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ORIGINAL RESEARCH

To determine the risk factors, therapeutic options, and preventative measures associated with ectopic pregnancy

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ABSTRACT

Background: An ectopic pregnancy develops when a fertilized egg implants in a location other than the uterus. The predominant site of occurrence is inside the fallopian tube, and the disorder may pose a significant hazard to life as a result of the potential for tubal rupture and bleeding. In order to decrease death rates and provide fertility-preserving treatment, it is imperative to identify more patients at an early stage. **Aim:** To determine the risk factors, therapeutic options, and preventative measures associated with ectopic pregnancy. **Materials and Methods:** This prospective observational study was carried out at the Department of Obstetrics and Gynaecology, Muzaffarnagar Medical College , Muzaffarnagar. Upon admission, a comprehensive medical history of the patients was documented using a specialized form. These included details like age, menstrual and obstetrical histories, past pelvic surgeries, pelvic infections, contraceptive practices, and other known risk factors, as well as socioeconomic status as determined by the modified Kuppuswamy scale. **Results:** The current investigation identified 100 instances of ectopic pregnancy among a total of 7685 births in the same year with incidence rate of 13.01 per 1,000 deliveries. Among these 100 instances, 53% were diagnosed as right-sided ectopic pregnancies. LSCS was the predominant risk factor, accounting for 26% of cases. Prior medical records indicated a prevalence of pelvic inflammatory disease (PID) in nineteen percent of women, but in eleven percent of instances, no identifiable risk factors were present. Out of the 10 women assessed, 10 were deemed acceptable for medical and expectant care. Out of the 100 women, a surgical technique was used to handle 90 of them. Among these, only 4 women were eligible for conservative surgeries such as salpingostomy, milking, and ovarian wedge resection. The most usually performed radical procedure was salpingectomy, which was done in 86% of the cases. Additionally, several preoperative observations were recorded, revealing that 75% of the patient's undergoing surgery had ruptured ectopic pregnancies. **Conclusion:** The research mostly included instances that were brought in a ruptured state, making it hard to pursue conservative care. This limitation is particularly significant in the context of contemporary diagnostics. The worldwide rise in cesarean section (CS) rates is a risk factor for an increase in ectopic pregnancies, which is a cause for worry.

Keywords: Cesarean section, Kuppuswamy scale, PID, LSCS

INTRODUCTION

Ectopic pregnancy (EP) is a life-threatening medical emergency that is often managed by primary care physicians. Nevertheless, it is often disregarded during the first assessment, resulting in a postponed diagnosis. Lower abdominal pain and vaginal bleeding with amenorrhea in women of reproductive age often suggest the potential occurrence of ectopic pregnancy. Nevertheless, it is crucial to acknowledge that some women may display non-specific symptoms and remain oblivious to an ongoing pregnancy, which might possibly result in hemodynamic shock. This study is significant for synthesizing all the risk factors associated with ectopic pregnancy, since maternal mortality is positively connected with a higher number of risk variables and high-risk pregnancies, which include ectopic pregnancy. To guarantee precise diagnosis of ectopic pregnancy, primary care providers should refer patients with early pregnancy and risk factors to a tertiary care institution [1,2].

The atypical clinical manifestation of this illness has continually presented a challenge to obstetricians and gynecologists, necessitating them to use their ingenuity. Hoover et al. performed a study which

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revealed that the occurrence of eating disorders (EPs) increases as individuals become older. The prevalence of the condition was estimated to be 0.3% among girls and women aged 15 to 19 years, and it was anticipated to be 1% among women aged 35 to 44 years [3].

Accurate recording of the patient's complete medical background and a comprehensive physical assessment, together with the use of sophisticated diagnostic tools, are essential in accurately diagnosing ectopic pregnancy. To diagnose ectopic pregnancy, one must have a mentality that is dedicated to recognizing and comprehending ectopic pregnancies. The prevalence of ectopic pregnancies is rising in prosperous countries, although the rates of morbidity and mortality associated with them are declining. This may be linked to the existence of highly efficient healthcare systems that are well-coordinated, along with the prompt detection and treatment of ectopic pregnancies. During the time periods of 1980-1984 and 2003-2007, the mortality rate for ectopic pregnancy reduced by 56.6%, going from 1.15 to 0.50 deaths per 100,000 live births. Further decline is anticipated. The main causes of death in women with EP are hemorrhage, infection, and complications associated with anesthesia [4,5].

