Original Research Article

Risk Factors and Complications Associated with Ectopic Pregnancy among Women in Abia State, Nigeria

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Abstract

Ectopic pregnancy remains a major cause of maternal morbidity and mortality in low resource settings. Understanding its determinants and associated complications is vital for early recognition and improved outcomes. This study examined the risk factors and complications associated with ectopic pregnancy among women who received care at Abia State University Teaching Hospital, Aba. A hospital-based unmatched case control study was carried out from July 2023 to June 2025. Eighty-seven women with confirmed ectopic pregnancy served as cases, while 174 women with intrauterine pregnancies were selected as controls, with frequency matching by age category. Data were obtained through structured interviews and clinical record abstraction. Information collected included sociodemographic characteristics, reproductive history, previous pelvic infection, prior tubal or abdominal surgery, contraceptive history and pertinent laboratory and imaging findings. Data were double entered, cleaned and analysed using SPSS version 25. Bivariate associations were examined using chi-square tests and t-tests, followed by multivariable logistic regression to identify independent predictors of ectopic pregnancy. Complications among cases were summarised descriptively. Significant risk factors on multivariable analysis included prior pelvic infection (adjusted odds ratio 3.12, confidence interval 1.58 to 6.17), prior tubal or abdominal surgery (adjusted odds ratio 3.98, confidence interval 1.38 to 11.47), history of infertility (adjusted odds ratio 3.45, confidence interval 1.51 to 7.90) and having more than two lifetime sexual partners (adjusted odds ratio 1.78, confidence interval 1.01 to 3.12). Common clinical features among cases included abdominal pain, vaginal bleeding and amenorrhea. Complications were frequent, particularly tubal rupture which was reported in over forty percent of cases. Significant intra-abdominal bleeding, the need for transfusion, hypovolemic shock and prolonged admission were also documented. One maternal death occurred. Ectopic pregnancy in this setting is strongly associated with preventable reproductive health factors, particularly prior pelvic infection, tubal surgery and infertility. High rates of tubal rupture and bleeding underscore the need for early recognition and prompt care. Strengthening sexual and reproductive health services, improving early referral pathways and increasing community awareness are essential steps to reduce the burden of ectopic pregnancy and its complications.

Keywords: Ectopic pregnancy, Infertility, Pelvic infection, Risk factors, Tubal surgery

INTRODUCTION

Ectopic pregnancy, defined as implantation of the fertilized ovum outside the endometrial cavity, remains an important cause of maternal morbidity and mortality worldwide and is a frequent cause of first-trimester maternal death in low- and middle-income countries (Akwuruoha et al., 2025a; Ezirim et al., 2025). The global burden of pregnancy-related mortality has shown worrying trends in recent years, and complications that arise early in pregnancy, including ruptured ectopic gestation and massive haemorrhage, contribute substantially to this burden in settings with limited emergency obstetric capacity (World Health Organi-

zation, 2025). Within Nigeria, ectopic pregnancy continues to present both as a common gynaecological emergency and as a persistent public health problem. Facility-based and regional reviews from across the country report variable incidence estimates but consistently document ectopic gestation as a major contributor to early pregnancy morbidity and, in some series, to maternal death. These studies emphasize late presentation, high rates of tubal damage, and the frequent need for surgical interventions such as salpingectomy, which have implications for future fertility and reproductive health (Anorlu et al., 2005; Onyemereze et al., 2024).

Understanding risk factors for ectopic pregnancy is central to designing prevention strategies, improving early diagnosis, and reducing adverse outcomes. International epidemiological work has identified a reproducible set of risk factors that compromise tubal function or reflect genital tract infection and inflammation. Pelvic inflammatory disease, most often consequent to sexually transmitted infections such as Chlamydia trachomatis, is among the strongest and most consistent predictors of tubal ectopic implantation because of the scarring and altered tubal motility that follow infection. Several recent case-control and seroepidemiological studies from sub-Saharan Africa and Nigeria have confirmed the association between prior Chlamydia infection and increased odds of tubal ectopic pregnancy, underscoring the pathogenetic link between STI-related tubal damage and ectopic gestation (John et al., 2024; Mbamba et al., 2020). Additional epidemiological correlates described in Nigerian hospital series include previous pelvic or abdominal surgery, a prior ectopic pregnancy, induced abortion complicated by infection, use of assisted reproductive technologies, intrauterine device failure, and cigarette smoking at conception. The relative prominence of specific risk factors varies across Nigerian regions, reflecting local patterns of sexual health, abortion practices, access to contraceptive services, and healthcare-seeking behaviour (Anorlu et al., 2005; Oyedeji et al., 2024).

The clinical consequences and complications of ectopic pregnancy are both immediate and longer-term. Acute complications include tubal rupture, intra-abdominal haemorrhage, hypovolemic shock, sepsis after attempted unsafe abortion, and death, where definitive surgical or blood transfusion services are unavailable. Hospital series from Nigeria continue to report substantial proportions of women presenting with ruptured ectopic pregnancy and hypovolemic shock, with many requiring blood transfusion and emergency salpingectomy. Late presentation and limited access to early diagnostic imaging and serum beta human chorionic gonadotropin testing are important contributors to these adverse outcomes (Oyedeji et al., 2024). Beyond the acute phase, affected women face increased risks of future tubal infertility, recurrent ectopic pregnancy, chronic pelvic pain, and significant psychosocial distress associated with loss of fertility potential. In resource-constrained environments, the combination of high incidence of sexually transmitted infections, barriers to safe abortion services, and episodic gaps in emergency obstetric care amplifies both the clinical impact of ectopic gestation and its contribution to national maternal mortality statistics (World Health Organization, 2025; Samadet al., 2025).

