

Prevalence Ratio of Body Mass Index and Age at Menarche with Endometriosis Among Gynecology Patients: A Retrospective Cross-Sectional Study

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ABSTRACT

Endometriosis is a chronic gynecological disorder characterized by the growth of endometrial-like tissue outside the uterine cavity, often accompanied by chronic pelvic pain and infertility. Age at menarche and body mass index (BMI) have been proposed as factors associated with endometriosis, yet earlier findings remain inconsistent. This study examined the association between age at menarche, BMI, and the presence of endometriosis. This observational analytic study used secondary data from medical records of gynecology patients at Fatmawati Central General Hospital, Jakarta. Sixty-nine records that met the eligibility criteria were included consecutively. Endometriosis status served as the outcome, while age at menarche and BMI were the independent variables. Data were summarized descriptively and analyzed with the chi-square test; associations were expressed as prevalence ratios (PR) with 95% confidence intervals (CI), and $p < 0.05$ was considered statistically. Most participants were older than 40 years (62.3%), had menarche after 13 years (63.8%), and had an abnormal BMI (62.3%); endometriosis was documented in 43.5% of the records. Results found no significant association was observed between age at menarche and endometriosis ($p = 0.947$; PR = 0.947; 95% CI: 0.640-1.519). Abnormal BMI, by contrast, was significantly associated with endometriosis ($p = 0.031$; PR = 1.571; 95% CI: 1.057-2.336), with a prevalence 1.57 times higher than among women with normal BMI. In this hospital-based sample, abnormal BMI was associated with a higher prevalence of endometriosis, but because this was a cross-sectional design, age at menarche was not given and causal interpretation is not warranted.



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INTRODUCTION

Endometriosis is defined by the presence of endometrial-like tissue outside the uterine cavity, a condition that drives chronic inflammation, fibrosis, and adhesions and frequently presents as dysmenorrhea, pelvic pain, dyspareunia, and subfertility. Because of its chronic and often progressive course, the disease carries substantial clinical, psychological, and social consequences, and the World Health Organization estimates that it affects roughly 190 million women of reproductive age worldwide, or about 10% of this population (Becker et al., 2022; World Health Organization, 2023).

The burden of endometriosis appears to be particularly high in Asian countries, including Indonesia. Although nationwide epidemiological data remain scarce, hospital-based studies report varying prevalence estimates. These discrepancies likely reflect differences in study populations, diagnostic approaches, and the prolonged interval between symptom onset and definitive diagnosis. Delayed recognition of the disease frequently results in patients presenting with more advanced stages of endometriosis, thereby increasing the likelihood of infertility and other adverse reproductive outcomes (Ministry of Health Republic Indonesia, 2024; Ottolina et al., 2024; World Health Organization, 2023).

In addition to its high prevalence, endometriosis imposes a considerable burden on healthcare systems because of its chronic symptoms, repeated medical consultations, and frequent requirement for long-term treatment or surgical intervention. Women affected by endometriosis commonly experience persistent pelvic pain, dysmenorrhea, dyspareunia, and infertility, all of which substantially impair physical functioning, psychological well-being, social relationships, and work productivity. The disease's chronic nature also increases healthcare utilization and economic costs, underscoring the need to identify modifiable risk factors that may support earlier detection and preventive strategies (Taylor et al., 2021; McDonnell et al., 2025).

Endometriosis pathogenesis is multifactorial and involves retrograde menstruation, estrogen-dependent growth, immune dysregulation, and genetic susceptibility (Becker et al., 2022; Chen et al., 2023). Among reproductive characteristics, age at menarche has received particular attention, because earlier menarche extends cumulative exposure to endogenous estrogen and may favor the implantation and survival of endometrial cells outside the uterus (Becker et al., 2022; Petraglia et al., 2025). Body mass index (BMI) is a second plausible determinant: adipose tissue is an endocrine organ that converts androgens to estrogen through aromatase activity and secretes adipokines that sustain a pro-inflammatory milieu (Chen et al., 2023; Garmendia et al., 2025; Petraglia et al., 2025). Nevertheless, the epidemiological evidence is mixed; a large cohort study found that the direction of the anthropometric association differed across subgroups (Missmer, 2004), and family-based analyses indicate that menarche and BMI modify endometriosis risk in interaction with hereditary and lifestyle factors rather than independently (Kim et al., 2021).

Evidence from Indonesia remains limited, and only a small number of hospital-based studies have examined these exposures in local populations (Usman et al., 2022). Differences in ethnicity, nutritional status, and reproductive patterns mean that findings from Western populations cannot be assumed to apply directly to Indonesian women. This study therefore analyzed the association between age at menarche, BMI, and the presence of endometriosis using medical records of gynecology patients at a Jakarta referral hospital, with the expectation that the results will provide local evidence to support early detection, identification of at-risk groups, and preventive strategies.

