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Review Article

A Scoping Review of Risk Factors and Implantation Sites in Ectopic Pregnancy

Halfie Zaqiyah Gusti Puspitasari[1], **Agung Subakti Nuzulullail**[1], **Dwina Oktavia Deli**[1], **Elsi Dwi Hapsari**[2], **Wiwin Lismidiati**[2]

[1] Master of Nursing Study Program, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
[2] Department of Pediatric and Maternity Nursing, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

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Abstract

Ectopic pregnancy Ectopic pregnancy is an obstetric condition with serious clinical consequences. This study aims to map the risk factors and location of ectopic pregnancy implantation based on the latest evidence. The design of this study is a scoping review with literature searches conducted on May 20–23, 2025, through ScienceDirect, PubMed, Web of Science, and ProQuest. Inclusion criteria included open-access original articles published between 2020 and 2025 that reported risk factors and implantation sites for ectopic pregnancy. Theoretical articles and instrument development studies were excluded. The selection and synthesis process followed the PRISMA-ScR (2020) guidelines, the JBI Critical Appraisal Checklist (2020), and the Guidance for Conducting Systematic Scoping Reviews (2015). Of the 5,519 articles identified, eight studies with observational (n=7) and cross-sectional (n=1) designs met the criteria. The synthesis results showed that a history of previous ectopic pregnancy was the most consistently reported risk factor, followed by a history of surgery and infertility. The most common implantation site was the fallopian tube, particularly in the ampulla, fimbria, and isthmus. These findings emphasize the importance of comprehensive identification of risk factors to support more effective prevention, early detection, and long-term management strategies.

INTRODUCTION

Ectopic pregnancy (EP) is a complex health issue in women that can increase morbidity and mortality rates. Its clinical presentation not only affects physical condition but also psychological well-being [1]. In 2019, the global incidence of EP was recorded at 6.7 million cases. The three countries with the highest incidence rates were Nigeria, Papua New Guinea, and Chad [2]. Although some studies have reported a decline in incidence rates over the past few years, EP remains prevalent in low-income countries. This is due to limited access to healthcare services, low health education levels, and insufficient

Corresponding author:
Agung Subakti Nuzulullail
Email: baktiagungsn@gmail.com
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early detection, particularly in the context of maternal and child health [3].

Early detection plays a crucial role in diagnosing EP. Diagnosis should be confirmed using transvaginal ultrasound (USG) with serial HcG testing [4]. Other methods used to confirm the diagnosis of EP include experimental serum markers (Activin-AB, Pregnancy-Associated Plasma Protein A, ADAM-12, microRNA), endometrial sampling, and hematological examinations such as complete blood counts, primarily to assess platelet count and platelet characteristics, as well as creatinine phosphokinase (CPK) testing [5]. Lower abdominal pain and vaginal bleeding outside the menstrual cycle should be a cause for concern in sexually active women. This may indicate the occurrence of EP. Therefore, further examination with early ultrasound is necessary as soon as possible [6].

Women suspected of having EP generally complain of abdominal or pelvic pain, abdominal discomfort, cervical pain during sexual intercourse, and vaginal bleeding [7]. However, some cases do not show symptoms, causing women to delay seeking medical help [8]. On the other hand, women with EP cannot sustain their pregnancy due to the high risk of bleeding and other complications [9]. In addition, miscarriage or termination due to EP can lead to complications in subsequent pregnancies and worsen psychological conditions, including depression, anxiety, and Post-Traumatic Stress Disorder (PTSD) [10,11].

Several studies have reported various risk factors and locations of EP implantation, but the findings still show variation and inconsistency. Low knowledge, especially among older women, those with low education and income, and ethnic minorities, also hinders prevention efforts [12]. EP also has long-term effects, such as the risk of recurrence in subsequent pregnancies and the severity of complications is influenced by the location of implantation and the management provided [13,14]. The variation in findings indicates the need for comprehensive evidence mapping. Therefore, this review aims to identify and map risk factors and implantation sites for ectopic pregnancy based on the latest research evidence.