Abia State in south-eastern Nigeria shares many of the epidemiological features observed elsewhere in the country. Local hospital-based investigations have documented a strong association between markers of prior genital tract infection and ectopic pregnancy and have highlighted specific sociodemographic and reproductive factors, such as early sexual debut and history of induced abortion, as important correlates in the local population. The study of anti-Chlamydia trachomatis IgG among women presenting with ectopic pregnancy at a tertiary centre in Umuahia found significantly higher seropositivity in cases than controls and estimated a substantial population attributable fraction for prior chlamydial infection, suggesting a meaningful opportunity for preventive intervention through STI control and reproductive health education (Mbamba et al., 2020). Regional reviews and five-year hospital series from comparable Nigerian settings similarly show high proportions of ectopic cases with antecedent pelvic inflammatory disease and prior abdominal surgery, frequent need for surgical management, and a substantial rate of complications such as hypovolemic shock and transfusion requirement (Oyedeji et al., 2024). These findings indicate that in Abia State, as elsewhere in Nigeria, ectopic pregnancy is not only a medical emergency but also a marker of broader sexual and reproductive health system gaps.

The global, national and regional literature supports a focused investigation of risk factors and complications associated with ectopic pregnancy in Abia State. Such research is important for three linked reasons. First, clarifying the prevalence and relative contribution of modifiable risk factors, particularly sexually transmitted infections, unsafe abortion and poor access to early pregnancy care, will inform targeted prevention and screening activities. Second, documenting the pattern and frequency of complications and delays in care will identify critical bottlenecks in emergency response, blood transfusion availability, and surgical capacity. Third, local evidence is necessary to guide context-appropriate interventions that can reduce the acute morbidity of ectopic pregnancy and preserve future fertility for affected women. This study, therefore, aims to generate robust, locally grounded evidence on risk profiles and complication rates among women with ectopic pregnancy in Abia State, to inform clinical practice, public health prevention strategies and policy priorities for reproductive health in the region.

MATERIALS AND METHODS

Study Design

A hospital-based, unmatched case-control study was conducted using clinical records and direct participant interviews. The study covered a two-year period from July 1, 2023, to June 31, 2025.

Study Area

The study took place at Abia State University Teaching Hospital, Aba. The facility is a tertiary referral centre that provides obstetric and gynaecological care to women in Abia State and neighbouring areas. Clinical services relevant to this study included emergency obstetric care, ultrasound imaging, laboratory services, and operative gynaecology.

Study Population

Eligible participants were women of reproductive age who sought care at the facility during the study period and who met the case or control definitions below:

Cases

Women with a confirmed diagnosis of ectopic pregnancy during the study period. Diagnosis was based on one or more of the following documented criteria in the medical record: transvaginal ultrasound evidence of an extrauterine gestation or adnexal mass together with a compatible clinical picture, rising or plateauing serum beta human chorionic gonadotropin pattern consistent with ectopic gestation, and operative confirmation at laparoscopy or laparotomy when available.

Controls

Women with confirmed intrauterine pregnancy attending antenatal or emergency services during the same period, and with no history or clinical evidence of ectopic pregnancy at presentation. Controls were selected from the same hospital population and frequency matched by broad age category.

Inclusion and exclusion criteria

Inclusion criteria for cases and controls
1.   Women aged 15 to 49 years who received care at the hospital during the study period.

2.   Willingness to participate and provide informed consent or assent together with parental or guardian permission when the participant was aged below 18 years.
Exclusion criteria
1.   Women whose diagnosis could not be confirmed by clinical records or imaging.
2.   Women with incomplete records for key study variables and who could not be contacted for supplementary information.
3.   Women who declined participation.

Sample Size Determination

Sample size was calculated for an unmatched case-control design with a control-to-case ratio of two to one. The calculation assumed an alpha of 0.05 and a power of 80%. As an example, scenario, a prior pelvic infection was considered a key exposure. Assuming a prevalence of prior pelvic infection among controls of 10% and an expected odds ratio of 3.0, the corresponding exposure prevalence among cases is approximately 25%. Using the standard two-proportion sample size formula for unequal group sizes and the Z values for alpha and beta, the minimum sample size required was calculated to be79 cases and 158 controls. To account for incomplete records and non-response, a 10% contingency was applied, resulting in a target recruitment of 87 cases and 174 controls, for a total of 261 participants.A worked sample size formula and calculation were prepared and retained as part of the study documentation so the assumptions and computations can be reviewed.

Sampling Procedure

Cases

All eligible women with a confirmed diagnosis of ectopic pregnancy who presented during the study period were identified through the gynaecology and emergency registers and the hospital information system. Where the number of eligible cases exceeded the calculated target, cases were selected by systematic sampling from the list of eligible cases in chronological order.

Controls

For each case, two controls were selected from women with confirmed intrauterine pregnancy who presented to the same facility in the same month. Frequency matching by age category was used to reduce confounding by age. Controls were randomly selected from the antenatal register using a random number table or computer-generated random numbers.

Data Collection Instruments and Procedures

Data Sources

1. Structured participant interview using a standardized questionnaire administered by trained research assistants.
2. Review and abstraction of clinical records, ultrasound reports, operative notes, and laboratory results.
3. Hospital registers and electronic medical records for dates of admission, diagnosis, procedures, transfusions and discharge outcomes.

