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Original Research Article

Hemodynamic havoc: complicated ectopic pregnancy may trigger acute kidney injury

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ABSTRACT

Background: The incidence of complicated ectopic pregnancies highlights the need for awareness of risk factors, as well as associated morbidity and mortality. This study aimed to determine the incidence of acute kidney injury (AKI) in patients with complicated ectopic pregnancy and to assess associated morbidity and mortality.
Methods: A retrospective observational study evaluated the incidence of AKI in patients with complicated ectopic pregnancy and assessed related morbidity and mortality at hospitals in Prayagraj, UP, from January 1, 2010, to December 31, 2024.
Results: A total of 180 ectopic pregnancies (EPs) were diagnosed, comprising 70 (38.89%) cases in primiparous and 110 (61.11%) in multiparous females. EP locations included tubular (83.8%), cervical (1.11%), ovarian (0.005%), and cesarean scar (14.44%), with an observed increase in cesarean scar implantations. Prior to admission to the nephrology intensive care unit (nephro ICU), salpingectomy was performed in 83.88% of cases, hysterectomy in 14.45%, and subtotal hysterectomy in 1.67%. In addition to severe haemorrhage, primary clinical findings were shock, septicemia, acute respiratory distress syndrome, oliguria, and multiple organ failure. Renal replacement therapy was initiated in 65 patients; among these, 46 (71.5%) received haemodialysis and 19 (15.84%) underwent plasmapheresis. The occurrence of these complications, particularly those necessitating RRT, was associated with a poor prognosis.
Conclusions: Early diagnosis of ectopic pregnancy reduces complications, morbidity, and mortality. Patients recovering from AKI must follow up with nephrology to ensure long-term health. Public awareness and training healthcare professionals in ultrasound for early detection are essential.

Keywords: AKI, Complicated, Ectopic pregnancy

INTRODUCTION

The term ectopic pregnancy has often been considered synonymous with extrauterine pregnancy, as most ectopic pregnancies are located in the Fallopian tubes. The classical locations for EP implantation include the ampullary, isthmic, fimbrial interstitial, cervical, and ovarian regions.[1] In recent years, there has been a significant increase in the number of ectopic pregnancies, which are located outside the uterine cavity, but within the confines of the uterus, such as caesarean scar, cervical, intramural, and interstitial pregnancies. These types of ectopic pregnancies are usually caused by scarring or incomplete uterine healing following surgical trauma to the uterus during procedures such as caesarean section, myomectomy, and operative hysteroscopy. Heterotopic pregnancy is a rare condition where an ectopic pregnancy occurs alongside an intrauterine pregnancy.[2]

The diagnosis of ectopic pregnancy is often missed, and the rising incidence of such pregnancies highlights the

need for increased awareness of their risk factors, as well as the associated morbidity and mortality.[3] When EP is not properly diagnosed, it is considered a serious obstetric emergency due to the possibility of tubal rupture and intraperitoneal bleeding. Therefore, complicated EPs are associated with significant morbidity and even mortality.[4] This study specifically aimed to determine the incidence of AKI in patients with complicated ectopic pregnancy and to assess the morbidity and mortality related to AKI in this population.

METHODS

A retrospective observational study was conducted to evaluate the incidence of AKI in patients with complicated ectopic pregnancy and to assess the morbidity and mortality related to this population at various hospitals in Prayagraj, UP, from January 1, 2010, to December 31, 2024. A total of 180 patients with a diagnosis of AKI were admitted to the nephro ICU. Records were analysed for demographic characteristics, obstetric history, and clinical profiles at admission. We excluded patients with preexisting conditions such as diabetes mellitus, hypertension, contracted kidney conditions, renal transplant recipients, and CKD. Relevant microbiological, pathological, and radiological investigations were sent to the laboratories upon admission and as needed during the hospital stay. Data were analysed, including maternal outcomes, using descriptive statistics with SPSS (version 22).

