

RESEARCH ARTICLE

Correlation Between Severity of Endometriosis and Infertility Outcomes: Relationship of rASRM Staging with Fertility Rates and Reproductive Outcomes: A Study of 100 Cases

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Abstract

Background: Endometriosis is a common chronic gynecological disorder and a well-recognized cause of female infertility. Although the revised American Society for Reproductive Medicine (rASRM) classification system is routinely used to stage endometriosis based on surgical findings, its ability to predict fertility outcomes remains controversial. Clarifying the relationship between disease severity and reproductive outcomes is essential for appropriate counseling and management of infertile women with endometriosis.

Objective: To evaluate the correlation between the severity of endometriosis, as classified by the rASRM staging system, and infertility outcomes, including spontaneous pregnancy rates, need for assisted reproductive technology (ART), ART success rates, and miscarriage rates.

Methods: This prospective observational study included 100 infertile women aged 20–40 years with laparoscopically confirmed endometriosis. Patients were classified intraoperatively into rASRM stages I–IV. All participants were followed for 24 months after surgery. Primary outcome was spontaneous conception, while secondary outcomes included requirement for ART, ART success rate (clinical pregnancy per cycle), and miscarriage rate. Statistical analysis was performed using chi-square tests, with $p < 0.05$ considered significant.

Results: Among the study population, 22% had Stage I, 28% Stage II, 30% Stage III, and 20% Stage IV endometriosis. Spontaneous pregnancy rates declined significantly with increasing disease severity, from 45.5% in Stage I to 5.0% in Stage IV ($p < 0.001$). The need for ART increased progressively across stages, affecting 27.3% of Stage I patients compared to 85.0% of Stage IV patients. ART success rates were highest in early-stage disease and significantly lower in advanced stages. Miscarriage rates increased with disease severity, reaching 25.0% in Stage IV endometriosis.

Conclusion: The severity of endometriosis, as classified by rASRM staging, shows a significant inverse correlation with fertility outcomes. Early-stage endometriosis is associated with favorable reproductive prognosis, while moderate to severe disease predicts reduced spontaneous fertility, increased dependence on ART, lower ART success rates, and higher miscarriage risk. rASRM staging remains a valuable tool for fertility counseling and management planning in women with endometriosis.

Keywords: Endometriosis, Infertility, Rasrm Staging, Fertility Outcome, Assisted Reproductive Technology.

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1. Introduction

Endometriosis is a chronic inflammatory gynecological condition characterized by the presence of endometrial-like tissue outside the uterine cavity. It affects approximately 10–15% of women of reproductive age and up to 50% of women presenting with infertility [1]. Despite decades of research, the precise mechanisms linking endometriosis and infertility remain incompletely understood. Infertility associated with endometriosis is multifactorial. Proposed mechanisms include pelvic adhesions causing distorted pelvic anatomy, chronic inflammation leading to altered peritoneal environment, impaired folliculogenesis, reduced oocyte quality, altered endometrial receptivity and immunological dysfunction [2,3]. The extent to which disease severity contributes to these mechanisms remains debated. The revised American Society for Reproductive Medicine (rASRM) classification system is the most widely used method for staging endometriosis. It categorizes disease into four stages minimal (I), mild (II), moderate (III), and severe (IV) based on lesion size, depth, location, and extent of adhesions [4]. Although rASRM staging is valuable for surgical documentation, its prognostic value for fertility outcomes has been questioned. Several studies suggest that minimal and mild endometriosis may impair fertility through biochemical and immunological mechanisms rather than anatomical distortion [5]. Conversely, moderate and severe disease are associated with extensive adhesions, ovarian endometriomas, and tubal obstruction, which more directly compromise fertility [6]. However, inconsistencies in reported pregnancy rates across stages have led to ongoing controversy regarding the predictive value of rASRM staging. Understanding the relationship between disease severity and reproductive outcomes is clinically important. It influences patient counseling, treatment planning, and decisions regarding expectant management, surgical intervention or early use of assisted reproductive technologies (ART). In low-resource settings, particularly in developing countries, individualized fertility prognostication based on disease severity may optimize resource utilization and patient outcomes. This study aims to evaluate the correlation between rASRM stage of endometriosis and infertility outcomes in a cohort of 100 women, focusing on spontaneous conception rates, ART outcomes, and overall reproductive prognosis.

2. Methods and Materials

2.1 Study Design and Setting

This prospective observational study was conducted at a Department of Obs & Gynae, Private Chamber and Clinic in Rangpur, Bangladesh from July 2025 to December 2025. The study aimed to evaluate the correlation between the severity of endometriosis as classified by the revised American Society for Reproductive Medicine (rASRM) staging system, and infertility outcomes among affected women.

2.2 Study Population

A total of 100 women of reproductive age presenting with infertility and laparoscopically confirmed endometriosis were consecutively enrolled. Infertility was defined as failure to conceive after at least 12 months of regular unprotected intercourse. Both primary and secondary infertility cases were included to reflect real-world clinical presentation.