Questionnaire

A structured questionnaire was developed in English and translated into the predominant local languages where required. The questionnaire collected information on sociodemographic characteristics, reproductive and obstetric history, contraceptive history, sexual and medical history, including prior pelvic infection and sexually transmitted infection, previous abdominal or tubal surgery, infertility treatment, smoking and alcohol use, and history of prior ectopic pregnancy.

Medical Record Abstraction

A data abstraction form captured clinical presentation, imaging findings, serum beta human chorionic gonadotropin values, management approach (expectant, medical or operative), intraoperative findings, blood loss and transfusion, complications recorded during admission, length of hospital stay, and discharge status.

Training and Pilot Testing

Data collectors were nurses and midwives trained in research ethics, interview techniques and abstraction procedures. The questionnaire and abstraction form were pilot tested on 5% of the calculated sample size at a similar facility. Feedback from the pilot informed final wording and item ordering. Pilot data were excluded from the main analysis.

Definitions and Outcome Measures

Primary outcome: Occurrence of ectopic pregnancy as defined above.

Secondary outcomes: Complications associated with ectopic pregnancy, including but not limited to tubal rupture, significant intra-abdominal bleeding necessi-

tating blood transfusion, hypovolemic shock as recorded in the medical chart, need for emergency operative intervention, requirement for intensive monitoring or admission to higher level care, and maternal death.

Operational Definitions

1. Prior pelvic infection: self-reported history of an infection treated as pelvic inflammatory disease or documented diagnosis in previous clinical notes.
2. Significant blood loss: blood loss recorded in the operative note exceeding 500 millilitres or the requirement for blood transfusion.
3. Early presentation: presentation to care within seven days of the onset of symptoms.
4. Late presentation: presentation after seven days from symptom onset.

Laboratory and imaging methods

Ultrasound

Transvaginal ultrasound reports were reviewed. Key elements abstracted included the presence or absence of an intrauterine gestational sac, adnexal mass or free fluid in the cul de sac, and estimated haemoperitoneum when documented.

Serum assays

Where available, quantitative serum beta human chorionic gonadotropin values and haemoglobin concentrations at presentation were recorded from the hospital laboratory reports.

Operative findings

For women managed surgically, intraoperative descriptions were abstracted from the operative notes, including site of ectopic implantation, presence of tubal rupture, estimated blood loss, and any concurrent procedures such as salpingectomy or salpingostomy.

Data Management

Completed questionnaires and abstraction forms were checked daily for completeness. Data were double-entered into a password-protected electronic database. Discrepancies between entries were resolved by reference to the source documents.Data cleaning included range and consistency checks, validation of key dates and cross-checking of laboratory and operative

data against the original medical records.Participant names and hospital numbers were removed from the analytic dataset. A unique study identifier was used for each participant. Paper files were stored in locked cabinets, and electronic files were stored on encrypted drives accessible only to the research team.

Quality control

1. Training of data collectors and supervisors to standardize interview and abstraction procedures.
2. Pilot testing of instruments and modification before the main study.
3. Daily review of completed forms by the field supervisor to correct missing or ambiguous responses promptly.
4. Double data entry and reconciliation to minimize keying errors.
5. Periodic cross-checks between interview data and medical record items to detect reporting bias.

Ethical Considerations

Written informed consent was obtained from all participants before the interview and record review. For participants aged below 18 years, written assent was obtained together with written consent from a parent or legal guardian. Participation was voluntary and participants were free to withdraw at any time without affecting their care. All procedures complied with relevant national and institutional guidelines for human subjects' research.

Data Analysis

Analysis was performed using SPSS version 25. All analyses were documented with code for reproducibility. Sociodemographic, clinical and obstetric characteristics were summarized. Continuous variables were assessed for normality and presented as mean and standard deviation or median and interquartile range as appropriate. Categorical variables were summarized as frequencies and percentages.Associations between potential risk factors and the occurrence of ectopic pregnancy were assessed using chi-square tests for categorical variables and t-tests for continuous variables. Crude odds ratios with 95% confidence intervals were reported.

Variables with a p-value less than 0.20 on bivariate testing or variables with known clinical importance were entered into multivariable logistic regression models to identify independent risk factors. Model building used a stepwise approach informed by epidemiologic considerations. Adjusted odds ratios with 95% confidence

intervals and p-values were reported. Model fit was assessed using the Hosmer and Lemeshowgoodness-of-fit test and by examining residuals and influential observations.Among cases, the frequency and type of complications were described. Factors associated with complications were explored using logistic regression, where the outcome was any recorded major complication. Length of hospital stay and time to definitive management were analysed using survival techniques or non-parametric comparisons when distributions were skewed.The extent and pattern of missing data were examined. If missingness was less than 5% and appeared random, complete case analysis was used. For variables with greater missingness or non-random patterns, multiple imputation methods were considered and sensitivity analyses performed to assess the impact of imputation on effect estimates.All tests were two-sided, and p-values below 0.05 were considered statistically significant.

