

Literature Review: The Effect of Maternal Age on the Incidence of Ectopic Pregnancy

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Article Info	Abstract
Article History Submitted, 2026-04-12 Accepted, 2026-05-19 Published, 2026-06-30	Ectopic pregnancy is a life-threatening obstetric emergency and remains a major cause of maternal morbidity and mortality during the first trimester of pregnancy. Maternal age has been recognized as one of the potential risk factors; however, findings across studies remain inconsistent. This literature review aimed to synthesize current evidence regarding the association between maternal age and the occurrence of ectopic pregnancy. A literature review was conducted using articles published between 2021 and 2026. Literature searches were performed in Google Scholar, GARUDA, PubMed, and relevant international journals using the keywords “ectopic pregnancy,” “extrauterine pregnancy,” “tubal pregnancy,” “maternal age,” “advanced maternal age,” “adolescent pregnancy,” “risk factor,” “predictor,” and “determinant”, combined with Boolean operators (AND/OR). The inclusion criteria were original research articles, full-text availability, publication between 2021 and 2026, studies investigating ectopic pregnancy, its risk factors, diagnosis, management, or patient outcomes, and articles published in English or Indonesian. Exclusion criteria included duplicate publications, editorials, opinion papers, letters to the editor, conference abstracts, inaccessible full-text articles, and studies unrelated to the review objectives. Following title and abstract screening and full-text assessment, seven studies that met the eligibility criteria were included in the qualitative synthesis. Five of the seven included studies reported a statistically significant association between maternal age and ectopic pregnancy ($p < 0.05$), indicating that women younger than 20 years and older than 35 years were at greater risk. Two studies found no statistically significant association. Variations in study design, sample size, population characteristics, statistical analyses, and adjustment for confounding factors may explain these inconsistent findings. Additional factors associated with ectopic pregnancy included parity, previous abortion, infertility, previous ectopic pregnancy, pelvic inflammatory disease, smoking, assisted reproductive technology, and a history of tubal surgery. Current evidence suggests that maternal age is an important risk factor for ectopic pregnancy, particularly among women younger than 20 years and older than 35 years. However, methodological heterogeneity across studies warrants cautious interpretation. Further high-quality studies with standardized methodologies are needed to strengthen the available evidence
Keywords: Ectopic pregnancy, extrauterine pregnancy, tubal pregnancy, maternal age, advanced maternal age, adolescent pregnancy	

Introduction

Ectopic pregnancy is a pathological condition characterized by the implantation of a fertilized ovum outside the uterine cavity, most commonly within the fallopian tube. It is a potentially life-threatening condition because it may lead to tubal rupture and intra-abdominal hemorrhage if not diagnosed and managed promptly. According to the American College of

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The 3th International Conference on Health, Faculty of Health, Vol 3 No 1 2026

Universitas Ngudi Waluyo

Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynaecologists, more than 90% of ectopic pregnancies occur in the fallopian tubes, making tubal ectopic pregnancy the most common form of this condition.

Globally, ectopic pregnancy occurs in approximately 1–2% of all reported pregnancies and remains one of the leading causes of maternal morbidity and mortality during the first trimester of pregnancy. Although advances in early diagnosis and treatment have reduced mortality in many high-income countries, ectopic pregnancy continues to contribute substantially to maternal deaths, particularly in low- and middle-income countries, due to delayed diagnosis and limited access to emergency obstetric care (World Health Organization; American College of Obstetricians and Gynecologists; Williams Obstetrics).

In Indonesia, ectopic pregnancy remains an important reproductive health problem and is frequently reported in hospital-based studies. However, nationally representative prevalence data are limited because most available evidence originates from single-center or regional hospital studies rather than nationwide surveillance.