METHOD

Research Design

A scoping review design was used in this study to systematically map and synthesize existing evidence and identify gaps in the literature. This study was conducted to answer the question "*what are the risk factors for ectopic pregnancy and where does it occur*?". The writing was conducted using the Arksey and O'Malley approach with the following stages: (1) formulating research questions, (2) identifying relevant studies, (3) selecting studies, (4) mapping data, and (5) compiling, summarizing, and reporting findings [14].

Search Strategy

The researchers conducted a literature review using four data sources, including ScienceDirect, PubMed, Web of Science, and ProQuest, from May 20 to 23, 2025. Inclusion and exclusion criteria were used to obtain relevant articles. The inclusion criteria were original articles published between 2020 and 2025, open access, and articles that discussed and reported risk factors and implantation sites in ectopic pregnancy. For the exclusion criteria, the researchers excluded articles that discussed ectopic pregnancy theoretically and studies that developed measurement tools. The selected articles were also considered based on the PCC framework: Population: women of reproductive age (15–49 years), Concept: risk factors and location of ectopic pregnancy, Context: clinical studies in a healthcare setting. In the article search process, the researchers used keywords found in Medical Subject Headings (MeSH) with the following boolean operator:

("ectopic pregnancy" OR "tubal pregnancy" OR "ovarian pregnancy") AND ("risk factor" OR "associated factor" OR "ectopic pregnancy risk factor") AND ("location" OR "implantation site" OR "implantation").

Article Selection

The article selection process was conducted by three researchers independently, referring to the PRISMA-ScR (2020) guidelines and using Rayyan software to support the screening process. The screening stages included identifying and removing duplicate articles, assessing the suitability of titles and abstracts with the research focus based on the PCC scheme, and applying the predetermined inclusion criteria (original articles, published between 2020 and 2025, and reporting risk factors and EP implantation) and exclusion criteria (theoretical articles and instrument development). After duplicates were removed, three researchers independently reviewed the titles and abstracts, then reviewed the full text for compliance with the inclusion and exclusion criteria to determine final eligibility and answer the research questions. Differences of opinion were resolved through discussion until consensus was reached to minimize bias and ensure accuracy and consistency in article selection (Rožanc & Mernik, 2021; Page et al., 2021).

Critical Appraisal

Article quality assessment is not a mandatory step in scoping reviews. However, in this study, appraisal was still carried out to assess the reliability, quality, relevance, and validity of the articles used so as to minimize potential bias in decision making [16]. All selected articles were assessed by three researchers independently using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist (2020). The critical appraisal checklist was customized to the methodologies employed in the selected articles, and each inquiryconsisted of four response options: Yes=1, No=0, Not Applicable=0, and Unclear=0. After all questions were answered, the articles were categorized as include or exclude based on the assessment results. Articles were included and proceeded to the data synthesis process if they had a good score (>70%). Differences in assessment results between researchers were discussed together to ensure objectivity and consistency in determining the quality of each article.

Article Extraction and Synthesis

The researchers used the Guidance Conducting Systematic Scoping Review Guidelines to extract and synthesize articles. The components sought included authors and year, research objectives, research design, country, population involved, and research results [17]. A narrative-descriptive approach was used to integrate research findings conducted through systematic synthesis. The researchers then grouped the findings from the data obtained based on the extraction results to identify risk factors and locations of ectopic pregnancies.

RESULT

Search Result

The results of the article search used in this study are described in a structured manner in PRISMA:

