Health Affairs ISSN - 0278-2715 Volume 13 ISSUE 10 page 4828-4847
Journal link: https://health-affairs.com/
Abstract Link: https://health-affairs.com/13-10-4828-4847/
Submission 17 July 2025
Acceptance 26 Aug 2025
Publication 13 October 2025

Comparison of levonorgestrel intrauterine system versus hysterectomy on efficacy and quality of life in patients with adenomyosis

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Abstract

Background: Adenomyosis is a benign uterine condition causing heavy menstrual bleeding, dysmenorrhea, and reduced quality of life (QoL). Hysterectomy is definitive treatment, whereas the levonorgestrel-releasing intrauterine system (LNG-IUS) offers a less invasive, uterus-preserving alternative.

Objective: To compare the efficacy and QoL outcomes of LNG-IUS and hysterectomy in women with adenomyosis.

Methods: This descriptive case series was conducted over six months in Unit II, Department of Obstetrics and Gynecology, Lady Willingdon Hospital, Lahore. Sixty women aged 30–50 years with adenomyosis were enrolled using non-probability consecutive sampling and equally assigned to LNG-IUS (n=30) or hysterectomy (n=30). Primary outcomes were patient satisfaction and control of heavy menstrual bleeding at six months.

Results: Baseline characteristics were similar between groups. At six months, satisfaction was significantly higher in the hysterectomy group (96.7%) versus LNG-IUS (66.7%) ($p=0.002$). Persistent heavy bleeding occurred in 30.0% of LNG-IUS users and none in the hysterectomy group ($p=0.003$). Subgroup analysis showed lower satisfaction and higher bleeding rates among LNG-IUS users aged 40–50 years, with BMI ≥28 kg/m², or adenomyoma size >3.5 cm ($p<0.05$).

Conclusion: Hysterectomy offers superior bleeding control and satisfaction for adenomyosis. LNG-IUS remains a viable alternative, especially for younger women with lower BMI and

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smaller adenomyomas. Careful patient selection is essential to optimize outcomes.

Keywords: Adenomyosis; LNG-IUS; hysterectomy; heavy menstrual bleeding; patient satisfaction; quality of life

1. Introduction

Adenomyosis is a chronic, benign uterine disorder defined by the presence of ectopic endometrial glands and stroma within the myometrium, causing hypertrophy and hyperplasia of the surrounding smooth muscle tissue [1]. This infiltration disrupts the normal myometrial architecture and results in uterine enlargement, abnormal uterine contractility, and chronic inflammatory changes. Once considered a diagnosis confirmed only after hysterectomy, adenomyosis can now be reliably detected through non-invasive imaging modalities such as transvaginal ultrasonography (TVUS) and magnetic resonance imaging (MRI) [2]. Epidemiological estimates for adenomyosis vary widely, ranging from 5% to over 70% depending on the diagnostic method and criteria used [3]. Histopathological analysis of hysterectomy specimens for benign gynecologic conditions reveals a prevalence between 20–35% [4]. Adenomyosis most frequently affects women between the ages of 35 and 50 years and is more common in multiparous women and those with a history of uterine surgery, such as cesarean section or myomectomy [5]. The pathogenesis remains incompletely understood, but two major theories predominate: invagination of the endometrial basalis layer into the myometrium due to junctional zone disruption, and de novo metaplasia of Müllerian remnants displaced during embryogenesis [6]. Hormonal influences, particularly prolonged estrogen exposure, are implicated in both onset and progression [7].

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Clinically, adenomyosis presents with heavy menstrual bleeding (menorrhagia), dysmenorrhea, chronic pelvic pain, dyspareunia, and sometimes infertility [8]. Menorrhagia affects up to 60% of patients, while dysmenorrhea and pelvic pain are reported in more than one-third [9]. These symptoms not only cause physical discomfort but also profoundly impact health-related quality of life (HRQoL), leading to reduced work productivity, limitations in daily activities, and increased prevalence of mood disorders such as anxiety and depression [10]. Diagnosis is based on clinical history, pelvic examination, and imaging. TVUS is the first-line diagnostic tool due to its wide availability, affordability, and high accuracy in expert hands. Typical sonographic features include asymmetrical myometrial thickening, sub-endometrial echogenic linear striations, myometrial cysts, and a heterogeneous myometrial echotexture [2, 11]. MRI, with its superior tissue contrast, is recommended in equivocal cases and can detect junctional zone thickening of more than 12 mm, a hallmark finding in adenomyosis [12].

