ORIGINAL RESEARCH

Analyzing 10-year time trends for Hysterectomy and Oophorectomy: Focus on Endometrial sampling and risk factors for Endometrial Cancer

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Abstract

Background

Hysterectomy is a versatile and commonly employed treatment option for various benign and malignant gynecological conditions. Our study aims to take a comprehensive perspective on hysterectomy over the years using accumulated data and provide clinicians with an accurate insight into the hysterectomy operation.

Material-Method

This retrospective observational study was conducted on women who underwent hysterectomy at our clinic between 2012 and 2021. Comprehensive medical histories of all patients were thoroughly reviewed as the primary data. Surgical procedures were categorized and compared by year. Operation indications, preoperative endometrial sampling, and the pathology results of the final hysterectomy specimens were also examined. Risk factors were evaluated in confirmed cases of endometrial cancer and atypic endometrial hyperplasia based on pathology results. The analyses were performed using IBM SPSS 20 statistical analysis software.

Results

In our study,752 patients(mean age: 52±8.2) underwent various hysterectomy procedures, with total abdominal hysterectomy being the most frequent(73.3%). The primary indication was uterine leiomyomas-adenomyomas(33.5%). Endometrial sampling was performed in 57.2% of patients, showing no significant difference in reliability(p=0.143) and endometrial cancer diagnosis(p=0.334). Among 38 patients diagnosed with endometrial cancer, approximately 28.9%(11 patients) did not undergo preoperative endometrial sampling. Further examination revealed that these patients were obese, 63.6% presented with spotting-like bleeding, and most were in the postmenopausal period. Risk factors for these patients and those with atypical hyperplasia indicated statistically significant positive family history(p=0.037) and estrogen therapy history(p=0.028). Out of 536 oophorectomies, 236 were performed in women under 50.

Conclusion

The study highlights the need to implement the current literature and promote minimally invasive approaches. Widespread adoption of non-hysterectomy options is essential for rate reduction. Physicians must integrate current literature, refine skills in minimally invasive methods, and advance surgical techniques to achieve an idealized approach for premalignant lesions and endometrial cancer. Presenting clinic data to personalize algorithms and treatments will strengthen the literature, enhancing the field and increasing the applicability of knowledge for personalized implementation of ideal algorithms and treatments.

Keywords: Dilatation and curettage, Endometrial carcinoma, Endometrial hyperplasia, Endometrial sampling, Hysterectomy, Minimally invasive surgery, Oophorectomy, Pipelle curettage, Risk factors, Surgical techniques, Time trends

Introduction

Hysterectomy serves as a versatile treatment option for various benign gynecological conditions, including gynecologic cancers, leiomyomas, adenomyosis, pelvic organ prolapse, chronic pelvic pain, and dysfunctional uterine bleeding resistant to medical treatment, as well as obstetric complications. Studies in the United States have indicated that nearly 45% of women undergo hysterectomy in their lifetime, highlighting its prevalence as a treatment option for various gynecological issues[1]. It is the most common non-pregnancy-related procedure in the United States and many other countries[2]. The leading indication for hysterectomy is leiomyoma Increasing evidence suggests that hysterectomy may lead to undesired consequences regardless of whether oophorectomy is performed[3].

Consequently, alternative leiomyomas and abnormal uterine bleeding treatments are being explored[1]. Despite advances in medical alternatives, the rate of hysterectomies has remained stable, with no significant decrease reported[4]. Therefore, it is crucial to carefully evaluate the indications for hysterectomy, consider the surgical technique, and involve the patient in the decision-making process. Hysterectomy can be executed using abdominal, vaginal, laparoscopic, or robotic surgery techniques. The choice of technique depends on factors such as the underlying condition, uterine size, patient's comorbidities, hospital's technical capabilities, and surgeon's experience. Technological advancements have significantly improved surgical techniques recently, with minimally invasive approaches becoming the preferred method[5]. Given the significance of hysterectomy in gynecological operations

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worldwide, considering appropriate indications and preoperative preparations, a thoughtful approach is essential. Notably, the vast majority of hysterectomies are elective procedures, while a relatively small proportion of around 8% is performed to address genital system malignancies. Accurately diagnosing premalignant lesions and excluding coexisting endometrial carcinomas (EC) are important aspects of properly managing endometrial hyperplasia (EH)[6]. Atypic EH (AEH) is a premalignant condition that does not have easy clinical management. Almost one in two women may already have concurrent endometrial cancer; up to 30% of cases can progress to cancer within 12 months[7]. Accurate diagnosis is pivotal for women candidates for surgery or conservative treatment. Some EC predictors may affect the rate of unexpected cancer in AEH, and the endometrial sampling method (ESM) used preoperatively[8,9].

