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# INCIDENCE OF RUPTURE OF ECTOPICPREGNANCYINEARLY GESTATIONAL AGE

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**Abstract**

Background:Ectopicpregnancyisalife-threateningconditionwithaglobalprevalenceof1-2%.Early rupture, a significant complication, increases maternal morbidity and mortality due to hypovolemic shock and internal hemorrhage. Timely diagnosis remains challenging, particularly in early gestational weeks, where symptoms may be subtle. This study aimed to evaluate the incidence of rupture in ectopic pregnancies diagnosed during early gestational ages and identify associated demographic, clinical, and diagnostic factors.

Methods: This was a prospective observational study conducted at saveetha medical college and hospital over 12 months. A total of 64 participants diagnosed with ectopic pregnancy during the first trimester were enrolled based on clinical, laboratory, and imaging findings. Data on demographic characteristics, clinical symptoms, diagnostic parameters, and management strategies were collected. Descriptive statistics summarised participant characteristics, and multivariate logistic regression identified independent predictors of rupture.

Results: The incidence of rupture was 87% (n=56), predominantly managed via laparotomy (91%). Lower abdominal pain (84.4%), vaginal bleeding (75%), and abdominal tenderness (100%) were common clinical features. Key factors associated with rupture included lower parity (p=0.021) and hemoglobinlevels(p=0.025),Thedurationofamenorrheawasfoundtohaveasignificantassociation with rupture, with a coefficient of -2.150 (p = 0.009). This indicates that a shorter duration of amenorrhea(<6weeks)wassignificantlylinkedtoanincreasedlikelihoodofrupture.Beta-hCGlevels werenotpredictiveofrupturerisk(p=0.536).Participantswithrupturedectopicpregnanciesshowed higher rates of anemia (mean hemoglobin: $8.70 \pm 1.94$ g/dL) and hemodynamic instability (mean SBP: $93.75 \pm 6.04$ mmHg).

Conclusion:A shorter duration of amenorrhea (<6 weeks) was significantly associated with an increased risk of rupture (coefficient = -2.150, p = 0.009). The high incidence of rupture emphasizes the need for early diagnosis and intervention. Clinical indicators such as abdominal tenderness and anemia should prompt suspicion. Improving access to diagnostic tools and exploring non-surgical management options could mitigate complications and improve outcomes. Further research is needed to validate these findings and refine management protocols.

## BACKGROUND

Ectopic pregnancy remains a significant obstetric concern, particularly due to its potential to cause severe complications, including maternal mortality and long-term reproductive health issues. Defined as theimplantation ofa fertilisedovum outsidethe uterinecavity, ectopicpregnancies most

commonly occur in the fallopian tubes, although other sites such as the ovary, cervix, or abdominal cavity may also be involved (1). The global prevalence of ectopic pregnancies is estimated at 1-2% of all pregnancies, with higher rates observed among women with known risk factors, such as a history of pelvic inflammatory disease, tubal surgery, or assisted reproductive technology (ART) (2).

One of the most alarming complications of ectopic pregnancy is rupture, which often occurs early in gestation. Rupture is associated with significant morbidity, including hypovolemic shock due to internal haemorrhage, and can be life-threatening if not promptly managed (3). Early rupture poses additional challenges because it often develops before clinical symptoms are fully apparent or diagnostic modalities, such as ultrasound, can confirm the ectopic implantation site.

Despite advances in diagnostic imaging and the availability of serum beta-hCG testing, many ectopic pregnancies are diagnosed only after rupture, particularly in low-resource settings. The timing of rupture is influenced by factors such as the ectopic site, the growth rate of the trophoblast, and the vascular supply at the implantation site (4). Understanding the incidence of rupture in early gestational weeks and its clinical correlates is vital for reducing maternal morbidity and mortality through timely intervention.

The early detection and management of ectopic pregnancy are central to improving maternal outcomes. While advances in medical technology have improved the overall diagnostic rate of ectopic pregnancies, the focus on early gestational rupture remains limited. This is a critical gap in knowledge because most studies addressing ectopic pregnancy outcomes examine a heterogeneous cohort of gestational ages and locations, often conflating early and late presentations (5). The implications of early rupture—where clinical signs may be subtle or absent— necessitate a distinct and targeted approach.