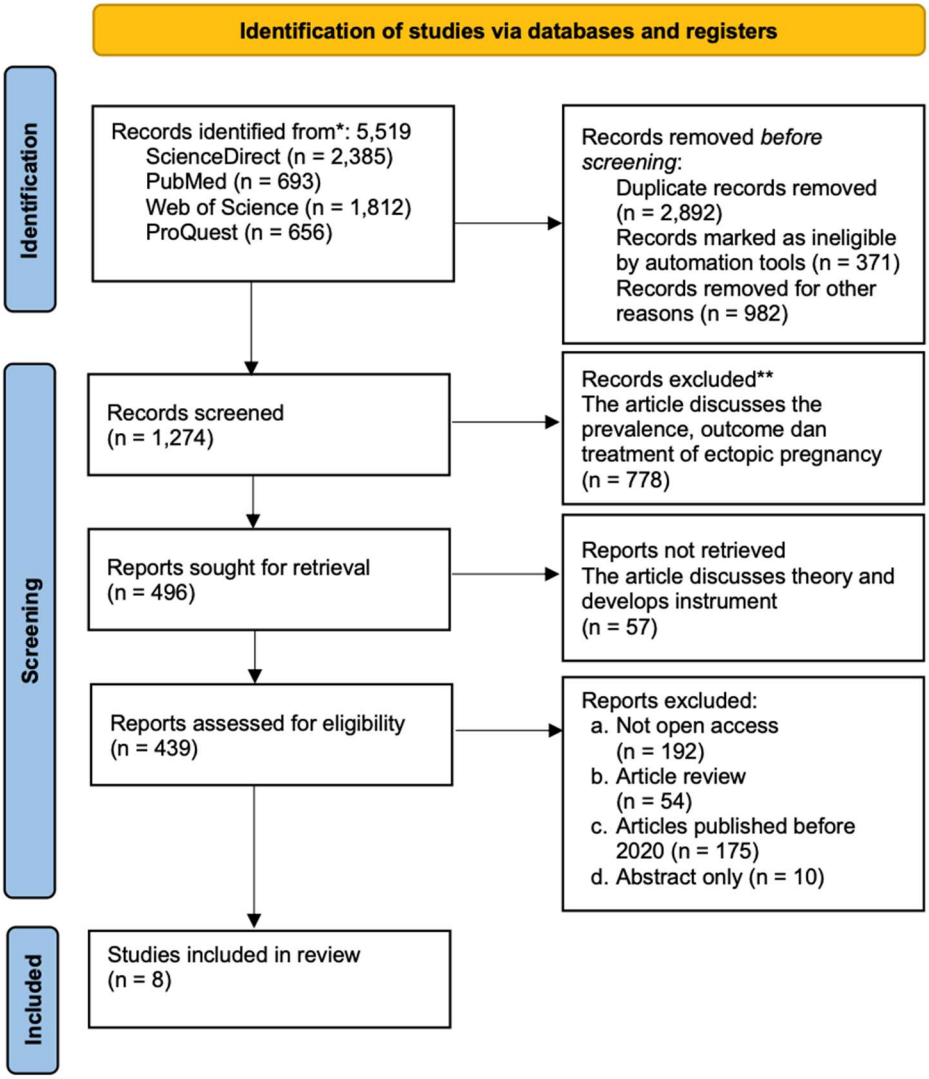

Figure 1.
PRISMA flowchart in article search

The researchers obtained 5.519 articles from four data sources, namely ScienceDirect (n= 2.385), PubMed (n= 693), Web of Science (n=1.812), and ProQuest (n= 656). The articles were then subjected to further screening by checking for duplicates (n=2.892), automatically excluded (n=371), and excluded for other reasons (n=982), resulting in 1.274 articles for further analysis. In the next screening stage, the researchers excluded articles discussing prevalence, outcomes, and treatment of ectopic pregnancy (n=778). Additionally, the researchers also excluded articles discussing theory and instrument development in ectopic pregnancy (n=57), leaving 439 articles. In the final screening stage, articles that were not openly accessible (n=192), literature reviews (n=54), articles published before 2020 (n=175), and those available only as abstracts (n=10) were excluded. The final screening yielded 8 articles suitable for extraction and further analysis.

Risk of Bias Assessment

Based on the results of the article quality assessment conducted by the researchers, all articles used were of good quality with low bias. All articles scored ≥87.5% (table 1), with most questions in the JBI critical appraisal checklist answered “yes” [15].

Study Characteristic

There were eight articles extracted in this study. Six of the articles used were retrospective studies [18–23], one cross-sectional study [24], and one prospective study [25]. The study locations reported in the articles were China (n= 4), India (n= 2), Brazil (n= 1), and Austria (n= 1). The population involved in the studies included not only women with primary ectopic pregnancy but also women with secondary ectopic pregnancy, intrauterine pregnancy, and number of deliveries. Most articles not only discussed risk factors and the location of ectopic pregnancy but also the symptoms experienced, clinical conditions, and the time interval between recurrent ectopic pregnancies (table 2).

Table 1.
JBI Critical appraisal result

Author and Year	Research Design	Assessment Result
Wang et al., 2020	Retrospective case-control Study	9/10 (90%)
Andola et al., 2021	Cross-Sectional	7/8 (87,5%)
Trindade et al., 2021	Retrospective case-control study	9/10 (90%)
Murtinger et al., 2020	Retrospective single-center study	11/11(100%)
Lin et al., 2024	Retrospective matched-pair study	11/11 (100%)
Ji et al., 2024	Retrospective case-control study	9/10 (90%)
Huang et al., 2024	Retrospective cohort study	11/11 (100%)
Nalini et al., 2023	Prospective observational study	7/8 (87,5%)

Table 2.
Data Extraction

Author and Year	Aim	Design	Country	Population	Result
Wang et al., 2020	Identifying risk factors for recurrent EP.	*Retrospective Case-Control Study*	China	162 patients a. 81patients with recurrent EP b. 81 with primary EP	a. The average interval between EP is 25 months. b. Risk factors for recurrent EP include low educational attainment, infertility, prior salpingotomy, and a history of abortion. c. Patients with recurrent EP often experience adhesions in the pelvic region or fallopian tubes.
Andola et al., 2021	Reviewing clinical presentations, risk factors, mortality, and morbidity associated with EP.	*Cross-Sectional*	India	42 patient (19-36 years old)	a. The risk factors for EP identified were vaginal discharge (36%), history of tubal ligation (11%), pelvic inflammatory disease (9%), infertility (7%), use of intrauterine contraceptive devices (7%), history of dilation and curettage (7%), and tuberculosis (2%). b. The most commonly reported symptoms include amenorrhea (83.33%), abdominal pain (73.81%), bleeding (59.52%), and other symptoms (nausea, vomiting, syncope) (33.33%) c. The location of EP occurs in the ampulla (61.90%),

Author and Year	Aim	Design	Country	Population	Result
					fimbrial (11.90%), and isthmus (9.52%). d. The most common treatment is unilateral laparoscopy salpingectomy.
Trindade et al., 2021	Reviewing risk factors for EP after In Vitro Fertilization (IVF) procedures.	*Retrospective case-control study*	Brazil	499 patients a. 90 EP patient b. 409 intrauterine pregnancy	a. EP occurs in approximately 2.35% of cases after IVF. b. One significant risk factor for EP after IVF is being an oocyte recipient (ORP).
Murtinger et al., 2020	Understanding the risk of EP in In Vitro Fertilization (IVF) programs.	*Retrospective single-center study*	Austria	a. Clinical population: 5,061 pregnancies b. 43 cases of EP	a. The location of EP occurs in the fallopian tubes b. Risk factors that increase the incidence of EP include infertility, uterine abnormalities, uterine pathology (polyps, fibroids), history of uterine surgery (polypectomy, myomectomy), history of previous ectopic pregnancy, and history of previous tubal surgery. c. Factors related to embryo transfer include endometrial thickness (<8 mm and >12 mm) and low blastocyst expansion.
Lin et al., 2024	Reviewing whether a history of EP is an independent risk factor for recurrent EP in IVF programs.	*Retrospective matched-pair study*	China	268 women a. Case group: 67 EP b. Control group: 201 non-EP	a. Women with a history of ectopic pregnancy are at risk of recurrent EP. b. Women with a history of EP still have the chance of pregnancy and live birth. c. Recurrent EP often occur in the fallopian tubes and cornua uteri.
Ji et al., 2024	Evaluating the relationship between body mass index (BMI) and EP.	*Retrospective case-control study*	China	2.119 woman a. Case group: 659 EP b. Control group: 1,460 childbirth	a. The average age of patients with EP is 31 years old. b. Most patients with EP have a normal BMI (75.6%). c. Other related risk factors include age >35 years, history of previous, history of induced abortion, and low BMI (18 kg/m2).
Huang et al., 2024	Evaluating the relationship between endometrial thickness and EP.	*Retrospective cohort study*	China	27,549 women underwent frozen embryo transfer cycles a. 27.086 intrauterine pregnancy b. 463 EP	a. Endometrial thickness is associated with the occurrence of EP. b. The average EP occurs at an endometrial thickness of 8.35 ± 1.44 mm. c. Other risk factors increasing the incidence of EP in thin endometrium include Diminished Ovarian Reserve (DOR), tubal factor infertility, number of embryos transferred, and embryo development stage.

Author and Year	Aim	Design	Country	Population	Result
Nalini et al., 2023	Assessing the clinical profile, risk factors, management, and outcomes of EP.	*Prospective observational study*	India	1,350 outpatients, with 75 patients experiencing EP	a. The most common symptoms are amenorrhea (97.3%), lower abdominal pain (94.7%), vaginal bleeding (40%), and syncope (8%). b. The most common locations for EP are the ampulla, fimbria, uterine horns, ovaries, isthmus, and infundibulum. c. Risk factors identified include pelvic inflammatory disease (19.5%), history of medical abortion (15%), history of cesarean section (14.5%), and spontaneous abortion (11.25%). d. The most common management for EP cases is surgical procedures (98.7%) and medical treatment (1.3%). e. Common complications include rupture and hemoperitoneum.

The synthesis of findings from all included articles subsequently identified a range of reported risk factors for ectopic pregnancy. These factors were categorized into obstetric history, surgical or medical interventions, underlying medical conditions, assisted reproduction, uterine anatomy, demographic characteristics, and general health status. The categorization was conducted to organize the breadth of evidence identified across the included studies (Table 3).

Table 3.
Risk Factors for ectopic Pregnancy

Obstetric history	1. Previous history of ectopic pregnancy [19–21,23] 2. History of induced or spontaneous abortion [19,23,25] 3. Use of intrauterine contraceptive devices[24]
History of surgery or medical interventions	1. History of surgery (salpingotomy, salpingectomy, polypectomy, myomectomy, tubectomy) [21,23,24] 2. History of cesarean section [25] 3. History of dilation and curettage [24]
Medical conditions and diseases	1. Pelvic inflammatory disease [24,25] 2. Infertility [18,21,23,24] 3. Tuberculosis [24] 4. Endometriosis [18] 5. *Diminished Ovarian Reserve* (DOR) [18] 6. Uterine pathology (polip, mioma) [21] 7. Vaginal discharge [24]
Assisted reproduction and embryos	1. Oocyte recipient [22] 2. Number of embryos transferred [18] 3. Low blastocyst expansion [21]
Anatomy and structure of the uterus	1. Uterine abnormalities [21] 2. Endometrial thickness [18,21]
Demographics	1. Age >35 years [19] 2. Low education level [23]
Health status	Body mass index <18 kg/m^2 [19]

The review also mapped the reported anatomical sites of implantation in ectopic pregnancy. The fallopian tube was described across studies, with implantation occurring in the ampullary, fimbrial, isthmic, and infundibular segments (Table 4).

Table 4.
Implantation sites

Fallopian tube:	[21,23–25]
a. Ampulla	
b. Fimbrial	
c. Isthmus	
d. Infundibulum	
Cornual uterus	[20,25]
Ovary	[25]

Risk Factors for Ectopic Pregnancy

Based on the analyzed literature, researchers categorized the findings on risk factors for ectopic pregnancy into seven groups: obstetric history, history of surgery or medical intervention, medical conditions and diseases, assisted reproduction and embryo transfer, uterine anatomy and structure, demographics, and health status. Most studies indicate that the most common factor causing ectopic pregnancy is a history of previous ectopic pregnancy [19–21,23]. Other dominant factors include a history of surgery (salpingotomy, salpingectomy, polypectomy, myomectomy, tubectomy) [21,23,24] and a long history of infertility [18,21,23,24]. Ectopic pregnancy is also commonly found in assisted reproductive technology using IVF, where risk factors are associated with the oocyte recipient [22], the number of embryos transferred [18], and low blastocyst expansion [21]. On the other hand, there are risk factors related to the anatomy and structure of the uterus as the site of ectopic pregnancy attachment, such as uterine malformations [21] and endometrial thickness that is too thin or too thick [18,21]. In ectopic pregnancy, there are modifiable risk factors, including age >35 years [19], low education level [23], and having a BMI <18 kg/m^2 [19].

Implantation sites of Ectopic Pregnancy

Ectopic pregnancy most commonly occurs in the fallopian tubes. The locations include the ampulla, fimbrial, isthmus, and infundibulum [21,23–25]. Other sites of attachment include the cornual uterus [20,25] and the ovary [25].

DISCUSSION

Maternal death in early pregnancy. The symptoms experienced by women with EP are similar to those of normal pregnancy, so there is a risk of misdiagnosis if not analyzed properly [26]. Various risk factors associated with EP have been identified, with four of the most common being a history of previous EP, pelvic inflammatory disease, infertility, and a history of surgery in the abdominal or pelvic area [27]. Additionally, other risk factors associated with EP include pregnancy age over 35 years, smoking habits, IUD use, anatomical abnormalities of the reproductive system, and the use of assisted reproductive technology [28,29]. This aligns with findings from the literature review conducted. Another risk factor to consider is maternal malnutrition. Therefore, nutritional management for pregnant women to prepare for pregnancy is crucial in preventing serious complications [30].

Several of these risk factors are associated with pathophysiological mechanisms that can increase the likelihood of ectopic pregnancy [31]. For example, pelvic inflammatory disease and a history of pelvic surgery can cause damage to the structure of the fallopian tubes and impair the function of the cilia that transport the zygote to the uterine cavity [32]. Disruption of this transport process can cause the embryo to implant before reaching the uterus. In addition, smoking has also been reported to affect fallopian tube motility and ciliary function, thereby increasing the risk of abnormal implantation outside the uterine cavity [33].

In addition to risk factors, the location of the ectopic pregnancy is also important to consider. Many studies report that ectopic pregnancies frequently occur in the fallopian tubes. It is also not uncommon for ectopic pregnancy to occur in scar tissue, particularly cesarean scars, the cervix, and the abdomen, although the prevalence is low and it is rare (Angielczyk et al., 2025; Marlina et al., 2024; Matorras et al., 2020; Mullany et al., 2023). Recent research indicates that EP has also been found in the broad ligament [38]. Another location where implantation occurs in EP is the interstitial area. In reported cases, symptoms are rarely felt, but it is commonly found in first pregnancies (primigravida) [39]. In another case study, EP was also found in the rectum. This case is extremely rare and requires further medical examination using laparotomy to confirm it [40].

These variations in implantation sites indicate that the abnormal implantation process in ectopic pregnancies is influenced not only by clinical risk factors, but also by the anatomical and physiological conditions of the female reproductive system [41,42]. Changes in the structure of the fallopian tubes, chronic inflammatory processes, and hormonal disturbances can contribute to the implantation of embryos in inappropriate locations. Therefore, understanding the variation in ectopic pregnancy locations is important for improving clinical awareness and diagnostic accuracy [42].

Currently, interventions for ectopic pregnancy focus on managing the condition to reduce the risk of complications for the mother. Management of ectopic pregnancy involves the administration of medications such as methotrexate, expectant management, and surgical procedures, with the most common being laparoscopy, salpingectomy, and salpingostomy [6,43]. The earlier an ectopic pregnancy is addressed, the better the long-term reproductive outcomes. This is associated with the likelihood of a healthy intrauterine pregnancy and live birth. Women who experience an ectopic pregnancy with rupture can also have positive pregnancy outcomes if managed appropriately [44,45]. However, women are advised to delay pregnancy for at least three months after experiencing an ectopic pregnancy. This delay can also be achieved using contraception, although it is one of the risk factors for ectopic pregnancy [46].

Early identification of risk factors identified in this review has important implications for clinical practice, particularly in improving antenatal care and early diagnosis of ectopic pregnancy [47]. Healthcare professionals can utilize information such as a previous history of ectopic pregnancy, infertility, pelvic inflammatory disease, and prior pelvic or abdominal surgery to stratify women who may be at higher risk during early pregnancy [48]. Women with these risk profiles may benefit from closer clinical monitoring, including earlier confirmation of pregnancy location through serial β-hCG measurement and transvaginal ultrasound [49]. In addition, integrating risk assessment into early antenatal care visits allows healthcare providers to provide targeted counseling regarding warning symptoms, such as abdominal pain and abnormal vaginal bleeding, which may indicate ectopic implantation [48]. By incorporating risk factor identification into routine reproductive health assessments, healthcare professionals can facilitate earlier detection of ectopic pregnancy, reduce the likelihood of delayed diagnosis and rupture, and ultimately improve maternal safety and future reproductive outcomes.[49,50]

These findings highlight the complexity of ectopic pregnancy prevention and management strategies, particularly regarding the use of contraception to delay pregnancy after a PE event . While contraception can help allow the reproductive system time to recover [51],

education regarding appropriate contraceptive method selection and reproductive health monitoring are still needed to minimize the risk of future ectopic pregnancies [52].

All interventions performed for ectopic pregnancy must be well-educated. However, knowledge about ectopic pregnancy remains low, particularly regarding its risk factors [53]. Additionally, various symptoms experienced do not directly indicate ectopic pregnancy. Nausea, vomiting, fever, and abdominal pain can also be experienced in other diagnoses such as endometrioma, neoplasms, and tubo-ovarian abscesses [54]. Another example is the relationship between risk factors for pelvic inflammatory disease and ectopic pregnancy. This condition is also associated with bacterial vaginosis (BV) and Mycobacterium tuberculosis infections. This implies that prevention of ectopic pregnancy can begin with maintaining reproductive organ hygiene [55]. Therefore, health promotion regarding ectopic pregnancy needs to be enhanced, including the development of innovative media. Access to healthcare and post-ectopic pregnancy follow-up are integral components of efforts to prevent and manage ectopic pregnancy optimally in the long term.

The findings of this review have important implications for nursing and midwifery practice, particularly in the prevention and early detection of ectopic pregnancy. Nurses and midwives play a key role in conducting early risk screening during reproductive health and antenatal services by identifying women with known risk factors such as previous ectopic pregnancy, pelvic inflammatory disease, infertility, or a history of pelvic surgery. In addition, counseling should be provided to women with a previous history of ectopic pregnancy regarding potential recurrence risks, early warning symptoms, and the importance of early pregnancy confirmation. Nurses and midwives are also involved in monitoring women undergoing assisted reproductive technologies, as these patients may have a higher risk of ectopic implantation and require closer observation during early pregnancy to support timely diagnosis and appropriate management.

This review presents a comprehensive mapping of evidence on various risk factors and implantation sites in ectopic pregnancy, with consistent findings that a history of previous ectopic pregnancy, infertility, and a history of surgery are the most frequently reported factors. The strength of this review lies in its systematic approach to identifying and synthesizing the latest evidence, thereby providing a clearer picture of the clinical complexity of ectopic pregnancy and the importance of early detection and appropriate management, particularly in the context of preconception preparation. However, the results of this review need to be interpreted with consideration of several limitations, such as limited data on specific populations, variations in the study designs included, and the paucity of reports on rare implantation sites. Therefore, further research is needed to strengthen the evidence regarding risk factors and to develop more effective strategies for the prevention and management of ectopic pregnancy risks.

CONCLUSION

Previous history of EP, surgical procedures such as polypectomy and myomectomy, and infertility are the most commonly reported risk factors, accompanied by other conditions such as pelvic inflammatory disease, endometriosis, uterine pathology, and leukorrhea. EP most commonly occurs in the fallopian tubes, although it can be found in other less common locations such as the uterine cornua, ovaries, cesarean section scars, cervix, broad ligament, and rectum. Delayed detection can lead to emergency conditions such as bleeding. These findings have important implications for clinical practice, particularly in

increasing awareness and screening for risk in women with a history of EP, infertility, or gynecological surgery. In the context of reproductive health education, there is a need to strengthen education on risk factors, signs and symptoms of EP, and the importance of early detection to encourage adaptive reproductive behavior. Furthermore, future research should focus on developing risk-based prevention strategies, more effective screening models, and evaluating long-term interventions to reduce EP recurrence rates and complications.

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