Treatment options for adenomyosis depend on patient age, reproductive desires, severity of symptoms, and disease extent [13]. Hysterectomy remains the only definitive treatment, eliminating symptoms by removing the uterus entirely [14]. While highly effective, hysterectomy carries risks including intraoperative bleeding, infection, thromboembolic events, and longer recovery periods. Importantly, it results in irreversible loss of fertility, which can be emotionally distressing for women who wish to retain their uterus. Conservative options are aimed at symptom control and uterine preservation. These include medical therapies such as combined oral contraceptives, gonadotropin-releasing hormone (GnRH) agonists, aromatase inhibitors, and progestins [13]. Among progestin-based therapies, the levonorgestrel-releasing intrauterine system (LNG-IUS) has emerged as one of the most effective and widely used treatments for adenomyosis. LNG-IUS provides a continuous, local release of levonorgestrel directly into the endometrium and adjacent myometrium, inducing decidualization of endometrial tissue, suppressing ectopic lesions, and reducing prostaglandin-mediated uterine contractions [1, 11, 15].

Multiple prospective studies have shown LNG-IUS to significantly reduce menstrual blood loss, alleviate dysmenorrhea, and improve HRQoL in women with adenomyosis [4, 8, 11]. Increases in hemoglobin levels following LNG-IUS use—by an average of 1.5 g/dL at six

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months and 2.3 g/dL at twelve months—are comparable to improvements seen after hysterectomy [8]. Importantly, LNG-IUS avoids the risks of major surgery, is reversible, and preserves reproductive potential. However, LNG-IUS is not universally successful. Persistent heavy bleeding occurs in up to one-third of patients, and some eventually undergo hysterectomy for complete symptom resolution [8, 14]. Expulsion rates are also higher in enlarged adenomyotic uteri, reducing long-term efficacy in certain cases [15]. Conversely, hysterectomy guarantees complete symptom relief but is associated with the physical and psychological burden of major surgery [14]. Comparative studies between LNG-IUS and hysterectomy demonstrate that while hysterectomy offers superior control of physical symptoms, LNG-IUS often yields better scores in psychological and social domains of QoL, likely due to uterine preservation and avoidance of surgical morbidity [8, 12, 15]. Meta-analyses have highlighted that both treatments significantly improve HRQoL, but differences in domain-specific outcomes warrant individualized treatment planning [11].

Rationale of this study is to compare the outcome of LNG-IUS versus hysterectomy in patients with adenomyosis. Literature showed that LNG-IUS is a good replacement of interventional procedure (hysterectomy). Studies comparing LNG-IUS and hysterectomy for adenomyosis-associated menorrhagia show mixed results. While LNG-IUS improves hemoglobin levels and enhances psychological and social well-being, heavy bleeding persists in 32.3% of cases, unlike hysterectomy, which is 100% effective. Dissatisfaction rates are also higher with LNG-IUS (38.7% vs. 3.2%). These variations highlight the need for further research to determine the optimal treatment. Based on this conflicting data, limited reported limited work in this regard and as well as there is no study done before in local setting and hysterectomy is done in routine. Therefore, we want to conduct this study to get evidence for local population and to confirm that which method would be more appropriate for adenomyosis. This will help to improve our practice and knowledge and we will implement findings of this study in local setting in future.

2. Material and methods

2.1 Study design

This descriptive case series was conducted in Unit II, Department of Obstetrics and

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Gynecology, Lady Willingdon Hospital, Lahore. The study was carried out over a duration of six months

2.2 Sample size and technique

Using the WHO sample size calculator, a total of 60 female participants were calculated for the study, with 30 allocated to each group. The calculation was based on a 5% level of significance, 90% power of the test, and the reported percentage of heavy menstrual bleeding of 32.3% in the LNG-IUS group and 0% in the hysterectomy group [14]. A non-probability, consecutive sampling technique was employed for participant recruitment.

The inclusion criteria comprised females aged 30–50 years presenting with adenomyosis as per the operational definition. Exclusion criteria included females with endometrial pathology, submucous myomas, intramural or subserous myomas >2 cm, postmenopausal status, pelvic inflammatory disease, malignancy or suspicion of malignancy, thromboembolism, desire to become pregnant, cardiac or hepatic disease, use of oral progestogens within the previous three months, or those who had already received hormonal treatment as documented in medical records.