Furthermore,theincidenceofrupturevariessignificantlyacrosspopulationsandhealthcaresettings. Studieshavereportedthattheriskofruptureincreaseswithdelayeddiagnosis,emphasizingtherole of timely medical evaluation (6). However, there remains a lack of data specifically focusing on early gestationalageandthefactorspredisposingindividualstorupturewithinthistimeframe.Addressing this knowledge gap could pave the way for improved screening protocols and clinical interventions tailored to high-risk populations.

Ectopic pregnancy is also a significant contributor to maternal mortality, accounting for 4-10% of all pregnancy-related deaths worldwide (1). The mortality risk is particularly high in cases of rupture that are not managed promptly, highlighting the need for effective preventive strategies. Identifying the demographic, clinical, and diagnostic variables associated with early rupture can inform healthcare providers about at-risk individuals, enabling earlier detection and appropriate management.

Another important consideration is the fertility outcomes of women experiencing ectopic pregnancies. Studies indicate that rupture, particularly in early gestation, may compromise future fertility due to tubal damage or the need for surgical intervention. By understanding the clinical trajectoryofearlyruptures,clinicianscandevelopstrategiestopreservereproductivepotentialwhile managing immediate risks.

This study is motivated by the need to bridge the gap in understanding the incidence and contributing factors of early rupture in ectopic pregnancies. It aims to provide actionable insights that will enhance clinical outcomes, reduce mortality, and inform evidence-based guidelines for managing ectopic pregnancies.

## Objectives

Todeterminetheincidenceofruptureinectopicpregnanciesdiagnosedduringearlygestational ages.
- To identify the demographic, clinical, and diagnostic factors associated with early rupture of ectopic pregnancies.

## MaterialsandMethods

Study Design: This study was a prospective observational study conducted to evaluate the incidence of rupture in ectopic pregnancies diagnosed during early gestational ages and to identify associated demographic, clinical, and diagnostic factors.

StudyPopulation
- InclusionCriteria:
    1. Womendiagnosedwithectopicpregnancyduringthefirsttrimester(upto12weeks of gestation).
    2. Casesconfirmedviaclinicalpresentation,laboratoryinvestigations(e.g.,serumbeta- hCG levels), and imaging (e.g., transvaginal ultrasonography).
    3. Womenwhoprovidedinformedconsentforparticipationinthestudy.
- ExclusionCriteria:

4. Womenwithincompletediagnosticorclinical data.
5. Casesinvolvingheterotopicpregnanciesorcoexistinggestationaltrophoblasticdisease.
6. Patientspresentingwithectopicpregnanciesdiagnosedafterthefirsttrimester.

Study Setting and Duration: The study was conducted at Saveetha MEdical College and Hospital, a tertiary care facility with a dedicated obstetrics and gynaecology department. Data collection occurred over a 12-month period, from December 2023 to December 2024.

Sample Size: The sample size was calculated based on an expected incidence of ruptured ectopic pregnancies in early gestational ages, with a confidence level of 95% and a margin of error of 5%. A minimum of 64 participants were required for statistical validity.

DataCollection

Datawerecollectedprospectivelyusingastructuredcasereportform(CRF).

1. DemographicData:
   o Age,parity,socioeconomicstatus,andhistoryofpelvicinflammatorydiseaseor previous ectopic pregnancies.
2. ClinicalData:
   o Presentingsymptoms(e.g.,abdominalpain,vaginalbleeding,orsyncope).
   o Vitalsignsatpresentation,includingbloodpressure,heartrate,andsignsof hypovolemic shock.
3. DiagnosticData:
   o Serumbeta-hCGlevels.

- o Findingsontransvaginalultrasonography,includinggestationalsaclocation,size,and evidence of rupture (e.g., free fluid in the pouch of Douglas).
4. TreatmentDetails:
    - o Typeofintervention(medicalorsurgical).
    - o Outcomemeasures,includingintraoperativefindings,needforbloodtransfusions, and postoperative recovery.

Data Management: All collected data were anonymised and stored in a secure electronic database. Eachparticipantwasassignedauniqueidentifiertoensureconfidentiality.Dataentrywasmonitored for accuracy by an independent research assistant.