METHOD

This observational analytic study used a cross-sectional design and secondary data from medical records for January-December 2024 at the Obstetrics and Gynecology Department of Fatmawati Central General Hospital, Jakarta, Indonesia. The sampling frame consisted of the medical records of female patients who consulted the department with gynecological complaints during the study period. The researchers screened records for eligibility, which required complete documentation of age, age at menarche, body weight and height, and the recorded presence or absence of endometriosis; records missing information on any of these variables were excluded. The researchers enrolled all records meeting the criteria consecutively, yielding a final sample of 69 patients.

The researchers defined endometriosis status as a diagnosis documented in the medical record by the attending clinician and used it as the outcome. Because the data were captured retrospectively at a single point in time, this report uses prevalence rather than incidence. The researchers dichotomized age at menarche into menarche at 13 years or younger and menarche after 13 years; this grouping was chosen a priori to contrast earlier and later menarche while preserving adequate group sizes, and we applied it consistently in the tables and text. BMI was calculated from recorded weight and height and classified using World Health Organization cut-offs into normal (18.5-24.9 kg/m²) and abnormal (<18.5 or ≥25.0 kg/m²), with the latter combining underweight and overweight/obese categories. The researchers grouped current age as 40 years or younger and older than 40 years. Age was included because the probability of having a recorded diagnosis tends to increase with age through longer disease duration and diagnostic delay; it was assessed in bivariate analysis only, since the small number of outcome events did not permit multivariable modelling.

Data were extracted using a structured form and checked for consistency and completeness before analysis. Statistical analysis was performed with statistic application. Participant characteristics were summarized as frequencies and percentages. The association between each independent variable and endometriosis status was tested with the chi-square test, or Fisher's exact test when expected cell counts were below five. The magnitude of association was expressed as a prevalence ratio (PR) with a 95% confidence interval (CI), calculated as the proportion of patients with endometriosis in the category of interest divided by the corresponding proportion in the reference category. A p-value below 0.05 was considered statistically significant.

The Health Research Ethics Committee of Fatmawati Central General Hospital granted ethical permission for this study No PP.05.01/D.XXI.18/091/2026. before any data were collected. Throughout the research procedure, all personal identifiers were anonymized to protect patient confidentiality.

RESULTS

Table 1. Respondent characteristics

Variable	Category	n	%
Age (current)	< 40 years	26	37.7
	≥ 40 years	43	62.3
Age of menarche	≤13 years	25	36.2
	>13 years	44	63.8
BMI	Normal (18.5-24.9 kg/m ²)	26	37.7
	Abnormal (<18.5 or ≥25 kg/m ²)	43	62.3
Endometriosis	No	39	56.5
	Yes	30	43.5

A total of 69 respondents met the inclusion and exclusion criteria. Table 1 presents the distribution of respondents by age, age at menarche, BMI, and endometriosis status. Most participants were older than 40 years (62.3%), had reached menarche after the age of 13 years (63.8%), and had a BMI outside the normal range (62.3%). Endometriosis was documented in 43.5% of the records, while 56.5% of the patients had no such diagnosis.

Table 2. Relationship between current age, age at menarche, and BMI with the incidence of endometriosis

Variable	Endometriosis				Total		PR	95%CI	P Value
	Yes		No						
	n	%	n	%	n	%			
Age (current)									
≤40 years (R)	14	53.8	12	46.2	26	100.0	0,735	0,457-1,182	0,177
>40 years	16	37.2	27	62.8	43	100.0			
Age of menarche									
≤13 years(R)	11	44.0	14	56.0	25	100.0	0,947	0,640-1,519	0,947
>13 years	19	43.2	25	56.8	44	100.0			
BMI									
Normal (18.5-24.9) (R)	7	26.9	19	73.1	26	100.0	1,571	1,057-2,336	0,031*
Abnormal (<18.5 or ≥25)	23	53.3	20	46.5	43	100.0			

*p<0.05

Table 2 shows the relationship between current age, age at menarche, and BMI and the incidence of endometriosis. The incidence of endometriosis did not significantly correlate with current age (p=0.177). With a PR value of 0.735 (95% CI: 0.457–1.182), the incidence of endometriosis was not correlated with present age. Bivariate analysis showed no significant association between age of menarche and the incidence of endometriosis (p=0.947). Age of menarche was not linked to the incidence of endometriosis in this research (PR=0.947; 95% CI: 0.640–1.519). BMI and the incidence of endometriosis were significantly correlated (p=0.031).

Endometriosis was 1.57 times more common in individuals with abnormal BMI than in those with normal BMI (PR=1.571; 95% CI: 1.057–2.336).

