

# Significance of Sonography in Assessment of Ectopic Pregnancy

Sonography in  
Assessment of  
Ectopic  
Pregnancy

Nasir Mahmood<sup>1</sup>, Kishwar Naheed<sup>2</sup>, Zille Huma<sup>2</sup>, Aqeel Ahmed<sup>2</sup>, Huda A Majeed<sup>2</sup> and Zahir Mustafa<sup>3</sup>

## ABSTRACT

**Objective:** To assess the role of sonography in the assessment of ectopic pregnancy and to discover additional advantages of TVS over the TAS.

**Study Design:** Prospective study

**Place and Duration of Study:** This study was conducted at the Departments of Radiology & Obstetrics and Gynecology, Pak Red Crescent Teaching Hospital, Kasur from March 2013 to March 2018.

**Materials and Methods:** 100 women with clinical suspicion of ectopic pregnancy were assessed through sonography. Sonography information was correlated with the post surgical histopathology diagnosis to find out specificity, sensitivity and predictive value of sonography.

**Results:** Among 100 patients, 25.4% had pelvic inflammatory disease, 7.4% had previous history of ectopic pregnancy, 2.6% had tubal surgery and 1.8% patient had in vitro fertilization while most of the patients (80.0%) had no any risk factor. Among ONE HUNDRED patients, 47 cases were diagnosed with ectopic pregnancy (true positive results). The ectopic pregnancy unambiguous diagnosis was reached with transabdominal sonography in just 29.0% patients while remaining 71.0% patient needed biphasic sonography. For the diagnosis of ectopic pregnancy, sensitivity was 94.0% and specificity 100.0% while positive predictive value was 100.0% and negative predictive value was 63.0%.

**Conclusion:** Study concluded that accuracy of ultrasonography was almost 100% especially the trans-vaginal sonography which is believed as a procedure of choice in early gestation and reliable workup in women having suspected ectopic gestation.

**Key Words:** Ectopic pregnancy (EP), Transvaginal Sonography (TVS), Transabdominal sonography TAS

**Citation of articles:** Mahmood N, Naheed K, Huma Z, Ahmed A, Majeed HA, Mustafa Z. Significance of Sonography in Assessment of Ectopic Pregnancy. Med Forum 2018;29(12):6-9.

## INTRODUCTION

Ectopic pregnancy (EP) is referred to an abnormal pregnancy process in which fertilized eggs develop beyond uterine cavity and it is also described as exfetation. Ectopic pregnancy takes place once a fertilized ovum implants beyond endometrial cavity. The word ectopic is taken from 'ektos' which is a Greek word and the meaning is 'out of place'.<sup>1</sup>

The EP is an elevated risk condition which takes place among 1.9% of the reported cases. Majority of the ectopic pregnancies are reported among women aged between 26-30 years.<sup>2</sup>

<sup>1</sup>. Department of Radiology/Obs. & Gynae<sup>2</sup>, Pak Red Crescent Medical and Dental College & Teaching Hospital, Kasur.

<sup>3</sup>. Department of Radiology, Sheikh Zayed Medical College, Rahim Yar Khan.

Correspondence: Dr. Nasir Mahmood, Assistant Professor of Radiology, Pak Red Crescent Medical and Dental College & Teaching Hospital, Kasur.  
Contact No: 0300-4875060  
Email: sanza521@hotmail

Received by: April, 2018

Accepted by: September, 2018

Printed by: December 2018

Among females who visit emergency department in their first trimester with bleeding, pain or both range from 6 to 16 percent. The reported prevalence in Pakistan has been described as 1:112 – 1:130.<sup>3</sup> Among ectopic pregnancies, almost 98% take place in uterine tubes. Out of these, 70% of tubal EP takes place in ampullary section, followed by fimbriae, isthmus and interstitial tubal sections. The remaining EP can be observed in numerous locations outside the uterine tubes including ovary, cervix, peritoneal cavity and cesarean section scars.<sup>4</sup>

Sign and symptom of ectopic pregnancy are same like several other gynecological complaints and clinical doubt will be raised amongst the women of reproductive age, who visit hospitals due to irregular vaginal bleeding and abdominal pain.<sup>5</sup>

