Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2011
Original Article

Pioneering early diagnosis and management in ectopic pregnancy: A cross-sectional study to enhance maternal safety and clinical outcomes in a tertiary care setting.

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Abstract

Background:

Ectopic pregnancy is a leading cause of maternal morbidity and mortality in the first trimester, requiring early diagnosis and prompt management to protect maternal health. This study evaluated the clinical spectrum, risk factors, implantation site, and management strategies in ectopic pregnancies.

Methods:

A cross-sectional observational study was conducted at Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram, from November 2023 to November 2024. A total of 38 women diagnosed with ectopic pregnancy were enrolled. Data on demographics, clinical presentations, risk factors, ectopic site, and management modalities were collected. Descriptive statistics were analyzed using SPSS software.

Results:

The incidence of ectopic pregnancy was found to be 2%. The majority of women were below 26 years of age (65.7%) and multiparous (55.2%). Pelvic infections (31.5%) emerged as the predominant risk factor, followed by previous miscarriage (18.42%) and pelvic surgeries (15.7%). The most common clinical presentation was a combination of bleeding per vaginum and lower abdominal pain (50%). The ampulla of the fallopian tube was the site of implantation in 73.68% of cases. Surgical management was the mainstay in 84.2% of cases, predominantly through salpingectomy. Methotrexate was utilized in 2.6% of cases. Intraoperative findings revealed ruptured ectopic pregnancies in 76.3% of cases, necessitating blood transfusion in 31.5% of women.

Conclusion:

Ectopic pregnancy continues to pose significant clinical challenges, particularly when diagnosed late in the course of the disease. Early identification of high-risk women through vigilant assessment of risk factors, combined with rapid diagnostic protocols like transvaginal ultrasound and serum β-hCG levels, can markedly improve maternal outcomes. Surgical intervention remains the cornerstone of treatment in hemodynamically unstable cases, while select stable patients may benefit from medical therapy.

Recommendations:

Public health initiatives should prioritize infection prevention, enhance access to early antenatal care, and strengthen primary healthcare providers' skills in detecting early ectopic pregnancy.

Keywords: *Ectopic pregnancy, Risk factors, Clinical presentation, Diagnosis, Surgical management, Maternal morbidity, Early detection.*
Submitted: *2025-06-09* ***Accepted:*** *2025-08-04* ***Published:*** *2025-09-01*

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Introduction

Ectopic pregnancy (EP), defined as the implantation of a fertilized ovum outside the uterine cavity, remains a significant obstetric emergency and continues to be a leading cause of maternal morbidity and mortality during the first trimester of pregnancy [1]. Globally, ectopic pregnancies account for approximately 1–2% of all reported pregnancies; however, this figure is likely underestimated in resource-constrained settings due to delayed diagnosis and limited access to early antenatal care services [2]. Despite substantial advancements in diagnostic imaging and biochemical markers, the clinical diagnosis of EP often remains challenging due to its diverse and frequently nonspecific clinical manifestations [3].

Numerous risk factors have been implicated in ectopic implantation, including pelvic inflammatory disease (PID), prior tubal surgeries, history of previous ectopic pregnancy, intrauterine contraceptive device (IUCD) usage, infertility treatments, and modifiable lifestyle factors such as smoking [4]. The fallopian tube is the predominant site of ectopic implantation, accounting for over 95% of cases, with the ampullary segment being the most commonly involved [5]. Nevertheless, non-tubal ectopic pregnancies—including ovarian, cervical, interstitial, and cesarean scar locations—though rare, present considerable diagnostic and therapeutic challenges [5].

The classical triad of amenorrhea, vaginal bleeding, and lower abdominal pain is observed in less than half of ectopic pregnancy cases, necessitating a high index of clinical suspicion for early detection [3]. Transvaginal ultrasonography (TVUS), when combined with serial serum β-human chorionic gonadotropin (β-hCG) measurements, remains the cornerstone of early and accurate diagnosis [1,2]. Management strategies for ectopic pregnancy are individualized, taking into account the patient's hemodynamic stability, anatomical site, size of the ectopic mass, and β-hCG levels. Treatment options include expectant management, medical therapy with methotrexate, or surgical intervention, depending on clinical scenarios [4,5].