2.3 Data Collection Procedure

Before data collection, ethical approval will be obtained, ensuring voluntary participation, confidentiality, risk disclosure, and the right to withdraw at any stage. After approval from ethical review board, 60 females fulfilling the selection criteria will be enrolled in the study through OPD. Written informed consent will be obtained, ensuring participants understand the study objectives, procedures, potential risks, benefits, and their right to withdraw at any stage without consequences. Demographics including name, age, BMI, marital status, parity, duration of symptoms, size of adenomyoma, education, residence, and socioeconomic status will also be noted. Frequency of patients undergoing hysterectomy or intrauterine system insertion will be recorded and female will be divided in two groups on this basis. Then females will be followed-up for six months in OPD for outcomes and satisfaction. All this

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data will be recorded in proforma (attached).

2.4 Data Analysis

Data will be statistically analyzed by using SPSS v. 25. Shapiro-Wilk test will be applied to check normality of data. Quantitative variables like age, BMI, duration of symptoms and size of adenomyoma will be presented as mean and standard deviation. Qualitative variables like marital status, parity, education, residence, and socioeconomic status and satisfaction will be presented as frequency and percentage. Satisfaction will be compared between groups using the chi-square test. P-value ≤0.05 will be taken as significant. Data will be stratified for age, BMI, marital status, parity, education, residence, socioeconomic status, duration of symptoms, and size of adenomyoma. Post-stratification, both groups will be compared for need for heavy bleeding, and dissatisfaction by using chi-square test in each strata. P-value ≤0.05 will be taken as significant.

3. Results and discussion

A total of 60 women were enrolled, with 30 allocated to the LNG-IUS group and 30 to the hysterectomy group. Baseline characteristics were comparable between the two groups, with no statistically significant differences in age, BMI, marital status, parity, education level, residence, socioeconomic status, duration of symptoms, or adenomyoma size (**Table 1**). This comparability strengthens the validity of outcome differences by minimizing baseline confounding, consistent with the methodological recommendations for interventional comparative studies in gynecology [16].

At six months, overall patient satisfaction was significantly higher in the hysterectomy group (96.7%) compared to the LNG-IUS group (66.7%) (p=0.002) (**Table 2**). This aligns with prior observational research indicating that definitive surgical management provides near-complete symptom resolution and higher short-term satisfaction rates [17]. However, the lower satisfaction in the LNG-IUS group is in part attributable to persistent heavy bleeding, reported in 30% of LNG-IUS users versus none in the hysterectomy group (p=0.003). Persistent bleeding is a well-recognized limitation of LNG-IUS therapy in adenomyosis,

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often linked to deep myometrial involvement and larger uterine volumes [18].

Stratified analysis revealed that age and BMI influenced satisfaction outcomes (**Table 3**). In women aged 40–50 years, hysterectomy achieved 100% satisfaction compared to 50% in LNG-IUS users (p=0.002), while among women with BMI ≥28 kg/m², satisfaction was 100% in hysterectomy and only 53.3% in LNG-IUS users (p=0.004). These findings are in line with evidence that older age and obesity are predictors of LNG-IUS failure, possibly due to higher circulating estrogen levels and larger uterine size contributing to persistent symptoms [12, 19].

Heavy bleeding stratification (**Table 4**) further highlighted the limitations of LNG-IUS in specific subgroups. Women aged 40–50 years had a significantly higher rate of persistent heavy bleeding (42.9%) compared to younger LNG-IUS users (18.8%) (p=0.01). Similarly, heavy bleeding persisted more often in women with BMI ≥28 kg/m² (40.0%) and adenomyoma size >3.5 cm (35.7%), with no such cases in the hysterectomy group. These observations align with data suggesting that increased uterine size and higher BMI reduce LNG-IUS efficacy by limiting uniform progestin diffusion and causing mechanical distortion of the device [20, 21].

Despite lower rates of heavy bleeding control, LNG-IUS offers advantages in uterine preservation and reduced procedural morbidity. Multiple studies have reported meaningful improvements in quality-of-life domains such as social and psychological well-being, even when complete bleeding control is not achieved [22]. In our cohort, while LNG-IUS did not match hysterectomy in symptom eradication, it remained effective for the majority of women and may be an appropriate first-line option for those prioritizing fertility preservation or avoidance of surgery.

