

# Clinical Profile, Surgical Treatment, and Outcomes of Ectopic Pregnancy in a Tertiary Training Hospital in the Philippines

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## ABSTRACT

**Objective.** The study aimed to examine the clinical profile, surgical management, and outcomes of patients admitted for ectopic pregnancy.

**Methods.** A five-year retrospective study of ectopic pregnancies admitted in a tertiary training hospital in the Philippines was performed. Data from admission and operating room records were used to obtain the annual cumulative incidence of ectopic pregnancy. Subjects were divided into laparotomy versus laparoscopy groups, and salpingostomy versus salpingectomy groups; differences in the means/medians/mean-ranks and proportions of the different clinical and outcome variables of interest were compared by Student t test/Mann-Whitney U test and chi-square/Fisher exact test of homogeneity, respectively.

**Results.** The cumulative incidence of ectopic pregnancy ranged from 2.30% to 4.01% from 2017 to 2021. A total of 128 patients were included in the final analysis with a mean age of  $27.8 \pm 5.73$  years. The most common identified risk factors were smoking (17.97%), previous ectopic pregnancy (17.19%), and previous tubal surgery (15.62%). The ampulla was the most common site of tubal involvement. Of the 128 patients, 45.31% underwent laparotomy while 54.69% underwent laparoscopy. Salpingectomy was performed in 76.56% of patients. Tubal rupture was noted in 42.97% of cases. Patients with abdominal pain, back pain, shoulder pain, and dizziness were more likely to undergo laparotomy than laparoscopy ( $p < 0.05$ ). A lower  $\beta$ -hCG value was noted in patients who underwent salpingostomy compared to salpingectomy (5,569.80 mIU/mL vs 10,555.47,  $p < 0.05$ ). Salpingostomy was more likely to be performed on patients with previous ectopic pregnancy ( $p < 0.05$ ) and previous tubal surgery ( $p < 0.05$ ) than salpingectomy.

**Conclusions.** The cumulative incidence of ectopic pregnancy in our institution was higher than global estimates. Risk factors and anatomic site of tubal involvement were similar to those reported in literature. Laparoscopy seemed to be underutilized for cases of ruptured ectopic pregnancy. Training on minimally invasive procedures should be provided to point-of-care trainees or residents for patients to be afforded the benefits of laparoscopy.

**Keywords:** ectopic pregnancy, salpingectomy, salpingostomy



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## INTRODUCTION

Ectopic pregnancy is the implantation of a fertilized ovum outside the uterus. The fallopian tube is the most common site of ectopic pregnancy. Specific sites of ectopic pregnancy include ampullary (70%), isthmic (12%), fimbrial (11%), cesarean scar (6%), ovarian (3%), interstitial (2%), abdominal (1%), and cervical (<1%). Risk factors include prior ectopic pregnancy, pelvic inflammatory disease, sexually transmitted infections, smoking, use of an intrauterine device, previous tubal surgery, infertility, and post-operative adhesions from past pelvic surgeries.<sup>1</sup>

Ectopic pregnancies present with a classic triad of symptoms, including delayed menses, vaginal bleeding, and lower abdominal pain. Other signs and symptoms include an adnexal mass, adnexal tenderness, cervical motion tenderness, fullness in the cul-de-sac, and features of shock. The diagnostic evaluation of women with suspected ectopic pregnancy must include a transvaginal ultrasound. Documentation of a gestational sac outside the uterus establishes the diagnosis of ectopic pregnancy and justifies prompt management.<sup>2</sup>

There has been a steady rise in the global incidence of ectopic pregnancy over the last decade.<sup>1</sup> The incidence varies depending on the predominant risk factors present in a specific population and geographic location. Advances in diagnostic techniques have allowed early diagnosis and management of ectopic pregnancy. These advances resulted not only in a reduced risk of tubal rupture and damage but likewise allowed conservative management and preservation of fertility.<sup>3</sup> The mortality rate attributed to ectopic pregnancy is 0.48 to 0.50 deaths per 100,000 livebirths.<sup>4</sup>