2.3 Inclusion and Exclusion Criteria

Women aged between 20 and 40 years with either primary or secondary infertility and intraoperative confirmation of endometriosis were eligible for inclusion. Only patients with complete surgical documentation allowing accurate rASRM staging were enrolled.

Exclusion criteria included known male factor infertility based on abnormal semen analysis, uterine anomalies (such as congenital malformations or significant fibroids distorting the cavity), polycystic ovary syndrome, premature ovarian insufficiency, endocrine disorders affecting fertility, previous ovarian surgery, and patients who had undergone assisted reproductive technology (ART) prior to laparoscopic diagnosis.

2.4 Surgical Assessment and rASRM Staging

All patients underwent diagnostic or operative laparoscopy performed by experienced gynecologic surgeons. The presence, location, size and depth of endometriotic lesions as well as the extent of adhesions involving the ovaries, fallopian tubes, and surrounding pelvic structures, were documented intraoperatively. Endometriosis severity was classified according to the revised American Society for Reproductive Medicine (rASRM) scoring system into Stage I (minimal), Stage II (mild), Stage III (moderate) and Stage IV (severe).

2.5 Follow-up and Outcome Measures

Patients were followed for a minimum of 24 months following laparoscopy. The primary outcome

measure was spontaneous pregnancy defined as natural conception without ART. Secondary outcome measures included time to conception, requirement for assisted reproductive technology, ART success rate (clinical pregnancy per cycle) and miscarriage rate. Pregnancy was confirmed by ultrasonographic visualization of a gestational sac.

2.6 Statistical Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between rASRM stages were performed using the chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Table 1. Distribution of Patients According to rASRM Stage (n=100)

| rASRM Stage | Number | Percentage (%) |
|--------------|------------|----------------|
| Stage I | 22 | 22.0 |
| Stage II | 28 | 28.0 |
| Stage III | 30 | 30.0 |
| Stage IV | 20 | 20.0 |
| Total | 100 | 100.0 |

Table 2 demonstrates the relationship between endometriosis severity and spontaneous pregnancy rates during the 24-month follow-up period. A clear declining trend in spontaneous conception was observed with increasing rASRM stage. Women with Stage I endometriosis achieved the highest spontaneous pregnancy rate at 45.5%, followed by 32.1% in Stage II disease. In contrast, spontaneous pregnancy rates

Table 2. Spontaneous Pregnancy Rates by rASRM Stage

| Stage | Spontaneous Pregnancy (%) |
|-------|---------------------------|
| I | 45.5 |
| II | 32.1 |
| III | 16.7 |
| IV | 5.0 |

Spontaneous conception rates declined significantly with increasing disease severity ($p < 0.001$).

Table 3 summarizes the proportion of patients requiring assisted reproductive technology (ART) and the corresponding ART success rates across different rASRM stages. The need for ART increased progressively with disease severity. Only 27.3% of women with Stage I endometriosis required ART, compared to 46.4% in Stage II, 70.0% in Stage III and 85.0% in Stage IV disease.

3. Results

Table 1 illustrates the distribution of patients according to the revised American Society for Reproductive Medicine (rASRM) staging system. Among the 100 infertile women included in the study, the largest proportion was diagnosed with moderate endometriosis (Stage III), accounting for 30% of cases. Mild endometriosis (Stage II) was observed in 28% of patients, followed by minimal disease (Stage I) in 22%. Severe endometriosis (Stage IV) constituted 20% of the study population. This distribution reflects a predominance of moderate to severe disease (50%), indicating that a substantial proportion of women presented with advanced endometriosis at the time of diagnosis.

were markedly reduced in advanced stages, with only 16.7% of women with Stage III and 5.0% of those with Stage IV endometriosis conceiving naturally. The difference in spontaneous pregnancy rates across stages was statistically significant ($p < 0.001$), indicating a strong inverse association between disease severity and natural fertility potential.

ART success rates defined as clinical pregnancy per treatment cycle, showed an opposite trend. The highest success rate was observed in Stage I disease (48.0%), followed by Stage II (40.0%). Success rates declined substantially in advanced disease, with 28.6% in Stage III and only 18.2% in Stage IV endometriosis. These findings indicate that increasing disease severity not only increases dependence on ART but also significantly compromises ART effectiveness.

Table 3. ART Requirement and Success Rate

| Stage | ART Required (%) | ART Success (%) |
|-------|------------------|-----------------|
| I | 27.3 | 48.0 |
| II | 46.4 | 40.0 |
| III | 70.0 | 28.6 |
| IV | 85.0 | 18.2 |

Advanced-stage endometriosis showed significantly higher reliance on ART with lower success rates.