DISCUSSION

Most of the respondents in this study were older than 40 years, had experienced menarche after the age of 13, and had a BMI outside the normal range. The predominance of older women is consistent with the usual pattern of endometriosis diagnosis, which commonly occurs in the later reproductive years after a considerable diagnostic delay (Allaire et al., 2023). Although the ESHRE guideline emphasizes that endometriosis can develop at any point during the reproductive years, many cases are recognized only after years of symptoms, often at an advanced stage (Becker et al., 2022; Comptour et al., 2024). The proportion of patients with endometriosis in this sample (43.5%) reflects a selected hospital population and should not be interpreted as a population prevalence.

Current age was not significantly associated with endometriosis in the bivariate analysis ($p = 0.177$). This finding should be interpreted cautiously, because the age recorded in the medical records reflects age at the time of data collection rather than age at disease onset, and the modest sample size limits the statistical power to detect small differences. The absence of a significant association does not rule out an influence of age-related factors, such as cumulative hormonal exposure, on the disease process (Becker et al., 2022).

The researchers found no significant association between age at menarche and endometriosis ($p = 0.947$). In this sample, most participants (63.8%) had menarche after age 13, so the comparison involved uneven group sizes and limited exposure variation, which may have reduced the ability to detect a difference. Endometriosis is a multifactorial disease, and reproductive characteristics interact with genetic, immune, and environmental influences rather than acting alone (Chen et al., 2023; Kim et al., 2022). Indonesian hospital-based evidence on this topic remains scarce and methodologically heterogeneous, which limits direct comparison across studies (Usman et al., 2022). Accordingly, age at menarche should be regarded as one of several possible contributory factors rather than a standalone determinant of endometriosis.

Abnormal BMI was significantly associated with endometriosis in this study ($p = 0.031$), with the prevalence roughly 1.6 times higher among women whose BMI fell outside the normal range. Several biological pathways could explain this observation. Adipose tissue acts as an endocrine organ: aromatase-mediated conversion of androgens increases circulating estrogen, which may stimulate the growth and persistence of ectopic endometrial tissue, while adipokines and pro-inflammatory cytokines, including interleukin-6 and tumor necrosis factor- α , contribute to the chronic inflammatory environment thought to sustain endometriotic lesions (Chen et al., 2023; Garmendia et al., 2025; Petraglia et al., 2025). Caution is nevertheless required, because the abnormal category pools underweight with overweight and obese participants, and the mechanisms outlined above relate primarily to excess adiposity rather than to low body weight. The cross-sectional design also precludes conclusions about the direction of the relationship; chronic pain and reduced physical activity associated with endometriosis could themselves influence body weight (Taylor et al., 2021).

The wider literature on BMI and endometriosis remains inconsistent. Earlier cohort work reported anthropometric associations that varied according to fertility status and other participant characteristics (Missmer, 2004), while more recent analyses emphasize interactions with hereditary and lifestyle factors (Kim et al., 2021). Divergences across studies may stem from differences in population characteristics, diagnostic verification, BMI categorization, and sample size (Ottolina et al., 2024). Keep these methodological considerations in mind when comparing the present findings with other reports.

For clinical practice, the results suggest that BMI, which is recorded routinely, may help identify gynecology patients who warrant more thorough evaluation for endometriosis, particularly when pain symptoms are present. The findings should not, however, be read as evidence that weight modification prevents endometriosis, since observational data of this type cannot establish causality. Future research should employ prospective, multicenter designs with surgically confirmed cases, larger samples, and detailed measurement of reproductive history,

hormonal contraceptive use, and other potential confounders to clarify the contribution of body composition to endometriosis risk.

This study has several limitations. The cross-sectional design means that temporality cannot be established, and the observed associations cannot be interpreted causally. Second, the sample was relatively small ($n = 69$), which produced wide confidence intervals and limited power for subgroup analysis. The study was conducted in a single hospital among symptomatic gynecology patients, so selection bias is possible and the findings may not be generalizable to the wider population. Other risk factors known to be associated with endometriosis, such as family history, parity, menstrual cycle length, and use of hormonal therapy, could not be analyzed due to limited data availability.

CONCLUSION

In conclusion, this study found that abnormal body mass index (BMI) was significantly associated with a higher prevalence of endometriosis, whereas age at menarche showed no significant association. These findings indicate an association within this study sample; causal and population-level interpretations are not warranted. However, further prospective studies with larger and more diverse populations are needed to confirm these findings and explore underlying mechanisms.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

APF: Conceptualization, methodology, data curation, formal analysis, investigation, visualization, writing original draft, review, and editing; **MM:** Supervision, methodology, validation, review, and editing.

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Availability of data and materials

The authors made all data available.

Competing interests

The authors declare no competing interests.

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