 32(44.44%) had normal findings and rest 10(13.88%) had other findings. On the other hand, USG showed 14(19.44%) had acute appendicitis, 12(16.66%) had acute intestinal obstruction, 10(13.88%) had acute cholecystitis, 17(23.61%) had normal findings and rest 19(26.38%) had other findings. Per operative diagnosis found that 18(25.0%) had perforation, 16(22.22%) had appendicitis, 12(16.66%) had intestinal obstruction, 10(13.88%) had acute cholecystitis and rest had other findings. This study revealed that sensitivity & specificity of plain x-ray abdomen, USG and combined both test in diagnosis of non-traumatic acute abdomen was 61.29% & 80.0% and 83.8% & 70.0% and 96.0% & 80.0% respectively.* ***Conclusion:*** *Plain x-ray abdomen and USG are the useful easily available, cheap diagnostic tools for diagnosing non-traumatic acute abdomen and help to prevent negative laparotomies.*

*Key words: Plain x-ray abdomen, USG, acute abdomen.*

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## INTRODUCTION:

Acute attack of abdominal pain that may occur suddenly or gradually over a period of several hours and presents a symptoms complex which suggests a disease that possibly threatens life and demand an immediate or urgent diagnosis for early treatment is known as acute abdomen.[1] the term encompasses a long list of differential diagnosis within it and constitute 5% of emergency hospital admission.[2]

Radiological and imaging tests are the most important part of early diagnosis of acute abdomen. Most of the cases radiological diagnosis depends on intra-abdominal gas pattern (e.g- presence of gas inside or outside of the lumen) and primarily plain x-ray are likely to remain the method of imaging these gas shadows for many years. In certain specific condition eg- acute cholecystitis, acute pancreatitis, gynaecological emergencies, USG become the initial imaging technique of choice.[1]

Erect chest and supine abdomen radiographs remain the investigation of choice when perforation or obstruction is suspected. Ultrasonography is the best investigation for the gall bladder and biliary system and the best first line test for liver disease.[3]

Ultrasonography has a diagnostic sensitivity of about 80% for acute appendicitis and is most useful in pregnant patient, atypical appendicitis and particularly in severe localized infection.[4] Plain x-ray abdomen is sometimes 100% accurate in intestinal perforation.[5] CT and MRI has important role for evaluation of non-traumatic acute abdomen but those are expensive and not easily available in rural community. Ultrasound and x-ray are the quick, non-invasive, reliable and accurate test for diagnosing acute abdomen.[4]

These tests are available almost all area of Bangladesh. But data regarding validity of those tests in comparison with operative findings are rare. This study finding will help our doctors to ensure proper management with appropriate plan of treatment of non-traumatic acute abdomen patients.

**Materials and methods:** This cross-sectional study was carried out to assess the usefulness of ultrasonography (USG) and plain x-ray abdomen in the evaluation of non-traumatic acute abdomen. Initially 150 patients were selected purposively from emergency department of Dhaka Medical College and Hospital (DMCH) during the period of 15 months from June 2012 to September 2013. Among them 50 had history of trauma, 20 were cured with conservative treatment, 5 patients were refused to undergo operation and 3 patients had negative operative findings so data were collected from 72 patients.

After initial management in the department of surgery, patients were sent for radiology and imaging tests along with routine tests. USGs were performed by researcher herself and plain x-rays were done by patient party and report was made by a radiologist who did not know about USGs findings. 'Operative findings' were the gold standard for confirming positive case for this study and operative findings were taken from

post-operative notes written by surgeon after taking permission from proper authority. All the test findings were collected from history sheet and investigation papers. All the information was noted in a predesigned questionnaire. Ethical clearance for the study was taken from IRB of DMCH. Data were analyzed through SPSS software version 16 for Windows.

**RESULTS:**

Among the 72 respondents' majority 52(72.22%) were male and 20 (27.78%) were female.