Previous studies have shown that some cancer predictors in women with AEH are associated with concurrent EC[10]. In light of this information, accurately assessing predictive symptoms as risk factors is crucial in managing both EC and AEH. More is needed in the literature about the diagnostic reliability of ESMs in women with AEH. Our study will contribute to the literature in this regard. Dilation, curettage (D&C), and pipelle were the most used and studied ESM. Previous authors showed that ~30% of women with AEH at D&C revealed EC on hysterectomy[11]. Therefore, the most reliable ESM in women with AEH must be clarified. Furthermore, it is unknown if the presence of EC predictors can affect the reliability of ESMs[12].

This study aims to provide a detailed analysis of practice trends and outcomes related to hysterectomy over ten years. It considers factors such as pre- and post-operative data, indications, oophorectomy preferences, and changes in surgical techniques over the years. Furthermore, the study considers patients' sociodemographic characteristics and detailed medical histories of patients in which the risk factors are detailed. Notably, the study's distinctive feature lies in its evaluation of preoperative endometrial sampling preferences, along with assessing endometrial cancer risk factors and examining pathology results after surgery. DC and pipeline processes will also be compared. This approach can aid clinicians in tailoring patient treatments effectively and efficiently. The comprehensive findings of this study will contribute significantly to the literature on hysterectomy, both locally and globally.

Material-Method

Study Design and Participants: This retrospective observational study was conducted on women who underwent hysterectomy at the Kafkas University Faculty of Medicine Research Hospital between 2012 and 2021. The study received ethics committee approval with the number 80576354-050-99/232. The inclusion criteria encompassed all women who had undergone hysterectomy during this period, regardless of their operative indications, surgical techniques, or pathology results. Comprehensive medical histories of all patients were thoroughly reviewed and recorded as the primary data. Information obtained from hospital records included their ages, body mass index (BMI), menstrual patterns, menstrual phase at examination, endometrial thickness measurements recorded during examinations, complaint, family history, cancer syndrome history, estrogen treatment history, tamoxifen usage history, ages at menarche and menopause, parity, polycystic ovary syndrome (PCOS) history, inquiries about systemic diseases, and specifically, the presence of diabetes mellitus. Patients with missing data or incomplete file scans, amounting to 48 cases, were excluded from the study.

Surgical Procedures: The various surgical techniques for hysterectomy, including total abdominal hysterectomy (TAH), subtotal abdominal hysterectomy (subtotal AH), vaginal hysterectomy (VH), or total laparoscopic hysterectomy (TLH) approaches, were categorized and compared. It should be noted that robotic surgery equipment was not available in our clinic. Similar vaginal and laparoscopic combined techniques like V-Notes were not included in our study due to the lack of data confirming the application of these approaches.

Additionally, oophorectomy data were collected and compared based on years and age groups. Contrary to the conventional belief that the loss of one ovary would not have significant consequences, considering publications associating oophorectomy with a significant increase in the risk of dementia in later life 13, patients undergoing oophorectomy were recorded without distinguishing between unilateral and bilateral oophorectomy. The pathology results of the final hysterectomy specimens were also examined.

The analyses were performed using IBM SPSS 20 statistical analysis software. The data were presented as mean, standard deviation, median, minimum, maximum, percentage, and count. The normal distribution of continuous variables was assessed through the Shapiro-Wilk, Kolmogorov-Smirnov, Q-Q plot, skewness, and kurtosis. For comparisons between two independent groups, the Independent Samples t-test was used when the normality assumption was met, and the Mann-Whitney U test was used when the assumption was not met. The ANOVA test was employed for comparisons involving more than two independent groups and meeting the assumption of normal distribution. When the normality assumption was not met, the Kruskal-Wallis test was used. Post-hoc tests following ANOVA were conducted using the Tukey test when variances were homogenous and Tamhane's T2 test when variances were non-homogenous. Post-hoc tests after the Kruskal-Wallis test were performed using the Kruskal-Wallis 1-way ANOVA (k samples) test. The Pearson Chi-square test was utilized for 2x2 comparisons between categorical variables with an expected count (>5). The Chi-square Yates test was used when the expected count was between 3 and 5. For expected counts (<3), the Fisher's Exact test was applied. For comparisons between categorical variables larger than 2x2, the Pearson Chi-square test was used when the expected count was greater than 5, and the Fisher-Freeman-Halton test was used when the expected count was less than 5. The statistical significance level was set at $p < 0.05$.

Results

Between 2012 and 2021, a total of 752 patients who underwent hysterectomy at our center and met the inclusion criteria of our study were examined. When analyzing the demographic characteristics of the patients, it was observed that their average age was 52, with a mean menarche age of 12 and a mean menopause age of 49. Furthermore, 93.6% of the patients were multiparous (having two or more births), and 30.7% had a BMI greater than or equal to 27 (Table 1).