StatisticalAnalysis:Descriptivestatistics(means,medians,andpercentages)wereusedtosummarise demographic and clinical characteristics. The incidence of rupture was calculated as the proportion of ruptured ectopic pregnancies among all diagnosed ectopic pregnancies during early gestational ages. Inferential statistics, including chi-square tests for categorical variables and t-tests for continuous variables, were used to identify factors associated with rupture. Multivariate logistic regression analysis was performed to determine independent predictors of rupture. A p-value <0.05 was considered statistically significant. All analysis was done using SPSS version 22.0

**Results**

The study included a total of 64 participants with a mean age of 25.11 years (SD = 4.14), reflecting a relatively young cohort. Regarding gravidity, 39.06% of participants were gravida 1, 37.50% were gravida 2, and the remainder were distributed among gravida 3 (10.94%), gravida 4 (9.38%), and gravida 5 (1.56%), indicating a predominance of women with fewer prior pregnancies. Parity distribution revealed that 62.50% of participants were nulliparous (para 0), while 28.13% had one prior delivery and 9.38% had two, further emphasising a majority of participants with limited obstetrichistory.Regardingabortionhistory,64.06%ofparticipantshadnohistoryofabortion,while 25.00% reported one previous abortion and 10.94% had experienced two. Most participants presented with amenorrhea, with 59.38% reporting a duration of six weeks or less, and only 40.63% reporting more than six weeks of amenorrhea.

**Table1:DemographicCharacteristicsofStudyParticipants**

| Variable | Totalnumberofparticipants(n=64) | Percentage(%) |
|---|---|---|
| AGE(Mean (SD)) | 25.11(4.14) | |
| GRAVIDA | | |
| 1 | 25 | 39.06 |
| 2 | 24 | 37.50 |
| 3 | 7 | 10.94 |
| 4 | 6 | 9.38 |
| 5 | 1 | 1.56 |
| PARA | | |
| 0 | 40 | 62.50 |
| 1 | 18 | 28.13 |
| 2 | 6 | 9.38 |

| ABORTION | | |
|---|---|---|
| 0 | 41 | 64.06 |
| 1 | 16 | 25.00 |
| 2 | 7 | 10.94 |
| AMENORRHEA | | |
| 6 | 38 | 59.38 |
| 7 | 26 | 40.63 |

The pie chart illustrates the distribution of ruptured versus unruptured ectopic pregnancies among the study participants. The majority of cases, 87% (n=56), involved ruptured ectopic pregnancies, while only 13% (n=8) were unruptured. This indicates a high incidence of rupture in the cohort, emphasising the critical nature of timely diagnosis and intervention to prevent complications associated with ectopic pregnancy rupture.