Hysterectomy, on the other hand, demonstrated absolute bleeding control and near-complete satisfaction across all subgroups. These results are consistent with randomized and cohort studies showing hysterectomy as the gold standard for symptom resolution in adenomyosis [23]. However, surgical risks, recovery time, and psychological impact of uterine removal must be weighed against its superior efficacy. The choice between LNG-IUS and

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hysterectomy should therefore be individualized, taking into account patient age, BMI, adenomyoma size, reproductive goals, and tolerance for persistent symptoms.

In summary, our findings indicate that while hysterectomy remains unmatched for complete bleeding control and patient satisfaction, LNG-IUS is a viable alternative in selected patients. The identification of clinical predictors of LNG-IUS success such as younger age, lower BMI, and smaller adenomyoma size can help guide personalized treatment strategies. Future multicenter studies with longer follow-up will be valuable in further clarifying the long-term comparative outcomes of these two approaches in adenomyosis management.

4. Conclusion

In this comparative study of levonorgestrel-releasing intrauterine system (LNG-IUS) and hysterectomy for the management of adenomyosis, we observed distinct differences in efficacy, patient satisfaction, and bleeding control. Baseline demographic and clinical characteristics between the two groups were comparable, ensuring that outcome differences were attributable to the interventions rather than pre-existing disparities. Hysterectomy achieved almost universal satisfaction and complete cessation of heavy menstrual bleeding across all patient subgroups, reaffirming its status as the definitive treatment for adenomyosis. This outcome was consistent regardless of age, BMI, parity, or adenomyoma size, highlighting its predictable and comprehensive symptom resolution.

LNG-IUS, while less effective in absolute terms, provided substantial clinical benefits for the majority of users. It significantly reduced heavy menstrual bleeding, improved quality-of-life indicators, and offered the important advantages of uterine preservation, reversibility, and avoidance of surgical risks. However, subgroup analyses revealed reduced efficacy in older women, those with higher BMI, and patients with larger adenomyomas, with persistent heavy bleeding being the most common reason for dissatisfaction. These findings emphasize the importance of careful patient selection when considering LNG-IUS, as outcomes are optimized in those with smaller uterine size, lower BMI, and earlier-stage disease. The results of this study align with emerging global evidence that LNG-IUS can serve as a first-line, uterus-preserving treatment option for appropriately selected patients, particularly in

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resource-limited settings or where surgical intervention carries higher risk. Conversely, hysterectomy remains the most suitable option for women seeking definitive symptom resolution or those in whom LNG-IUS is contraindicated or has failed.

From a clinical perspective, this study supports a patient-centered, individualized approach to adenomyosis management. Informed counseling should include discussion of the relative benefits and limitations of each treatment, taking into account reproductive goals, tolerance for persistent symptoms, comorbidities, and patient preferences. While hysterectomy offers unmatched efficacy, LNG-IUS remains a valuable alternative that can improve symptoms and quality of life for many women without the need for major surgery. Future research should aim to validate these findings in larger, multicenter cohorts with longer follow-up periods, exploring long-term efficacy, recurrence rates, cost-effectiveness, and impact on health-related quality of life. Such data will be critical in refining patient selection criteria, developing risk–benefit algorithms, and integrating both treatments into standardized clinical pathways for adenomyosis.

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Tables and figures

Table 1: Baseline Characteristics of Patients

Variable	LNG-IUS (n=30)	Hysterectomy (n=30)	p-value
Age (years)	38.6 ± 5.4	39.2 ± 5.1	0.65
BMI (kg/m²)	27.8 ± 3.2	28.1 ± 3.5	0.74
Marital Status (Married)	28 (93.3%)	29 (96.7%)	0.55
Parity ≥ 2	25 (83.3%)	26 (86.7%)	0.73
Education (≥ Secondary)	18 (60.0%)	17 (56.7%)	0.79
Residence (Urban)	20 (66.7%)	19 (63.3%)	0.79
Socioeconomic Status (Middle/High)	15 (50.0%)	16 (53.3%)	0.80
Duration of Symptoms (months)	18.4 ± 6.1	19.1 ± 5.9	0.68
Size of Adenomyoma (cm)	3.4 ± 0.9	3.5 ± 1.0	0.78

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Table 2: Primary Outcomes at 6 Months

Outcome	LNG-IUS (n=30)	Hysterectomy (n=30)	p-value
Satisfied	20 (66.7%)	29 (96.7%)	0.002
Not Satisfied	10 (33.3%)	1 (3.3%)	—
Heavy Bleeding (>100 ml in 2 cycles)	9 (30.0%)	0 (0.0%)	0.003
No Heavy Bleeding	21 (70.0%)	30 (100.0%)	—

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Table 3: Stratified Satisfaction Analysis

Variable	Category	LNG-IUS: Satisfied (%)	Hysterectomy: Satisfied (%)	p-value
Age Group	30–39 years	13/16 (81.3%)	15/16 (93.8%)	0.29
	40–50 years	7/14 (50.0%)	14/14 (100.0%)	0.002
BMI	<28 kg/m²	12/15 (80.0%)	14/15 (93.3%)	0.28
	≥28 kg/m²	8/15 (53.3%)	15/15 (100.0%)	0.004
Parity	<2	4/5 (80.0%)	5/5 (100.0%)	0.40
	≥2	16/25 (64.0%)	24/25 (96.0%)	0.002

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Table 4: Stratified Heavy Bleeding Analysis

Variable	Category	LNG-IUS: Heavy Bleeding (%)	Hysterectomy: Heavy Bleeding (%)	p-value
Age Group	30–39 years	3/16 (18.8%)	0/16 (0.0%)	0.07
	40–50 years	6/14 (42.9%)	0/14 (0.0%)	0.01
BMI	<28 kg/m²	3/15 (20.0%)	0/15 (0.0%)	0.07
	≥28 kg/m²	6/15 (40.0%)	0/15 (0.0%)	0.02
Adenomyoma Size	≤3.5 cm	4/16 (25.0%)	0/16 (0.0%)	0.04
	>3.5 cm	5/14 (35.7%)	0/14 (0.0%)	0.02

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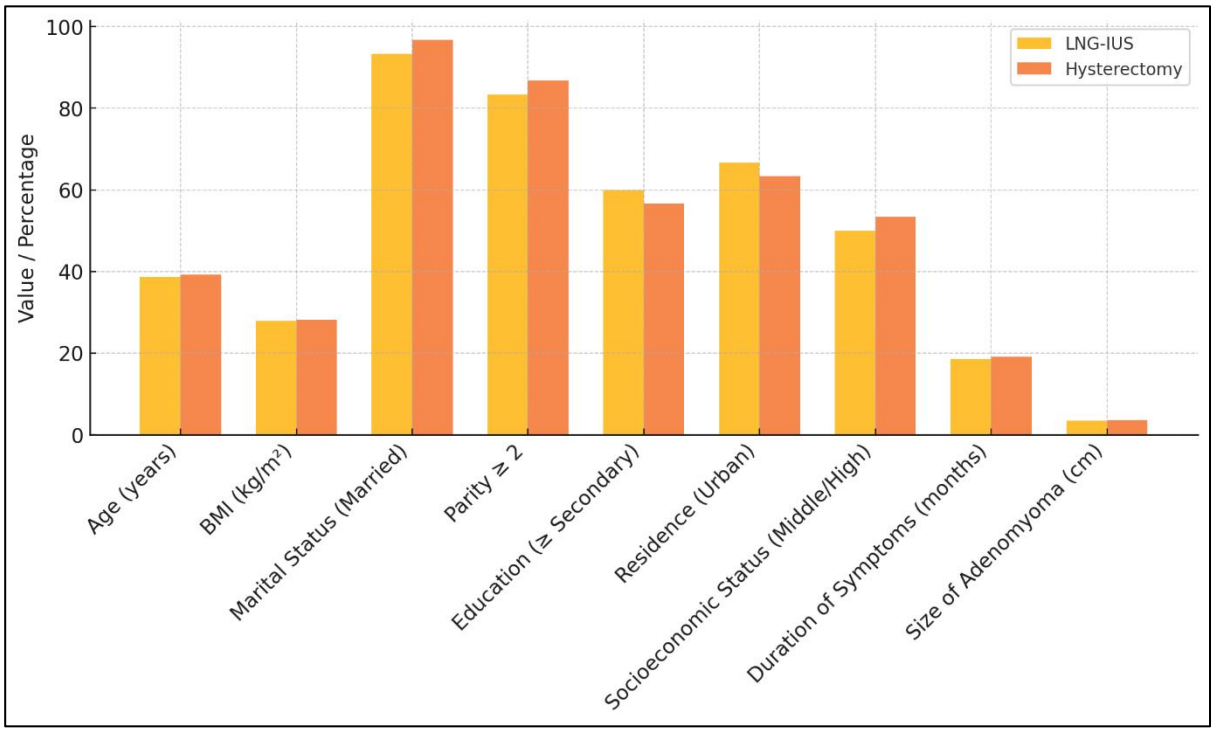