Table 1. Patient characteristics

		Operation Method						
		TAH	**TLH**	**VH**	**Subtotal AH**	**Chi-square**	**p**	**Post-hoc**
Age	Mean	51.34	50.55	61.96	47.81	91.373	0	1-3, 2-3, 4-3
	Standard Deviation	8.13	6.11	9.29	6.32			
	Median	50	50	62	48			
	Minimum	1	39	39	35			
	Maximum	83	72	85	57			
Menarch age	Mean	11.93	12.01	12.14	11.95	5.420	0.143	
	Standard Deviation	0.74	0.73	0.74	0.67			
	Median	12	12	12	12			
	Minimum	11	11	11	11			
	Maximum	13	13	13	13			
Menopasue age	Mean	49.29	48.84	49.24	48.50	2.157	0.540	
	Standard Deviation	1.49	1.76	1.48	2.74			
	Median	50	49	50	50			
	Minimum	45	45	45	43			
	Maximum	53	52	52	50			
Parity	Mean	3,37	3,20	4	3	38,406	**<0.001**	1-3, 2-3, 4-3
	Standard Deviation	1,28	1,13	1	1			
	Median	3,00	3,00	4	3			
	Minimum	0,00	1,00	1	1			
	Maximum	8,00	6,00	7	5			
n (%)								
BMI	1	83 (15.1%)	17 (15.7%)	22 (30.6%)	4 (19.0%)	27.468	**<0.001**	
	2	302 (54.8%)	62 (57.4%)	18 (25.0%)	13 (61.9%)			
	3	166 (30.1%)	29 (26.9%)	32 (44.4%)	4(19.0%)			

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Table 2. Frequency of operation indications

Operation Indications		
	Frequency	Percent (%)
Adenomyosis	125	16.62%
Leiomyoma	127	16.88%
Pelvic organ prolapse	108	14.36%
Endometrial Hyperplasia	105	13.96%
Medical therapy resistance to abnormal uterine bleeding	51	6.78%
Endometrial carcinoma	27	3.59%
Adnexal mass	209	27.79%
Total	752	100,0

Table 3. Frequency of surgical techniques

	Frequency	Percent(%)
TAH	551	73.3
TLH	108	14.4
VTH	72	9.6
Subtotal AH	21	2.8
Total	752	100.0

Table 4. Pathology results of hysterectomy material

	Frequency	Percent(%)
Uterine leiomyomas	129	17.2
Adenomyosis	126	16.8
Atrophic Endometrium	99	13.1
Chronic Endometritis	55	7.3
Endometrial Polyp	54	7.2
Simple Non-Atypical Endometrial Hyperplasia	42	5.6
Complex Non-Atypical Hyperplasia	19	2.5
Simple Atypical Endometrial Hyperplasia	15	2
Complex Atypical Hyperplasia	29	3.9
Endometrial Cancer	38	5.1
Others*	146	19.3
Total	752	100.0

*: Basal Endometrium: 7.3%, Proliferative Endometrium: 3.1%, Irregularly Proliferative Endometrium: 3.1%, Secretory Endometrium: 2.3%, Otolithic Endometrium: 1.6%, Stromal Glandular Breakdown: 1.3%, Endometrial Inflammation: 1.1%, Pseudostratified Epithelium-Lined Gland: 0.1%, Atypical Polypoid Adenocarcinoma: 0.1%

Table 5. Relationship between premalignant and malignant lesions and risk factors

	Atypical Endometrial Hyperplasia n: 31	**Endometrial Cancer n: 12**	**p**
BMI> 30	21	11	0.139
Abnormal uterine bleeding	26	12	0.300
Endometrial thickness under 5mm	13	7	0.334
5mm and above Endometrial thickness	18	5	0.334
Family history of cancer	9	8	**0.037**
Positive cancer syndrome	0	0	NA
Presence of diabetes mellitus (DM)	11	6	0.492
PCOS	19	8	1
History of estrogen therapy	28	7	**0.028**
History of tamoxifen therapy	2	2	0.308
Nulliparity	1	1	0.485

Upon examination of the data in our study, the indications for surgery in patients who underwent hysterectomy are presented in Table 2. The cases were analyzed considering the preferred surgical method. It was determined that the most frequently used surgical technique in hysterectomy cases at our clinic was TAH, accounting for 73.3% of the cases (Table 3).