RESULTS

The study included 261 women whose sociodemographic profile showed that most participants were between 25 and 34 years old, with the largest age group being 30 to 34 years (27.20%), as shown in Table 1. A large proportion were married (77.78%), and more than half had a tertiary education (55.17%). Most participants worked in either the formal or informal sector, with only about one quarter classified as unemployed or homemakers. Parity distribution demonstrated that more than one-third were multiparous, while 26.05% were nulliparous, as presented in Figure 1.
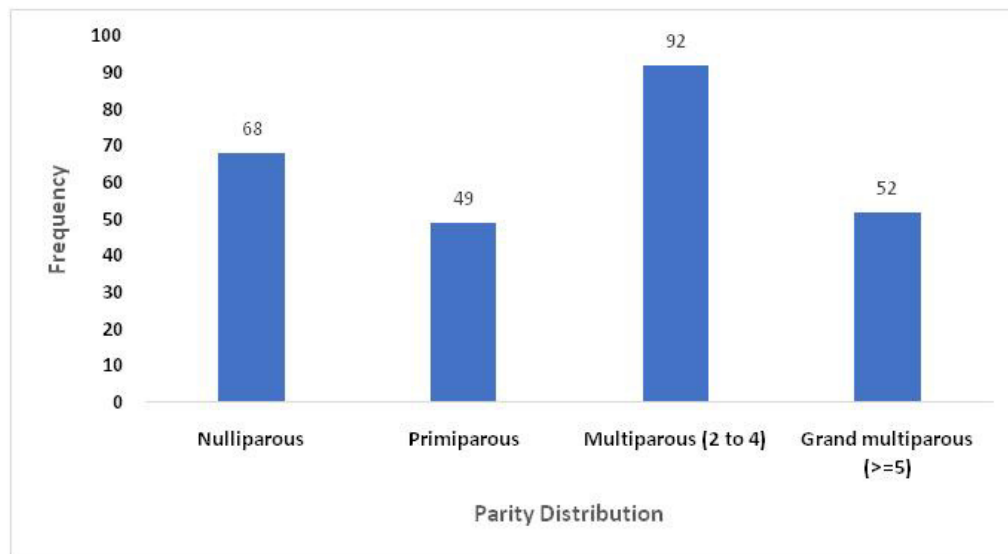
Reproductive and sexual history data in Table 2 indicate that 17.24% reported a prior pelvic infection, 6.90% had undergone tubal or abdominal surgery, and 11.49% had a history of infertility. Nearly half had used modern contraception, and 21.07% reported having more than two lifetime sexual partners.

Among the 87 cases of ectopic pregnancy, the most common presenting symptoms were abdominal or pelvic pain (85.06%), amenorrhoea (77.01%), and vaginal bleeding (66.67%), as shown in Table 3. Nearly half had an adnexal mass on ultrasound, and 41.38% had free intraperitoneal fluid. Management patterns in Figure 2 indicate that surgical treatment was the most common, accounting for 73.56% of cases. Among those who underwent surgery, salpingectomy was the leading procedure at 76.56%, followed by salpingostomy at 14.06%, as shown in Figure 3.

Complications were common among cases as presented in Table 4. Tubal rupture was the most frequent complication (43.68%), followed by significant intra-abdominal bleeding (25.29%) and prolonged hospital stay (24.14%). One maternal death was recorded. Table 5 shows that cases were slightly older

Table 1. Sociodemographic Characteristics of Participants

Variable	Frequency (n = 261)	Percentage (%)
Age group (years)		
<20	6	2.30
20 to 24	29	11.11
25 to 29	57	21.84
30 to 34	71	27.20
35 to 39	49	18.77
40 to 44	34	13.03
45 to 49	15	5.75
Marital status		
Married	203	77.78
Single	34	13.02
Divorced or separated	12	4.60
Widowed	12	4.60
Highest educational level		
None or primary	28	10.73
Secondary	89	34.10
Tertiary	144	55.17
Occupation		
Unemployed or a homemaker	61	23.37
Informal sector	86	32.95
Formal sector	114	43.68

Figure 1. Parity Distribution (n = 261)

Table 2. Reproductive and sexual historyamong all participants

Variable	Frequency (n = 261)	Percentage (%)
Prior pelvic infection documented or self-reported	45	17.24
Prior tubal/abdominal surgery	18	6.90
History of infertility	30	11.49
Prior ectopic pregnancy	6	2.30
Current intrauterine device in situ	12	4.60
Multiple lifetime sexual partners (>2)	55	21.07
Ever used modern contraception	121	46.36
Current smoker	3	1.15
Alcohol use (current)	39	14.94

Table 3. Clinical presentation among cases only

Variable	Frequency(n = 87)	Percentage (%)
Abdominal or pelvic pain	74	85.06
Vaginal bleeding	58	66.67
Amenorrhea or missed period	67	77.01
Syncope or presyncope on presentation	6	6.90
Shoulder tip pain	4	4.60
Hemodynamic instability on arrival	18	20.69
Positive adnexal mass on transvaginal ultrasound	41	47.13
Free intraperitoneal fluid on ultrasound	36	41.38