Delayed diagnosis and inadequate management remain key contributors to the high rates of complications and mortality associated with ectopic pregnancy. According to clinical guidelines, ectopic pregnancy is often difficult to diagnose in the early stages because its initial symptoms—such as abdominal pain, vaginal bleeding, and amenorrhea—are non-specific and may mimic other early pregnancy conditions, including threatened miscarriage or normal early intrauterine pregnancy. In addition, limited access to early transvaginal ultrasound, delayed presentation to health facilities, and low clinical suspicion in primary care settings further contribute to diagnostic delays. Consequently, rupture may occur before diagnosis, significantly increasing the risk of hemorrhage and maternal mortality (World Health Organization; American College of Obstetricians and Gynecologists; Royal College of Obstetricians and Gynaecologists).

Several risk factors have been consistently associated with ectopic pregnancy, including advanced maternal age, high parity, history of abortion, infertility, contraceptive use (particularly intrauterine device use), and a history of pelvic inflammatory disease. These factors are well documented in international clinical guidelines and obstetric literature, which emphasize tubal damage and impaired embryo transport as the main underlying mechanisms leading to ectopic implantation (American College of Obstetricians and Gynecologists; Royal College of Obstetricians and Gynaecologists; Williams Obstetrics). Similar findings have also been reported in regional studies, including those conducted in Indonesia (Tammu et al., 2025).

These factors are known to influence both the structural and functional integrity of the fallopian tubes, as well as the transport mechanism of the fertilized ovum toward the uterine cavity. Any disruption in tubal function or morphology may result in aberrant implantation outside the uterus, thereby increasing the likelihood of ectopic pregnancy.

From a theoretical perspective, multiple biological mechanisms may explain the association between maternal age and ectopic pregnancy, and these mechanisms are consistent with the findings of the reviewed studies, which generally reported a higher incidence of ectopic pregnancy among women in advanced maternal age groups.

Advancing maternal age is associated with degenerative changes in the fallopian tubes, including reduced ciliary activity, which plays a critical role in ovum transport. Impaired ciliary function may lead to delayed or arrested migration of the embryo, facilitating ectopic implantation. In addition, oocyte quality declines with increasing age, potentially increasing the risk of abnormal implantation. Age-related hormonal alterations may further disrupt the balance of reproductive hormones, thereby affecting tubal function and endometrial receptivity.

Conversely, younger maternal age (<20 years) has been associated with biological and physiological immaturity of the reproductive system, including incomplete maturation of the hypothalamic–pituitary–ovarian axis, which may affect ovulatory function, tubal motility, and endometrial receptivity, thereby potentially influencing fertilization and implantation processes. Evidence from reproductive physiology literature suggests that these developmental factors may contribute to altered reproductive outcomes in adolescent pregnancies. Consequently, both extremes of maternal age may be associated with an increased risk of ectopic pregnancy (Williams Obstetrics; American College of Obstetricians and Gynecologists; Vadakekut & Gnugnoli, 2025).

Despite the growing body of literature examining the relationship between maternal age and ectopic pregnancy, the findings remain inconsistent. The inconsistencies are primarily observed in several aspects, including differences in the categorization of maternal age groups (<20 years, 20–35 years, and >35 years versus alternative cut-off points used across studies), variability in study designs (cross-sectional, case-control, and cohort studies), and differences in statistical outcomes, with some studies reporting significant associations while others report non-significant results. In addition, variation in the control of confounding factors such as parity, pelvic inflammatory disease, infertility, and prior ectopic pregnancy may also contribute to the heterogeneity of findings across studies.

Methods

This study employed a systematic literature review to identify, evaluate, and qualitatively synthesize evidence regarding the association between maternal age and ectopic pregnancy. A structured literature search was conducted using Google Scholar, GARUDA, PubMed, and relevant international journals. Articles were identified using predefined keywords combined with Boolean operators (AND/OR). The selection process followed predefined inclusion and exclusion criteria and consisted of title and abstract screening, followed by full-text eligibility assessment. The study selection process is presented in a PRISMA-style flow diagram. As no quantitative pooling of data was performed, the findings were synthesized qualitatively without meta-analysis.

