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Original Research Article

Sociodemographic and menstrual profile of infertile women with endometriosis: a comparative cross-sectional analysis from a tertiary centre in Rajasthan

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ABSTRACT

Background: Endometriosis disproportionately affects women during their reproductive years and has been associated with various sociodemographic and menstrual factors. Understanding these associations is critical for early identification and improved public health strategies, particularly in resource-constrained settings. Data on the sociodemographic profile of endometriosis from North India remain sparse.
Methods: A hospital-based cross-sectional comparative observational study of 60 infertile women (30 with laparoscopically confirmed endometriosis and 30 controls) was conducted at a tertiary care centre in Jaipur, between July 2023 and July 2025. Demographic, anthropometric, and menstrual data were collected. Chi-square, Fisher exact test, and unpaired t-test were used for analysis.
Results: No significant age difference was found between cases (mean 28.01±4.78 yrs) and controls (28.73±5.13 yrs; p=0.604). Women with endometriosis were significantly more likely to belong to higher socioeconomic status (53.33% upper class vs. 26.66% in controls; p=0.043) and had significantly lower BMI (21.26±2.91 vs. 23.26±3.26 kg/m²; p=0.0147). Shorter menstrual cycle length was significantly associated with endometriosis (mean 26.97±3.91 vs. 30.13±4.66 days; p=0.0013). No significant differences in religion, literacy, or parity were observed.
Conclusions: Higher socioeconomic status, lower BMI, and shorter menstrual cycle length are significantly associated with endometriosis in infertile women. These factors may serve as clinical flags to prompt earlier investigation in appropriate patient populations.

Keywords: BMI, Endometriosis, Infertility, Laparoscopy menstrual cycle, Sociodemographic, Socioeconomic status

INTRODUCTION

Endometriosis is a chronic, estrogen-dependent disorder that affects an estimated 190 million women of reproductive age worldwide close to one in ten. Global Burden of Disease data through 2021 show a somewhat paradoxical pattern: age-standardized prevalence and incidence have edged down since 1990, yet the absolute number of affected women keeps climbing, driven by population growth and ageing, with the burden falling hardest on low- and middle-sociodemographic-index regions where diagnostic capacity is often thin to begin with.[14,15] In many ways it remains one of the more enigmatic conditions in gynaecology, and its toll on quality of life, chronic pain, and fertility is still under-recognized across much of resource-constrained India.

One defining feature of endometriosis is the long wait between symptom onset and a confirmed diagnosis. Older estimates put this delay at 6-7 years; newer reviews land in much the same range a 2024 scoping review found a global mean of 6.6 years, spanning as little as 0.5 years in Brazil to a striking 27 years in the United Kingdom, with the delay accumulating at several points along the way, from

symptom onset to a first primary-care visit, and again from gynaecological referral to laparoscopic confirmation.[1,13] A separate systematic review reported similarly long delays, often close to a decade, and traced them to the normalization of menstrual pain, limited clinician awareness, and a continued reliance on invasive diagnostic confirmation.[12] Sorting out which risk factors are modifiable and which are not through sociodemographic and menstrual profiling is one practical way to narrow this gap, especially where laparoscopy and specialist gynaecological care are hard to come by.

Age, BMI, socioeconomic status, education, menstrual characteristics, and parity have all been examined as possible risk factors for the disease. Lower BMI shows up consistently across populations, and the association has recently been pushed further: a 2026 cross-sectional study using body fat percentage, waist-hip ratio, and mid-upper arm circumference under the AAGL 2021 classification found each measure inversely related to disease severity supporting the idea that it is reduced adipose-derived oestrogen and altered ovulatory patterns doing the driving, rather than adiposity being a purely incidental association.[5,16] Shorter menstrual cycles tell a similar story. As a proxy for more frequent retrograde menstruation under Sampson's theory, they carry real weight: a meta-analysis of 11 case-control studies put the odds ratio at 1.22 for cycles ≤27 days, turning protective past 29 days.[6] Parity runs the other way, with a pooled odds ratio of 0.53 across 17 studies.[8]

Socioeconomic and healthcare-access factors complicate the picture further. Higher SES keeps turning up alongside a greater likelihood of diagnosis, though this is usually put down to better healthcare-seeking behaviour, greater diagnostic awareness, and delayed childbearing rather than any true difference in disease incidence.[7,11] Brazilian and Indian cohort data echo this: higher-SES, urban-domiciled women appear more often among diagnosed cases.[4,9] Worth flagging here an apparent sociodemographic 'risk' may in part be diagnostic ascertainment bias, showing up in health systems where laparoscopy is costly and unevenly accessible. That concern is especially relevant to India, where access to definitive diagnostic work-up tracks closely with income and education. Data from Western populations remain far more abundant than from India a large and demographically varied country where evidence from the north, and from Rajasthan specifically, is still thin.