The most significant risk factors of ectopic pregnancy are history of EC, gynecologic surgery and pelvic inflammatory disease. Several other risk factors comprise history of placenta previa, infertility, intrauterine device use, in vitro fertilization, endometriosis, congenital uterine abnormalities, smoking history and exposure to diethylstilbestrol.<sup>6</sup>

Women who become pregnant and have known significant risk factors should be evaluate for possible ectopic pregnancy even in absence of symptoms.<sup>7</sup>

Ectopic pregnancy is an obstetric emergency with permanent morbidity as well as mortality. Therefore, high level of doubt, timely diagnosis and adequate treatment enhances future reproductive capability. In early identification sonography plays a helpful role.<sup>8</sup> Before the introduction of ultrasound and sensitive rapid assay serum, HCG (human chorionic Gonadotrophin) quantification, ectopic pregnancy was mostly a serious diagnosis.<sup>9</sup> The ultrasonography is widely available, inexpensive, rapid, simple and noninvasive investigative modality which helps in rapid detection, presence, and location of pregnancy.<sup>10</sup>

Accurate calculation of gestation with Transvaginal Ultrasound, when it is within the uterus, is the best determinant of pregnancy, rather than an absolute HCG.<sup>11</sup>

Due to current ultrasound equipment and capability to measure serum beta human chorionic Gonadotrophin level, the diagnosis of EC has been improved but still a challenge for health care providers.<sup>12</sup> In ectopic pregnancy, the range of ultrasonography findings is broad, detection of the extra-uterine gestational sac having a yolk sac and ectopic heart beat substantiates the identification and investigative findings comprise a cystic or tubal masses or solid adnexal masses (including tubal ring sign, showing a tubal gestational sac) and fluid in the cul-de-sac.<sup>2</sup>

The recent ultrasonography methods that are utilized in health facilities are TVS (trans-vaginal sonography) and TAS (transabdominal sonography).<sup>13</sup> Several researchers who worked on EP, started with transabdominal sonography to detect the ectopic pregnancy and have demonstrated correct diagnosis among 70 to 89 percent cases.<sup>2</sup> The accuracy of abdominal ultrasonography can be affected due to factor like obesity inadequate bladder filling and pelvic structures obscuration through bowel gas. Sonography scanning in combination with beta human chorionic Gonadotrophin was observed extremely helpful in determination of ectopic pregnancy or otherwise. If transabdominal investigation is not correct, a TVS should be carried out when possible.<sup>12</sup>

During past two decades, TVS is being used on vast level among women having suspected ectopic pregnancy primarily owing to its availability, outstanding diagnostic performance, repeatability, safety and low cost.<sup>14</sup> For the identification of EC, the TVS is believed first-line imaging method and it has 90.9% diagnostic accuracy.<sup>15</sup> Transvaginal sonography with high frequency transducer, can offer better diagnostic information regarding site of ectopic pregnancy when compared with transabdominal sonography. Early identification of ectopic pregnancy helps in successful therapeutic management.<sup>16</sup>

Ectopic pregnancy is believed a leading problem among females. It is high risk condition which can cause morbidity as well as mortality. Hence, present study

aims to assess the role of sonography in the assessment of ectopic pregnancy and to discover additional advantages of TVS over the TAS.

## MATERIALS AND METHODS

It was prospective study in which 100 women with clinical suspicion of ectopic pregnancy were assessed through sonography. Study was carried out from October 2013 to March 2018. It was non-consecutive patients group who fulfilled clinical criteria of positive serum beta human chorionic Gonadotrophin levels of above 1500 miu/ml, bleeding per vaginum, with/without amenorrhea and abdominal pain.

Pelvic sonography was carried out, initially utilizing transabdominal route with complete urinary bladder, after that, trans-vaginal sonography if results were doubtful. Sonography machines utilized during research were GE (General Electric) PRO 200 and ECCOCEE (Toshiba) Convex 3.75 MHZ, multi frequency probe (3-5 MHZ) and transvaginal multi-frequency probes (5.5-6.5 MHZ) were utilized for investigations. Following sonographic standard features were utilized as diagnostic criteria of EP.