The Mayo Clinic's 2020 guidelines include many variables that heighten the probability of encountering an ectopic pregnancy. These risk factors include a prior ectopic pregnancy, inflammation or infection, fertility treatments including in vitro fertilization (IVF), surgical procedures on the fallopian tubes, the use of intrauterine devices (IUDs) for contraception, and smoking [6]. The aim of this study was to thoroughly examine the clinical presentation, variables that contribute to the risk, associated maternal illness and death, and various treatment methods.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Muzaffarnagar Medical College, Muzaffarnagar. All cases of ectopic pregnancy admitted and treated during the study period were included. Informed consent was obtained from all participants prior to discharge, permitting the use of their clinical data for research purposes. The total number of deliveries during the study period was retrieved from the labor ward records. Upon admission, a detailed medical history was systematically recorded using a structured data collection form. This included demographic and clinical parameters such as age, socioeconomic status (based on the modified Kuppuswamy scale), presenting symptoms, menstrual and obstetric history, previous pelvic surgeries, history of pelvic infections, contraceptive practices, and other identified risk factors.

A thorough physical examination was performed, focusing on signs of shock, abdominal tenderness, guarding, rigidity, distension, adnexal masses, and cervical motion tenderness. Diagnostic evaluations included complete blood count, urine and serum β-hCG (analyzed only in positive cases), ultrasonography, culdocentesis, diagnostic peritoneal tap, and selective use of laparoscopy. The diagnosis was made by considering the clinical symptoms, using ultrasonography to identify signs of ectopic pregnancy, monitoring the levels of β-hCG over time, and doing procedures such as culdocentesis, diagnostic peritoneal tap, or laparoscopy in cases where the patient tested positive for urine β-hCG. The treatment approach was tailored to each patient based on factors such as hemodynamic stability, ectopic pregnancy size, blood β-hCG levels, history of prior ectopic pregnancies, and future fertility desires. Patients with ruptured ectopic pregnancies or shock were resuscitated and underwent emergency laparotomy without delay. After the surgery, patients received further blood transfusion and were provided with intensive care unit (ICU) treatment if necessary. Patients with stable, unruptured ectopic pregnancies unsuitable for medical or expectant management primarily underwent laparoscopic salpingectomy or salpingostomy. Laparotomy was performed in cases with anticipated adhesions, and some laparoscopic procedures were converted to laparotomy due to complications. Outcomes of both laparotomy and laparoscopy were recorded along with treatment results.

Medical management was offered to eligible women meeting the following criteria: hemodynamic stability, no tubal rupture, gestational sac <3.5 cm, β-hCG <5,000 IU, absence of cardiac activity on ultrasound, and desire for future fertility. Treatment involved a single-dose injectable methotrexate calculated based on body surface area (50 mg/m²), with most doses ranging from 75 mg to 90 mg. Serum β-hCG levels were monitored on days 4 and 7, with a second dose administered if levels did not decrease by >15%. Weekly β-hCG assessments continued until undetectable levels were achieved.

Expectant management was used for women who were hemodynamically stable, asymptomatic, had an adnexal mass <3 cm, β-hCG <1,500 IU/mL, no evidence of intraperitoneal bleeding or rupture, and no cardiac activity. These cases were monitored with biweekly β-hCG measurements and weekly transvaginal ultrasonography (TVS) to confirm a decrease in β-hCG levels and reduction in mass size within seven days. Monitoring continued weekly until β-hCG levels dropped below 15 IU/L.

Failure of medical or expectant management refers to cases where patients experience a rupture of an ectopic pregnancy that was previously unruptured during the course of medical or expectant management. It can also include cases where there is an increase in β-hCG levels during follow-up, or a failure to reduce the size of the mass and decrease β-hCG levels, even after receiving two doses of

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methotrexate. Surgical intervention was used to handle these individuals.

Statistical analysis

The data were documented in tabular and graphical formats. Following the appropriate categorization of data using MS Excel, statistical analysis was conducted using SPSS software version 25.0.

RESULTS

The current investigation identified 100 instances of ectopic pregnancy among a total of 7685 births in the same year, resulting in an incidence rate of 13.01 per 1,000 deliveries. Among these 100 instances, 53% were diagnosed as right-sided ectopic pregnancies (Table 1).