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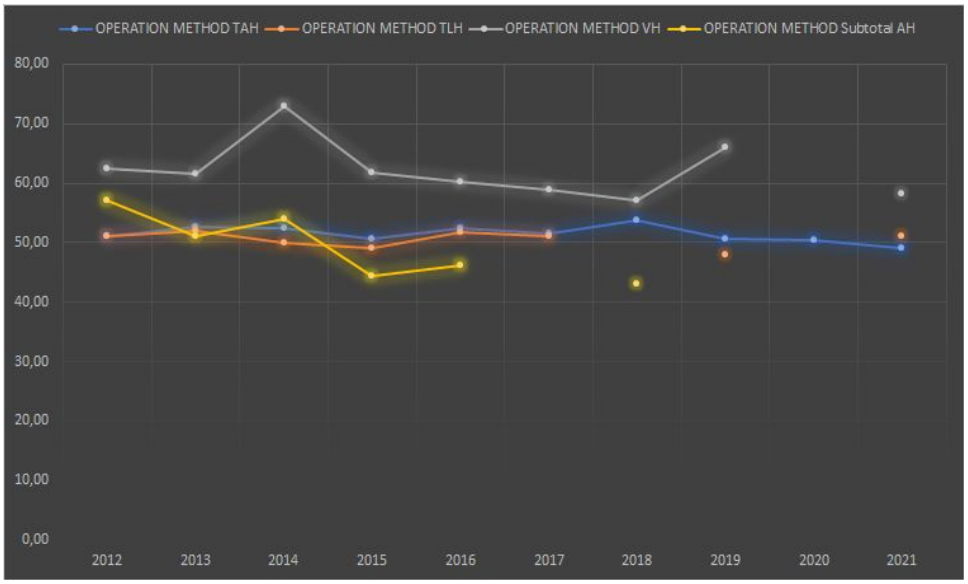

Figure 1. Distribution of preferred surgical techniques by age and years

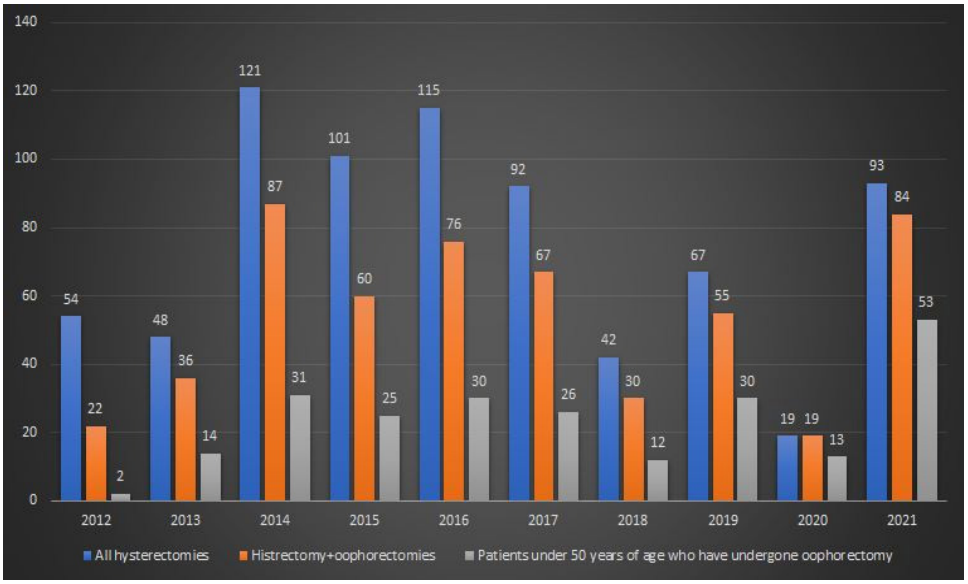

Figure 2. Distribution of hysterectomy, oophorectomy, and oophorectomy under 50 years by years

The dates of hysterectomy operations performed at our clinic and the ages of the patients have been recorded. Based on the obtained data, it has been observed that the preferred hysterectomy techniques have varied over the years. This distribution has been analyzed and presented in Figure 1. Based on the table, it is evident that the most preferred surgical technique throughout the years has been TAH without significant changes. Subtotal AH was a technique used before 2016 but had the lowest preference among all other techniques. After 2016, it was hardly performed at our clinic. Moreover, there has been a significant decrease in the use of vaginal and laparoscopic hysterectomies over the years, contrary to the expected increase in their utilization. Regarding the indications for surgery based on the final pathology results, uterine leiomyomas were the most common indications in 129 patients (17.2%), followed by adenomyosis in 126 patients (16.8%). In our study, 105 cases (14%) were reported to have endometrial hyperplasia atrophic endometrium in 68 patients (9%), and 38 cases (5.1%) were diagnosed with endometrial cancer (Table 4).