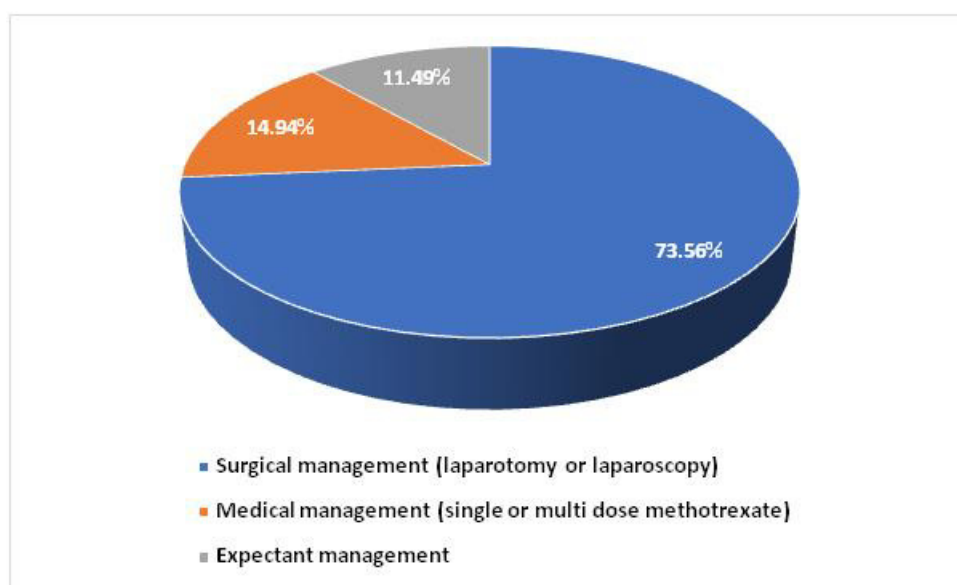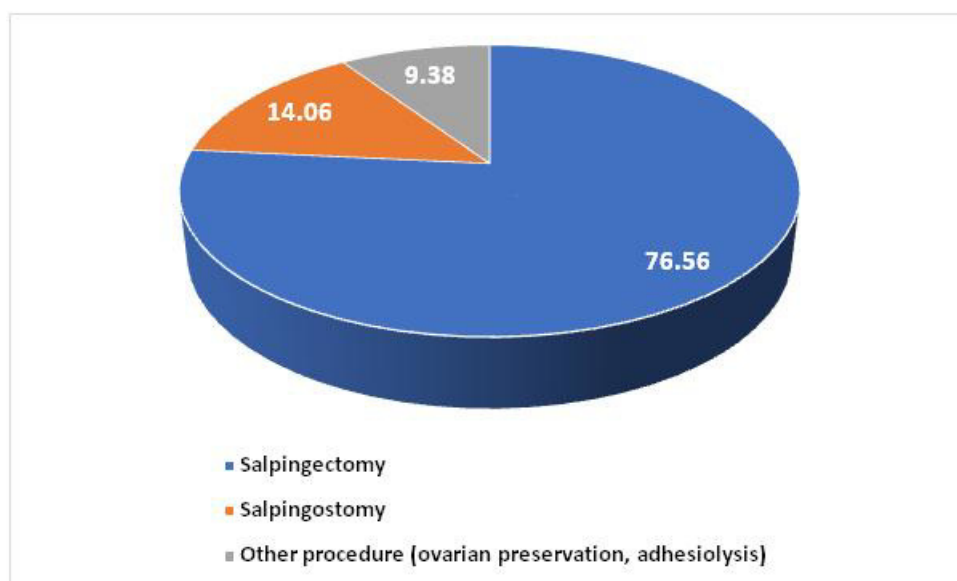

Figure 2. Management Modality for Ectopic Pregnancy (cases only, n = 87)

Figure 3. Surgical modality among those managed surgically (n = 64)

Table 4. Complications recorded among cases (n = 87)

Complication	Frequency	Percentage (%) of cases
Tubal rupture documented at surgery	38	43.68
Significant intra-abdominal bleeding (>500 ml)	22	25.29
Blood transfusion required	18	20.69
Hypovolemic shock	12	13.79
Need for intensive monitoring or high dependency care	6	6.90
Prolonged hospital stay (>5 days)	21	24.14
Maternal death	1	1.15

Table 5. Continuous variables and laboratory values

Variable	Mean ± SD	N
Maternal age, cases (years)	29.54 ± 6.12	87
Maternal age, controls (years)	27.83 ± 5.89	174
Gestational age at presentation, cases (days)	45.12 ± 12.34	87
Gestational age at presentation, controls (days)	62.45 ± 9.56	174
Serum beta hCG at presentation, cases (IU/L) median (IQR) because skewed	1,850 (900 to 4,200)	69
Hemoglobin at presentation, cases (g/dL)	10.45 ± 2.12	87
Haemoglobin at presentation, controls (g/dL)	11.68 ± 1.34	174
Estimated blood loss at surgery, cases (ml)	732 ± 415	64

Table 6. Reasons for delayed presentation among cases (n = 87)

Reason	Mean score	Standard deviation
Perceived symptoms are not serious	3.82	1.01
Fear of surgery or hospital	4.15	0.95
Distance to hospital/transport difficulty	3.44	1.23
Cost concerns	3.97	1.08
Preference for traditional healers first	2.56	1.34

Table 7. Chi-square analysis and crude odds ratios for selected risk factors

Exposure	Cases exposed n (%)	Controls exposed n (%)	Chi square	p-value	Crude OR	95% CI
Prior pelvic infection	28 (32.18)	17 (9.77)	18.88	<0.001	4.38	2.24 to 8.59
Prior tubal or abdominal surgery	12 (13.79)	6 (3.45)	8.12	0.004	4.48	1.62 to 12.39
Multiple lifetime sexual partners (>2)	30 (34.48)	25 (14.37)	12.08	0.001	3.03	1.64 to 5.58
Current intrauterine device	8 (9.20)	4 (2.30)	4.98	0.026	4.28	1.21 to 15.17
History of infertility	20 (22.99)	10 (5.75)	15.30	<0.001	4.90	2.18 to 11.01
Prior ectopic pregnancy	5 (5.75)	1 (0.57)	4.80	0.028	10.55	1.21 to 91.75

and presented earlier in gestation than controls, with markedly lower haemoglobin levels among cases. Median serum β-hCG was also relatively low at presentation.