Within the Indian literature specifically, Udupa et al reported from Northeast India a mean age of 34.54±6.72 years and a preponderance of upper-middle-class women, while Devi et al, working in Tamil Nadu, found peak incidence in the 26-30-year age group.[2,3] Together, these regional studies hint that endometriosis in India may carry a different sociodemographic signature than in Western cohorts but the pool of Indian studies is still small, and none that we know of has directly compared cases and controls drawn from the same infertility-clinic population in Rajasthan.

In our own clinical experience, sociodemographic and menstrual clues are often the first hint sometimes the only one a treating gynaecologist has to go on before laparoscopy, particularly in a tertiary public-sector setting where imaging and laparoscopy slots are scarce. A locally derived profile of who is more likely to have endometriosis could help triage infertile women toward earlier surgical evaluation instead of prolonged empirical treatment.

This study was designed to address characterizing the sociodemographic and menstrual profile of infertile women with endometriosis at a major tertiary centre in Rajasthan, adding much-needed North Indian data, and comparing cases and controls systematically enough to translate the findings into practical clinical flags for earlier work-up.

METHODS

This study was conducted at the Department of Obstetrics and Gynaecology in a tertiary care center in Jaipur, Rajasthan, India, from July 2023 to July 2025, following Institutional Ethics Committee approval. Sixty infertile women aged 18-38 years undergoing diagnostic laparoscopy were enrolled: 30 with laparoscopically confirmed endometriosis (cases) and 30 without (controls). Exclusion criteria included thyroid disorders, PCOS, pituitary adenoma, and prior pelvic surgery.

Sociodemographic data collected included age, religion, literacy level, socioeconomic status (classified as lower, middle, and upper based on Modified BG Prasad scale), BMI (height and weight measured at admission), menstrual history (cycle length, flow), and parity. Endometriosis was staged per ASRM classification at laparoscopy. Continuous variables are presented as Mean±SD; categorical variables as frequency (%). Chi-square/Fisher exact test was used for categorical comparisons; unpaired t-test for continuous variables. ANOVA was used for inter-stage comparisons. $P<0.05$ was considered statistically significant.

RESULTS

Age distribution

The mean age was 28.01±4.78 years in the endometriosis group and 28.73±5.13 years in controls (p=0.604, NS). The majority in both groups were in the 26-35-year age band (66.66% in endometriosis vs. 60% in controls). No women with endometriosis were above 35 years, compared to 13.33% of controls (Table 1).

Religion

Total 76.7% of cases were Hindu and 23.3% Muslim, compared to 83.3% and 16.7% in controls respectively. No

statistically significant difference was observed (Fisher exact test, p=0.748).

Table 1: Age distribution in endometriosis and control groups.

Age group (years)	Endometriosis (n=30), N (%)	Control (n=30), N (%)	P value
21-25	10 (33.33)	8 (26.66)	p=0.604
26-30	9 (30)	9 (30)	
31-35	11 (36.66)	9 (30)	
>35	0 (0)	4 (13.33)	
Mean±SD	28.01±4.78	28.73±5.13	p=0.604

Literacy

Total 83.33% of endometriosis cases were literate (vs. 80% controls; p=1.0, NS). Among literate women with endometriosis, 60% had studied up to high school and above. No significant difference was found across stages of endometriosis for literacy levels (Chi-square p=0.711).

Socioeconomic status

A statistically significant difference was found in socioeconomic status (SES) between the two groups (Chi-square p=0.043). Majority of women with endometriosis (53.33%) belonged to the upper SES class, whereas the majority of controls (53.33%) were from the middle class (Table 2). Intra-group stage analysis did not reveal a significant difference between stages and SES (p=0.69).

Table 2: Socioeconomic status in endometriosis vs. controls.

Socioeconomic status	Endometriosis (n=30), N (%)	Control (n=30) (%)	P value
Lower class	7 (23.33)	6 (20)	0.043*
Middle class	7 (23.33)	16 (53.33)	
Upper class	16 (53.33)	8 (26.66)	

* Statistically significant

Body Mass Index (BMI)

The mean BMI was significantly lower in women with endometriosis (21.26±2.91 kg/m²) compared to controls (23.26±3.26 kg/m²; p=0.0147). 16.7% of cases were underweight (BMI <18.5) versus only 3.3% of controls, while overweight and pre-obese categories were more represented among controls (26.7%) than cases (16.7%) (Table 3). No significant difference was found between stages of endometriosis and BMI (ANOVA p=0.91).

Menstrual cycle length

Women with endometriosis had significantly shorter menstrual cycles compared to controls (mean 26.97±3.91 vs. 30.13±4.66 days; p=0.0013). 33.33% of endometriosis cases had cycle length <25 days versus none among controls. Conversely, 30% of controls had cycles >30 days. No significant difference was found between stages and cycle length within the endometriosis group (ANOVA p=0.885) (Table 4).

Table 3: BMI distribution in endometriosis vs. controls.