Table 1: Perveances of the ectopic pregnancy

No. of ectopic pregnancy cases	Total no. of deliveries per year	Incidence (per 1,000 deliveries)
100	7685	13.01
Laterality	Frequency n = 100	Percentage
RT-sided	53	53
LT-sided	47	47

The age group with the greatest number of patients was 20-25 years, accounting for 36% of the total, while the age group with the fewest patients was 35-40 years, representing just 2%. 43% of the participants were primipara, whereas the remaining participants were multiparous. Most patients (55%) belonged to a lower socioeconomic class. The demographic information is shown in Table 2.

Table 2: Basic demographic profile of the Patients

Parameters	Frequency	Percentage
Maternal age (in years)		
<20	13	13
21-25	36	36
26-30	31	31
31-35	18	18
36-40	2	2
Parity		
Primipara	43	43
Multipara	57	57
Socioeconomic status		
Low	55	55
Middle	37	37
High	8	8

The study population's distribution of risk variables was comprehensively studied in Table 3, which indicated that prior LSCS was the predominant risk factor, accounting for 26% of cases. Review of medical records revealed a prevalence of pelvic inflammatory disease (PID) in 19% of women, while 11% of cases had no identifiable risk factors. Other significant risk factors included previous tubal sterilization, prior abortions, and a history of infertility.

Table 3: Associated risk factors

Associated factors	Frequency	Percentage
No risk factors	11	11
Previous LSCS	26	26
PID	19	19
Previous tubal/abdominal surgery	10	10
Infertility	9	9
IUD	7	7
Both surgical and medical	4	4
Previous ectopic pregnancy	5	5
Curettage	4	4
Others	5	5

Table 4 displayed the diverse indications and symptoms of presentation seen in these ladies. Only 46% of women exhibited the classic triad of amenorrhea, stomach discomfort, and vaginal bleeding. The predominant symptom reported by the subjects was abdominal discomfort, with a prevalence

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of 98%, followed by amenorrhea and vaginal hemorrhage. 59% of women sought medical attention within 8 weeks of amenorrhea, but in 42% of instances, ectopic pregnancy was not detected until the latter part of the first trimester. Women with ruptured ectopic pregnancies often had symptoms such as dizziness and shoulder discomfort, which were often associated with hemoperitoneum. From a clinical perspective, 91% of women had cervical motion discomfort, while pallor and adnexal soreness were also often seen. 29% of the female patients arrived at the emergency department in a condition of severe shock.

Table 4: Distribution of Study Population Based on Signs and Symptoms

Clinical presentation	Number	Percentage
Amenorrhea	86	86
≤8 weeks	59	59
9–12 weeks	41	41
Abdominal pain	98	98
Vaginal bleeding	68	68
Classic triad	46	46
Fainting	36	36
Gastrointestinal tract symptoms	4	4
Nausea, vomiting	11	11
Clinical signs		
Shoulder pain	21	21
Pallor	86	86
Abdominal tenderness	81	81
Adnexal tenderness	86	86
Abdominal rigidity	51	51
Adnexal mass	76	76
Abdominal distention	46	46
Cervical motion tenderness	91	91
Acute shock	11	11

The various treatment approaches were listed in Table 5. Out of the 10 women assessed, 10 were deemed acceptable for medical and expectant care. However, owing to the failure of conservative therapy, seven of these instances required surgery. Out of the 100 women, a surgical technique was used to handle 90 of them. Among these, only 4 women were eligible for conservative surgeries such as salpingostomy, milking, and ovarian wedge resection. The most usually performed radical procedure was salpingectomy, which was done in 86% of the cases. Additionally, several preoperative observations were recorded, revealing that 75% of the patients undergoing surgery had ruptured ectopic pregnancies. The majority of ectopic pregnancies were located in the ampulla of the fallopian tube (58%), followed by isthmic pregnancies as the second most common site. Only two cases of ovarian pregnancy were identified.In terms of morbidity, the need for blood transfusion was prevalent in a significant majority of cases (72%), although the overall recovery was smooth and without complications. No deaths were observed in our research population (Table 6).

Table 5: Distribution of the study population according to treatment modality

Treatment modality	Number	Percentage
Selected for nonsurgical =10		
Medical	7	7
Expectant	3	3
Failure	3	3
Successful nonsurgical	7	3
Mode of surgery (n = 90)		
Laparotomy	78	78
Laparoscopy	10	10
Laparoscopy followed by laparotomy	2	2
Total	90	90
Type of surgery (n = 90)		
Conservative surgery		
Milking	1	1
Salpingostomy	2	2

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Ovarian wedge resection	1	2
Total	4	4
Radical surgery		
Salpingectomy	82	82
Salpingo-oophorectomy	4	4

Table 6: Distribution of the study population according to per operative and USG findings

Findings	No. of cases =100	Percentage
Ruptured ectopic	71	71
Tubal abortion	6	6
Chronic ectopic/TO mass	2	2
Unruptured	21	21

Table 7: Distribution of the study population according to morbidity

Morbidity	No. of cases =100	Percentage
Anemia	79	79
Blood transfusion	72	72
Fever	6	6
Paralytic Ileus	3	3
ICU admission	2	2
Wound infection	2	2
Mortality	0	0

DISCUSSION

Ectopic pregnancy is a perplexing phenomenon in the field of medical research. The clinical presentation of ectopic pregnancy can be so complex that it challenges the diagnostic and management skills of practitioners across all specialties, not limited to obstetricians.Failure to accurately diagnose or promptly address a condition may have severe and disastrous consequences. Unsurprisingly, it remains a prominent factor in causing maternal death during the early stages of pregnancy, contributing to 3.5-7.1% of maternal mortality in India[7,8].

The occurrence of ectopic pregnancy has unquestionably risen in the last ten years, perhaps due to improved diagnostic methods and an increase in couples turning to assisted reproductive technologies. The current investigation revealed an occurrence rate of 13.01 per 1000 deliveries. By analyzing data from many studies conducted in different regions of India in recent years, it is evident that there is a clear and consistent increase in occurrences (as shown in Table 8).

Table 8: Rising trend of ectopic pregnancy

Author	Year	Rate of ectopic
Sanjay et al.[9]	2008	2.46:1,000 deliveries
Mufti et al.[10]	2012	3.99:1,000 deliveries
Shetty et al.[11]	2014	5.6:1,000 deliveries
Mehta et al.[12]	2016	30.2:1,000 deliveries

The age group with the largest number of patients was 20-25 years, accounting for 36% of the total. Conversely, the age group with the lowest number of patients was 35-40 years, representing just 2%. This conclusion aligns with the majority of recent research conducted in India [9–12]. In contrast, Westrom in Sweden and Rubin et al. in the USA documented a rise in the occurrence of ectopic pregnancy with advancing age [13,14]. This disparity arises from the fact that in India, a significant number of women enter into marriage at a young age and complete their childbearing at an early stage, resulting in a lower occurrence of pregnancies in their third decade of life. Various studies demonstrate varying correlations between parity and ectopic pregnancy. Some studies have shown that primigravida women are more impacted [9,15], while others have showed that third or fourth gravida women are most affected [12,16,17]. Our research revealed that 43% of the participants were primipara, whereas the remaining individuals were multiparous. Most patients (55%) belonged to a lower socioeconomic class. In research conducted by Vyas et al., they saw a similar image in their analysis of 196 cases in Mumbai, India. The study revealed that 52.04% of the patients belonged to low socioeconomic classes [18]. However, it is important to note that the patient demographic at our institution may introduce a potential bias to this finding. As our hospital serves as a referral center, the majority of patients here originate from rural areas and belong to a lower socioeconomic position.

An analysis of risk factors for ectopic pregnancy identified cesarean section as the most common prior pelvic surgery, recorded as an independent risk factor. Over 25% of women in the study had a history of cesarean section. This finding aligns with observations by Wakankar et al. and Ranji et al., who also reported that lower segment cesarean section (LSCS) is a significant and common risk factor associated with ectopic pregnancy. [19,20].

Prior abortion has been identified as the predominant risk factor, comprising 17-31% of all cases of ectopic

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pregnancies according to many studies [10-12,16,17,21]. Pelvic inflammatory disease (PID) is a recognized risk factor for ectopic pregnancy, with a prevalence ranging from 3.2% to 47.5% [9,11]. Our research found that 19% of women had a moderate prevalence of a previous history of pelvic inflammatory disease (PID).

A positive urine pregnancy test in a woman who has had tubal ligation should immediately raise concerns about the possibility of an ectopic pregnancy. 10% of the female participants in this research had already had tubal sterilization. The majority of cases had open ligation, whereas just two instances involved laparoscopic tubal ligation. The results of this research were similar to those of Mehta et al. (11.25%). However, another study conducted in Eastern India reported a much higher rate of 30.5% [12,15].

The overall occurrence of ectopic pregnancies has risen due to advancements in reproductive medicine and the widespread use of ovulation induction medications. Out of the women included in our research, a total of 10% received medical intervention for infertility. The prevalence of ectopic pregnancy has increased as a result of infertility and its treatment, rising from 8% in 2012 to as high as 31% in 2018[10,20].

