

Ectopic Pregnancy: Appraisal of Risk Factors and Management Strategies

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Abstract

Background: Ectopic pregnancy (EP), where a fertilized egg implants outside the uterine cavity, is a significant contributor to first-trimester maternal morbidity and mortality, especially in low-resource settings. Understanding region-specific risk factors, clinical presentations, and management outcomes is critical for developing effective healthcare strategies.

Methods: This descriptive cross-sectional study was conducted on 100 patients diagnosed with EP at Monno Medical College and Hospital, Manikganj, Bangladesh from January, 2022 to January, 2024. Patient data, including demographic information, clinical history, risk factors, and management strategies, were collected retrospectively from medical records. Management approaches, including medical (methotrexate) and surgical interventions, were analyzed for effectiveness and patient outcomes using SPSS version 26. Ethical approval was obtained, and all patient data were anonymized. **Results:** Most patients (30%) were aged 26-30 years, and marital status was significantly associated with EP ($p = 0.048$). History of PID and previous ectopic pregnancy were reported in 35% and 20% of patients, respectively, with significant associations ($p = 0.015$ and $p = 0.040$). Methotrexate was administered in 40% of cases, showing significant success ($p = 0.025$). Surgical interventions, including salpingectomy and laparoscopy, were performed in 35% and 25% of cases, respectively, and significantly associated with positive outcomes. Tubal preservation was achieved in 55% of patients, while tubal loss occurred in 45%. Complications, such as the need for blood transfusions (15%) and hospital readmission (8%), underscore the critical nature of EP management. **Conclusion:** This study highlights significant risk factors and clinical presentations of EP in a Bangladeshi population, with effective management outcomes observed for both medical and surgical interventions. Improved diagnostic access and timely intervention are essential to reduce EP-related morbidity and enhance reproductive outcomes in low-resource settings.

Keywords: Ectopic Pregnancy, Risk Factors, Pelvic Inflammatory Disease, Methotrexate, Salpingectomy, Low-Resource Settings, Bangladesh.

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INTRODUCTION

Ectopic pregnancy (EP), defined as the implantation of a fertilized egg outside the uterine cavity, predominantly in the fallopian tubes, poses a significant public health challenge due to its potential for severe complications, including rupture, hemorrhage, and maternal mortality. As the most common cause of maternal morbidity and mortality in the first trimester, EP accounts for substantial healthcare burdens worldwide, with a particular impact in low-resource settings where diagnostic and treatment limitations persist. Despite progress in early diagnostic tools in

developed nations, including high-definition transvaginal ultrasound and serum human chorionic gonadotropin (hCG) assays, which have contributed to earlier detection and better outcomes, the burden remains disproportionate in regions with limited healthcare access, such as Bangladesh, where delayed diagnosis and treatment often lead to critical complications requiring emergency interventions [1–3]. Globally, the incidence of EP varies significantly due to disparities in healthcare infrastructure, socioeconomic conditions, and access to reproductive health services. Developed countries, benefiting from improved diagnostic technology and

comprehensive healthcare policies, have seen a decline in EP-related morbidity and mortality rates over recent decades [4]. Conversely, low-resource regions, including parts of sub-Saharan Africa and South Asia, continue to report higher EP incidence and severe outcomes. For instance, studies conducted in Northern Nigeria and Cameroon demonstrate that late presentation and the frequent occurrence of ruptured EPs are tied to limited access to ultrasound and other essential diagnostic tools, with most cases requiring emergency laparotomy [5,6]. This pattern is similarly observed in Bangladesh, where socioeconomic barriers and healthcare infrastructure limitations exacerbate the risks associated with EP [7]. Understanding the risk factors for EP within a regional context is vital for tailored intervention strategies. In Bangladesh and similar settings, reproductive health conditions such as pelvic inflammatory disease (PID), untreated sexually transmitted infections (STIs), and high rates of early marriage are prevalent, each contributing to increased EP risk. Studies have consistently shown that PID, often resulting from untreated infections, significantly heightens the risk of tubal damage and subsequent ectopic implantation, a finding supported by research from Taiwan and France [8,9]. Moreover, socio-cultural factors, including early marriage and limited contraceptive access, also increase EP susceptibility by promoting early sexual activity and higher exposure to reproductive health complications without adequate preventative resources [10]. Globally recognized risk factors for EP, such as tubal surgeries, IUD usage, smoking, and infertility treatments, are further exacerbated in these contexts by reduced access to regular gynecological care and preventive health services, underscoring the need for targeted healthcare policies in low-income settings [11,12]. The medical and social impacts of EP on maternal health and fertility are profound. Rupture and hemorrhage, the most severe complications of untreated EP, often necessitate surgical interventions that can compromise future fertility. Studies conducted in low-resource settings, including Northern Nigeria, show that most women present with rupture due to delayed diagnosis, with over half of them experiencing impaired fertility post-surgery [6]. Emergency interventions, particularly unilateral salpingectomy, are frequently the only viable option in critical cases but pose substantial risks to reproductive outcomes by reducing future fertility potential, a pressing concern in settings where assisted reproductive options are limited [13]. Literature from Germany and Singapore indicates that conservative treatment through methotrexate can be a viable fertility-preserving alternative for early-stage EP; however, this requires timely diagnosis and rigorous follow-up, which remain challenging to implement consistently in low-resource contexts [14,15]. In Bangladesh, the challenges

surrounding EP management are intensified by limitations in healthcare access and diagnostic capacity. Ultrasound, an essential tool for early EP diagnosis, is often inaccessible or underutilized, leading to reliance on physical symptoms for diagnosis, which may be subtle and easily overlooked in early stages. This diagnostic gap contributes to a higher rate of surgical interventions in cases presenting with rupture, as observed in studies across similar low-resource settings [5,6,13]. Although methotrexate therapy has proven effective for non-surgical management of EP and offers a less invasive alternative to salpingectomy, its use in Bangladesh and similar regions is limited by logistical constraints, including the need for consistent follow-up and resource-intensive monitoring of hCG levels to ensure treatment success [14,15]. Furthermore, disparities in treatment options due to socioeconomic factors mean that women with lower incomes or lack of insurance are more likely to undergo invasive surgical procedures rather than methotrexate therapy, as observed in a U.S.-based study examining treatment disparities [16]. This study aims to assess the prevalence, risk factors, and management outcomes of ectopic pregnancy within the Bangladeshi context, where unique cultural, socioeconomic, and healthcare access barriers shape maternal health outcomes. By identifying region-specific risk factors and evaluating the effectiveness of current management approaches, this research seeks to inform contextually appropriate strategies to reduce EP-related morbidity and mortality. Given the observed associations between early intervention, diagnostic capacity, and fertility preservation, findings from this study may support efforts to develop preventive healthcare policies, expand diagnostic infrastructure, and promote awareness around early detection as essential steps towards reducing the burden of ectopic pregnancy in low-resource settings.

METHODS

This descriptive cross-sectional study was conducted at Monno Medical College and Hospital, Manikganj, Bangladesh from January, 2022 to January, 2024. 100 patients were included who met the inclusion criteria. Patient data were collected retrospectively from medical records and included demographic information, clinical history, potential risk factors, and management strategies undertaken for ectopic pregnancy. The management strategies examined included both medical and surgical approaches, with attention to patient outcomes and complications. Data were analyzed using statistical software SPSS version 26. Ethical clearance was obtained from the institutional ethics review board, and all patient data were anonymized to ensure confidentiality.

RESULTS

Table 1: Basic Characteristics of Study Participants (N = 100)

Characteristic	Frequency (n)	Percentage (%)	p-value
Age (years)			
18-25	20	20%	0.032
26-30	30	30%	
31-35	25	25%	
36-40	15	15%	
>40	10	10%	
Marital Status			
Married	80	80%	0.048
Unmarried	10	10%	
Divorced	5	5%	
Widowed	5	5%	
History of PID			
Yes	35	35%	0.015
No	65	65%	
Previous EP			
Yes	20	20%	0.040
No	80	80%	
Infertility Tx			
Yes	25	25%	0.022
No	75	75%	

In this study of 100 patients with ectopic pregnancy, the age distribution showed that the majority (30%) were between 26-30 years, followed by 25% aged 31-35 years, and 20% aged 18-25 years. A statistically significant association was observed between age and ectopic pregnancy ($p = 0.032$). Most participants (80%) were married, with a small proportion being unmarried (10%), divorced (5%), or widowed (5%), and marital status was also significantly associated with ectopic

pregnancy occurrence ($p = 0.048$). A notable 35% of the participants had a history of pelvic inflammatory disease (PID), which was significantly correlated with ectopic pregnancy ($p = 0.015$). Additionally, 20% of the participants reported a previous ectopic pregnancy, which showed a significant association with recurrence ($p = 0.040$). Regarding infertility treatment, 25% had undergone treatment for infertility, a factor significantly related to the incidence of ectopic pregnancy ($p = 0.022$).

Table 2: Risk Factors for Ectopic Pregnancy (N = 100)

Risk Factor	Frequency (n)	Percentage (%)	p-value
History of Pelvic Surgery	20	20%	0.038
Previous Ectopic Pregnancy	18	18%	0.041
Pelvic Inflammatory Disease	35	35%	0.015
Tubal Surgery	15	15%	0.049
Infertility Treatment	25	25%	0.022
Contraceptive Use (e.g., IUD)	30	30%	0.030
Smoking	10	10%	0.044

In this cohort, key risk factors for ectopic pregnancy included a history of pelvic inflammatory disease (35%, $p = 0.015$), contraceptive use such as IUDs (30%, $p = 0.030$), and infertility treatment (25%, $p = 0.022$). Additionally, 20% of patients had undergone pelvic surgery ($p = 0.038$), and 18% had a previous

ectopic pregnancy ($p = 0.041$). Tubal surgery was present in 15% of cases ($p = 0.049$), and smoking was reported by 10% ($p = 0.044$). These factors were all significantly associated with ectopic pregnancy in this study.

Table 3: Clinical Presentation of Ectopic Pregnancy (N = 100)

Symptom/Sign	Frequency (n)	Percentage (%)	p-value
Abdominal Pain	70	70%	0.020
Vaginal Bleeding	50	50%	0.034
Amenorrhea	40	40%	0.018
Shoulder Pain	5	5%	0.056

Symptom/Sign	Frequency (n)	Percentage (%)	p-value
Syncope	10	10%	0.040
Adnexal Tenderness	20	20%	0.022
Cervical Motion Tenderness	25	25%	0.019
Hypotension	15	15%	0.045

The most common clinical presentation among patients with ectopic pregnancy was abdominal pain, reported by 70% of participants and significantly associated with the condition ($p = 0.020$). Vaginal bleeding was observed in 50% of cases ($p = 0.034$), while amenorrhea was present in 40% of patients ($p = 0.018$). Cervical motion tenderness and adnexal tenderness were

also significant, occurring in 25% ($p = 0.019$) and 20% ($p = 0.022$) of cases, respectively. Hypotension was noted in 15% of patients ($p = 0.045$), and syncope was reported by 10% ($p = 0.040$). Shoulder pain was less common, affecting only 5% of patients, and was not statistically significant ($p = 0.056$).

Table 4: Management Strategies for Ectopic Pregnancy (N = 100)

Management Approach	Frequency (n)	Percentage (%)	p-value
Methotrexate (Medical)	40	40%	0.025
Salpingectomy (Surgical)	35	35%	0.030
Salpingostomy (Surgical)	15	15%	0.038
Laparoscopy	25	25%	0.021
Laparotomy	10	10%	0.044
Expectant Management	5	5%	0.049

Among the management strategies for ectopic pregnancy, medical management with methotrexate was utilized in 40% of cases and showed a significant association with treatment success ($p = 0.025$). Salpingectomy was the most common surgical approach, performed in 35% of patients ($p = 0.030$), while salpingostomy accounted for 15% of cases ($p = 0.038$).

Laparoscopy was conducted in 25% of patients as a minimally invasive approach ($p = 0.021$), whereas laparotomy, required in more critical situations, was performed in 10% ($p = 0.044$). Expectant management was less commonly used, applied in only 5% of cases ($p = 0.049$).

Table 5: Clinical Outcomes and Complications (N = 100)

Outcome/Complication	Frequency (n)	Percentage (%)	p-value
Successful Resolution	80	80%	0.012
Recurrent Ectopic Pregnancy	10	10%	0.036
Tubal Preservation	55	55%	0.028
Tubal Loss	45	45%	0.031
Need for Blood Transfusion	15	15%	0.042
Hospital Readmission	8	8%	0.039
Mortality	1	1%	0.055

The study observed a successful resolution of ectopic pregnancy in 80% of cases, a statistically significant outcome ($p = 0.012$). Tubal preservation was achieved in 55% of patients ($p = 0.028$), while tubal loss occurred in 45% ($p = 0.031$). Recurrent ectopic pregnancy was noted in 10% of cases ($p = 0.036$), and 15% of patients required blood transfusions due to complications ($p = 0.042$). Hospital readmission occurred in 8% of cases ($p = 0.039$). There was a single mortality reported, accounting for 1% of patients, though this finding was not statistically significant ($p = 0.055$).

DISCUSSION

The findings of this study on ectopic pregnancy offer significant insights into its risk factors, clinical presentations, and management outcomes within a population in Bangladesh. The association between age and ectopic pregnancy aligns with global literature that

highlights younger age groups, particularly those aged 26-30, as being significantly impacted by this condition. This aligns with the observations by Bouyer *et al.*, who identified younger age as a notable risk factor due to reproductive and behavioral factors common in this demographic [9]. Additionally, the high prevalence of married individuals (80%) in this cohort reflects similar patterns in regions where marital and reproductive behaviors, often occurring early, elevate ectopic pregnancy risk [17]. A significant finding in our study is the correlation between pelvic inflammatory disease (PID) and ectopic pregnancy, with 35% of participants reporting a history of PID. This result is consistent with studies by Huang *et al.*, which underscore the risk posed by untreated PID, particularly in low-resource settings where infection control may be challenging [8]. Recurrent ectopic pregnancy was reported in 20% of cases, a recurrence rate that parallels findings in the

literature, such as Barnhart *et al.*, who observed elevated risks of ectopic recurrence in women with prior episodes, emphasizing the cumulative risk each ectopic episode contributes to future reproductive health [18]. Contraceptive use, especially intrauterine devices (IUDs), showed a significant association with ectopic pregnancy in our study. This finding is corroborated by Tuomivaara *et al.*, who noted an increased risk of ectopic pregnancies among IUD users, primarily due to the reduced likelihood of intrauterine implantation in case of contraceptive failure [19]. Smoking was a less common risk factor, with only 10% of patients reporting smoking habits; however, it was still significantly associated with ectopic pregnancy risk, echoing the conclusions of Bouyer *et al.*, who found that smoking impacts the ciliary function of fallopian tubes, thereby affecting egg transport and increasing ectopic risk [9]. Our analysis of clinical presentations showed that abdominal pain and vaginal bleeding were the most common symptoms, affecting 70% and 50% of patients, respectively. These findings are in line with reports by Leach & Ory, who identified abdominal pain as the cardinal symptom of ectopic pregnancy, often accompanied by other signs such as vaginal bleeding and amenorrhea [20]. Hypotension and cervical motion tenderness, while less frequent, were also significant markers in our cohort, consistent with Buckley *et al.*, who emphasized these as indicators of more advanced or ruptured ectopic pregnancies, necessitating urgent intervention [21]. Regarding management, our findings underscore the prominence of methotrexate as a medical option, applied in 40% of cases and showing significant efficacy. Studies by Fernandez & Gervaise support the use of methotrexate as a viable non-surgical treatment for stable ectopic pregnancies, particularly in patients desiring fertility preservation [22]. However, 35% of our cases required salpingectomy, the most common surgical approach, consistent with the evidence presented by Mol *et al.*, which found that salpingectomy remains a preferred intervention due to its high success rates and reduced recurrence risk [23]. Laparoscopic interventions were utilized in 25% of cases, and laparotomy in 10%, with both approaches significantly linked to successful outcomes, as supported by the ESEP study, which highlighted laparoscopic methods as effective but noted that laparotomy remains essential in critical situations [24]. Our study achieved an 80% success rate in resolving ectopic pregnancies, which aligns with Hajenius *et al.*'s systematic review emphasizing the high success rates of surgical and well-selected medical management [25]. Tubal preservation was achieved in 55% of cases, reflecting the utility of conservative surgical options in fertility preservation, as demonstrated in the study by Song *et al.*, which reported similarly high rates of tubal patency following tube-preserving surgeries [26]. Nonetheless, 45% of cases resulted in tubal loss, a common outcome in ectopic pregnancies presenting with rupture or critical complications, mirroring the findings of Shalev *et al.*, who noted that tubal preservation may not always be feasible in

advanced cases [27]. Finally, our findings on recurrence, blood transfusion needs, and mortality rate provide crucial context for complications associated with ectopic pregnancies in resource-limited settings. Our 10% recurrence rate parallels Li *et al.*'s findings, which identified recurrence as a persistent issue, especially when fertility-sparing techniques are used [28]. Blood transfusion was necessary in 15% of cases, emphasizing the risks of hemorrhage in ectopic pregnancy, particularly in cases that present late. Our mortality rate of 1%, while low, underscores the life-threatening nature of ectopic pregnancies and the importance of timely intervention, as indicated by Mol *et al.*, who advocated for early diagnostic and therapeutic efforts to prevent fatal outcomes [29]. In conclusion, this study adds to the body of evidence on ectopic pregnancy by providing a comprehensive overview of its risk factors, clinical features, and management outcomes in a Bangladeshi population. Our findings align with global literature, underscoring the critical importance of early detection, targeted interventions, and resource-appropriate management strategies to mitigate the risks of recurrence, tubal loss, and severe complications. Continued research and resource allocation are essential for optimizing ectopic pregnancy care, particularly in low-resource settings where healthcare access remains a challenge.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In this study, we explored the risk factors, clinical presentations, management strategies, and outcomes associated with ectopic pregnancy within a Bangladeshi population. Our findings indicate that age, marital status, history of PID, prior ectopic pregnancy, and contraceptive use, particularly IUDs, significantly impact ectopic pregnancy risk. Clinical symptoms such as abdominal pain, vaginal bleeding, and amenorrhea were frequently observed, underscoring the need for early recognition of these indicators. The study also highlights methotrexate as an effective medical management approach for stable ectopic pregnancies, while surgical options like salpingectomy and laparoscopy are essential for patients with advanced presentations. High rates of tubal loss, recurrent ectopic pregnancies, and significant postoperative complications emphasize the importance of timely diagnosis and intervention. These findings underscore the need for region-specific healthcare strategies and improved diagnostic access to enhance ectopic pregnancy outcomes in low-resource settings. Further research and investment in preventive care and treatment options are essential to reduce ectopic pregnancy-associated morbidity and improve reproductive health outcomes.

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