**Figure1:IncidenceofRuptureofEctopicpregnancy**
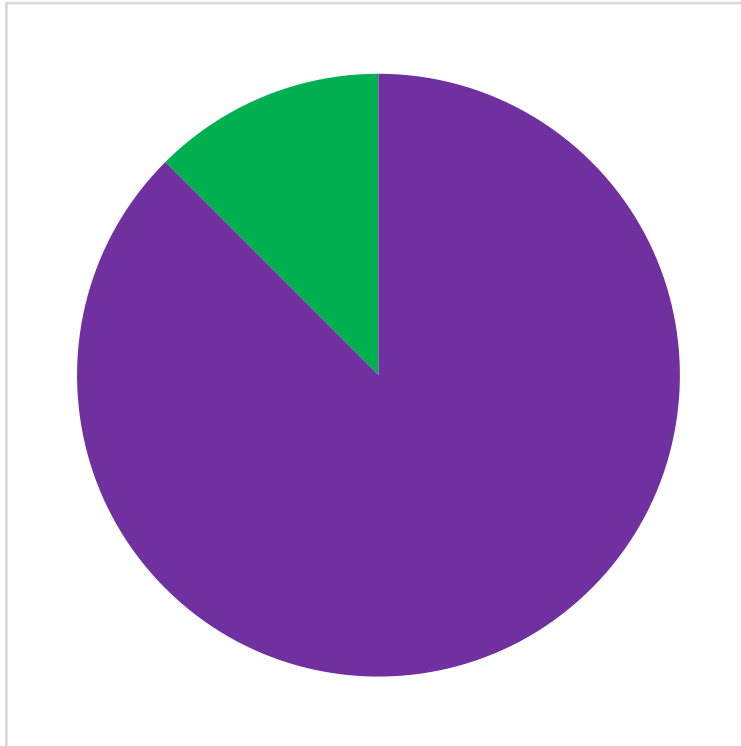


The bar chart provides an overview of the clinical features observed among the study participants with ectopic pregnancy. Lower Abdominal Pain: This was present in 54 participants (84.4%), while only 10 participants (15.6%) reported no such symptom. Lower abdominal pain is a predominant symptomofectopicpregnancy.BleedingPerVaginum:Bleedingwaspresentin48participants(75%) and absent in 16 participants (25%), indicating that vaginal bleeding is a common but not universal presentation. Abdominal Tenderness: All participants (100%, n=64) exhibited abdominal tenderness, emphasizing its significance as a diagnostic clue. Cervical Motion Tenderness: Similarly, cervical motion tenderness was present in all participants (100%, n=64), making it another consistent clinical finding. These findings highlight that lower abdominal pain, vaginal bleeding, and tenderness (both abdominal and cervical) are key clinical indicators of ectopic pregnancy and should raise clinical suspicion during evaluation.

**Figure2:Clinicalfeatures**
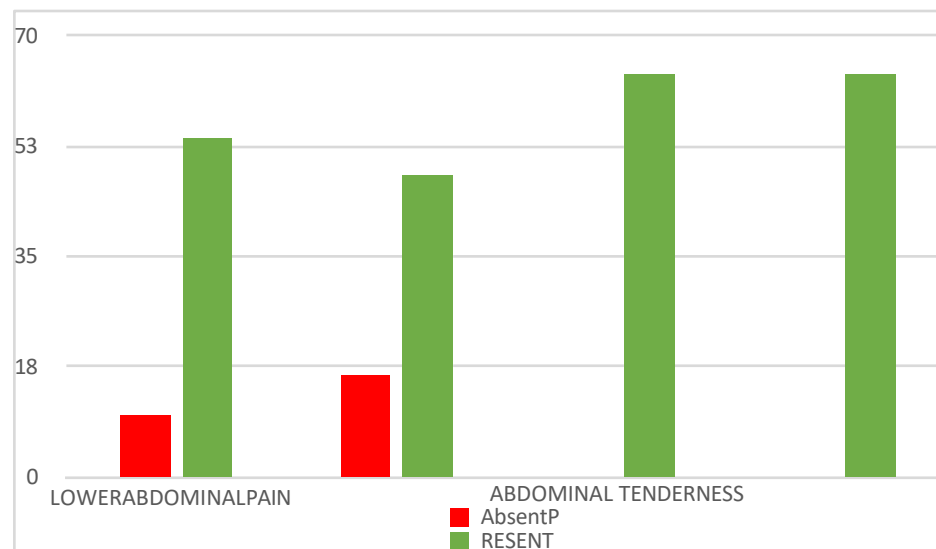


The table summarises key clinical and laboratory parameters of the study participants. The average pulse rate was 98.36 beats per minute (SD = 10.89), indicating a tendency towards tachycardia, which may be associated with hypovolemia or pain due to ectopic pregnancy. The mean systolic bloodpressure(SBP)was93.75mmHg(SD=6.04),andthemeandiastolicbloodpressure(DBP)was

72.50 mmHg (SD = 7.35), suggesting that some participants may have been hemodynamically unstable, likely due to blood loss from rupture. The mean serum beta-hCG level was 1499.98 IU/L(SD = 1465.29), reflecting variability in the progression of ectopic pregnancies. Lastly, the mean hemoglobin level was 8.70 g/dL (SD = 1.94), indicative of anemia, which could result from blood loss in ruptured ectopic cases.

**Table2:ClinicalandLaboratoryParametersofStudyParticipants**

| Variable | Mean | SD |
|----------|------|-----|
| **PULSERATE** | 98.36 | 10.89 |
| **SBP** | 93.75 | 6.04 |
| **DBP** | 72.50 | 7.35 |
| **BetaHCG** | 1499.98 | 1465.29 |
| **HEMOGLOBIN** | 8.70 | 1.94 |

The chart illustrates the distribution of management strategies employed for ectopic pregnancies in the study cohort. The majority of participants (91%, n=58) underwent laparotomy as the primary modeoftreatment,indicatingthepredominanceofsurgicalintervention,likelyduetotheseverityof rupture or unstable clinical presentation. In contrast, only 9% (n=6) were managed medically with methotrexate, a non-surgical option often reserved for stable patients with unruptured ectopic pregnancies.

**Figure3:ManagementofRupturedEctopicPregnancy**
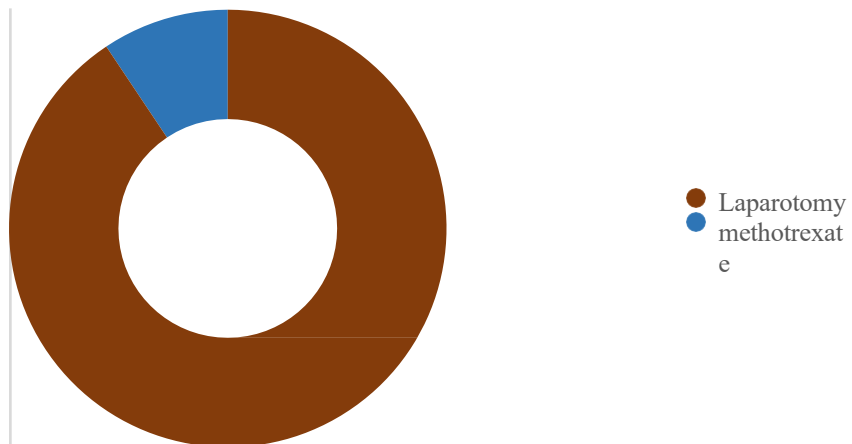


Themultivariateanalysisrevealskeyfactorsassociatedwithruptureinectopicpregnancies:**Age**:The coefficient for age was 0.232, with a p-value of 0.065, indicating a trend toward significance but not reaching statistical significance. Older age may have a weak association with rupture risk. **Gravida**: The coefficient for gravidity was 1.014, with a p-value of 0.220, suggesting no statistically significant association between gravidity and rupture. **Para**: Parity showed a statistically significant negative association with rupture (coefficient: -2.974, p=0.021). Higher parity appears to reduce the risk of rupture, possibly due to differences in reproductive history. **Amenorrhea**: The coefficient for the duration of amenorrhea was -2.150, with a p-value of 0.009, indicating a significant relationship between amenorrhea duration (<6 weeks) and rupture. **Hemoglobin**: Hemoglobin levels demonstrated a significant negative association with rupture (coefficient: -0.895, p=0.025). Lower hemoglobin levels are associated with a higher likelihood of rupture, likely reflecting anemia secondary to blood loss. **Beta-hCG**: The coefficient for beta-hCG was 0.000, with a p-value of 0.536, indicating no significant association between beta-hCG levels and rupture risk. Overall, the analysis highlights that **lower hemoglobin levels** and **lower parity, shorter duration of amenorrhea(< 6 weeks)** are significantly associated with an increased risk of rupture in ectopic pregnancies.

**Table3:MultivariateAnalysisofFactorsAssociatedwithRupture**

|  | Coef. | Std.Err. | z | 95% CI | P value |
|---|---|---|---|---|---|
| **AGE** | 0.232 | 0.126 | 1.846 | -0.014 - 0.479 | 0.065 |
| **GRAVIDA** | 1.014 | 0.825 | 1.228 | -0.604 - 2.632 | 0.220 |
| **PARA** | -2.974 | 1.290 | -2.305 | -5.503 - -0.446 | **0.021** |
| **AMENORRHEA** | -2.150 | 0.820 | -2.622 | -3.757 - -0.543 | **0.009** |
| **HEMOGLOBIN** | -0.895 | 0.400 | -2.239 | -1.678 - -0.112 | **0.025** |
| **BETAHCG** | 0.000 | 0.000 | -0.619 | -0.001 - 0.000 | 0.536 |

**Discussion**

This study aimed to explore the demographic, clinical, and management factors associated with ruptured ectopic pregnancies, providing critical insights into the risks and outcomes in this condition. The findings highlight several significant aspects of ectopic pregnancy management and the clinical presentation of affected patients.

The study population consisted of predominantly young women (mean age: 25.11 years), reflecting the age group most at risk of ectopic pregnancies. Most participants were nulliparous (62.50%), and nearly 40% were gravida 1, suggesting a higher prevalence of ectopic pregnancies among women with limited reproductive history. This finding aligns with prior research indicating that younger, nulliparous women are more prone to ectopic pregnancies due to risk factors such as tubal anomalies and pelvic infections. Clinical features observed in this study underline the importance of early symptom recognition. Lower abdominal pain was present in 84.4% of participants, while 75% experienced vaginal bleeding. These symptoms, coupled with universal findings of abdominal and cervical motion tenderness, underscore their diagnostic value. The high incidence of abdominal tenderness (100%) supports its role as a key clinical indicator for clinicians evaluating suspected ectopic pregnancies.

The study observed an alarmingly high rate of rupture among ectopic pregnancies, with 87% of cases presenting as ruptured. This finding highlights the critical need for early diagnosis and timely management to prevent rupture and its associated complications.

Management strategies were heavily weighted towards surgical intervention, with 91% of participants undergoing laparotomy. This reflects the severity of clinical presentations, as surgical management is typically preferred for unstable or ruptured ectopic pregnancies. Only 9% of cases were managed with methotrexate, indicating that medical management remains an option for a small subset of patients, specifically those with stable, unruptured ectopic pregnancies.

The incidence of rupture in this study (87%) aligns with the findings of **Najam et al.**, who reported rupture in 85% of ectopic pregnancy cases requiring emergency intervention (7). Similarly, the predominance of surgical management through laparotomy (91%) is comparable to findings by **Singh et al.**, who noted that nearly 89% of ruptured ectopic pregnancies required emergency surgical intervention due to hemodynamic instability (8).

The association of low hemoglobin levels with an increased risk of rupture in this study is in agreement with observations by **Tegene and Kabtamu**, who emphasized that anemia often reflects significant internal hemorrhage in cases of ruptured ectopic pregnancies (9). Additionally, the lack of significant association between beta-hCG levels and rupture risk, as noted in this study, is consistent with findings by **Saha et al.**, who suggested that beta-hCG levels are not predictive of rupture but are useful for confirming diagnosis (10).

The clinical and laboratory parameters provide a deeper understanding of the severity of cases in this cohort. The mean pulse rate of 98.36 beats per minute suggests a tendency toward tachycardia, likely associated with pain or hypovolemia secondary to rupture. Systolic and diastolic blood pressures were relatively low (mean SBP: 93.75 mmHg, DBP: 72.50 mmHg), indicating that some patients may have presented with hemodynamic instability due to significant blood loss. The mean hemoglobin level of 8.70 g/dL further supports the presence of anemia in these patients, likely due to hemorrhage associated with ruptured ectopic pregnancies.

Interestingly, the mean serum beta-hCG level was 1499.98 IU/L, showing a wide variability. While beta-hCG levels can help confirm pregnancy, their lack of significant association with rupture risk in this study suggests that beta-hCG alone may not be a reliable predictor of rupture.

Thestudyunderscoresthatlowerabdominalpain,vaginalbleeding,andtenderness(bothabdominal and cervical) are prominent clinical indicators of ectopic pregnancy. This aligns with the findings of **Hu et al.**, who reported similar presenting features in 82% of cases with ruptured ectopic pregnancies (11). The universal presence of abdominal tenderness in this study (100%) mirrors observations in a systematic review by **Mule et al.**, highlighting the diagnostic importance of this symptom(12).Thepredominanceofsurgicalmanagementinthisstudyreflectstheseverityofcases. However, **Rizwan et al.** highlighted a growing trend towards conservative management in early, unruptured ectopic pregnancies, which constituted only 9% of cases in this study (13). This underscores the need for early detection and timely diagnosis, which may increase the feasibility of non-surgical approaches, such as methotrexate therapy.

Parity was significantly associated with rupture, with higher parity reducing the risk (p=0.021). This finding aligns with the idea that reproductive history may influence tubal integrity or vascular response, thereby affecting the likelihood of rupture. Hemoglobin levels were also significantly associated with rupture risk (p=0.025), with lower levels indicating a higher likelihood of rupture. This underscores the role of anemia, likely reflecting ongoing or previous blood loss in ruptured cases. Other variables, such as age, gravidity, and beta-hCG levels, did not show statistically significant associations with rupture. However, age demonstrated a borderline trend toward significance (p=0.065), suggesting a potential weak association that may warrant further investigation in larger studies.

The significant negative association of parity with rupture risk observed in this study suggests that women with fewer prior pregnancies may be at higher risk, potentially due to differences in reproductive anatomy or tubal resilience. This finding is supported by **AlAshqar and Huynh**, who identified similar associations in their analysis of risk factors for rupture (14). The trend toward significanceforage(p=0.065)inthisstudyalsoalignswith findingsby**Tianetal.**,whoreportedthat advanced age slightly increased rupture risk due to delayed tubal response to implantation (15).