Treatment options for tubal ectopic pregnancies include expectant, medical, and surgical management. Candidates for expectant management are hemodynamically stable women with minimal abdominal pain, with an initial  $\beta$ -hCG concentration of less than 1,000 mIU/mL. Medical management may be offered to stable women with  $\beta$ -hCG levels less than 5,000 mIU/mL, ectopic mass less than 3.5 cm in size with absent fetal cardiac activity, and are keen and able to comply with monitoring and follow up. Women who are poor candidates for medical treatment should receive surgical management. Through innovations in technology, laparoscopy has become the standard surgical treatment for ectopic pregnancy. Even cases of ruptured ectopic pregnancy can be managed successfully by laparoscopy. Surgical management may be performed by salpingostomy or salpingectomy depending on the patient's clinical status, desire for future fertility, the extent of damage, and potential for salvage of the affected fallopian tube.<sup>5</sup>

Ectopic pregnancy is the most common cause of maternal morbidity and mortality in the first trimester.<sup>3</sup> As of the time of writing, there has been no published data on the local incidence and management of ectopic pregnancy. This study examined the clinical profile and treatment outcomes of ectopic pregnancy cases admitted for surgical management

through a five-year retrospective study in a tertiary training hospital in the Philippines. Specifically, it aimed to determine the incidence, sociodemographic characteristics, risk factors, presenting symptoms, gestational age at diagnosis, and sonographic findings, while also comparing surgical approaches. In addition, the study evaluated surgical outcomes such as salpingostomy success, intraoperative pelvic inflammatory disease, length of hospital stay, and post-operative complications, and examined the management in 2020-2021 whether COVID status influenced treatment choices.

## MATERIALS AND METHODS

This is a retrospective study describing the cumulative incidence, clinical and demographic profile, treatment, and outcomes of patients with ectopic pregnancy who underwent surgical management in a tertiary academic center in the Philippines from January 1, 2017 to December 31, 2021. Cases confirmed by ultrasonography and/or serum  $\beta$ -hCG determination and underwent surgical treatment were included. The minimum sample size was 128 in order to achieve at least 80% power with 5% two-tailed significance level.

The list of patients admitted for ectopic pregnancy was obtained from the Department of Obstetrics and Gynecology admission logbooks. Systematic random sampling was employed to achieve the minimum sample size. Hospital admission and operating room records were used to obtain and complete the case report forms. Monitoring of patients who underwent salpingostomy included serial determinations of  $\beta$ -hCG one day post-operatively and weekly thereafter until with normal levels.

Data was organized in an Microsoft Excel spreadsheet, and statistical analysis was performed using STATA 17.0. Descriptive statistics was used to summarize the clinical and demographic characteristics, surgical management received, and treatment outcomes of the census of the ectopic pregnancies who underwent surgical management. Frequency and proportion were used for categorical variables, median and interquartile range for discrete numerical and non-normally distributed continuous numerical variables, and mean and standard deviation for normally distributed continuous numerical variables.

The cumulative incidence of ectopic pregnancy among all registered pregnancies during the entire 5-year period, as well as for each year, were presented as cumulative incidence and 95% confidence intervals. Similarly, cumulative incidences of the different post-operative complications among all ectopic pregnancy patients who received surgical management were presented as cumulative incidence and 95% confidence intervals.

Subjects were grouped into laparotomy versus laparoscopy groups, and salpingostomy versus salpingectomy groups; differences in the means/medians/mean-ranks and proportions of the different clinical and outcome variables

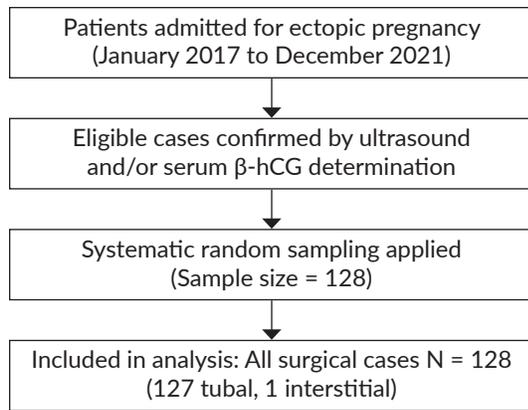


Figure 1. Flowchart of the study.

of interest were compared by Student t test/Mann-Whitney U test and chi-square/Fisher exact test of homogeneity, respectively. Missing variables were neither replaced nor estimated. Analyses were conducted using available cases per variable. In patient charts where certain risk factors (e.g., infertility) were not explicitly documented as negative, these were treated as missing rather than as absence of the condition. The null hypothesis was rejected at 0.05 $\alpha$ -level of significance.

