

Research Article**Comparison between Transabdominal and Transvaginal Sonography in
Diagnosis of Ectopic Pregnancy****¹M. Rashid Rasul, ²Humaira Rahim
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Maroof International Hospital Islamabad**ABSTRACT****Objectives:** To determine the accuracy of trans-abdominal ultrasonography in the diagnosis of ectopic pregnancy confirmed on trans-vaginal ultrasonography.**Materials & Methods:** A total of 196 patients with suspicion of ectopic pregnancy between 16-40 years were included in the study. Patients with premature rupture of membrane, urogenital anomalies and any gynecological malignancy were excluded. First, all the patients underwent trans-abdominal and then trans-vaginal ultrasonography. Trans-abdominal ultrasonography findings were correlated with findings of trans-vaginal sonography.**Results:** Age range in this study was from 16 to 40 years with mean age of 26.89 ± 5.43 years. Majority of patients 52.55% were < 16 weeks of gestational age with mean gestational age of 13.33 ± 2.12 weeks. In trans-abdominal ultrasound positive patients, 117 (59.69%) (True Positive) had ectopic pregnancy and 13 (6.63%) (False Positive) had no ectopic pregnancy on trans-vaginal sonography. Among, 66 trans-abdominal ultrasound negative patients, 15 (7.65%) (False Negative) had ectopic pregnancy on trans-vaginal sonography where as 51 (26.02%) (True Negative) had no ectopic pregnancy. So, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of trans-abdominal sonography in ectopic pregnancy are 88.64%, 79.69%, 90.0%, 77.27% and 85.71% respectively.**Conclusion:** This study concludes that trans-abdominal ultrasonography appears to be a reliable, accurate, easily available and cost effective method for the evaluation of ectopic pregnancy where trans-vaginal ultrasonography is not acceptable and available or easily accessible to the general population.**Keywords:** Bleeding, ectopic pregnancy, accuracy, ultrasonography.**INTRODUCTION**

An ectopic pregnancy, or eccysis, is a complication of pregnancy in which the embryo implants outside the uterine cavity. Most ectopic pregnancies occur in the Fallopian tube (so-called tubal pregnancies), but implantation can also occur in the cervix, ovaries, and abdomen.¹ In a normal pregnancy, the fertilized egg enters the uterus and settles into the uterine lining where it has plenty of room to divide and grow. About 1% of pregnancies are in an ectopic location with

implantation not occurring inside of the womb, and of these 98% occur in the Fallopian tubes.² Ectopic pregnancy (EP) is a major health problem for women of childbearing age and a leading cause of pregnancy-related death in the first trimester. Recently decreased mortality rate is due to improvement in diagnosis by improving ultrasound equipment and ability to quantify serum Beta hCG level.³ An ultrasound showing a gestational sac with fetal heart in the fallopian

tube is clear evidence of ectopic pregnancy.⁴ Ultrasound now has a pivotal role for the assessment of gynecological patients due to its wide availability, good resolution, low cost and lack of ionizing radiations. Ultrasound examination during the reproductive period in married females is most often performed by trans-vaginal route, it can also be performed by trans-abdominal, transrectal and trans-perineal route.⁵ Trans-vaginal sonography (TVS) has been shown to be an acceptable diagnostic procedure for women attending an early pregnancy unit with problems such as pain and bleeding in early pregnancy.⁶

Due to the increased availability of high resolution TVS in early first trimester, more than 80% of EPs are now detected before rupture and more than 50% are diagnosed in asymptomatic women by ultrasound (US) alone.⁷⁻⁸ It has been shown to be an accurate diagnostic test for ectopic pregnancy with a high sensitivity of 87–99% and specificity of 94–99.9%.⁹⁻¹⁰ The sensitivity of diagnosis of ectopic pregnancy by transabdominal scan is 82-91% and specificity is 77-93%.^{9,11}

Although, trans-vaginal ultrasonography is considered as a gold standard but in it patient may experience more discomfort and the procedure may be a bit more embarrassing than trans-abdominal scan. So, this study was conducted to determine the accuracy of trans-abdominal ultrasonography in diagnosing ectopic pregnancy in local population, so, patients could be given a cheap, easily available, more comfortable and acceptable alternative modality of transvaginalsonography for diagnosing and screening ectopic pregnancy in high risk patients to take timely and proper managements in these patients in order to reduce the maternal mortality and morbidity.

OPERATIONAL DEFINITIONS:

• Ectopic Pregnancy:

On ultrasonography, presence of all of these i.e. adnexal mass, pelvic free fluid, gestational sac and embryo with cardiac activity and

extrauterine gestational sac was considered positive.

• Accuracy:

was defined as the presence of ectopic pregnancy on trans-abdominal ultrasonography as well as on trans-vaginal ultrasonography or the absence of ectopic pregnancy on trans-abdominal ultrasonography as well as on trans-vaginal ultrasonography.