**Table-I: Distribution of the respondents according to age group (n=72)**

| Age group (Years) | Frequency | Percentage |
|---|---|---|
| up to 10 | 02 | 2.77 |
| 11 – 20 | 07 | 9.72 |
| 21- 30 | 36 | 50.00 |
| 31- 40 | 14 | 19.44 |
| 41-50 | 07 | 9.72 |
| 51-60 | 06 | 8.33 |
| **Total** | **72** | **100** |

Half of the patients were within 21-30 years' age group followed by 31-40 years' 14(19.44%), only 2(2.77%) were below 10 years of age.

**Table-II: Distribution of the respondents according to plain x-ray findings (n=72)**

| Findings | Frequency | Percentage |
|---|---|---|
| Perforation | 18 | 25.0 |
| Intestinal obstruction | 12 | 16.66 |
| Gall stone | 02 | 2.77 |
| Renal tract calculi | 06 | 8.33 |
| Appendicolith | 02 | 2.77 |
| Normal findings | 32 | 44.44 |
| **Total** | **72** | **100.0** |

Majority 32(44.44%) respondents had normal findings in plain x-ray abdomen test whereas 18(25.0%) had intestinal perforation, 12(16.66%) intestinal obstruction and 6 (8.33%) had renal colic.

**Table-III: Distribution of the respondents according to sonographic findings (n=72)**

| Findings | Frequency | Percentage |
|---|---|---|
| Acute cholecystitis | 10 | 13.88 |
| Intestinal obstruction | 12 | 16.66 |
| Acute appendicitis | 14 | 19.44 |
| Renal tract calculi | 06 | 8.33 |
| Ectopic pregnancy | 02 | 2.77 |
| Intraperitoneal collection | 11 | 15.27 |
| Normal findings | 17 | 23.61 |
| Total | 72 | 100.0 |

Seventeen (23.61%) had normal findings in ultrasonographic test whereas 14(19.44%0 had acute appendicitis, 12(16.66%) intestinal obstruction, 11(15.27%)

intraperitoneal collection, 10(13.88%) acute cholecystitis and 6((8.33%) had renal tract colic.

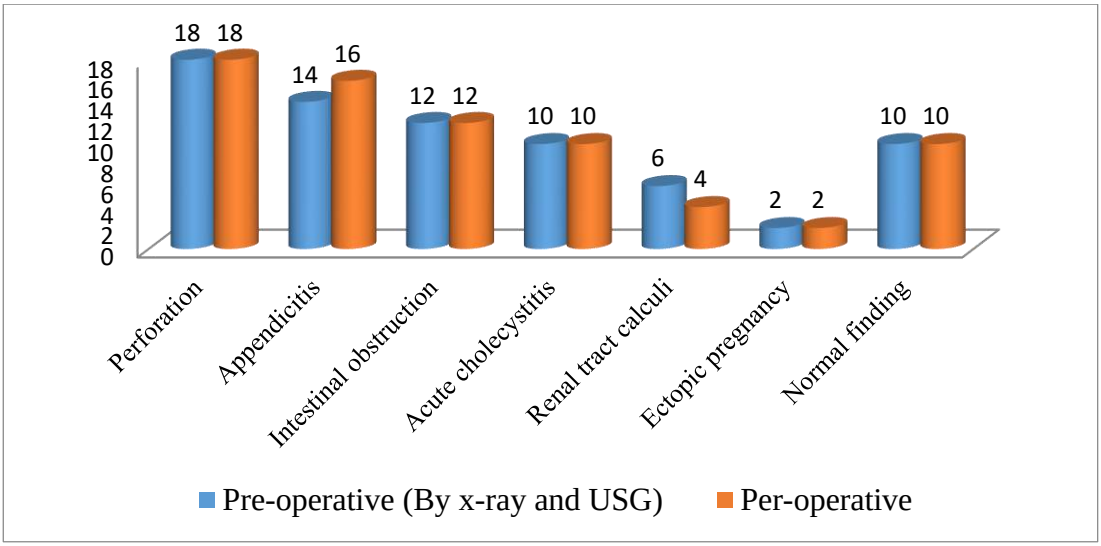


**Figure-1: Distribution of the respondents according to pre-operative and per-operative findings**

Figure-1 shows that almost similar findings during pre-operative test and per-operative observation except appendicitis and renal tract colic, 14 cases were diagnosed as appendicitis by pre-operative tests but 16 cases were diagnosed per-operatively. Six cases of renal tract colic were found by pre-operative tests and 4 cases were confirmed per-operatively.