Recognizing the increasing trend of ectopic pregnancies, particularly among women with pelvic infections and prior surgical histories, this study aims to analyze the risk factors, clinical presentation, anatomical sites, and management outcomes of ectopic pregnancy in a tertiary care setting to enhance maternal safety through early detection and prompt intervention.

Materials and Methods

Study Design and Setting

This hospital-based cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at Konaseema Institute of Medical Sciences and Research Foundation (KIMS & RF), Amalapuram, Andhra Pradesh, India. The study period spanned from November 2023 to November 2024.

Study Population

The study included all women diagnosed with ectopic pregnancy who presented to the gynecology outpatient department and emergency services during the study period. A total of **38 women** were enrolled after obtaining written informed consent.

Inclusion Criteria

Women with a confirmed diagnosis of ectopic pregnancy based on clinical examination, transvaginal ultrasonography (TVUS), and/or serum β-hCG levels.

Women who provided informed consent for participation.

Exclusion Criteria

Women diagnosed with heterotopic pregnancy.

Patients with incomplete medical records or who did not consent to participate.

Data Collection Procedure

Demographic details (age, educational status, parity), obstetric history, and presenting complaints were recorded using a structured proforma. Clinical examination findings, risk factors (e.g., PID, prior surgeries, miscarriages, IUCD usage), site of ectopic pregnancy, and management strategies (medical or surgical) were documented. Intraoperative findings and need for blood and blood product transfusions were also noted. Serum β-hCG levels were assessed where feasible.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee (IEC) of KIMS & RF, Amalapuram. All procedures were conducted in accordance with the Declaration of Helsinki. Participants were assured of confidentiality, and informed consent was obtained before data collection.

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Bias

To minimize selection bias, all consecutive women diagnosed with ectopic pregnancy during the study period were included. Standard diagnostic criteria, transvaginal ultrasonography, and/or serum β-hCG levels were applied uniformly to reduce misclassification bias. Data collection was performed prospectively using a structured proforma, ensuring consistency and limiting observer bias. Statistical analysis was conducted with predefined variables, and no post-hoc subgrouping was performed. As this was a single-center study, referral bias cannot be excluded, and findings may not fully represent community-level patterns.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic variables, clinical features, risk factors, sites of ectopic pregnancy, and management outcomes. Categorical data were expressed in frequencies and percentages.

RESULTS

Participant Flow

During the study period (November 2023–November 2024), a total of 1,896 pregnant women attended Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram. Of these, 1,858 women had intrauterine pregnancies and were excluded. Thirty-eight women were diagnosed with ectopic pregnancy, all of whom consented to participate. No cases were excluded after enrollment, and complete data were available for all 38 women. Thus, the final analysis included 38 participants.

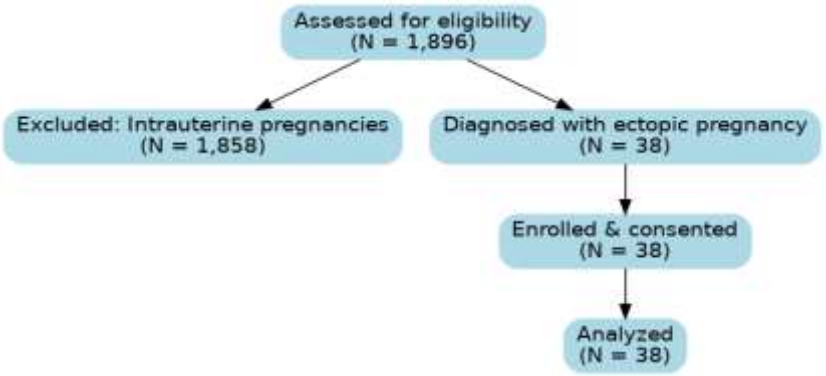

Figure 1. Participant Flow Diagram

During the study period from November 2023 to November 2024, a total of 1896 pregnant women presented to the Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram. Among them, 38 women were diagnosed with ectopic pregnancy, yielding an incidence rate of approximately 2%.