MATERIAL AND METHODS

This cross sectional study was conducted at Department of Radiology D.G Khan Hospital, D.G Khan from January 2017 to June 2017. Total 196 patients were selected for this study.

Inclusion Criteria:

- Clinically suspicious of ectopic pregnancy i.e. amenorrhea, followed by vaginal bleeding and pelvic pain with a positive pregnancy test and serum beta HCG >1500 IU/ml.
- Age range between 16-40 years.
- Singleton pregnancy and upto para-3.

b. Exclusion Criteria:

- Above 40 years of age.
- Premature rupture of the membranes.
- Bleeding associated with known placenta praevia
- Patients not willing for transvaginal ultrasound.
- Known gynecological malignancy.
- Known urogenital anomalies.

Data collection procedure:

After taking written, informed consent, transabdominalsonography was performed by using a 3.5 MHz convex probe with patient was positioned lying face up on an examination table and the transducer pressed firmly against the skin and sweeps it back and forth over the area of interest in the pelvic area. Trans-abdominal ultrasonography was performed using a full maternal urinary bladder as acoustic window that provide a wider field of view and greatest depth of view. Acoustic coupling gel was applied to help the transducer to be in secure contact with the

body and eliminate air pockets between the transducer and the skin. Immediately after this, trans-vaginal ultrasonography was done with 7 MHz probe in every patient after emptying their urinary bladder. In TVS, the patient was scanned in dorsal lithotomy position with her feet secure in stirrups and her perineum even with the end of the examination table. Before the insertion of the transducer gently into the vagina it was covered with a condom to avoid the risk of infection transmission between selected subjects. The uterus was imaged in the sagittal and transverse planes. Measurement of the endometrial stripe was obtained on a midline sagittal image. The cervix was evaluated to determine if the os was open or closed and whether fluid was present in the endocervical canal. The adnexa were carefully evaluated and measurements of the ovaries were obtained in the sagittal and transverse planes. If a mass was identified within the adnexa, pressure was applied with the probe internally and by the hand externally on the anterior abdominal wall to determine if the mass was arising from the ovary or was separate from it. The cul-de-sac was imaged for any evidence of free fluid.

During ultrasound examination, special note was made of presence of adnexal mass, pelvic free fluid, gestational sac and embryo with cardiac activity and extrauterine gestational sac. Each ultrasound findings was interpreted by one senior radiologist (at least 5 years of experience). On ultrasonography, presence of all of these i.e. adnexal mass, pelvic free fluid, gestational sac and embryo with cardiac activity and extrauterine gestational sac was considered positive.

The transabdominal ultrasonography results were correlated with transvaginal ultrasonography for accuracy i.e. presence of ectopic pregnancy on trans-abdominal ultrasonography as well as on trans-vaginal ultrasonography or the absence of ectopic pregnancy on trans-abdominal ultrasonography as well as on trans-vaginal ultrasonography. This all data was recorded on a specially designed proforma which contained two parts. Part 1st was included the demographic

features of the patients while part 2nd was included the study variables.

DATA ANALYSIS PROCEDURE:

Collected data was analyzed through computer software SPSS 16.0. Mean and standard deviation was calculated for quantitative variables i.e. age and gestational age. Frequency and percentage was calculated for qualitative variables i.e. parity, presence of ectopic pregnancy (yes/no) and site of ectopic pregnancy. All the results were presented in the form of tables and charts. 2x2 contingency table was used to calculate the accuracy of trans-abdominal ultrasonography in diagnosing ectopic pregnancy confirmed on trans-vaginal ultrasonography. Effect modifiers like age, parity, gestational age and site of pregnancy were controlled through stratifications and post-stratification chi square was applied to see their effect on outcome variable. P value ≤ 0.05 was considered as significant.

RESULTS

Age range in this study was from 16 to 20 years with mean age of 26.89 ± 5.43 years. Majority of the patients 55.61% were between 21 to 30 years of age as shown in Table I. Majority of patients 52.55% were < 16 weeks of gestational age with mean gestational age of 13.33 ± 2.12 weeks as shown in Figure I. Nulliparous were 48 (24.49%) followed by para 1, 2 and 3 were 62 (31.63%), 51 (26.02%) and 35 (17.86%) respectively. (Table II) Total 89.21% patients were found with tubal pregnancy and 10.71% patients were found with non-tubal pregnancy. (Fig. II) All the patients were subjected to first trans-abdominal and then trans-vaginal ultrasonography. Trans-abdominal ultrasonography supported the diagnosis of ectopic pregnancy in 130 (66.33%) patients. Trans-vaginal ultrasonography has shown ectopic pregnancy in 132 (67.35%) cases where as 64 (32.65%) patients revealed no ectopic pregnancy. In trans-abdominal ultrasound positive patients, 117 (59.69%) (True Positive) had ectopic pregnancy and 13 (6.63%) (False Positive) had no