For the 322 (approximately 57.2%) patients who underwent preoperative evaluations, Pipelle endometrial sampling (P&C) was chosen in 72.9% of cases, while Dilation and Curettage (D&C) were performed in 27% of cases. When comparing the results of the samplings with the pathology findings, it was observed that there was no statistically significant difference between the two methods in terms of reliability. Both methods showed similar reliability.

Among the 38 patients diagnosed with Endometrial Cancer, it was observed that 11 of them (approximately 28.9%) did not undergo preoperative endometrial sampling. Upon further examination of this patient group, it was noted that all patients were obese, 63.6% of them presented with spotting-like bleeding as their main complaint, and only two of them were in the perimenopausal period, while the others were in the postmenopausal period. Among the perimenopausal patients, one presented with Heavy Menstrual Bleeding (HMB), and the other presented with spotting-like vaginal bleeding. It is worth mentioning that 6 out of these patients (approximately 54.5%) had endometrial thickness measurements of 4mm or less in the postmenopausal period. Additionally, 7 patients had a positive family history and history of estrogen therapy, while 1 had a history of tamoxifen use. None of the patients had a history of cancer syndrome. The average age at menarche for the patients was 11, and the average age at menopause was 50.25. Only 1 patient was nulliparous, and 8 had a PCOS history. Based on these data, considering the positive correlation of high BMI, PCOS, family history, and estrogen use with endometrial cancer, we believe that preoperative sampling should be kept in mind for such patients regardless of the ultrasound measurements (Table 5).

We observe that among 752 hysterectomy operations, oophorectomy was added in 536 cases, and out of these cases, 236 were performed in women under the age of 50. Figure 2 presents the Distribution of Hysterectomies, Cases with Added Oophorectomy, and Hysterectomies Performed in Women Under 50 Years by Years.

Discussion

Hysterectomy is the most commonly performed surgical procedure among reproductive-age women after cesarean section[1]. Most hysterectomy procedures are conducted for benign conditions, with only approximately 8-10% performed as cancer treatment[14]. Despite the increasing availability of effective alternative treatments for benign gynecological conditions, it is noteworthy that hysterectomy remains widely preferred. Nevertheless, observational studies have increasingly highlighted the long-term adverse outcomes of hysterectomy, especially when accompanied

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by oophorectomy, such as cardiovascular disease, fractures, pelvic floor dysfunction, neurological issues, and all-cause mortality[1]. In our study, when considering histopathology reports of hysterectomy cases, it was determined that significant pathologies warranted alternative surgical treatments instead of hysterectomy. Therefore, the importance of preoperative evaluation needs to be emphasized. More widespread preoperative pathological assessments would lead to a more cautious approach when deciding on a hysterectomy, allowing for the possibility of follow-up or offering alternative treatment modalities to patients. In recent decades, there has been an emergence of effective alternative treatments for benign conditions. For instance, artery embolization is now commonly used to treat leiomyomas[15], and intra-uterine devices have shown success as an alternative treatment for abnormal uterine bleeding[14]. Although there has been a slight decrease in hysterectomy rates with the introduction of these effective alternative treatments over the last twenty years, hysterectomy remains one of the most frequently performed surgical procedures[1]. Although there has been a recent decline in hysterectomy rates in the United States[16], hysterectomy procedures are still considered to be overused, with around 60% of hysterectomies being performed for conditions that have available alternative therapies[17]. Among these cases, 38% lack documentation of alternative therapies attempted prior to hysterectomy, and 18% have poorly documented indications for the procedure[17], indicating that up to 30% of hysterectomies in the USA could be avoided. In some community-based studies, there are reports of a decrease in hysterectomy rates. In the study by Lycke et al., they evaluated 15 years of national data in Denmark. They found a decreased hysterectomy incidence for benign diseases, indicating a shift from abdominal hysterectomy to minimally invasive procedures in surgical practice[18]. Hysterectomy rates in Canada decreased from 1997 to 2017, with 90% of procedures performed for benign reasons, according to the Canadian Institute for Health Information [19]. The decline in the hysterectomy rate reflects the availability of alternatives, including hysteroscopic surgery, endometrial ablation systems, progesterone-containing intrauterine devices, and hormonal suppressive options[20].

According to the study by Hakkarainen et al., the hysterectomy rate demonstrated an average annual decline of 2.5% between 2014 and 2017[21]. The studies conducted by Simms et al. projected a decrease in hysterectomy rates by the year 2035. They even speculated that the declining hysterectomy numbers could lead to increased cervical cancer rates in the background[22]. In our study, due to the lack of continuity in our gynecology team, it is impossible to accurately assess the changes in hysterectomy rates. However, there has been no significant decrease in the number of hysterectomies. It is anticipated that in developed countries, the adoption of alternative treatments to hysterectomy would be faster and more systematic. Factors such as the accessibility of treatment alternatives in community-based studies nationwide and surgeons keeping up with the latest developments and integrating them into their practice can contribute to this trend.