Patients admitted with ectopic pregnancy from January 2017 to December 2021 were screened for eligibility. Those confirmed by ultrasonography and/or serum  $\beta$ -hCG and who underwent surgical management were included. Systematic random sampling was applied to reach the minimum sample size of 128 cases. Data were collected from admission and operating room records, with salpingostomy cases monitored by serial  $\beta$ -hCG. Analyses included cumulative incidence, clinical and demographic profile, treatment, and outcomes (Figure 1).

**Ethics Approval and Consent to Participate**

This study was approved by the University of the Philippines Manila Research Ethics Board (UPMREB 2022-0206-01). All methods were performed in accordance with the National Ethical Guidelines for Health and Health-Related Research (NEGHHR). Waiver of the informed consent form was approved by the UPMREB.

**RESULTS**

The cumulative incidence of ectopic pregnancy in the hospital was 2.30% to 4.01% from 2017 to 2021 (Table 1). A total of 128 cases were included in the study. The mean age of patients was 27.8  $\pm$  5.73 years. Majority were high school graduates (50.78%), single (52.34%), unemployed (74.22%). Table 2 summarizes the demographic characteristics of the study population.

Among the known risk factors of ectopic pregnancy, smoking was found to be the most common (17.97%)

Table 1. Cumulative Incidence of Ectopic Pregnancy from 2017 to 2021

Over-all	Cumulative Incidence	95% Confidence Interval
2017	3.85%	3.42, 4.33
2018	4.01%	3.48, 4.60
2019	3.91%	3.40, 4.48
2020	3.17%	2.56, 3.89
2021	2.30%	1.74, 3.00

Table 2. Clinical Characteristics of the Study Population

Profile	Mean/Median/Count	SD/IQR/%
<b>Age, years</b>	27.8	5.73
<b>Educational Attainment</b>		
Grade school	8	6.25%
High school	65	50.78%
Vocational	9	7.03%
College	46	35.94%
<b>Civil Status</b>		
Single	67	52.34%
Married	30	23.44%
Widowed	2	1.56%
Common-law partner	29	22.66%
<b>Employment status</b>		
Employed	33	25.78%
Unemployed	95	74.22%

followed by previous ectopic pregnancy (17.19%) and previous tubal surgery (15.62%). The median number of lifetime sexual partners was two and median gestational age was 7 weeks. In some charts, risk-factor histories such as infertility were not explicitly documented as negative; these were treated as missing rather than as absence of the condition. Missed menses was the most common presenting symptom (92.97%). Abdominal pain and vaginal bleeding were experienced by 73.44% and 69.53%, respectively. Table 3 summarizes their clinical profile. Other presenting symptoms (9.38%) included back pain, shoulder pain, and dizziness. The mean values of the blood pressure, heart rate, and baseline hemoglobin were within acceptable limits (Table 3).

Of the 128 cases included in the study, 58 underwent laparotomy while 70 underwent laparoscopy. Salpingectomy was performed in 98 patients; 30 patients underwent salpingostomy. The site of ectopic pregnancy was tubal in all cases. All patients presented with an adnexal mass on ultrasound with a mean size of 2.9  $\pm$  1.45 cm. Majority were on the right fallopian tube. The most common site of tubal involvement was the ampulla (92.97%). Rupture was noted in 42.97% of the cases with a mean hemoperitoneum volume of 200  $\pm$  400 mL. Signs of pelvic inflammatory disease were present in 22.66% (Table 4). One patient was diagnosed with an interstitial pregnancy intraoperatively and underwent salpingectomy with cornual resection. This case was excluded from Table 5 (laparotomy vs. laparoscopy comparison of

**Table 3.** Risk Factors and Presenting Symptoms of Patients with Ectopic Pregnancy

Profile	n/mean (N=128)	Percentage/SD
<b>Risk factors*</b>		
Smoking	23	17.97%
Previous ectopic pregnancy	22	17.19%
Previous tubal surgery	20	15.62%
Intrauterine device use	3	2.34%
Sexually transmitted infection	3	2.34%
Infertility	2	1.56%
<b>Presenting symptoms</b>		
Missed menses	119	92.97%
Abdominal pain	94	73.44%
Vaginal bleeding	89	69.53%
Others	12	9.38%
<b>Baseline findings</b>		
Systolic blood pressure, mmHg	111.96	11.96
Diastolic blood pressure, mmHg	73.21	9.38
Heart rate, bpm	90	20.50
Hemoglobin, mg/dL	124	20.50

\*Multiple risk factors and symptoms may be reported per patient; totals exceed 128. In some charts, risk factors (e.g., history of infertility) were not explicitly documented as negative. These were treated as missing values. Missing values were not imputed; analyses were based on available data per variable.