- i) Direct signs: Detection of live embryo in adnexa.
- ii) Indirect signs: Adnexal mass and/or free fluid presence in Douglas pouch. Masses, if found, were localized, their contour were described, internal architecture were examined and sonographic diagnosis was performed.

Sonographic information was correlated with the histopathologic diagnosis to find out specificity, sensitivity and predictive value of sonography. The collected data was analyzed through SPSS 20.0. Confidentiality of the data was also ensured.

## RESULTS

Result shows that among 100 patients, 12.7% (13) had pelvic inflammatory disease, 3.7% (4) had previous history of ectopic pregnancy, 1.8% (2) had tubal surgery and 1.8% (1) patient had in vitro fertilization while most of the patients 80.0% (80) had no any risk factor.

Among hundred patients, 80 cases were diagnosed with ectopic pregnancy (true positive results). The ectopic pregnancy unambiguous diagnosis was reached with transabdominal sonography in just 29.0% (29) patients while remaining 71.0% (71) patient needed biphasic sonography. Only 3.7% (4) cases were found having live ectopic gestation in the shape of fetal pole by cardiac activity, these were detected only on trans-vaginal sonography. Among remaining cases, the diagnosis was done due to indirect signs and found that 47.0% (47) patients had adnexal mass, 38.0% (38) patients had free fluid and 15.0% (15) patients had both features. Masses detected were varied in texture with cystic and solid areas. In a few patients, free fluid was anechoic and among other patients it had inner echoes

recommending blood loss. Fluid was expanding up to Morrison's pouch in one patient.

Among 10 patients, EP was excluded (true negative). The diagnosis was confirmed by subsequent follow up and association with beta human chorionic gonadotrophin. There were six patients who had false negative diagnosis while none of the patients had false positive diagnosis.

Results shows that sensitivity was 94.0% and specificity 100.0% while positive predictive value was 100.0% and negative predictive value was 63.0%.

## DISCUSSION

Ectopic pregnancy having mortality rate of 0.2/1000 of ectopic pregnancies, about two third of these death are associated with substandard care<sup>17</sup>. Ovarian ectopic pregnancy result from secondary implantation on the ovary or from failure of follicular extrusion<sup>18</sup> Although many earlier studies linked ovarian ectopic pregnancy to the use of intrauterine contraceptive devices, more recent research has refuted his ascertain.<sup>19</sup> Other risk factors for ovarian ectopic pregnancy include a history of endometriosis, ovulation induction and other assisted reproductive technologies and advanced maternal age<sup>20,21,22</sup>. Differential diagnosis of ovarian ectopic pregnancy can include ovarian cyst, appendicitis, tubal ectopic or an early or failed intrauterine pregnancy<sup>21,23</sup>. During current years, due to change in living habits of people and lack of sexual health education, the frequency of EP is constantly increasing. It is most significant factor that leads to maternal mortality and fertility loss. Timely identification and treatment evade the incidence of unfavorable events and reserve patients' fertility function. For diagnosis of the disease, sonography assessment is the first method of choice. The transabdominal sonography is comparatively comprehensive to show complete structures of pelvic cavity, however the sonographic beam is easily intervened by subcutaneous fat, intestinal gas and several other factors. Though, microscopic structure display is not very good, the trans-vaginal sonography resolution ratio is comparatively high with less interruption by factors mentioned above, however the range of display is limited.<sup>[24]</sup> Present study was carried out to assess the role of sonography in the assessment of ectopic pregnancy. To acquire appropriate outcomes, 100 women with clinical suspicion of ectopic pregnancy were included in the study and found that 12.7% patients had pelvic inflammatory disease, 3.7% previous history of ectopic pregnancy, 1.8% had history of tubal surgery and 1.8% patient had in vitro fertilization while mainstream (80.0%) of patients had no any risk factor. The findings of our study are better than the study undertaken in Dhaka (Bangladesh) by Nahar and coworkers (2013) who reported that 46% women had no risk factor while 32% patients had pelvic inflammatory disease, 10% had previous history

of EP, 2 % had history of tubal surgery and remaining proportion had other factors like history of appendicitis and salpingitis etc.<sup>5</sup>