Delayed presentation was strongly associated with fear of hospital treatment, cost concerns, and underestimation of symptom severity as reflected by mean Likert scores in Table 6.

Bivariate analysis in Table 7 identified several factors strongly associated with ectopic pregnancy, including prior pelvic infection, prior tubal or abdominal surgery, infertility, multiple sexual partners, intrauterine device use, and prior ectopic pregnancy. Many of these factors remained independently significant in the multivariable model presented in Table 8. Prior pelvic infection, prior surgery, infertility, and having more than two lifetime sexual partners were robust independent predictors of ectopic pregnancy, with adjusted odds ratios ranging from 1.78 to 3.98. Prior ectopic pregnancy also showed a strong association, though with wide intervals due to sparse data.

Correlation analysis in Table 9 revealed meaningful relationships between key clinical parameters. Older age correlated positively with parity and with prior pelvic

Table 8. Multivariable logistic regression summary: independent predictors of ectopic pregnancy

Variable	Adjusted OR	95% CI	p-value
Prior pelvic infection	3.12	1.58 to 6.17	0.001
Prior tubal/abdominal surgery	3.98	1.38 to 11.47	0.011
History of infertility	3.45	1.51 to 7.90	0.003
Multiple lifetime sexual partners (>2)	1.78	1.01 to 3.12	0.047
Current IUD in situ	2.85	0.78 to 10.44	0.11
Prior ectopic pregnancy	8.23	0.89 to 76.30	0.06
Age (per year)	1.03	0.99 to 1.08	0.12

Model notes. Hosmer and Lemeshow goodness of fit test p = 0.45, indicating acceptable model fit. Variables with sparse counts produce wide confidence intervals.

Table 9. Correlation Matrix for Selected Numeric and Binary Variables

Pair	Correlation coefficient	p-value
Age vs Parity	0.45	<0.001
Age vs Prior PID	0.12	0.046
Prior PID vs Ectopic status	0.31	<0.001
Prior surgery vs Ectopic status	0.21	0.002
Multiple partners vs Prior PID	0.15	0.014
Gestational age at presentation vs Ectopic status	-0.42	<0.001
Hemoglobin vs Estimated blood loss (surgical)	-0.48	<0.001

Note: Correlations with binary variables are point biserial and reported for interpretability. All p-values are two-sided.

infection. Ectopic status showed a negative correlation with gestational age and positive correlations with prior pelvic infection and prior surgery. Haemoglobin level among surgical cases demonstrated a moderate negative correlation with estimated blood loss.

DISCUSSION

Ectopic pregnancy remains a major contributor to maternal morbidity and mortality in low-resource settings. Understanding the epidemiologic profile, risk factors and complications is essential for targeted prevention and improved clinical outcomes. This study examined predictors of ectopic pregnancy and the pattern of associated complications among women receiving care at Abia State University Teaching Hospital in Aba, Nigeria.

Our participants ranged across age groups, with the highest proportion in the 30-34 year band (27.2 %) followed by 25-29 years (21.8 %). The mean maternal age among the cases was 29.54 ± 6.12 years, while controls averaged 27.83 ± 5.89 years. National and regional studies have reported similar age distributions. For example, a review in South-western Nigeria found a mean age of around 30.1 years for ectopic pregnancies, with peak incidence in the 26–30 age group (Igwegbe et al., 2013). The fact that our study centres on women in their late twenties to early thirties is consistent with the reproductive age range most affected by ectopic gestation and likely reflects the underlying fertility patterns of the study population. A recent systematic review found advanced maternal age (30-34 years OR 1.13; ≥40 years OR 1.46) to be weakly but significantly associated with ectopic pregnancy (Brim et al., 2025). In our multivariable model, however, maternal age per year was not a statistically significant independent predictor (adjusted OR 1.03; 95 % CI 0.99–1.08; p = 0.12), suggesting that within our population, age alone may play a less decisive role compared to other factors.

In terms of marital status, the large majority of participants were married (77.8 %). While many studies do not stratify by marital status, marital status may act as a proxy for sexual behaviour dynamics and access to reproductive health services, though in our adjusted model, it did not emerge as a significant independent risk factor. On educational attainment, over half (55.2 %) had a tertiary education, while 10.7 % had none or only primary education. Higher levels of education in our sample may reflect the catchment, recruitment or referral bias of the tertiary health setting in Abia State, and perhaps the growing educational attainment among Nigerian women (Akwuruoha et al., 2025b).

Parity distribution in our sample showed 26.0 % nulliparous, 35.3 % multiparous (2–4), and 19.9 % grand multiparous (≥5). Many prior studies have documented a

higher prevalence of ectopic pregnancy among nulliparous women. For example, in Delta State, Nigeria, 32.3 % of ectopic patients were nulliparous (Ononuju et al., 2019). In our sample, although a significant proportion were multiparous, the nulliparous group remains sizeable. The presence of ectopic pregnancies across the parity spectrum underscores that while tubal damage (often associated with low parity) is a key risk, ectopic pregnancy risks may extend across differing reproductive histories.