**Table 4.** Ectopic Pregnancy Characteristics

Characteristics	Mean/Median/Count	SD/IQR/%
<b>Sonographic findings</b>		
Adnexal mass	128	100%
Size, cm	2.9	1.45
Laterality		
Right	72	56.25%
Left	56	43.75%
Hemoperitoneum	27	21.09%
<b>Surgical findings</b>		
Site of tubal involvement		
Ampulla	119	92.97%
Interstitial	1	0.78%
Isthmus	8	6.25%
Ruptured tube	55	42.97%
Hemoperitoneum	65	50.78%
Volume, mL	200	400
Presence of PID	29	22.66%

Note: One patient with an interstitial pregnancy underwent salpingectomy with cornual resection. This case was classified under the salpingectomy group in subsequent analyses.

**Table 5.** Comparison of Clinical Characteristics and Treatment Outcomes between Laparotomy and Laparoscopy

	Laparotomy (n = 58)	Laparoscopy (n = 70)	p-value
	Count (%)/ Median (IQR; mean-ranks)		
<b>Gravidity</b>			0.078
G1	17 (29.31%)	20 (28.57%)	
G2-G5	37 (63.79%)	50 (71.43%)	
>G5	4 (6.90%)	0	
<b>Parity</b>			0.397
P0	24 (41.38%)	33 (47.14%)	
P1	17 (29.31%)	33 (31.43%)	
P2-P5	15 (25.86%)	12 (21.43%)	
>P5	2 (3.45%)	0	
<b>Previous ectopic pregnancy</b>	9 (15.52%)	13 (18.57%)	0.648
<b>Previous tubal surgery</b>	9 (15.52%)	11 (15.71%)	0.976
<b>Presenting symptoms</b>			
Missed menses	49 (84.48%)	70 (100.00%)	0.001
Abdominal pain	48 (82.76%)	46 (65.71%)	0.030
Vaginal bleeding	42 (72.41%)	47 (67.14%)	0.519
Others*	9 (15.52%)	3 (4.29%)	0.030
<b>Size of adnexal mass, cm</b>	3.11 (2.11)	2.6 (1.4)	0.059
<b>Site of tubal involvement</b>			
Ampulla	52 (89.66%)	67 (95.71%)	0.140
Isthmus	6 (10.34%)	2 (2.86%)	
<b>Presence of rupture</b>	49 (84.48%)	6 (8.57%)	<0.001
<b>Median blood loss</b>	325 (500)	100 (100)	<0.001
<b>Complications</b>			
Mortality	0	0	-
Need for blood transfusion	17 (29.31%)	0 (0.00%)	<0.001
Infection	0	0	-
Persistent ectopic pregnancy	0	0	-

\*Other presenting symptoms included back pain, shoulder pain, and dizziness.

**Table 6.** Comparison of Clinical Characteristics and Treatment Outcomes between Salpingostomy and Salpingectomy

	Salpingostomy (n = 30)	Salpingectomy* (n = 98)	p-value
	Count (%)/ Median (IQR; mean-ranks)		
<b>Gravidity</b>			0.984
G1	9 (30.00%)	28 (28.57%)	
G2-G5	20 (66.67%)	67 (68.37%)	
>G5	1 (3.33%)	3 (3.06%)	
<b>Parity</b>			0.783
P0	15 (50.00%)	42 (42.86%)	
P1	9 (30.00%)	30 (30.61%)	
P2-P5	6 (20.00%)	24 (24.49%)	
>P5	0	2 (2.04%)	
<b>Previous ectopic pregnancy</b>	9 (30.00%)	13 (13.27%)	0.034
<b>Previous tubal surgery</b>	9 (30.00%)	11 (11.22%)	0.013
<b>Presenting symptoms</b>			
Missed menses	30 (100.00%)	89 (90.82%)	0.115
Abdominal pain	19 (63.33%)	75 (76.53%)	0.152
Vaginal bleeding	21 (70.00%)	68 (69.39%)	0.949
Others	3 (10.00%)	9 (9.18%)	>0.999
<b>β-hCG, mIU/mL</b>	5569.80	10555.47	0.035
<b>Size of adnexal mass, cm</b>	2.35	3.1	0.008
<b>Site of tubal involvement</b>			0.534
Ampulla	27 (90.00%)	92 (93.88%)	
Interstitial	0	1 (1.02%)	
Isthmus	3 (10.00%)	5 (5.10%)	
Fimbria	0	0	
Non-tubal pregnancy	0	0	
<b>Median blood loss</b>	100 (150)	275 (400)	<0.001
<b>Presence of rupture</b>	9 (30.00%)	46 (46.94%)	0.101
<b>Complications</b>			
Mortality	0	0	-
Need for blood transfusion	3 (10.00%)	14 (14.29%)	0.761
Infection	0	0	-
Persistent ectopic pregnancy	0	0	-