BMI category (kg/m²)	Endometriosis (n=30), N (%)	Control (n=30), N (%)	P value
<18.5 (underweight)	5 (16.7)	1 (3.3)	0.0147*
18.5-22.9 (normal)	20 (66.7)	21 (70)	
23-24.9 (overweight)	2 (6.7)	2 (6.7)	
25-29.9 (pre-obese)	3 (10)	6 (20)	
Mean±SD	21.26±2.91	23.26±3.26	0.0147*

* Statistically significant

Table 4: Menstrual cycle length in endometriosis vs. controls.

Cycle length (days)	Endometriosis (n=30), N (%)	Control (n=30), N (%)	P value
<25	10 (33.33)	0 (0)	0.0013*
25-30	18 (60)	21 (70)	
31-35	1 (3.33)	3 (10)	
>35	1 (3.33)	6 (20)	
Mean±SD	26.97±3.91	30.13±4.66	0.0013*

* Statistically significant

Parity

Total 63.33% of endometriosis cases were nulliparous versus 70% in controls (Fisher exact test p=0.785, NS). No significant difference in parity was found across stages of endometriosis (Chi-square p=0.235). Notably, stage IV had the highest proportion of nulliparous women (81.81%).

Symptoms distribution

All participants had infertility. Dysmenorrhea was the most common symptom (73.33% vs. 6.66% in controls, p=0.0004), followed by chronic pelvic pain (60% vs. 0%, p<0.0001), menorrhagia (36.66% vs. 3.33%, p=0.01), and dyspareunia (33.33% vs. 0%, p=0.004). Symptom burden increased with disease stage, with all stage III-IV patients reporting chronic pelvic pain (Table 5).

Table 5: Associated symptoms in endometriosis vs. controls.

Symptoms	Endometriosis (n=30), N (%)	Control (n=30), N (%)	P value
Infertility	30 (100)	30 (100)	-
Dysmenorrhea	22 (73.33)	2 (6.66)	0.0004*
Chronic pelvic pain	18 (60)	0 (0)	0.0001*
Menorrhagia	11 (36.66)	1 (3.33)	0.01*
Dyspareunia	10 (33.33)	0 (0)	0.004*
Difficulty in micturition	2 (6.66)	0 (0)	0.49

*Statistically significant

DISCUSSION

This study offers a fairly comprehensive sociodemographic profile of endometriosis in North Indian infertile women seen at a public-sector tertiary hospital. We found no significant age difference between cases and controls (p=0.604), which lines up with several Indian studies. That said, the peak in our cohort fell in the 31-35-year band (36.66%), close to what has been reported from Tamil Nadu, where the 26-35-year group accounted for nearly 70% of cases.[3]

The link we found to higher socioeconomic status (p=0.043) is a familiar one. Eisenberg et al reported a similarly higher SES profile among endometriosis patients, attributing it to better healthcare access, greater diagnostic awareness, and delayed parity all of which track with higher SES.[7] Chandra et al found much the same, with half their endometriosis cases coming from upper-class strata (p=0.0445).[4] Health-seeking behaviour and diagnostic access are the more likely confounders here, rather than SES itself driving disease.

The lower BMI we found in the endometriosis group (21.26 vs. 23.26 kg/m²; p=0.0147) fits with what Hediger et al and Udupa et al reported.[2,5] It could reflect a systemic inflammatory burden, nutritional deficiency, or simply lower adipose-derived estrogen production any of which could tilt the hormonal milieu toward favouring endometriotic implant survival. BMI did not differ across disease stages within our cohort (ANOVA p=0.91), suggesting it is a general marker rather than something that tracks with severity.

Short menstrual cycles under 25 days in our study were markedly more common in the endometriosis group (33.33% vs. 0%; p=0.0013). This tracks with Wei et al.'s meta-analysis, which found cycles ≤27 days carry an OR of 1.22 for endometriosis, while longer cycles are protective.[6] The mechanism is fairly intuitive: more frequent cycles mean more retrograde menstruation, and with it, more opportunities for endometrial tissue to implant ectopically, per Sampson's theory.

Religion and literacy showed no difference between groups, in keeping with Esmaeilzadeh et al and consistent with a biological rather than socially-mediated basis for risk.[10] The symptom profile matched what we would expect clinically dysmenorrhea (73.33%), chronic pelvic pain (60%), and menorrhagia (36.66%) all stood out as the dominant complaints, each significantly more common than in controls.

A sample of 30 per group limits how confidently we can rule out subtler associations, and this was a single-centre study. Recall bias in menstrual history is also a fair concern.

CONCLUSION

In infertile women from Rajasthan, endometriosis tracked closely with higher socioeconomic status, lower BMI, and shorter menstrual cycles. Together with a characteristic symptom profile, these factors could serve as practical clinical flags a way to identify women who warrant earlier diagnostic work-up rather than prolonged empirical management. Larger, multicentre studies are needed to confirm these associations and build toward evidence-based risk-stratification models for Indian patients.

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