Definitions

AKI was defined on the basis of risk, injury, failure, loss of function, and end stage renal disease (RIFLE) criteria.[5]

CKD abnormalities of kidney structure or functional abnormalities with GFR≤ 60 ml/minute/1.73 m^2 that has been present for more than 3 months.[6]

Sepsis was defined as per the criteria laid down by the American College of Chest Physicians.[7]

RESULTS

A total of 180 EP cases were complicated by various factors. Among these cases, 70 (38.89%) EPs were diagnosed in primiparous females and 110 (61.11%) in multiparous females. Age and parity distribution is illustrated in Table 1.

Table 1: Age and parity distribution.

Age interval (in years)	(n=180)	Percentage	Parity			
			Primiparous	Percentage	Multiparous	Percentage
18-22	21	11.67	16	8.89	5	2.78
22-26	63	35.00	23	12.77	40	22.23
26-30	96	53.33	31	17.22	65	36.11

In terms of renal manifestations, all the complicated EPs were diagnosed with AKI at the time of admission and required ICU-level care. RRT was initiated in 65 patients, of whom 46 (71.5%) received continuous or intermittent haemodialysis, while 19 (15.84%) underwent plasmapheresis.

Table 2: Locations and surgical intervention for complicated EP implantation.

Locations	(n=180)	Percentage
Tubular	151	83.88
Cervical	2	1.11
Ovarian	1	0.005
Caesarean scar	26	14.44
Surgical intervention		
Salpingectomy	151	83.88
Hysterectomy	26	14.45
Sub-total hysterectomy	3	1.67

Locations of complicated EP implantations and their surgical interventions are listed in Table 2, while Table 3 reveals the clinical findings and maternal outcomes of complicated EP.

Table 3: Major clinical findings along with severe hemorrhage in complicated EP.

Clinical findings	(n=180)	Percentage
Shock	102	56.66
Septicemia	138	86.67
ARDS	21	11.66
Oligouria	22	12.22
Multiple organ failure	9	5.0
Ascites	42	23.33
Maternal outcomes		
Complete recovery	148	82.23
Progression to CKD	4	2.22
Secondary infertility	7	3.88
Mortality	21	11.67

Ruptured ectopic, massive hemoperitoneum, clots in the peritoneal cavity and laparoscopic pictures of hemoperitoneum are illustrated in Figures 1, 2, 3, and 4, respectively.

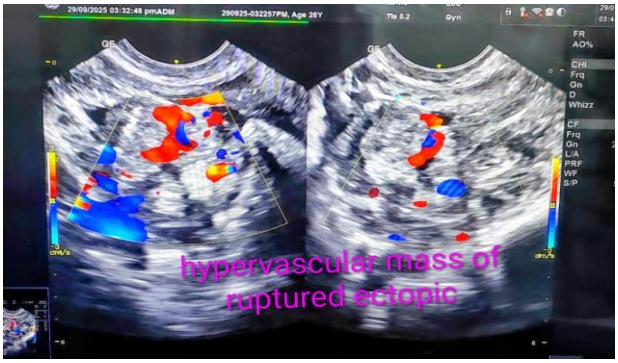

Figure 1: Hypervascular mass of ruptured ectopic.

Figure 2: Massive hemoperitoneum and empty uterine cavity.

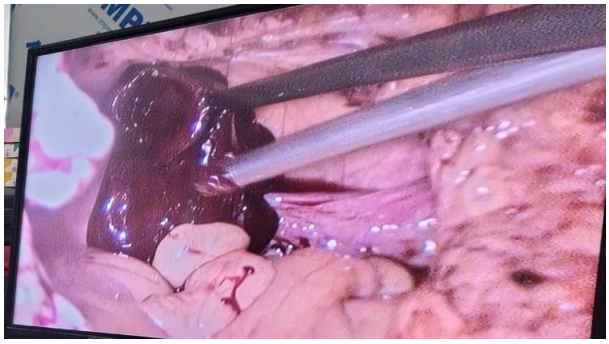

Figure 3: Clots in peritoneal cavity suggestive of massive blood loss.

Figure 4: Laparoscopy picture of hemoperitoneum following ruptured ectopic.

DISCUSSION

Our study included 180 women with ectopic pregnancies who experienced complications and subsequently developed AKI. In most cases (70%), patients were either referred from other facilities or presented late to the hospital following rupture or acute blood loss due to surgical interventions of the ectopic pregnancy. Out of these 38.89% EPs were diagnosed in primiparous females and 61.11% in multiparous females.

Table 2 indicates that complicated ectopic pregnancies were distributed as follows: tubal 83.8%, cervical 1.11%, ovarian 0.005%, and cesarean scar 14.44%. Previous studies have reported similar distributions, with tubal at 95%, interstitial at 2% to 4%, ovarian less than 3%, heterotopic at 1% to 3%, abdominal at 1%, cesarean scar less than 1%, and cervical less than 1%.[8-10] Cesarean scar implantations have demonstrated an increasing trend. However, a few studies have reported the incidence of scar ectopic pregnancies as high as 6%.[11,12]

Salpingectomy, hysterectomy, and subtotal hysterectomy were performed in 83.88%, 14.45%, and 1.67% of cases, respectively, prior to admission to the Nephro ICU, as shown in Table 2 traditional management of EP typically involves surgical intervention, such as salpingostomy, as referenced in literature, depending on the clinical scenario.[13,14]

Upon admission to the nephrology intensive care unit, the primary clinical findings in this study, besides severe haemorrhage, included shock, septicemia, acute respiratory distress syndrome, oliguria, and multiple organ failure. These complications, especially those requiring renal replacement therapy, are linked to a poor prognosis. Several reports indicate that missed diagnosis can cause tubal rupture, hypovolemic shock, blood transfusions, and salpingectomy, all typically associated with high morbidity.[15] In this study, 56.66% of female patients presented with circulatory shock and 86.8% with septicemia. The key recommendation is to administer fluid resuscitation at 20-30 ml/kg to maintain a mean arterial pressure above 65 mmHg, and to initiate a beta-lactam antibiotic infusion within 1 hour of patient admission.[16]

We observed that 82.23% of females achieved complete recovery, highlighting the effectiveness of our interventions. However, it is concerning that 3.88% of females progressed to CKD and 2.22% developed secondary infertility later on. Moreover, our findings indicate a significant mortality rate of 11.67% among patients, underscoring the urgency of addressing these serious outcomes. Recovered cases of AKI require ongoing follow-up with nephrology to ensure long-term health care.

The most recent report on maternal deaths in the United Kingdom shows an increase in ectopic pregnancy rates over the previous 20 years, from 8.6/1000 pregnancies in

1985 to 1987, to 11.1/1000 pregnancies in 2003 to 2005. A major recommendation from the most recent report on maternal deaths suggests that every unit should have clear guidelines for the management of pain and bleeding in early pregnancy because "there are persisting failures to recognise these conditions (ectopic pregnancies) promptly".[3]

A key strength of this study is the collection of data over a 15-year period. However, the study is limited by the inherent constraints of retrospective research designs. Data were obtained from a single centre, representing only a fraction of the broader patient population, as many individuals from peripheral regions could not access the facility. Importantly, this is the first study from India to focus on and monitor kidney injury in cases of ectopic pregnancy, with the objective of improving outcomes in complicated cases. As a result, direct comparison with data from other studies was not feasible.

CONCLUSION

Our study clearly states that patients with complicated ectopic pregnancy often present with acute tubal rupture and hemodynamic instability, which increases morbidity. These patients may experience reduced quality of life due to impaired reproductive capacity, as well as physical and psychological trauma. Early diagnosis reduces morbidity and mortality. Increasing public awareness and training healthcare professionals to use ultrasound for early detection are essential. Limited data exist on complicated ectopic pregnancy with acute AKI. This study aims to provide insights to support timely and effective management.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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