\*Includes one patient with interstitial pregnancy who underwent salpingectomy with cornual resection.

tubal pregnancies) but was included under salpingectomy in Table 6. This patient had undergone laparotomy.

All patients who underwent salpingostomy had adequate post-operative decline and subsequent return to normal levels of β-hCG. No cases of mortality and infection were noted in the study.

Patients who presented with abdominal pain, other presenting symptoms, and tubal rupture were more likely to undergo laparotomy compared to laparoscopy. Missed menses were more likely to be the presenting symptom of patients who underwent laparoscopy. Median blood loss and need for blood transfusion were significantly higher in laparotomy cases (Table 5). For these comparative analyses, only unadjusted p-values are presented; no multivariate adjustment was performed. Confidence intervals are provided where applicable.

Patients with larger adnexal masses tend to undergo laparotomy than laparoscopy but this was not significantly

different. There is no sufficient evidence to conclude significant differences with the following characteristics and outcomes when comparing those who underwent laparotomy than those who underwent laparoscopy: gravidity, parity, previous ectopic pregnancy, previous tubal surgery, vaginal bleeding, size of adnexal mass, and site of tubal involvement.

Table 6 shows the comparison of clinical characteristics and treatment outcomes between salpingostomy and salpingectomy. Salpingostomy was more likely to be performed on patients with previous ectopic pregnancy ( $p = 0.034$ ) and previous tubal surgery ( $p = 0.013$ ) compared to salpingectomy. There is significantly lower serum β-hCG values in patients who underwent salpingostomy than those who underwent salpingectomy. Likewise, patients who underwent salpingostomy had smaller size of the ectopic pregnancy (2.35 vs 3.10 cm). The median blood loss was higher in patients who underwent salpingectomy (275 mL vs 100 mL). There was no significant difference in the

presence of rupture and need for blood transfusion between the two groups.

Among the 47 patients admitted during the COVID-19 pandemic, cases with undetermined status at the time of surgery and those with positive swabs underwent laparotomy and salpingectomy. Most of the patients admitted during this period had tubal rupture (68.08%).

## DISCUSSION

Ectopic pregnancy is a potentially fatal condition accounting for 1-2% of all pregnancies.<sup>6</sup> In our institution, the annual cumulative incidence is higher than the reported global incidence and ranges from 2.30 to 4.01% of all obstetric admissions. Studies conducted in India and Nigeria reported lower incidences of ectopic pregnancies at 0.66% and 0.30%, respectively.<sup>3</sup> The true incidence of ectopic pregnancy is difficult to establish because some patients are treated on an outpatient basis and national surveillance may be lacking.<sup>5</sup> The Philippine General Hospital is the national university hospital and end-referral center in the region. As such, it receives cases which cannot be adequately managed by smaller facilities. Among the most common referrals are ectopic pregnancies either for medical or surgical management. Smaller hospitals lack the capacity for laparoscopy and  $\beta$ -hCG monitoring.

The study population had a mean age of 27.8 years similar to reported peak age incidence of ectopic pregnancy of 21 to 30 years. The most common risk factors noted in the study were smoking, previous ectopic pregnancy, and previous tubal surgery. The hospital did not receive patients who underwent assisted reproductive technology. Other less common risk factors noted in the study include history of sexually transmitted infection, intrauterine device use, and history of infertility. The risk for recurrence is estimated to be 10% for women who have had one previous ectopic pregnancy and 25% for those who had two or more.<sup>5</sup> Tubal damage from sexually transmitted infections, most commonly gonorrhea and chlamydia, increases the risk of ectopic pregnancy threefold. Smoking may induce decreased tubal ciliary beat frequency and lower efficiency capture of the oocyte-cumulus complex. However, up to 50% of women with ectopic pregnancies have no identifiable risk factor.<sup>6</sup>

The cases were diagnosed based on history taking, clinical evaluation, and transvaginal ultrasound. Determination of serum  $\beta$ -hCG was performed in some cases who were deemed as candidates for salpingostomy. Most patients presented with the classic triad of missed menses, abdominal pain, and vaginal bleeding. Sonographic evaluation revealed the presence of an adnexal mass. Histopathology confirmed the diagnosis of ectopic pregnancy in all cases.