In our clinic, there is a lack of prioritization and utilization of non-surgical treatments or alternative surgical options in managing and treating uterine conditions other than cancer. Although treatment options such as progesterone-releasing intrauterine devices, myomectomy, uterine artery embolization, hysteroscopic removal of myomas, and endometrial ablation[4,23] have been developed, there is a deficiency in referring patients to these treatments and considering them as alternatives to surgery. With advancements in assisted reproductive techniques and an increasing trend of delaying motherhood, women with uterine disorders are increasingly seeking treatment options that preserve their fertility for future purposes[24]. Due to its advantages, including faster recovery time and reduced risk of complications compared to traditional abdominal approaches, this approach has become the preferred method for hysterectomy[25,26]. Minimally invasive surgical techniques have been introduced for various procedures. While vaginal hysterectomy has been performed for many years, laparoscopically assisted hysterectomy and total laparoscopic hysterectomy have been utilized since the 1990s. More recently, robotic-assisted hysterectomy has also been described[27]. Minimally invasive approaches to hysterectomy offer numerous advantages and can even be performed as outpatient procedures. In a community-based study evaluating the 10-year trend of hysterectomies in Taiwan, Wu et al. reported the following results: There was a significant decrease in total abdominal hysterectomies, from 77.33% in 1996 to 45.68% in 2005. On the other hand, laparoscopic hysterectomies showed a significant increase, rising from 5.20% to 40.40%. Vaginal hysterectomies decreased from 14.70% to 8.86%, while subtotal abdominal hysterectomies increased from 2.76% to 5.06%[28]. In the study conducted by Luchristt et al., they observed a decline in the rates of total vaginal hysterectomy from 51% to 13% between 2008 and 2018, while the rates of total laparoscopic hysterectomy increased from 12% to 68% ($p<0.001$). Despite longer operative times, laparoscopic hysterectomy was preferred over vaginal hysterectomy due to its lower rate of complications[29]. In our study, although a shift towards laparoscopy was observed in the surgical procedure over 10 years, it was found that this transition occurred slowly, and abdominal hysterectomy remains a preferred choice. Chen et al.'s study discovered that various factors influence surgeons' adoption of laparoscopic hysterectomy. Among these factors, self-reported adequate training and the availability of operating room resources emerged as significant variables in determining the utilization of this surgical approach[30]. In Chen et al.'s study, it was observed that the introduction of laparoscopic techniques has decreased the number of vaginal hysterectomies performed in recent decades in Canada. The proportion of hysterectomies performed vaginally declined from 32% to 24.5% during the study period[24]. In our clinic, it is evident that the preference for vaginal hysterectomy is not in line with the general literature, and it is not the primary choice of surgical procedure. The continued preference for abdominal hysterectomy over the years in our clinic, located in a rural area with a lower socio-economic status patient population, can be explained by the findings from Chen et al.'s and Desai et al.'s studies. These studies suggest that women from lower socio-economic backgrounds have higher rates of hysterectomy, with a higher proportion of abdominal procedures performed among this specific group[24,31]. The likelihood of a woman undergoing a hysterectomy by the age of 55 is 20% in the United Kingdom, slightly higher at 25% in Australia, and increases to 37% in the United States by the age of 60 years[32]. In our study, the average age for a hysterectomy was determined to be 52 years. The study by Hakkarainen et al. found that the median