The literature search was conducted using a combination of keywords and Boolean operators (AND/OR) to maximize the retrieval of relevant studies. The primary keywords included “ectopic pregnancy,” “extrauterine pregnancy,” “tubal pregnancy,” “maternal age,” “advanced maternal age,” “adolescent pregnancy,” “risk factor,” “predictor,” and “determinant.” Search strings were developed by combining these terms using Boolean operators, such as ("maternal age" AND "ectopic pregnancy"), ("maternal age" AND "ectopic pregnancy" AND "risk factor"), and ("maternal age" OR "advanced maternal age") AND ("ectopic pregnancy" OR "extrauterine pregnancy"). The use of synonyms and alternative terminology was intended to improve the sensitivity and comprehensiveness of the literature search. Data sources were obtained through a comprehensive search of several scientific databases, including Google Scholar, Garuda, as well as relevant national and international journals. The publication period of 2021–2026 was selected to ensure that the review synthesized the most recent evidence on the association between maternal age and ectopic pregnancy, reflecting current clinical practices and recent developments in diagnosis and management.

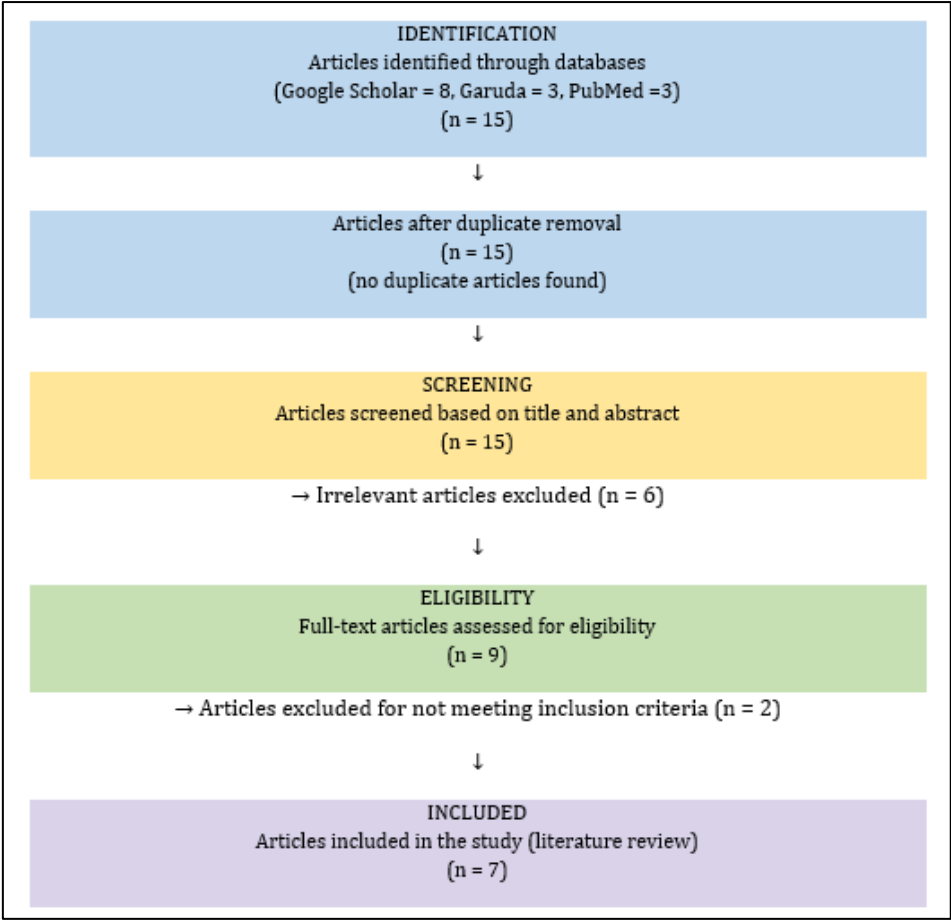


Figure 1. Article Selection Process

The eligibility criteria were established prior to the literature search to ensure the inclusion of studies that were relevant to the research objective. Studies were considered eligible if they met the following criteria: (1) original research articles published between 2021 and 2026; (2) full-text articles available in English or Indonesian; (3) observational studies, including cross-sectional, case-control, or cohort designs; (4) studies involving women diagnosed with ectopic pregnancy or pregnant women evaluated for ectopic pregnancy; (5) studies investigating maternal age as a primary exposure or one of the potential risk factors for ectopic pregnancy; and (6) studies reporting outcomes related to the association between maternal age and the incidence or risk of ectopic pregnancy, including statistical measures such as p-values, odds ratios (ORs), relative risks (RRs), or other measures of association. Studies were excluded if

they were duplicate publications, review articles, systematic reviews, meta-analyses, editorials, letters to the editor, conference abstracts, case reports, or animal studies.

In addition, studies without accessible full texts, articles published outside the specified publication period, studies not available in English or Indonesian, and publications that did not evaluate the association between maternal age and ectopic pregnancy or failed to report relevant outcome measures were excluded from the review. Studies were excluded if they met any of the following criteria: (1) duplicate publications; (2) review articles, systematic reviews, meta-analyses, editorials, letters to the editor, conference abstracts, case reports, or animal studies; (3) articles not available in full text; (4) articles published outside the period of 2021–2026; (5) articles published in languages other than English or Indonesian; (6) studies that did not investigate maternal age as a risk factor for ectopic pregnancy; (7) studies that did not report outcomes related to ectopic pregnancy; and (8) studies that did not provide statistical measures of association, such as p-values, odds ratios (ORs), relative risks (RRs), confidence intervals (CIs), or other relevant statistical analyses.