Sociodemographic and Obstetric Characteristics

The majority of the participants were below 26 years of age, with 39.44% being less than 20 years old and 26.35% aged between 20 to 25 years. Women aged 26–30 years constituted 34.21% of the study population. Regarding educational status, 47.36% had attained secondary education, 42.10% had only primary education, while graduates and postgraduates were relatively few (7.80% and 2.60%, respectively). Multiparity was predominant (55.2%), followed by nulliparity (31.5%) and grand multiparity (13.15%). A significant proportion of ectopic pregnancies (55.36%) were diagnosed at a gestational age of 6–7 weeks, while 34.21% were between 7–9 weeks (Table 1).

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Table 1: Sociodemographic and Obstetric Profile of Study Population (N = 38)

Parameter	Frequency (n)	Percentage (%)
Age Group		
< 20 years	15	39.44%
20–25 years	10	26.35%
26–30 years	13	34.21%
Educational Status		
Primary Education	16	42.10%
Secondary Education	18	47.36%
Graduate	3	7.80%
Post Graduate	1	2.60%
Parity		
Nulliparous	12	31.5%
Multiparous	21	55.2%
Grand multiparous	5	13.15%
Gestational Age		
6–7 weeks	21	55.36%
7–9 weeks	13	34.21%
9–12 weeks	2	5.2%
> 12 weeks	2	5.2%

Risk Factors and Clinical Presentation

Infections, primarily pelvic inflammatory disease (PID), emerged as the most prevalent risk factor (31.5%), followed by previous miscarriage (18.42%), prior pelvic or abdominal surgery (15.7%), and infertility (15.7%). Intrauterine contraceptive device (IUCD) usage, tubal ligation, and cases with no identified risk each accounted for 5.26%, while a history of prior ectopic pregnancy was noted in 2.63% of cases (Table 2).

Table 2: Risk Factors and Clinical Presentation of Ectopic Pregnancy (N = 38)

Risk Factors	Frequency (n)	Percentage (%)
Infections (PID)	12	31.5%
Previous Miscarriage	7	18.42%
Prior Surgery (Pelvic/Abdominal)	6	15.7%
Infertility	6	15.7%
Intrauterine Contraceptive Device	2	5.26%
Tubal Ligation	2	5.26%
No Identified Risk	2	5.26%
Previous Ectopic Pregnancy	1	2.63%
Symptoms at Presentation	**Frequency (n)**	**Percentage (%)**
Bleeding per vaginum & Abdominal Pain	19	50%
Bleeding per vaginum only	10	26.31%
Lower Abdominal Pain only	5	13.15%
Asymptomatic	4	10.52%

Clinically, 50% of women presented with both bleeding per vaginum and lower abdominal pain, whereas 26.31% reported bleeding per vaginum alone. Lower abdominal pain as an isolated symptom was noted in 13.15%, and 10.52% of women were asymptomatic at presentation (Table 2).

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Site of Ectopic Pregnancy and Management Modalities

The ampullary region of the fallopian tube was the most common site of ectopic implantation, accounting for 73.68% of cases, followed by fimbrial (13.5%), isthmic (7.8%), ovarian (2.6%), and cesarean scar (2.6%) locations. Surgical management was the predominant mode of treatment, performed in 32 women (84.2%). Medical management using methotrexate was instituted in 1 case (2.6%), while combined medical and surgical interventions were necessary in 5 cases (13.2%) (Table 3).

Table 3: Site of Ectopic Pregnancy and Type of Management (N = 38)

Site of Ectopic Pregnancy	Frequency (n)	Percentage (%)	Surgical Management (n)	Medical Management (n)	Combined (n)
Ampulla	28	73.68%	25	0	3
Isthmus	3	7.8%	0	1	2
Fimbrial	5	13.5%	5	0	0
Ovarian	1	2.6%	1	0	0
Caesarean Scar	1	2.6%	1	0	0

Surgical Procedures, Intraoperative Findings, and Transfusion Requirements

Among the surgical interventions, right salpingectomy was performed in 55.26% of cases, left salpingectomy in 36.84%, while scar ectopic excision and oophorectomy were performed in 2.63% each. Intraoperative findings revealed a ruptured ectopic pregnancy in 76.3% of cases, while 10.51% had an unruptured ectopic, and 10.56% presented with tubal abortion. A cesarean scar ectopic was identified in 2.63% of cases. Serum β-hCG measurements were performed in 92.1% of cases; however, it was not undertaken in 3 women who presented hemodynamically unstable. Blood transfusions were required in 31.5% of cases, primarily in those with ruptured ectopic pregnancies (Table 4).