A history of prior ectopic pregnancy was identified in 5% of our patients, which is consistent with findings from other comparable studies conducted in India. The occurrence of ectopic pregnancy with an intrauterine contraceptive device (IUCD) in place constituted only 7% of our cases. This finding supports the new understanding that the presence of an IUCD does not inherently raise the risk of ectopic pregnancy. However, if pregnancy does occur with an IUCD in place, it is very probable that it will be ectopic. 11% of patients in this research had unidentified risk factors.

The typical triad of symptoms for ectopic pregnancy consists of absence of menstruation, stomach discomfort, and vaginal hemorrhaging. Regrettably, this appearance is seldom easily available for straightforward diagnosis. Less than half of the patients (46%) exhibited the typical trio in our research.

Research conducted by Ranji and Srivastava et al. revealed that the traditional triad was seen in only 27.7% and 31.9% of the study population, respectively. However, Wakankar et al. and Soren et al. reported a higher occurrence of this triad, with 53.84% and 54.2% of total patients exhibiting it, respectively [15,17,19,20].

The presence of amenorrhea in women of reproductive age raises the early probability of pregnancy and aids in subsequent diagnostic procedures. The predominant symptom reported by patients was abdominal discomfort, with a prevalence of 98%. Amenorrhea and vaginal hemorrhage were also seen as symptoms. 59% of women sought medical attention within 8 weeks after the absence of menstruation, but in 42% of instances, ectopic pregnancy was not detected until the latter part of the first trimester. Women with ruptured ectopic pregnancies often had symptoms such as dizziness and shoulder discomfort, which were often associated with hemoperitoneum.

Ruptured ectopic pregnancy is typically indicated by symptoms such as pallor, varying degrees of shock, abdominal tenderness, distension, and guarding. Physical examination often reveals an adnexal mass or fullness, cervical motion tenderness, and occasionally a "floating uterus." Significant hemoperitoneum may present as referred shoulder pain. In this study, the majority of cases involved ruptured ectopic pregnancies. The most commonly observed clinical signs were pallor, adnexal and abdominal tenderness, and cervical motion tenderness, occurring in 80-85% of cases.

Seventy one percent of the individuals in our research had experienced ruptured ectopic pregnancies, which is consistent with the discovery made by Yadav et al., who reported an incidence rate of 82.50% for ruptured ectopic pregnancies [22]. Due to our institute's status as a referral center with a large catchment area, we received several cases that were submitted to us in a condition of rupture. This demonstrates the absence of timely detection of ectopic pregnancies in the periphery. Out of the 21 ectopic pregnancies we encountered, 10 instances were chosen for nonsurgical treatment, while the bulk of the other cases underwent laparoscopic. Right-sided ectopic pregnancies were prevalent, accounting for 53% of cases. This finding is consistent with the studies conducted by Shrivastava et al. (61.7%) and Ranji et al. (61%). The interval [17,20]

In our instances, the location of ectopic pregnancy was consistent with expectations, with the ampulla being the most frequent site in 60% of cases. This finding aligns with the investigations conducted by Wakankar et al. (53.84%) and Yadav et al. (51.25%) [19,22]. Interstitial and cornual ectopic pregnancies were few, with ovarian pregnancy being the least prevalent, accounting for just one percent of cases. The management of ectopic pregnancy aims to either save the patient's life or preserve their fertility. The research found that the majority of women (90%) had surgical therapy, with laparotomy being the most frequently performed procedure. Out of the total of 10 patients, 2 had to be switched from laparoscopy to laparotomy because of difficulties. Salpingostomy was performed in 2% of unruptured patients, which is consistent with the findings of a research conducted by Majhi et al. (1.75%) [23]. We effectively treated 7 patients (7%) using nonsurgical treatment techniques, which used a combination of medical and expectant approaches according on their eligibility requirements. The figure is much higher than the findings of earlier research, such as 1.75% reported by Majhi et al., 2.5% reported by Mehta et al., and 3.27%

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reported by Nootan et al. [12,16,23]. The reason for opting for medical care as the primary approach for unruptured ectopic pregnancies was to avoid surgery, namely laparoscopy, unless the predetermined criteria were not met.

CONCLUSION

The research mostly included instances that were brought in a ruptured state, making it hard to pursue conservative care. This limitation is particularly significant in the context of contemporary diagnostics. The worldwide rise in cesarean section (CS) rates is a risk factor for an increase in ectopic pregnancies, which is a cause for worry.

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