The most common interventions for ectopic pregnancy are medical management and surgery.<sup>6</sup> Methotrexate is a folic acid antagonist which inhibits dihydrofolate reductase. Rapidly dividing cells such as trophoblasts are particularly

vulnerable to its actions. Medical management with systemic methotrexate therapy is more cost-effective than surgery while maintaining treatment success and fertility prospects.<sup>7</sup> Absolute contraindications to methotrexate include hemodynamic instability, heterotopic pregnancy, abnormal liver function test, leukocytopenia (WBC <1500 u/L), thrombocytopenia (platelet <100,000 u/L), elevated creatinine level, current breastfeeding, active pulmonary and peptic ulcer disease, anemia, and known sensitivity to methotrexate.<sup>7</sup>

In our institution, patients deemed as good candidates for medical management are initially admitted for administration of methotrexate. Response to treatment is assessed by comparing the baseline serum  $\beta$ -hCG to the day 4 value. A decrease in  $\beta$ -hCG of more than 10-15% can be used as a predictor of success of medical management.<sup>8</sup> The patient is then managed on an outpatient basis if with sufficient decrease. They are advised monitoring of symptoms and weekly  $\beta$ -hCG levels. Patients are allowed to have their laboratory test done in other facilities. Documentation of serial serum  $\beta$ -hCG levels in hospital records was not consistent. Thus, these were excluded from the study.

Surgical management is indicated in patients with hemodynamic instability, contraindications to methotrexate, or evidence of intraabdominal bleeding. While reproductive outcomes are not significantly different between laparotomy and laparoscopy, purported advantages of laparoscopy are decreased length of hospital stay, faster recovery, decreased post-operative pain, and lower blood loss.<sup>9</sup> Laparoscopy has now been regarded as the gold standard for surgical treatment of ectopic pregnancy. However, laparotomy remains to be the most common surgical procedure in most local hospitals due to lack of infrastructure, equipment, and skilled physicians.<sup>10</sup> A recent study in Indonesia by Pramana et al. highlights surgeon preference to laparotomy as the approach in managing ruptured ectopic pregnancies.<sup>11</sup>

In the study, patients who presented with abdominal pain, shoulder pain, back pain, and vomiting were more likely to undergo laparotomy than laparoscopy. Laparotomy was significantly associated with the higher blood loss and need for blood transfusion compared to laparoscopy. These may indicate consequential tubal rupture thus necessitating emergency surgery. In our institution, laparotomy cases are performed in a shorter interval from admission compared to laparoscopy. Laparotomy is done by the residents-on-duty. On the other hand, laparoscopy cases are referred to the subspecialty services and performed by fellows-in-training. This reflects the need to train residents on the skills of laparoscopy to be able to perform the procedure on an emergency basis and provide patients with the benefits of laparoscopy.

The blood transfusion rate in the study was 29.31%. All cases had baseline hemoglobin levels below 100 g/dL, while 10 of 17 patients were tachycardic. The rate is higher compared to published data on the risk of blood transfusion

in cases of ectopic pregnancy necessitating surgery. Cullifer and his colleagues reported an overall transfusion rate of 8.7%. This may be due to the late presentation of patients and lack of efficient referral systems.<sup>12</sup>

There are two operative techniques used for surgical treatment of tubal pregnancy: salpingectomy and salpingostomy. In salpingostomy, a 1-2 cm longitudinal incision is made on the antimesenteric surface of the fallopian tube directly over the distended mass using an electrosurgical needle or scissors or a laser. The products of conception are gently detached with forceps or irrigation.<sup>13</sup> The tubal incision is left open to heal by secondary intention. Attempts at linear salpingostomy are successful in approximately 80% of women. In the remainder, persistent bleeding may require salpingectomy.<sup>14</sup>

Meanwhile, salpingectomy is preferred when the affected fallopian tube is severely damaged or when significant bleeding is encountered despite attempts at achieving hemostasis. Unilateral salpingectomy is a method of choice in patients desiring future fertility with a distorted tube when the contralateral tube appears normal or when the patient wants permanent sterilization. A Cochrane review reported no significant difference in recurrence rates and subsequent intrauterine pregnancy between the two techniques.<sup>13</sup> However, in undifferentiated cohort studies, salpingectomies are associated with a lower rate of subsequent intrauterine pregnancy and recurrent ectopic pregnancy.<sup>13</sup>

The study showed that more patients underwent salpingectomy compared to salpingostomy (76.56% vs 23.44%). This may be due to their late presentation, with higher serum  $\beta$ -hCG levels, greater size of the adnexal mass, and signs of tubal rupture. In patients with previous ectopic pregnancy and previous tubal surgery, salpingostomy was the procedure of choice to preserve fertility. Early consult upon suspicion of pregnancy should be emphasized to reproductive-aged patients for early recognition and management of ectopic pregnancy.

More than one-third of patients (36.71%) were admitted from 2020 to 2021 during the COVID-19 pandemic. All patients with undetermined COVID status and positive swabs underwent laparotomy and salpingectomy. This was based on the recommendation of local societies to defer a laparoscopic approach for emergency cases. Exploratory laparotomies were favored instead to decrease viral transmission during aerosol-generating procedures such as intubation, electrosurgery, and gas insufflation. Majority of the cases admitted during the pandemic had tubal rupture probably due to delayed consults brought about by travel restrictions. Patients may also defer hospital consults due to fear of infection. Dvash et al. reported a higher rate of ruptured ectopic pregnancies during the COVID-19 pandemic. There was a threefold increase in rupture rates and a fourfold larger volume of hemoperitoneum upon exploration of the abdomen.<sup>15</sup> Barg and his colleagues in Israel described similar results.<sup>16</sup> There was delayed presentation

of patients with ectopic pregnancy undergoing subsequent emergency surgery. Excessive blood loss was identified as a complication and collateral effect of the pandemic.

The study did not evaluate the post-operative pain level, recovery time, and length of hospital stay which are among the purported benefits of laparoscopy. The blood transfusion associated with laparotomy is most likely due to the late presentation and diagnosis of patients. Awareness of the condition and its life-threatening nature is critical for timely management. Strong referral systems should be established between healthcare providers. Meanwhile, laparoscopy remains to be underutilized in our institution despite its reported benefits. Advanced surgical training programs for residents should be undertaken to promote its practice. Through the availability of skilled surgeons, laparoscopy may be offered in the emergency setting.

An algorithm or decision tree for the management of ectopic pregnancy is recommended. Decision trees are highly effective analytical tool to help decide the best course of treatment. An institutional algorithm may be established guided by the findings of this study. Further research on patients who underwent medical management may likewise be undertaken.

### Limitations of the Study

The study was limited to patients admitted to the obstetrical wards of a tertiary academic center. The study results may not apply to patients admitted to other hospitals. This retrospective study has limited data available for some parameters, including duration and severity of symptoms before arriving at the emergency room and the availability of medical care. Moreover, in several patient charts, risk factor history of infertility was not explicitly documented as negative; thus, these were treated as missing rather than as absence of risk. Medical management was not included in the study because there is inconsistent documentation of serum  $\beta$ -hCG levels on monitoring.

Because the study relied on systematic random sampling of cases from admission logbooks, it is possible that non-tubal ectopic pregnancies were not included in the study population. As such, the findings are most applicable to tubal ectopic pregnancies.

Potential sources of bias included retrospective data collection and reliance on hospital admission logs, which may underestimate true incidence since outpatient or medically managed cases were not captured. Efforts were made to minimize bias by using systematic random sampling and standardized case report forms.

### CONCLUSION

Prompt recognition of ectopic pregnancy is important for its timely treatment. The cumulative incidence of ectopic pregnancy was higher than reported values in literature. Laparoscopy seemed to be underutilized in the management

of ruptured ectopic pregnancy in the institution. Training residents on laparoscopic procedures should be undertaken to be able to provide the gold standard management to patients with ectopic pregnancy.

### Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Statement of Authorship

Both authors certified fulfillment of ICMJE authorship criteria.

### Author Disclosure

Both authors declared no conflicts of interest.

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