The high incidence of rupture and the predominance of surgical management underscore the urgent need for improved diagnostic tools and early detection strategies. Clinical parameters, such as abdominal tenderness, tachycardia, and low hemoglobin levels, can guide early recognition and intervention.Moreover,theassociationoflowparityandanemiawithrupturehighlightsspecificrisk groups that may require closer monitoring during evaluation.

The reliance on laparotomy in this cohort reflects the need for emergency surgical intervention in most cases of rupture. Expanding access to early diagnostic tools, such as high-resolution ultrasound and point-of-care testing, could allow more cases to be managed medically, reducing morbidity and preservingfertility.Thehighincidenceofruptureandrelianceonlaparotomyinthisstudyemphasize the importance of early diagnosis. **Morris et al.** demonstrated that incorporating point-of-care ultrasound into routine evaluations significantly reduced time to diagnosis and improved outcomes in suspected ectopic pregnancies (16). Efforts to improve diagnostic accuracy and expand access to medical management options could reduce the reliance on surgical interventions, particularly in resource-limited settings.

This study provides valuable insights into the clinical and demographic profile of ectopic pregnancies and their management. Its prospective design allowed for the systematic collection of clinical and laboratory data, ensuring reliability and relevance. However, the relatively small sample size and single-center design may limit the generalizability of the findings. Future studies with larger, multicenter cohorts could help validate these findings and explore additional risk factors. While the findings of this study are supported by similar research, limitations include the relatively small samplesizeandthesingle-centerdesign,whichmaylimitgeneralizability.Futuremulticenterstudies withlargercohorts,assuggestedby**Guanetal.**,areneededtovalidatethesefindingsandrefine

management protocols for ectopic pregnancies (17).This study found a significant inverse relationship between the duration of amenorrhea and the risk of ectopic pregnancy rupture, with a coefficient of -2.150 (p = 0.009). This suggests that patients with a shorter duration of amenorrhea (<6 weeks) had a higher likelihood of rupture. One possible explanation is that early gestational age maybeassociatedwithrapidtrophoblasticinvasionandinadequatetubaldistensibility,leadingtoan increased risk of tubal rupture. Additionally, early implantation in the fallopian tube may result in compromised vascular integrity, making rupture more likely. Further studies with larger sample sizes are needed to explore the underlying mechanisms and potential preventive strategies.

This study highlights the critical burden of ruptured ectopic pregnancies and the need for timely intervention. The findings underscore the importance of clinical features, such as abdominal tenderness and tachycardia, in diagnosing ectopic pregnancies. Additionally, the associations of parityandhemoglobinlevels,shorterdurationofamenorrheawithruptureprovidevaluableinsights for risk stratification. Enhancing early diagnostic capabilities and expanding access to medical management options could help reduce the incidence of rupture and improve outcomes for women with ectopic pregnancies.

**Conclusion**

Thisstudyprovidescriticalinsightsintothedemographic,clinical,andmanagementcharacteristicsof ruptured ectopic pregnancies, highlighting the high incidence of rupture (87%) and the predominant relianceonsurgicalmanagement(91%).Keyclinicalfeatures,includinglowerabdominalpain,vaginal bleeding, and tenderness, were identified as vital diagnostic indicators, while lower hemoglobin levels, parity and early gestational age (less than six weeks ) were significantly associated with an increased risk of rupture. The findings emphasize the importance of early diagnosis and timely interventiontoreducetheseverityandcomplicationsofectopicpregnancies.Thelackofasignifcant association between beta-hCG levels and rupture risk reinforces the need for a multimodal diagnostic approach that prioritises clinical evaluation and imaging. The study underscores the need to improve diagnostic capabilities through the use of point-of-care ultrasound and other advanced techniques to facilitate early detection. Expanding the use of medical management options, such as methotrexate, in stable cases could reduce the reliance on surgical interventions and improve fertility outcomes. Further research with larger, multicenter studies is recommended to validate these findings, refine risk stratification strategies, and develop standardized protocols for managing ectopic pregnancies. By addressing these gaps, healthcare providers can enhance outcomes and reduce the morbidity and mortality associated with this potentially life-threatening condition.

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