During study transabdominal sonography was performed among 29.0% patients and biphasic among 71.0% patients. Among hundred suspected ectopic pregnancy cases, 80 were true positive. Out of these 80 cases, 3.7%(4) cases were found having live ectopic gestation in the form of fetal pole with cardiac activity while among remaining 76 cases of indirect signs like adnexal mass was found in 45 patients and free fluid in 19 patients while both features were observed in 12 patients. While the results of a study conducted by Imtiaz (2016) indicated that fetal pole with cardiac activity was seen in only 4.2% patients and adnexal mass among 43.4% cases which is almost comparable with our study findings.<sup>3</sup>

There were five true negative and three false negative cases of ectopic pregnancy. Study disclosed that sensitivity, specificity, positive predictive value and negative predictive value for the diagnosis of EP was 94.0%, 100.0%, 100.0% and 63.0% respectively. The results of our study are comparable but exhibited better scenario than the study carried out by Imtiaz (2016) who confirmed that sensitivity, specificity, positive predictive value and negative predictive value for the diagnosis of ectopic pregnancy was 93.98%, 95.07%, 96.15% and 92.34% respectively. Another study performed by Niazi and associates (2015) highlighted that sensitivity, specificity, positive predictive value and negative predictive value for the diagnosis of ectopic pregnancy was 96.0%, 89.0%, 97.0 and 84.0%, respectively.<sup>11</sup> A study carried out by Haque and teammates (2013) showed that for the detection of EC, the sensitivity was 92.64% specificity 74.47%, negative predictive value 90.90% and positive predictive value was 84.0%.<sup>25</sup>

Preferably patients suspected of EP should have ultrasonography when outcomes of beta human chorionic Gonadotrophin are available. Unluckily, in emergency situation, it is mostly not possible. It was found during study that at the time of sonography, most of the women had their results pending. Therefore, study was unable to correlate the sonographic findings with those of beta human chorionic Gonadotrophin.

Sonography is a best investigative modality but it has some limitations. One of these limitations is operator dependence. The pathology could be missed if it is getting any audio window in presence of the air, for example, bowel gases. It is an important factor to evaluate patients with full bladder in TAS, because the bowel loops obscure pelvic structure view. TVS does not need full bladder, though, sometimes, assessment becomes complicated owing to inadequate field of view.

## CONCLUSION

Ectopic pregnancy is believed to be a leading problem among females of reproductive age group. Our Study concluded that accuracy of ultrasonography was almost 100% especially the trans-vaginal sonography which is believed to be a procedure of choice in early gestation, and is a reliable ultrasonography workup in women having suspected ectopic gestation. Further studies are needed on large scale to assess the role of sonography in the assessment of ectopic pregnancy to prevent women from ill effects of the disease.

### Author's Contribution:

Concept & Design of Study: Nasir Mahmood  
 Drafting: Kishwar Naheed, Zille Huma  
 Data Analysis: Aqeel Ahmed, Huda A Majeed, Zahir Mustafa  
 Revisiting Critically: Nasir Mahmood, Kishwar Naheed  
 Final Approval of version: Nasir Mahmood