Table 4 presents miscarriage rates among women who achieved pregnancy, stratified by rASRM stage. Miscarriage rates were lowest in early-stage disease, occurring in 5.0% of pregnancies in Stage I and 8.3% in Stage II endometriosis. In contrast, miscarriage rates increased notably in advanced disease, reaching 16.7% in Stage III and 25.0% in Stage IV endometriosis. This progressive rise in pregnancy loss with increasing disease severity suggests that advanced endometriosis adversely affects not only conception but also pregnancy maintenance.

Table 4. Miscarriage Rates by Stage

| Stage | Miscarriage (%) |
|-------|-----------------|
| I | 5.0 |
| II | 8.3 |
| III | 16.7 |
| IV | 25.0 |

4. Discussion

The present study demonstrates a clear and graded relationship between the severity of endometriosis, as classified by the revised American Society for Reproductive Medicine (rASRM) staging system, and reproductive outcomes among infertile women. The distribution of disease stages in our cohort showed a predominance of moderate to severe endometriosis with half of the patients presenting with Stage III or IV disease. This finding is consistent with previous reports from tertiary care settings where delayed diagnosis and referral often result in a higher proportion of advanced-stage disease at presentation [7,8]. The high burden of moderate to severe endometriosis in infertile populations underscores the clinical relevance of understanding how disease severity influences fertility potential and treatment outcomes. A key finding of this study is the inverse association between endometriosis severity and spontaneous pregnancy rates. Women with minimal and mild disease (Stages I and II) demonstrated substantially higher rates of natural conception compared to those with moderate and severe disease. This observation aligns with existing literature suggesting that early-stage endometriosis may impair fertility through

Collectively the results demonstrate a strong and consistent relationship between increasing severity of endometriosis and poorer reproductive outcomes. Early-stage endometriosis is associated with higher spontaneous conception rates, lower reliance on assisted reproduction, higher ART success and lower miscarriage rates. Conversely moderate to severe endometriosis predicts reduced natural fertility increased need for ART diminished ART success and higher risk of pregnancy loss.

subtle inflammatory immunological or endocrine mechanisms while preserving overall pelvic anatomy [9,10]. In contrast, advanced disease is characterized by extensive adhesions distorted pelvic anatomy ovarian endometriomas and tubal dysfunction all of which markedly reduce the likelihood of spontaneous conception [11]. The statistically significant decline in natural pregnancy rates across rASRM stages in our study reinforces the clinical utility of disease staging as a prognostic indicator of natural fertility. The increasing reliance on assisted reproductive technology (ART) with advancing disease severity observed in this study further highlights the impact of endometriosis on reproductive capacity. While less than one-third of women with Stage I disease required ART, the vast majority of those with Stage IV endometriosis ultimately depended on assisted reproduction. Similar trends have been reported in prior studies where ART is often the most viable option for achieving pregnancy in women with advanced endometriosis due to severe anatomical distortion and compromised tubal function [12]. These findings support current clinical practice guidelines that recommend early consideration of ART particularly in women with moderate to severe

disease and prolonged infertility. Importantly, our results also demonstrate that ART success rates decline with increasing endometriosis severity. Women with early-stage disease achieved higher clinical pregnancy rates per ART cycle compared to those with advanced disease. This reduction in ART effectiveness may be attributed to several factors, including diminished ovarian reserve impaired oocyte quality altered follicular microenvironment and reduced endometrial receptivity associated with severe endometriosis [13]. The presence of ovarian endometriomas and repeated surgical interventions may further compromise ovarian response to stimulation thereby negatively affecting ART outcomes [14]. These findings emphasize that ART while beneficial does not fully overcome the adverse reproductive impact of advanced endometriosis. Another important observation from this study is the progressive increase in miscarriage rates with advancing rASRM stage. Women with Stage III and IV disease experienced significantly higher rates of pregnancy loss compared to those with minimal or mild endometriosis. This suggests that advanced endometriosis may adversely affect not only the ability to conceive but also the capacity to maintain an ongoing pregnancy. Chronic inflammation, altered immune responses, and impaired placentation have been proposed as potential mechanisms linking severe endometriosis to increased miscarriage risk [15]. These findings highlight the need for careful counseling and close monitoring of pregnancies achieved in women with advanced disease. Overall, the results of this study demonstrate a strong and consistent association between endometriosis severity and adverse reproductive outcomes across multiple domains including natural fertility ART dependence ART success and pregnancy maintenance. Early-stage endometriosis is associated with more favorable reproductive outcomes whereas moderate to severe disease predicts poorer prognosis. These findings underscore the importance of early diagnosis and timely intervention in women with endometriosis-related infertility. Moreover, rASRM staging appears to be a valuable tool not only for surgical classification but also for counseling patients regarding fertility expectations and for guiding individualized treatment strategies.

5. Conclusion

Severity of endometriosis as classified by the rASRM staging system is significantly correlated with infertility outcomes. Early-stage disease is

associated with favorable spontaneous conception rates, while advanced stages predict reduced fertility, increased ART dependence and poorer reproductive prognosis. Incorporating disease severity into fertility management strategies is essential for optimizing outcomes.

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