ectopic pregnancy on trans-vaginal sonography. Among, 66 trans-abdominal ultrasound negative patients, 15 (7.65%) (False Negative) had ectopic pregnancy on trans-vaginal sonography where as 51 (26.02%) (True Negative) had no ectopic pregnancy as shown in Table III. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of trans-

abdominal ultrasonography confirmed on trans-vaginal sonography are shown in Figure IX. So, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of trans-abdominal sonography in ectopic pregnancy are 88.64%, 79.69%, 90.0%, 77.27% and 85.71% respectively (Figure III).

Table-I: %age of patients according to Age distribution (n=196).

Age (in years)	Frequency	%age
16-20 years	34	17.35
21-30 years	109	55.61
31-40 years	53	27.04
Mean ± SD	26.89 ± 5.43	

Figure-I: %age of patients according to Gestational age (n=196).

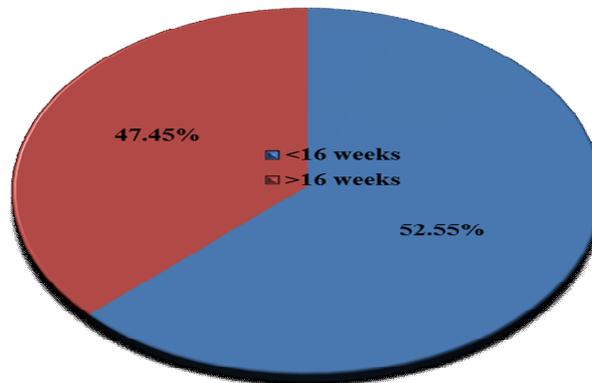


Table-II: distribution of patients according to Parity (n=196).

Parity	No. of Patients	%age
Nullipara	48	24.49
1	62	31.63
2	51	26.02
3	35	17.86
Total	196	100.0

Figure II: Division of patients according to site of ectopic pregnancy

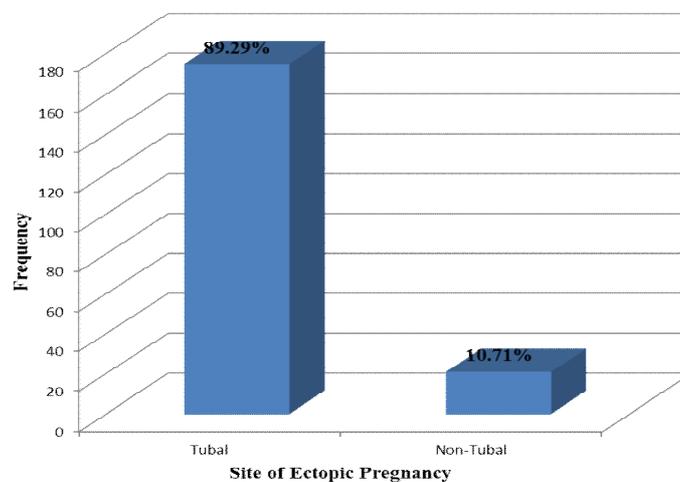
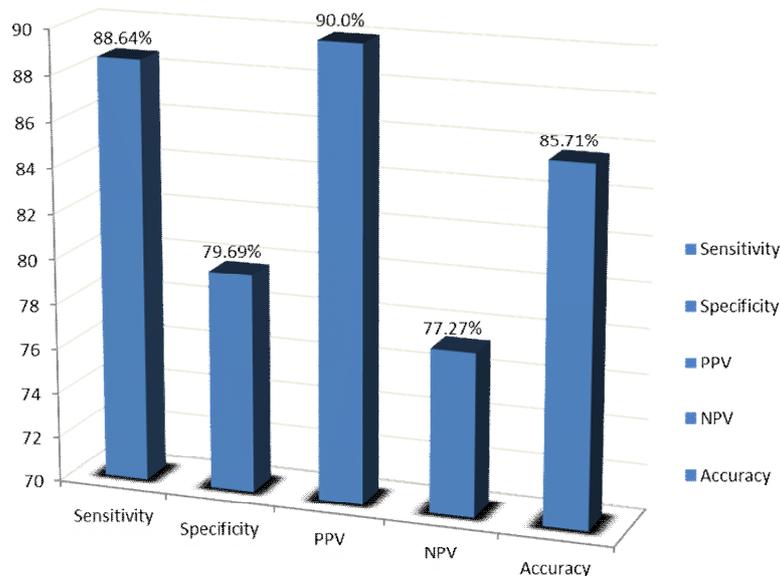


Table-III: Summary of Results.