Following the screening and eligibility assessment, seven studies met all predefined inclusion criteria and were included in the final review. These studies were considered sufficient to address the review objective because they specifically investigated the association between maternal age and ectopic pregnancy, employed appropriate observational study designs, and provided relevant statistical outcomes for qualitative evidence synthesis. Duplicate screening was performed manually by comparing the titles, authors, publication years, journal names, and, where available, Digital Object Identifiers (DOIs) of all retrieved records from Google Scholar, GARUDA, and PubMed. No duplicate articles were identified during this process; therefore, no records were removed at the duplicate screening stage.

Results and Discussion

Seven studies published between 2021 and 2026 were included in this review. The studies were conducted in Indonesia and internationally and employed observational designs, predominantly cross-sectional and case-control studies. Sample sizes and study settings varied across studies, reflecting differences in the populations investigated.

Table 1. Results of Journal Analysis

No	Research	Method	Results
1.	Effect of Maternal Age on EP (Sarwati et al, 2024)	Analytical Observational	Significant (p<0.05)
2.	Risk Factors of EP (Zahwa et al, 2022)	Analytical Observational	Not significant (p>0.05)
3.	Factors Related to EP (Pradana et al, 2021)	Analytical Observational	Not significant (p=0.897)
4.	Predisposing Factors of EP (Wulandari & Ernawati, 2025)	Analytical Observational	Significant (p=0.040; OR=2.909)
5.	Overview of EP (Aravianti et al, 2022)	Descriptive	Significant (p=0.024)
6	Clinical Characteristics of EP (Abdalla, 2026)	Observational	Significant (p=0.03)
7	Risk Factor Analysis of EP (Tammu et al, 2025)	Analytical Observational	Significant (p=0.037)

A study by Wahyuni Sarwati et al. (2024) found a significant relationship between maternal age and ectopic pregnancy using the chi-square test ($p < 0.001$). Similar findings were reported by Wulandari and Ernawati (2025), who found a significant association between maternal age and ectopic pregnancy ($p = 0.040$) with an odds ratio (OR) of 2.909, indicating that women aged <20 years and >35 years had approximately 2.9 times higher risk of ectopic pregnancy. However, confidence intervals were not consistently reported across studies, limiting the ability to assess the precision of the risk estimates. Comparable significant associations were also reported by Aravianti et al. (2022) ($p = 0.024$) and Tammu et al. (2025) ($p = 0.037$).

Furthermore, Abdalla (2026) reported a significant association between maternal age and the location of ectopic pregnancy ($p = 0.03$), with ovarian ectopic pregnancy being more frequently observed in women aged >35 years. Although this finding does not directly address the incidence of ectopic pregnancy, it provides additional clinical insight suggesting that maternal age may also influence the anatomical variation of ectopic implantation. Overall, the reviewed studies indicate a tendency toward an association between maternal age and ectopic pregnancy, although the results remain inconsistent across studies.

Maternal age is not an independent determinant of ectopic pregnancy (EP) incidence but is often interrelated with several established risk factors, including a history of pelvic inflammatory disease, contraceptive use (particularly intrauterine devices), previous ectopic

pregnancy, infertility, history of abortion, and prior reproductive tract surgery. These factors may act as confounders that either strengthen or modify the observed association between maternal age and EP risk. However, based on the reviewed studies, not all articles consistently controlled for these confounding variables in their analyses, and some studies only reported bivariate associations without adjustment for potential confounders. This methodological limitation may contribute to the variability of findings across studies and should be considered when interpreting the strength of the association between maternal age and ectopic pregnancy.

The findings of this review have important implications for midwifery practice in pregnancy risk screening and early management of ectopic pregnancy. Healthcare providers should implement early risk stratification during the first antenatal visit, with particular attention to pregnant women aged <20 years and >35 years. This should be followed by targeted early screening, including prompt assessment of early pregnancy symptoms and timely use of diagnostic evaluation when ectopic pregnancy is suspected. In addition, health education should be routinely provided to at-risk women regarding warning signs of ectopic pregnancy, such as abdominal pain, vaginal bleeding, and missed menstruation, to encourage early healthcare seeking behavior. Furthermore, a clear and rapid referral system should be established for high-risk cases to ensure timely diagnosis and management, thereby reducing the risk of complications and maternal mortality.

Several limitations were identified in the included studies, including differences in research design, limited sample sizes, reliance on secondary data (medical records) with varying levels of data completeness, and inadequate control of confounding factors. In addition, several studies were conducted in single healthcare facilities, which may limit the generalizability of the findings. Furthermore, this literature review also has its own limitations, including the relatively small number of included articles, the use of limited search strategies and databases, and the absence of a formal quality appraisal of the included studies. These limitations may affect the comprehensiveness and strength of the synthesized evidence regarding the association between maternal age and ectopic pregnancy.

In general, maternal age tends to be associated with the incidence of ectopic pregnancy, particularly in extreme age groups (<20 years and >35 years). However, this association is not consistently observed across all studies, as some studies report non-significant findings, indicating variability in the strength of evidence. Therefore, age should be considered as one of several risk factors that may contribute to ectopic pregnancy and should be evaluated alongside other clinical and reproductive factors in its prevention and management.

Conclusion

Based on the reviewed studies, maternal age is associated with the incidence of ectopic pregnancy, with the highest risk observed in women at the extremes of reproductive age (<20 years and >35 years) compared to those aged 20–35 years. However, the relationship is not consistently linear across studies, as some reports show no statistically significant association, indicating variability in the strength of evidence. The findings of the reviewed studies suggest an association between maternal age and ectopic pregnancy, with higher risk consistently observed at the extremes of reproductive age (<20 and >35 years), although variations exist in the strength and statistical significance of this relationship across studies.

Acknowledgments

The authors would like to express their gratitude to Ngudi Waluyo University and the lecturers of Ngudi Waluyo University for their guidance and support during the completion of this literature review.

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