age at the time of hysterectomy increased from 51 years in 1998-2001 to 55 years in 2014-2017[21]. Uterine leiomyomas are identified as the main reason for hysterectomies, comprising about one-third of all hysterectomies performed. Subsequently, abnormal uterine bleeding is the next most common indication, accounting for approximately 16% of hysterectomies. Conversely, gynecologic cancers constitute less than 8% of all hysterectomies[33]. In our study, the most common indication for hysterectomy was uterine leiomyomas, accounting for 53% of cases, while only 5.3% were diagnosed with endometrial cancer. Hakkarainen et al. observed a change in the primary indication for hysterectomy, shifting from uterine leiomyomas to genital prolapse and incontinence after 2010. The decline in hysterectomies between 1986 and 2017 can be attributed to the availability of conservative treatment options for bleeding disorders and uterine leiomyomas. Moreover, the study emphasizes the importance of adjusting endometrial cancer incidence rates based on hysterectomy incidence, as hysterectomy has been shown to reduce the risk of endometrial cancer[21]. Despite appropriate preoperative evaluation, hidden uterine malignancy can be diagnosed during hysterectomy for a condition thought to be benign. Two retrospective studies reported hidden cancer rates ranging from 0.19 to 0.82 in individuals undergoing hysterectomy for benign indications[34,35]. In the most comprehensive recent study, a secondary analysis of the 2014-2015 American College of Surgeons National Surgical Quality Improvement Program database, which included over 24,000 women undergoing benign hysterectomy, revealed that 1.4% of women had uterine cancer, 0.60% had cervical cancer, and 0.19% had ovarian cancer detected[36]. Our study investigated the risk factors of patients who did not undergo preoperative endometrial sampling and were later diagnosed with atypical hyperplasia and endometrial cancer. Positive family history and estrogen therapy were statistically significant risk factors, while other evaluated risk factors were not statistically significant. However, it is noteworthy that among the evaluated patients, there were 6 cases (54.5%) with endometrial thickness measured as 4mm or below during the postmenopausal period. These measurements indicate the importance of considering the possibility of malignancy in cases with endometrial wall thickness measured as 4mm or below on ultrasound and the need for thorough questioning of the patient's clinical features and known risk factors for malignancy to create clinical suspicion in preoperative evaluation and for making appropriate decisions regarding treatment and surgical technique selection. Due to the low number of patients in our hospital, as there is no oncology department, we have observed that the cut-off value of 4mm and above is only sometimes a safe threshold. However, our data is not statistically significant. In line with our findings, Shen et al.[37], in their recent postmenopausal study with 470 participants, reported that Among women with TVU abnormalities, a nomogram was constructed, and a score greater than 22.5 suggested the need for referral for endometrial biopsy, confirming results similar to our study. Unlike our study, Gianella et al. evaluated obesity and age as significant predictor factors[12]. In Parsons et al.'s study, unexpected endometrial carcinomas were found to occur in 0.19% or 1 in 537 (95% confidence interval 1 in 314 to 1 in 1008) hysterectomies performed for benign indications in our population[34]. When considering these results, it is essential for every clinical decision regarding hysterectomy to assess the patient's risk factors thoroughly. If necessary, preoperative endometrial sampling should be strongly considered. In their retrospective study evaluating the results of D&C in patients with abnormal uterine bleeding, Alshdaifat et al. found that in 13.3% of cases, the D&C results were insufficient to detect intrauterine issues identified in the hysterectomy material. Consequently, the authors concluded that D&C is highly effective in diagnosing premalignant and malignant cases[38]. In comparison to other endometrial sampling techniques, such as D&C, the Pipelle method was evaluated in one study, and it was found that the difference in negative predictive value (NPV) between D&C and Pipelle was not statistically significant. However, the positive predictive value (PPV) of D&C (100%) was higher than that of the Pipelle (86%). Both techniques have limitations in detecting focal lesions accurately. However, the Pipelle is preferable as it causes less pain and is more cost-effective since it can be performed in an outpatient setting 38. In their study, Berto et al. evaluated the diagnostic agreement between preoperative biopsy and the definitive histology of the surgical specimen to determine the most suitable sampling method. The study concluded that Pipelle sampling could be an adequate diagnostic method for endometrial cancer[39]. Elective oophorectomy performed alongside hysterectomy may reduce the risk of ovarian and breast cancer in women's later life. Ovarian cancer is not a commonly occurring type of cancer. However, it is known that hysterectomy may increase the risk of cardiovascular disease, and this risk may be related to the patient's age at the time of surgery, disruption of ovarian circulation during hysterectomy, and concurrent bilateral salpingo-oophorectomy (BSO)[40,41]. Some studies indicate favorable symptom relief and improved quality of life five to eight years after the procedure. In contrast, others express concerns about long-term risks associated with dementia and cardiovascular disease[40-43]. Even in hysterectomies where ovaries are preserved, it can still lead to the woman entering menopause earlier than her natural menopausal age and an increased risk of dementia[1,13,42,44-46]. Furthermore, experts argue that many hysterectomy outcomes may take 20 to 30 years to become evident[47]. According to the results of our study and considering the literature knowledge over the years, we observe that the importance of preserving ovaries, which are also endocrine organs, in hysterectomies performed for benign reasons has not been reflected in the clinical practice, despite the recommendations and suggestions from the authors. Indeed, when deciding on the removal of female genital organs, long-term health outcomes should be taken into consideration. The incidence of adding elective oophorectomy to hysterectomy has shown fluctuations in the last 50 years[48]. Prophylactic BSO is justified by some reasons: it reduces the risk of future ovarian and breast cancer for women, and since these organs are considered non-functional after menopause, it is believed that removing them would prevent potential gynecological diseases in the future, thus avoiding the need for reoperation. However, these assumptions are subject to serious debates. Although difficult to diagnose, ovarian cancer is a relatively rare disease with a mortality rate of approximately 1.3%, compared to other conditions such as coronary artery disease, osteoporosis-related bone fractures, and neurological diseases[47,49,50]. Therefore, numerous studies have reported that prophylactic BSO performed during the premenopausal period would significantly increase women's risk of death