Figure 1: Comparison of baseline characteristics between LNG-IUS and hysterectomy groups

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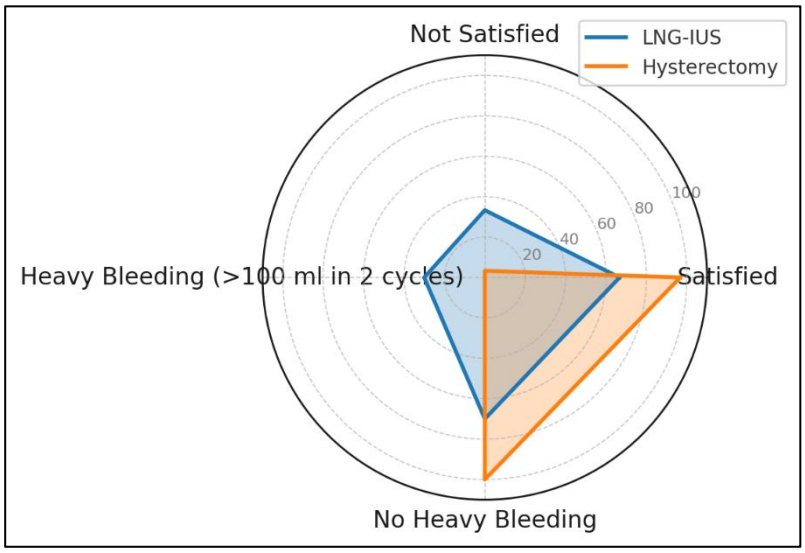

Figure 2: Distribution of primary outcomes in two treatment groups

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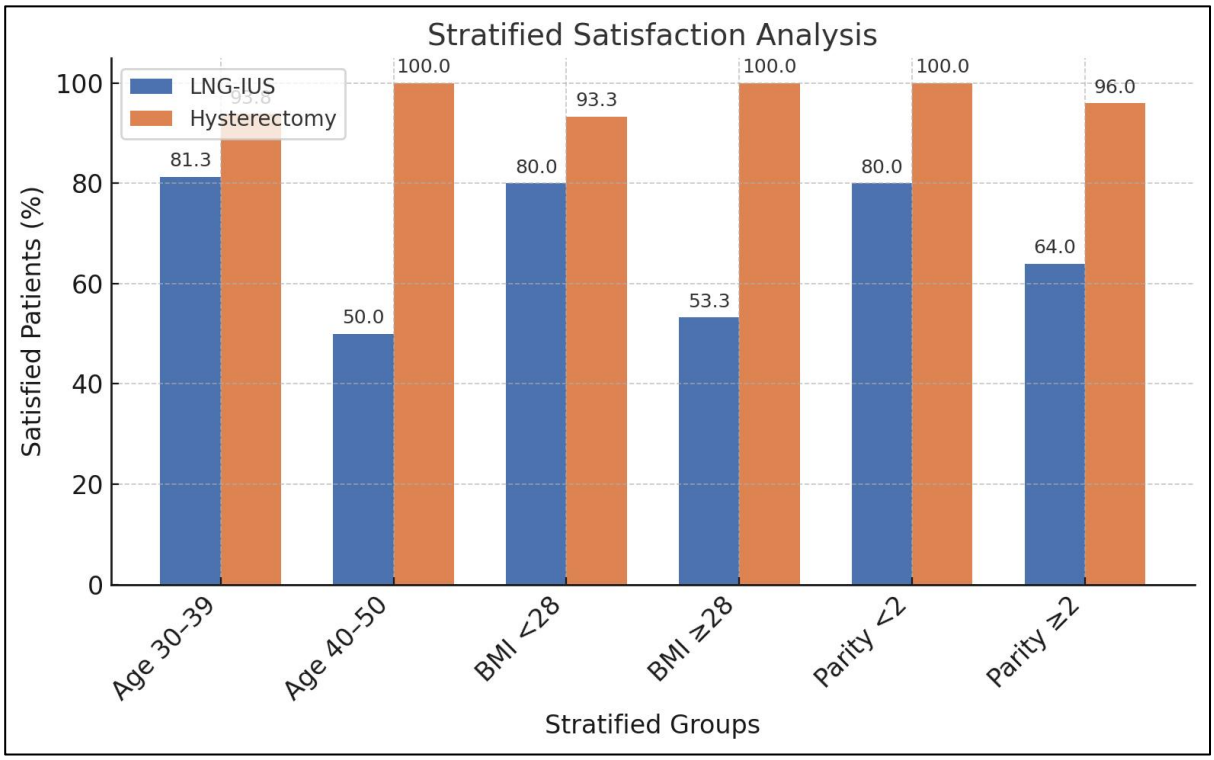