**Table-IV: Comparison of plain x-ray abdomen findings with operative findings**

| Plain x-ray findings | Per-operative findings | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 38 (TP) | 02 (FP) | **40** |
| Negative | 24 (FN) | 08 (TN) | **32** |
| **Total** | **62** | **10** | **72** |

* TP= True Positive, TN= True Negative, FP= False Positive, FN= False Negative

**Table-V: Validity of plain x-ray abdomen in diagnosis of non-traumatic acute abdomen**

| Validity test for X-ray abdomen | Percentage |
|---|---|
| Sensitivity | 61.29 |
| Specificity | 80.0 |
| Accuracy | 63.8 |
| Positive predictive value (PPV) | 95.0 |
| Negative predictive value (NPV) | 25.0 |

**Table-VI: Comparison of Ultrasonography findings with operative findings**

| Plain x-ray findings | Per-operative findings | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 52 (TP) | 03 (FP) | **55** |
| Negative | 10 (FN) | 07 (TN) | **17** |
| **Total** | **62** | **10** | **72** |

**Table-VII: Validity of Ultrasonography (USG) in diagnosis of non-traumatic acute abdomen**

| Validity test for ultrasonography | Percentage |
|---|---|
| Sensitivity | 83.8 |
| Specificity | 70.0 |
| Accuracy | 81.75 |
| Positive predictive value | 94.54 |
| Negative predictive value | 41.17 |

**Table-VIII: Comparison of both x-ray abdomen and ultrasonographic findings with operative findings**

| Plain x-ray findings | Per-operative findings | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 60 (TP) | 02 (FP) | 62 |
| Negative | 02 (FN) | 08 (TN) | 10 |
| Total | 62 | 10 | 72 |

**Table-IX: Validity of both x-ray & USG in diagnosis of non-traumatic acute abdomen**

| Validity test for Both x-ray and ultrasonography | Percentage |
|---|---|
| Sensitivity | 96.0 |
| Specificity | 80.0 |
| Accuracy | 94.44 |
| Positive predictive value | 96.77 |
| Negative predictive value | 80.0 |

**DISCUSSION:**

This cross-sectional study was conducted among purposively selected 72 clinically diagnosed non-traumatic acute abdomen patients attending in emergency department of Dhaka Medical College and Hospital (DMCH) who went for surgery. Among the enrolled, majorities (72.22%) were males and 27.78% were females. A similar result was found by Laal et al, and Wig et al,.[2,6]

Among all the respondents 50.0% belonged 21-30 years' age group. Hasan et al, Laal et al, and Chhetri et al, also found that majority of the respondents belong 21- 30 years' age group.[2,7,8]

Ultrasound was performed among 72 patients in whom 72.22% had positive findings. Correct diagnosis was 100% with cholecystitis and 75% with appendicitis and similar result was found by Laal et al,.[2] In this study 94.4% of the patients had same pre-test and post laparotomy diagnosis and negative laparotomy rate was 1.88%. Laal et al, found similar negative laparotomy rate but pre-test and post laparotomy diagnosis was less than this study. This difference may be due to quality of machine or competency of sonologist.[2]

This study also revealed that sensitivity of the plain x-ray abdomen in diagnosis of non-

traumatic acute abdomen was 61.29%, Specificity was 80.0%, diagnostic accuracy was 63.8% and almost similar result was found by Laal et al, and chhetri et al,.[2, 8]

In this study sensitivity of sonography in diagnosis of acute abdomen was 83.8%, specificity 70.0%, accuracy 81.75%, positive predictive value 94.54% and Negative predictive value was 41.17%. In another study conducted by Gupta et al, found that sensitivity of sonography was 90% and accuracy 98%. There is small difference in two study but both values are more than 80% which is satisfactory for this test.[4]

**CONCLUSION:**

It can be concluded that plain x-ray abdomen and ultrasonography are easily available, cheap diagnostic tools with satisfactory validity score in exact diagnosis of non-traumatic acute abdomen.

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