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

- Jilian S, Jiale Q, Junmei W, Jiamin L, Haili L. Application value of transvaginal ultrasound combined with abdominal ultrasonography in the diagnosis of ectopic pregnancy. *Biomed Res* 2017; 28(21):9358-61.
- Lal D, Ali M, Jesrani A, Zaidi SMH. The diagnostic accuracy of transabdominal sonography (TAS) in early (first trimester) detection of ectopic pregnancy using histopathology as gold standard in high risk patients. *Pak J Radio* 2016;26(3):206-11.
- Imtiaz S. Diagnostic accuracy of transvaginal ultrasound in early (first trimester) detection of ectopic pregnancy and to exclude an alternative diagnosis. *Pak J Radiol* 2016; 26(3): 212-7.
- Lee R, Dupuis C, Chen B, Smith. A, Kim YH. Diagnosing ectopic pregnancy in the emergency setting. *Ultrasonography* 2018;37:78-87.
- Nahar MN, Sattar A, Ara H, Rabbi AF, Shirin M, Kumu FK. Role of transabdominal ultrasonography in the evaluation of suspected ectopic pregnancy. *J Dhaka Med Coll* 2013;22(2):167-72.
- Kao LY, Scheinfeld MH, Chernyak V, Rozenblit AM, Oh S, Dym RJ. Beyond ultrasound: CT and MRI of ectopic pregnancy. *AJR* 2014;202:904-11.
- Tubal ectopic pregnancy. *Practice Bulletin No.193. ACOG* 2018;131:e91-103
- Shetty VH, Gowda S, Muralidhar L. Role of ultrasonography in diagnosis of ectopic pregnancy with clinical analysis and management in tertiary care hospital. *J Obstet Gynaecol Ind* 2014;64(5): 354-7.
- Winder S, Reid S, Condous G. Ultrasound diagnosis of ectopic pregnancy. *AJUM* 2011; 14(2):29-33.
- Nahar MN, Quddus MA, Sattar A, Shirin M, Khatun A, Ahmed R, et al. Comparison of transvaginal and transabdominal ultrasonography in the diagnosis of ectopic pregnancy. *Bangladesh Med Res Counc Bull* 2013; 39: 104-8
- Early pregnancy loss. *Practice Bulletin No. 150. American College of Obstetricians and Gynecologists. Obstet Gynecol* 2015;125:1258-67.
- Thapa NB, Dwa YP. Role of transabdominal ultrasound in detection of ectopic pregnancy *JCMS Nepal.* 2016;12(1):1-4.
- Niazi M, Kamal MM, Malik N, Farooq MA, Wahid N. Transabdominal vs transvaginal sonography - comparison in pelvic pathologies. *J Rawal Med Coll* 2015; 19(3): 223-6.
- Young L, Barnard C, Lewis E, Jones M, Furlan J, Karatasios A, et al. The diagnostic performance of ultrasound in the detection of ectopic pregnancy. *NZMJ* 2017;130(1452): 17-22.
- Vagg D, Arsala L, Kathurusinghe S, Ang WC. Intramural ectopic pregnancy following myomectomy. *J Investig Medi High Impact Case Rep* 2018; 6: 1-4.
- Saeed U, Muzhar N. Correlating serum beta hCG levels with transvaginal sonographic features of ectopic pregnancy. *J Rawal Med* 2017;21(1): 64-7.
- Ectopic pregnancy and miscarriages. *NICE clinical guideline Dec* 2012;154.
- Roy J, Babu AS: Ovarian pregnancy: two case reports. *Australas Med J* 2013;6:406-414.
- Melcer Y, Smorgick N, Vaknin Z, Mendlovic S, Raziell A, Maymon R. Primary ovarian pregnancy: 43 years experience in a single institute and still a medical challenge. *IMAJ* 2015;17:687-690.
- Marion LL, Meeks GR: Ectopic pregnancy: history, incidence, epidemiology, and risk factors. *Clin Obstet Gynecol* 2012;55:376-386.
- Comstock C, Huston K, Lee W. The ultrasonographic appearance of ovarian ectopic pregnancies. *Obstet Gynecol* 2015;105:42-45.
- Gupta N, Gupta A, Onyema G, et al: Accurate preoperative diagnosis of ovarian pregnancy with transvaginal scan. *Case Rep Obstet Gynecol* 2012.
- Jha S, Bosworth K, Quadri A, Ibrahim A: Ovarian ectopic pregnancy. *BMJ Case Reports* 2011; doi:10.1136/bcr.08.2010.3250.
- Coll Jing Z, Dan L, Liqing P. The characteristics of ectopic pregnancy ultrasound image and value of vaginal ultrasound combined with abdominal ultrasound in diagnosis of ectopic pregnancy. *J Hainan Med Uni* 2015; 161-4.
- Haque S, Kundu SS, Jalali MA, Noor N, Parveen S, Paul FN, et al. Efficacy of trans vaginal ultrasonography in detection of ectopic pregnancy. *Bangla J Radiol Imaging* 2013;21(1):30-2.