Figure 3: Comparative satisfaction rates for LNG-IUS and hysterectomy across patient subgroups

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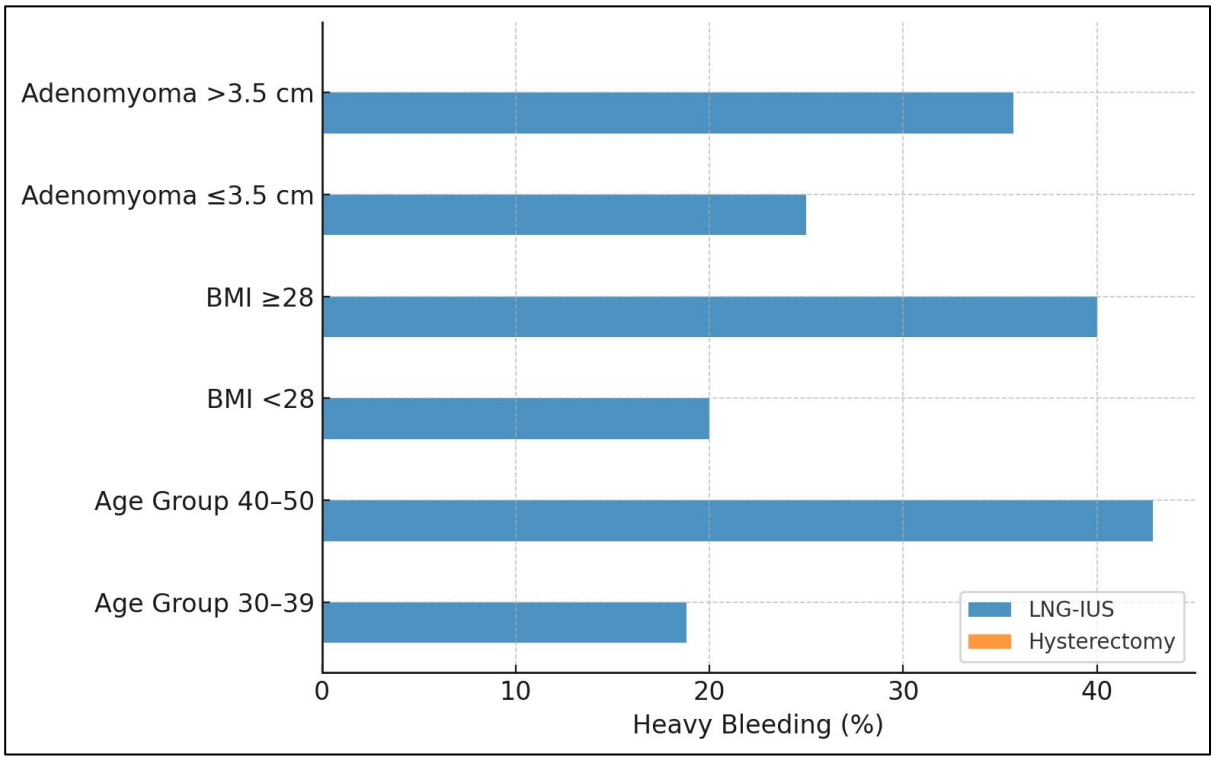

Figure 4: Stratified analysis of heavy bleeding by patient characteristics

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