Our bivariate analysis highlighted several exposures strongly associated with ectopic pregnancy: prior pelvic infection (32.2% of cases vs 9.8% controls; crude OR 4.38), prior tubal/abdominal surgery (13.8% vs 3.45%; OR 4.48), multiple lifetime sexual partners (>2) (34.5% vs 14.4%; OR 3.03), current IUD in situ (9.2% vs 2.3%; OR 4.28), history of infertility (22.99% vs 5.75%; OR 4.90) and prior ectopic pregnancy (5.75% vs 0.57%; OR 10.55). In the multivariable model, independent predictors were prior pelvic infection (adjusted OR 3.12, p = 0.001), prior tubal/abdominal surgery (adjusted OR 3.98, p = 0.011), history of infertility (adjusted OR 3.45, p = 0.003) and multiple lifetime sexual partners (adjusted OR 1.78, p = 0.047). Current IUD in situ showed an elevated adjusted OR 2.85 but did not reach statistical significance (p = 0.11). Prior ectopic pregnancy had a large adjusted OR 8.23 but a wide confidence interval (0.89–76.30; p = 0.06) likely reflecting sparse data and limited power.

These findings align substantially with the broader evidence base. A recent meta-analysis found that prior ectopic pregnancy (OR 9.03), pelvic inflammatory disease (OR 4.00), infertility (OR 3.70) and abdominal/pelvic surgeries (OR 5.60) are among the strongest risk factors for ectopic pregnancy (Brim et al., 2025). In a Nigerian case-control study in Lagos, risk factors including PID and prior tubal surgery were identified (Anorlu et al., 2005). Specifically, the magnitude of association for prior infection in our study echoes the magnitude seen elsewhere. That our study identifies prior pelvic infection and tubal surgery as important independent predictors reinforces the key role of tubal damage and altered anatomy in the pathogenesis of ectopic implantation.

Multiple sexual partners were an independent predictor in our study (adjusted OR 1.78). This is plausible since multiple partners may increase the risk of sexually transmitted infections, ascending pelvic infection and subsequent tubal damage. While many prior studies have not always included sexual behaviour variables in multivariable modelling, our result adds weight to the behavioural dimension of ectopic risk in this context.

The elevated crude OR for current IUD in situ (4.28) and adjusted OR of 2.85 (non-significant) suggest a possible but not definitively proven association in our sample. Some literature reports intrauterine device use as a risk factor for ectopic pregnancy, though the causality is complex since IUDs reduce overall pregnancy rates, so the relative risk of ectopic pregnancy if pregnancy occurs may be higher, but the absolute risk lower. For example, a review article noted IUD use among associated factors (Agbon-Ojeme et al., 2023). In our setting, the lack of statistical significance may result from small numbers (12 participants with an IUD *in situ*) and possible confounding (e.g., selection of women using an IUD who already have risk factors).

History of infertility (adjusted OR 3.45) emerged as a strong independent predictor in our study. This aligns with meta-analytic data (OR 3.70 for infertility) and highlights the likely mechanistic pathway of tubal dysfunction underlying both infertility and ectopic pregnancy (Brim et al., 2025). Prior ectopic pregnancy in our sample had a very high adjusted point estimate (OR 8.23) but statistical non-significance (p = 0.06) due to limited cases. The magnitude is consistent with the literature and suggests that in larger samples, this would likely reach significance.

Interestingly, age (per year) did not reach significance in our model despite moderate correlation (age vs parity r = 0.45, p < 0.001) and a small positive correlation with prior pelvic infection (r = 0.12, p = 0.046). This suggests in our population that once we account for direct tubal□pathology related variables, age plays a lesser independent role.

Among the 87 cases, the predominant presenting symptoms were abdominal or pelvic pain (85.1 %), amenorrhea/missed period (77.0 %) and vaginal bleeding (66.7 %). Hemodynamic instability on arrival occurred in 20.7 % of cases, and ultrasound evidence of adnexal mass and free intraperitoneal fluid were 47.1 % and 41.4 % respectively. The gestational age at presentation among cases averaged 45.12 ±12.34 days, compared to 62.45 ±9.56 days for controls.

Our findings correspond with the classical triad of pain-amenorrhea-bleeding described in ectopic pregnancy literature. For example, in Nigeria, the symptom of abdominal pain was reported in 87.91% of patients and missed menstrual flow in 65.93% in one study (Oluwole et al., 2023). The relatively high proportion of hemodynamic instability (20.7%) in our sample is a concern, signalling that a significant share of women presents in advanced or complicated states. In many low-resource settings, late presentation is common; for instance, in a Nigerian tertiary review, one study found 11% of patients had fainting attacks at presentation (Olamijulo et al., 2020). The imaging findings in our sample (adnexal mass ~47%, free fluid ~41%) indicate that ultrasound remains a useful diagnostic adjunct, though detection remains modest, as roughly half of the cases had identifiable adnexal masses.

Regarding laboratory findings, serum β-hCG in our cases had a median of 1,850 IU/L (IQR 900-4,200). Haemoglobin at presentation among cases averaged 10.45 ±2.12 g/dL (versus 11.68 ±1.34 g/dL in controls), and estimated intraoperative blood loss averaged

732 ± 415 mL among surgically managed cases. The lower haemoglobin and substantial blood loss reflect the morbidity burden of ectopic gestation in our setting.