from more prevalent diseases than ovarian cancer[1,43,48,51]. According to the study by Erickson et al., the incidence rates of unilateral salpingo-oophorectomy (USO) and bilateral salpingo-oophorectomy showed significant variations over the 69 years covered in the study. In the last 14 years, premenopausal USO and BSO incidence has decreased. These trends reflect expanding evidence against oophorectomy for non-cancer indications[52]. In the observational study of Tuesley et al., there might be an association between increased all-cause mortality in women under 50 who underwent hysterectomies with BSO for non-malignant reasons. However, this association was not observed in women aged 50 and above. Therefore, when considering BSO for indications other than ovarian cancer in premenopausal women, this finding should be considered[53]. Similarly, in the study conducted by Rocca et al., it was observed that adding BSO to hysterectomy for benign reasons in women under 50 and in the perimenopausal period might accelerate aging in women. These findings highlight the importance of carefully considering the potential long-term effects and age-related considerations when making decisions regarding BSO in premenopausal and perimenopausal women[54].

The strengths of the study lie in analyzing hysterectomy with various parameters, emphasizing the need to curb unnecessary surgery in the face of evolving indications for hysterectomy, reinforcing the literature with data to encourage the widespread adoption of minimally invasive surgical methods, and shedding light on the correct patient selection in endometrial sampling for analyzing risk factors for endometrial cancer. Although the increasing adoption of minimally invasive methods and the exploration of indications for hysterectomy and oophorectomy, as well as the implementation of new treatments, could potentially address this limitation, the high turnover of clinicians in the clinic and the resulting lower number of data over the 10 years have posed a challenge to obtaining a higher volume of data. Additionally, despite working as a gynecologic oncologist for ten years as a subspecialist, the absence of an oncology department in the hospital has limited the number of oncological cases. Due to the high turnover of physicians in our clinic, when we initially designed our study, we refrained from incorporating parameters related to all physicians, as there was a risk of failing to reach all of them. Therefore, querying the educational levels of surgeons, their knowledge about minimally invasive techniques, and their habits of keeping up with the current literature could inspire a new study. Since our data were generated through the retrospective scanning of records, it is unfortunately impossible to include information on patients' education in our study as it was not queried in their files. Furthermore, considering the perspective developed through the study, the preference for minimally invasive methods is more influenced by the knowledge and skills of the physician than the initiative of the patients. The physician's incomplete mastery of the learning curves associated with these techniques may be a more decisive factor.

Conclusion

The research emphasizes the importance of clinics sharing detailed data to contribute to developing alternative treatments, individualized therapies, and accurate algorithms for benign uterine pathologies. Providing data from clinics is crucial for guiding patients appropriately, reviewing existing knowledge, and developing improved surgical methods. It highlights the necessity for physicians to continuously update their knowledge with current literature, gain proficiency in alternative treatments to hysterectomy, and continuously engage in education and self-improvement. The study emphasizes the need for a more informed approach to decisions regarding hysterectomy and oophorectomy, promoting minimally invasive surgical techniques and procedures involving natural orifices. The research highlights the significance of building infrastructure and enhancing the surgeon's expertise to increase the adoption of these techniques. Surgeons are responsible for keeping pace with minimally invasive techniques and staying updated on non-surgical treatment options to avoid unnecessary surgical interventions. Both patients and healthcare providers need more information to understand the long-term effects of procedures and make informed decisions.

The future holds promise for medical therapies that reduce reliance on surgical intervention and hospitalization. Ensuring equitable access to these treatment options for all patients, regardless of their background, is crucial for the healthcare system. Although hysterectomy remains a standard solution for gynecologic conditions, ongoing research and developing better alternatives are essential. The long-term consequences of hysterectomy and its alternatives should be thoroughly investigated. Gynecologists should provide comprehensive information and guidance to empower women to make informed decisions about the most suitable treatment options for their needs.

Authors' Contributions

AY raised the presented idea and designed the study. AY and MC collected the data. AY did data analyses. MC and AY wrote a paper. All authors have read and approved the final manuscript.

Availability of Data and Materials

The data generated and analyzed during the study are available from the corresponding author. They are not available publicly.

Conflicts of Interest

The authors declare no conflict of interest concerning this article's authorship and publication.

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