	Positive result on trans-abdominal Ultrasonography	Negative result on trans-abdominal Ultrasonography
Positive result on trans-vaginal Ultrasonography	117 (TP)*	15 (FN)***
Negative result on trans-vaginal Ultrasonography	13 (FP)**	51 (TN)****

Figure III: Evaluation of Trans-abdominal Ultrasonography in Ectopic pregnancy



DISCUSSION

In this study, age range was from 16 to 40 years with mean age of 26.89 ± 5.43 years which is comparable to studies of Malik SA et al⁵ and Winder S et al¹² i.e. 27 and 26 years respectively. On the other hand, Mahmoud MZ et al¹⁰ has shown a much higher mean age i.e. 30 years, in his study as compared to our study. Majority of the patients 55.61% were between 21 to 30 years of age in our study. These results are very much comparable to studies of Ahmad M et al¹³ and Malik SA et al⁵ who have also found majority of patients in the same age group. Majority of patients 52.55% were < 16 weeks of gestational age with mean gestational age of 13.33 ± 2.12 weeks in our study which is higher than study of Wong TW et al¹¹ who had found mean gestational age of only nine weeks at the time of diagnosis. This difference is because of non-availability of ultrasonography at peripheries and lack of education for antenatal visits and screening for any untoward event during pregnancy.

In this study, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of trans-abdominal sonography in ectopic pregnancy are 88.64%, 79.69%, 90.0%, 77.27% and 85.71% respectively. Ahmad M et al¹³ the sensitivity of diagnosis of suspected ectopic pregnancy by trans-abdominal sonography scan as 82.3%, specificity 93.3%, positive predictive value is 98.5%, and negative predictive value is 48.2% and the accuracy rate of 84%. Braffman BH et al¹⁴ in his study evaluated the efficacy of pelvic sonography in 1427 patients as screening test for ectopic pregnancy in emergency department and found the sensitivity and specificity of screening sonography for ectopic pregnancy was 99% and 84% respectively. Mohsin H et al¹⁵ conducted a prospective study in 2001 in which efficacy of pelvic sonography was evaluated in 400 patients as screening test for ectopic pregnancy. In his study, he had found that ultrasound examination was clearly diagnostic in

96.3% patients without help of Beta hCG. But these results in both studies were for combined trans-abdominal and trans-vaginal sonography instead of trans-abdominal alone.

Dashefsky SM et al¹⁶ conducted a study in 1988 and found diagnostic accuracy of trans-abdominal sonography for detection of ectopic pregnancy is 67%. He had also found that both transvesical and trans-vaginal sonography significantly increase the diagnostic accuracy for ectopic pregnancy (from 60-83%). Although trans-vaginal sonography is superior to trans-abdominal sonography as there is an increase in number of diagnostic studies and decrease in the number of indeterminate studies, trans-vaginal sonography may miss an ectopic pregnancy that is located in high location beyond its view.¹⁵ Kivikoski AI et al¹⁷ had also found diagnostic accuracy of trans-abdominal sonography in ectopic pregnancy as 68%. Diagnostic accuracy of trans-abdominal sonography observed in these studies was much lower as compared to our study. The results of our study for diagnostic accuracy of trans-abdominal sonography in ectopic pregnancy are very much similar to the results reported by Nausheen F et al¹⁸ and Malik SA et al⁵ who had found 82% and 84% respectively.

There is no doubt that the radiologist's experience and training are very important factors in detecting ectopic pregnancy on ultrasonography. At the same time reliable statistical data of the diagnostic value of ultrasonography are also related with the independent base of reference. Regarding pelvic ultrasonography, in most of the studies, the base of reference is histopathology while in this study we have used trans-vaginal sonography as the base of reference. This presupposes that trans-vaginal sonography is 100% accurate and uses for the diagnosis of every possible ectopic pregnancy.

Although, trans-abdominal ultrasonography is one of the very good diagnostic modalities; however, it has a few limitations, one of these being operator dependence. A very skillful operator can pick up subtle findings, which on the other hand can be missed. Moreover, it can miss any

pathology, if it is not getting an acoustic window in the presence of air, such as bowel gases. This is one of the very important factors for evaluating patients through trans-abdominal technique. In patients with an empty bladder, bowel loops obscure the view of pelvic structures.¹⁹

CONCLUSION

This study concludes that trans-abdominal sonography is a reliable, easily available and cost effective method for the evaluation of ectopic pregnancy with high accuracy & sensitivity in diagnosing ectopic pregnancy which nearly approaches the value of trans-vaginal sonography. Moreover, trans-abdominal ultrasonography is also more comfortable and acceptable modality than trans-vaginal sonography for general population.

So, we recommend trans-abdominal sonography in high risk patients for diagnosing and screening ectopic pregnancy to take timely and proper managements in these patients in order to reduce the maternal mortality and morbidity.

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