In our series, of the 87 cases, 73.6 % were managed surgically (laparotomy or laparoscopy), 14.9% medically (methotrexate) and 11.5% expectantly. Among the 64 surgically managed patients, 76.6 % underwent salpingectomy, 14.1 % salpingostomy, and 9.4 % other procedures (ovarian preservation, adhesiolysis). In many Nigerian studies, surgical management remains predominant. For example, Igwegbe et al. (2013) in South-east Nigeria found salpingectomy in 88.2% of cases and only 2.5% managed medically. The somewhat higher medical and expectant management proportions in our study may reflect evolving practice, earlier diagnosis or patient selection favouring conservative treatment. Nevertheless, the dominance of surgical intervention indicates that many patients still present late, or with tubal rupture or significant bleeding necessitating operative care.

Complications among cases in our study were substantial: tubal rupture documented in 43.7 % of cases, significant intra-abdominal bleeding (>500 mL) in 25.3 %, blood transfusion required in 20.7 %, hypovolemic shock in 13.8 %, prolonged hospital stay (>5 days) in 24.1 %, and maternal death occurred in 1.15 % of cases (one death). These figures underscore the severe morbidity associated with ectopic pregnancy in our setting.

Comparatively, many studies highlight rupture as a common outcome. For example, Oyetunji et al. (2023), in North-west Nigeria, reported that the vast majority of patients presenting had ruptured ectopic pregnancies. A review article emphasised that delayed diagnosis in lower-resource settings leads to higher rupture rates, haemorrhage and need for emergency surgery (Agbon-Ojeme et al., 2023). The maternal death rate of 1.15% in our sample is within the range documented in low- and middle-income countries, but obviously remains concerning given the potentially preventable nature of many of these complications.

This study also explored reasons for delayed presentation among cases on a Likert scale: highest mean scores related to fear of surgery/hospital (4.15 ± 0.95), cost concerns (3.97 ± 1.08), perceived symptoms not serious (3.82 ± 1.01), distance/transport difficulty (3.44 ± 1.23) and preference for traditional healers (2.56 ± 1.34). These findings speak to socio-cultural and health-system barriers underlying late presentation. Several other studies in Nigeria and sub-Saharan Africa have similarly documented that limited awareness of ectopic pregnancy, fear of hospital interventions, cost and transport/logistics hinder early access to care (Olamijulo et al., 2020). Tackling such barriers may be as important as clinical risk factor management in reducing morbidity.

Our findings affirm that ectopic pregnancy in Abia State is significantly associated with risk factors reflecting tubal damage (prior pelvic infection, prior surgery, infertility) and behavioural markers (multiple sexual partners). The high burden of complications and late presentation reinforces the need for improved early detection, public health awareness, timely referral and access to conservative management when feasible.

That prior pelvic infection emerged as the strongest independent predictor emphasises the need for strengthened prevention, diagnosis and treatment of pelvic inflammatory disease. Sexual and reproductive health programmes should include counselling on the risks of multiple sexual partners and sexually transmitted infections, and their downstream implications for fertility and ectopic pregnancy risk.

The high proportion of surgical management and salpingectomy underlines that many women lose future fertility potential, a particularly important concern in a context where childbearing is highly valued. The use of medical and expectant management in a non-negligible minority of our sample suggests some progress, but broader adoption requires earlier presentation, accessible diagnostics (high sensitivity ultrasound, β-hCG monitoring) and appropriate patient selection.

The rates of tubal rupture, significant blood loss, transfusion and hypovolemic shock point to the critical importance of reducing delay to diagnosis and management. Health system strategies might include community education to recognise early symptoms of ectopic pregnancy (pain, amenorrhea, bleeding), reducing fear and cost barriers, expanding access to ultrasound in peripheral centres, and ensuring prompt referral pathways. Traditional healer preference and transport difficulties must be addressed through culturally sensitive interventions and logistical support.

One strength of our study is its case-control design, which allows estimation of adjusted odds ratios and independent predictors of ectopic pregnancy in the local Nigerian context. The relatively large sample of 261 women (87 cases, 174 controls) provides decent power for common exposures. We also collected detailed socio-demographic, behavioural, reproductive, clinical and outcome variables.

However, limitations must be acknowledged. Our study is hospital-based and may not capture women who never presented or who presented at lower-level facilities; thus, there is potential for selection bias. Some exposures (e.g., prior pelvic infection, multiple sexual partners) relied on self-report and may be under- or mis-reported due to social desirability or recall bias. The number of women with an IUD in situ or with a prior ectopic pregnancy was small, limiting precision (as reflected in wide confidence intervals). Residual confounding is always possible. Also, our study setting, being in Abia State, may limit generalisability to other Nigerian states or regions, especially those with different healthcare access, contraceptive prevalence or sociocultural patterns.

CONCLUSION AND RECOMMENDATIONS

Our findings demonstrated that among women in Abia State, the primary independent risk factors for ectopic pregnancy are prior pelvic infection, prior tubal or abdominal surgery, history of infertility and multiple lifetime sexual partners. Clinical presentation is often advanced, with a high rate of rupture and substantial morbidity. To reduce the burden of ectopic pregnancy and preserve maternal health and fertility, efforts should focus on prevention of pelvic infection, public education to encourage early recognition of symptoms and prompt presentation, expanding access to diagnostic services, and prioritising conservative management when feasible. For future research, longitudinal community-based studies could provide better incidence estimates and explore the temporal relationship between risk exposures and ectopic pregnancy. Implementation research evaluating interventions to reduce delay in presentation and widen access to medical management of ectopic pregnancy would also be valuable.

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