Table 4: Surgical Procedures, Intraoperative Findings, and Blood Transfusion Requirement (N = 38)

Parameter	Frequency (n)	Percentage (%)
Type of Surgery		
Right Salpingectomy	21	55.26%
Left Salpingectomy	14	36.84%
Scar Ectopic Excision	1	2.63%
Oophorectomy	1	2.63%
Intraoperative Findings		
Ruptured Ectopic	29	76.3%
Unruptured Ectopic	4	10.51%
Tubal Abortion	4	10.56%
Scar Ectopic	1	2.63%
β-hCG Measurement		
Performed	35	92.1%
Not Performed	3	7.9%
Blood Transfusion Requirement		
Transfusion Done	12	31.5%
Not Required	26	68.5%

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Discussion

Ectopic pregnancy (EP) remains a significant contributor to maternal morbidity and early pregnancy-related mortality globally, with a reported incidence of 1–2% of all pregnancies [6]. The incidence observed in this study (2%) aligns with data from other tertiary care centers in low-to middle-income countries (LMICs), emphasizing the persistent burden in resource-constrained regions [7,8]. Despite technological advancements in diagnostic modalities, delayed presentations and ruptured ectopic pregnancies are still frequently encountered, highlighting the critical need for heightened clinical vigilance [9].

A notable finding in this study was the predominance of younger women under 26 years of age (65.7%), which reflects demographic patterns seen in LMICs where early marriage and higher fertility rates increase susceptibility to ectopic gestations [10]. Multiparity (55.2%) was the most common obstetric profile in this cohort, corroborating findings from similar studies where cumulative exposure to pelvic infections and surgical interventions contributes to tubal damage, thereby elevating the risk of ectopic implantation [6].

Pelvic inflammatory disease (PID) emerged as the leading risk factor in this study, accounting for 31.5% of cases. This is consistent with prior research underscoring the pivotal role of PID in causing tubal damage and compromising ovum transport, thereby facilitating ectopic implantation [6,7]. Other established risk factors observed included previous miscarriages (18.42%), prior pelvic surgeries (15.7%), and infertility (15.7%), which are well-recognized contributors to tubal pathology and subsequent ectopic gestation [8].

Interestingly, the study reported a lower association of IUCD usage (5.26%) and prior ectopic pregnancy (2.63%), which reflects the demographic and clinical profile of the population, characterized by low contraceptive uptake and limited accessibility to assisted reproductive technologies (ART) [7].

Clinically, the classic triad of amenorrhea, vaginal bleeding, and lower abdominal pain was present in only 50% of patients, which is a common diagnostic challenge in ectopic pregnancies, necessitating a high degree of clinical suspicion even in atypical presentations [9].

The ampullary segment of the fallopian tube was the most frequent site of ectopic implantation (73.68%), which is in concordance with global data indicating ampullary pregnancies as the most prevalent anatomical site [10]. The predominance of surgical management (84.2%) in this study mirrors findings from similar settings, where delayed diagnosis often leads to ruptured ectopic pregnancies (76.3%) requiring emergency laparotomy and salpingectomy [11].

While medical management with methotrexate remains a viable option in hemodynamically stable patients, only 2.6% of the cases in this cohort were suitable candidates for medical therapy, underscoring the necessity for prompt intervention in late-presenting cases [12].

Blood transfusions were required in 31.5% of cases, directly correlating with the high incidence of ruptured ectopic pregnancies observed. This emphasizes the importance of preoperative assessment and preparation for transfusion in patients presenting with signs of hemoperitoneum [13].

Emerging literature advocates for the widespread adoption of point-of-care ultrasonography and early serum β-hCG monitoring to facilitate early detection, thus enabling conservative management in selected patients [10]. Strengthening primary healthcare systems to ensure timely diagnosis, combined with public health initiatives aimed at increasing awareness about ectopic pregnancy symptoms, could significantly mitigate maternal morbidity in similar resource-limited settings [12,13].

Generalizability

The findings of this study, though based on a single tertiary care center, have broader relevance to similar resource-constrained settings where delayed diagnosis of ectopic pregnancy is common. The predominance of ruptured ectopic pregnancies and the reliance on surgical management reflect systemic challenges such as limited access to early transvaginal ultrasonography, inadequate awareness of warning symptoms, and delayed health-seeking behavior. Therefore, these results may be generalizable to peripheral hospitals and rural regions across India and other low- and middle-income countries that share comparable healthcare infrastructure and patient demographics. However, extrapolation to populations in high-income countries with wider access to early antenatal care should be made with caution.

Conclusion

Ectopic pregnancy remains a critical obstetric emergency with significant implications for maternal health, particularly in resource-limited settings where delayed diagnosis is common. The high incidence of ruptured ectopic pregnancies observed in this study underscores the need for clinicians to maintain a high index of suspicion, especially in women with known risk factors such as pelvic

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infections and prior surgeries. Early utilization of transvaginal ultrasound and serum β-hCG assessments can facilitate timely diagnosis and intervention, thereby reducing morbidity. Surgical management continues to be the mainstay in unstable cases, while medical management is effective in selected stable patients. Public health initiatives focusing on prevention and early detection are imperative.

Limitations

The primary limitation of this study is its small sample size, which may restrict the generalizability of findings to larger populations. Being a single-center, hospital-based study, selection bias is possible as cases presenting to peripheral or primary health centers were not included. Additionally, the observational design limits the ability to establish causal relationships between risk factors and ectopic pregnancy. Long-term follow-up of patients was not undertaken, preventing assessment of future fertility outcomes post-treatment.

Recommendations

To reduce the burden of ectopic pregnancy, early screening and prompt diagnosis should be prioritized, particularly in women with high-risk profiles such as pelvic infections, prior surgeries, and infertility. Strengthening primary healthcare infrastructure with point-of-care ultrasonography and β-hCG testing is essential for early detection. Public health initiatives should focus on educating women about the warning signs of ectopic pregnancy and the importance of early antenatal visits. Additionally, training programs for healthcare providers in rural settings on emergency management protocols can significantly improve maternal outcomes. Multicentric, large-scale studies are recommended to further validate these findings.

Acknowledgements

The authors sincerely thank the Department of Obstetrics and Gynaecology, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, for their continuous support and guidance throughout the study. We are deeply grateful to all the patients who consented to participate and shared their clinical information, making this research possible. Special thanks to the medical and nursing staff for their assistance in data collection and patient care. We also acknowledge the Institutional Ethics Committee for approving the study.

Abbreviations

EP – Ectopic Pregnancy
PID – Pelvic Inflammatory Disease
IUCD – Intrauterine Contraceptive Device
TVUS – Transvaginal Ultrasonography
β-hCG – Beta-Human Chorionic Gonadotropin
ART – Assisted Reproductive Technology
LMICs – Low- and Middle-Income Countries
SPSS – Statistical Package for the Social Sciences
KIMS – Konaseema Institute of Medical Sciences

Source of funding

The study had no funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

GR-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **TM**-Concept and design of the study, results interpretation, review of literature, preparing the first draft of the manuscript, and revision of the manuscript**.VAH**-Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation. **SP**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of the manuscript

Data availability

Data available on request

Author Biography

Dr. Gangadhar Rama completed her Bachelor of Medicine and Bachelor of Surgery (MBBS) from Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Andhra Pradesh, India. Following her graduation, she worked as an Epidemiologist for the Non-Communicable Diseases (NCD) Program at the Office of the District Medical and Health Officer (DM&HO), Visakhapatnam, Andhra Pradesh, where she was actively involved in public health initiatives targeting chronic disease management and prevention.

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https://doi.org/10.51168/sjhrafrica.v6i9.2011
Original Article

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e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2011
Original Article

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PUBLISHER DETAILS.

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa