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Impact of Obesity on Treatment and Survival Outcome in Epithelial Ovarian Cancer Patients: A 10-year retrospective study

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ABSTRACT

Objectives: To assess the influence of women with obesity on surgical outcomes, chemotherapy side effects, and survival rates in Thai patients with epithelial ovarian cancer.

Materials and Methods: A retrospective review was conducted of the medical records of patients with epithelial ovarian cancer who underwent staging laparotomy at Siriraj Hospital between January 2008 and December 2017. Patients were categorized as patients without obesity (body mass index [BMI] < 25.0 kg/m^2) or patient with obesity (BMI ≥ 25 kg/m^2) according to the Western Pacific Regional Office BMI criteria. We compared patient demographics, surgical outcomes, chemotherapy complications, and survival data between the two groups.

Results: From an initial cohort of 444 patients, 18 were excluded, leaving 426 for analysis. The women with obesity group, representing 21.9% (n = 93) of the patients, exhibited a higher prevalence of diabetes mellitus (p < 0.0001), hypertension (p = 0.003), and dyslipidemia (p = 0.027) than the women without obesity group (78.1%, n = 333). Patients with obesity were significantly associated with increased postoperative complications, notably wound issues (adjusted odds ratio [OR] 6.175, 95% confidence interval [CI] 1.891–13.191; p < 0.001) and venous thromboembolism (adjusted OR 5.991, 95% CI 2.848–12.605; p < 0.001), but it correlated with fewer cases of neutropenia (p = 0.002) and reduced delays in chemotherapy (p = 0.015). There were no significant differences in progression-free survival (p = 0.135) or five-year overall survival (p = 0.923).

Conclusion: Thai women with obesity with epithelial ovarian cancer was linked to an increased risk of postoperative complications, increased chemotherapy tolerability, but did not affect survival outcomes.

Keywords: obesity, ovarian cancer, wound complication, thromboembolism, survival

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ผลกระทบของโรคอ้วนต่อการรักษาและผลลัพธ์การรอดชีวิตในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว: การศึกษาย้อนหลังระยะเวลา 10 ปี

อัศวรักษ์ สมพรมนัส, ไอรีน เรืองขจร, นิดา จารีมิตร, เขมณัฏฐ์ เขมวรพงศ์, วุฒินันท์ อัจฉริยะโพ

บทคัดย่อ

วัตถุประสงค์: *การศึกษานี้จัดทำเพื่อศึกษาความสัมพันธ์ระหว่างโรคอ้วนต่ออัตราการรอดชีวิตในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว และเพื่อศึกษาความสัมพันธ์ระหว่างโรคอ้วนต่อผลการผ่าตัดและการให้ยาเคมีบำบัดในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว*

วัสดุและวิธีการ: *เป็นการทบทวนเวชระเบียนย้อนหลังผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิวที่ได้รับการรักษาผ่าตัดประเมินระยะของโรคและให้ยาเคมีบำบัด ระหว่างเดือน มกราคม พ.ศ. 2551- ธันวาคม พ.ศ.2561 ณ โรงพยาบาลศิริราช โดยเก็บข้อมูลลักษณะพื้นฐานของผู้ป่วย ข้อมูลระหว่างการผ่าตัด การให้ยาเคมีบำบัด รวมถึงผลข้างเคียงที่เกิดขึ้น ไปจนถึงระยะเวลาที่โรคกลับมาเป็นซ้ำ หรือระยะเวลาที่เสียชีวิต โดยแบ่งคนไข้เป็นกลุ่มจากการคำนวณค่าดัชนีมวลกาย (BMI) โดยแบ่งตามเกณฑ์ขององค์การอนามัยโลกภูมิภาคแปซิฟิกตะวันตก (Western Pacific Regional Office (WPRO) โดยกลุ่มโรคอ้วนคือมี ดัชนีมวลกาย BMI ≥ 25 กก./ม^2 และกลุ่มไม่มีโรคอ้วนคือ BMI < 25.0 กก./ม^2 เพื่อทำการเปรียบเทียบอัตราการรอดชีวิตในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว ผลแทรกซ้อนระหว่างและหลังการผ่าตัดและผลข้างเคียงระหว่าการให้ยาเคมีบำบัดระหว่างสองกลุ่ม*

ผลการศึกษา: *ผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิวทั้งหมด 426 คน แบ่งเป็นกลุ่มที่มีโรคอ้วนร้อยละ 21.9 (93 คน) กลุ่มไม่มีโรคอ้วนร้อยละ 78.1 (333 คน) โดยพบว่าในกลุ่มที่มีโรคอ้วน จะพบโรคประจำตัว เบาหวาน (p < 0.0001), ความดันโลหิตสูง (p = 0.003), และไขมันในเลือด (p = 0.027) มากกว่ากลุ่มที่ไม่มีโรคอ้วน โดยพบว่าโรคอ้วนในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว เพิ่มความเสี่ยงต่อการเกิดภาวะแทรกซ้อนของแผลผ่าตัด (adjusted odds ratio (OR): 6.175; 95% CI: 1.891-13.191; p < 0.001) และภาวะลิ่มเลือดอุดตันในหลอดเลือดดำหลังการผ่าตัด (adjusted OR: 5.991; 95% CI: 2.848-12.605; p < 0.001) ในด้านผลของโรคอ้วนต่อการให้ยาเคมีบำบัดพบว่า ในกลุ่มที่มีโรคอ้วนพบการมีเม็ดเลือดขาวต่ำหลังให้ยาเคมีบำบัดที่น้อยกว่า (p = 0.002) และการเลื่อนในการให้ยาเคมีบำบัดที่น้อยกว่า (p = 0.015) เมื่อเปรียบเทียบกับกลุ่มไม่มีโรคอ้วน โดยอัตราการรอดชีวิตในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว (p = 0.135) และอัตราการอยู่รอดโดยโรคสงบใน 5 ปี (p = 0.923) ทั้งสองกลุ่มพบว่าไม่มีความแตกต่างมีนัยสำคัญทางสถิติ*

***สรุป**: โรคอ้วนไม่มีผลต่ออัตราการรอดชีวิตในผู้ป่วยมะเร็งรังไข่ชนิดเยื่อบุผิว แต่เพิ่มความเสี่ยงต่อภาวะแทรกซ้อนของแผลภายหลังการผ่าตัดและภาวะลิ่มเลือดอุดตันในหลอดเลือดดำหลังการผ่าตัด*

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Introduction

The prevalence of women with obesity, which is increasingly recognized as a major global public health challenge, has increased markedly over the last decade. In Thailand, the prevalence of women with obesity (body mass index [BMI] ≥ 25 kg/m²) increased from 33.9% in 2012 to 44.8% in 2018[1]. This condition is associated with a higher incidence of several health issues, including cardiovascular diseases, diabetes mellitus, sleep apnea, arthritis, and various cancers[2, 3]. Notably, increased BMI has been linked to elevated mortality in women with cancers specific to the breast, uterus, cervix, or ovaries[4, 5]. Prior studies suggest that obesity may contribute to poorer survival in epithelial ovarian cancer through alterations in tumor biology. For instance, Pavelka et al hypothesized that the elevated mortality observed in obese patients is attributable to more aggressive tumor characteristics[6].

Ovarian cancer is the seventh most common cancer among Thai women and ranks third among gynecologic malignancies, trailing only cervical and endometrial cancers[7]. It remains the most lethal gynecologic cancer in Thailand, and its challenging prognosis is reflected in a 30%–50% five-year survival rate following diagnosis[8].

For ovarian cancer, the standard treatment protocol includes cytoreductive debulking surgery and adjuvant chemotherapy. The primary goal of debulking surgery in ovarian cancer treatment is extensive removal of the tumor. This procedure aims to achieve a residual tumor size that is either microscopic or does not exceed 1 cm in maximum diameter, a criterion defined as “optimal” by the Gynecologic Oncology Group. Studies indicate that achieving this optimal surgical standard, followed by adjuvant chemotherapy, significantly improves patient outcomes and survival rates[9]. However, the presence of obesity has been linked to challenges in achieving optimal outcomes in cytoreductive surgery. These challenges include prolonged surgery durations, increased intraoperative blood loss, and a heightened risk of wound complications in patients with obesity[10, 11]. Furthermore, chemotherapy treatment in individuals with obesity often involves dosing based on ideal body weight. This approach may lead to an underestimation of the glomerular filtration rate using standard formulas, resulting in suboptimal chemotherapy dosages and potentially diminished treatment effectiveness[12, 13]. Although some studies have identified women with obesity as an independent prognostic factor for ovarian cancer survival, the scientific community has not reached a consensus on this relationship[11, 14-16].

This study evaluated the impact of patients with obesity on surgical outcomes (including intraoperative and postoperative complications), the adverse effects of chemotherapy, and survival rates in Thai patients diagnosed with epithelial ovarian cancer.

Materials and Methods

This retrospective, single-center cohort study spanned a 10-year period at Siriraj Hospital, Mahidol University, Bangkok, Thailand. Institutional Review Board approval was obtained (approval number SI-018/2022), permitting the review of medical records of 444 patients who attended the Division of Gynecologic Oncology between January 1, 2008, and December 31, 2017.

This study included patients diagnosed with epithelial ovarian cancer who underwent staging laparotomy at Siriraj Hospital during the study period. Excluded were individuals with nonepithelial ovarian cancer, borderline tumors, simultaneous primary malignancies, or other cancer types potentially influencing survival outcomes. Additionally, patients lacking recorded height and weight data were omitted.

The collected data included demographic and clinical information: underlying disease, age at diagnosis, disease stage, initial cancer antigen 125 (CA 125) level, and surgical outcome. We also recorded intraoperative and postoperative complications within 30 days, side effects from chemotherapy, and survival rates. This comprehensive data collection aimed to evaluate the impact of women with obesity on these outcomes among patients with epithelial ovarian cancer.

Body weight was measured upon admission for the first cycle of chemotherapy following surgical staging, or before receiving the first cycle of neoadjuvant chemotherapy. Body mass index was calculated using these weight and height measurements according to this formula: BMI = weight (kg) ÷ height^2 (meters). Considering our Thai study population, we adopted the Western Pacific Regional Office guidelines, which define women with obesity as a BMI ≥ 25 kg/m^2, instead of the World Health Organization's threshold of ≥ 30 kg/m^2. Accordingly, patients were categorized into women without obesity (BMI < 25 kg/m^2) and women with obesity (BMI ≥ 25 kg/m^2) groups.

For disease status, underlying conditions were recorded at the time of diagnosis of epithelial ovarian cancer. The initial CA 125 level was determined before surgical staging or the initiation of neoadjuvant chemotherapy. Surgical staging defined as women who underwent exploratory laparotomy for at least salpingo-oophorectomy of affected ovary and/or hysterectomy or pelvic lymphadenectomy or omentectomy.

The operation time encompassed the duration from surgery commencement to completion. Optimal cytoreductive surgery was considered to have been achieved when residual tumor was either nonexistent or measured 1 cm or less.

Postoperative complications were defined in specific terms. Fever defined as an oral (or equivalent) body temperature of 100.4 °F (38 °C) or greater, occurring on two separate postoperative days, excluding the first 24 hours after surgery[17]. Gastrointestinal complications included bowel ileus and bowel obstruction that necessitated treatment. Respiratory complications encompassed postoperative atelectasis and pneumonia. Wound problems were identified as complications, including infections, occurring at the surgical wound sites on the abdomen and vaginal stump. Venous thromboembolism was defined as confirmed pulmonary embolism and deep vein thrombosis in the lower limbs. Any serious events requiring immediate treatment during the hospital stay or within 30 days after surgery were also considered.

In documenting chemotherapy side effects, we deemed severe adverse hematologic events as thrombocytopenia (platelet count < 100,000 platelets per microliter.), neutropenia (absolute neutrophil count < 1,500 neutrophils per microliter), or anemia

(hemoglobin < 10 grams per deciliter). Liver toxicity was defined as an increase in aspartate aminotransferase or alanine aminotransferase levels to more than twice the upper normal limit. Peripheral neuropathy was assessed using grade I or higher of the World Health Organization grading scale. Treatment delays, dose reductions, and permanent discontinuations due to chemotherapy toxicity were also recorded.

Disease recurrence was identified by abnormal findings in physical or per-vaginal examinations, and unusual results from computed tomography scans and/or elevated tumor markers such as CA 125 or CA 19-9, progression-free survival (PFS) and overall survival (OS) were calculated from the time of diagnosis to the date of recurrence, death, or the most recent follow-up, whichever came first.

The required sample size was determined based on the primary objective of evaluating the association between obesity and survival outcomes in patients with epithelial ovarian cancer at Siriraj Hospital. A previous study by Zhang et al reported mortality rates of 28%, 45%, 44%, and 65% among underweight, normal, overweight, and obese groups, respectively, with statistically significant differences across BMI categories. Using these findings, the sample size calculation was performed with a two-sided significance level of 0.05 (type I error = 5%) and a power of 90% (type II error = 10%), indicating a minimum of 52 patients per group. To estimate feasibility, a pilot study of 50 patients with epithelial ovarian cancer treated at Siriraj Hospital was reviewed, which demonstrated that 14% of patients were classified as underweight, representing the smallest subgroup. Based on this distribution, the total study population required was approximately 370 patients. To account for an anticipated 20% rate of incomplete or missing data, the final sample size was set at 444 patients.

The statistical analyses in this study were performed using IBM SPSS Statistics version 29 (SPSS Inc, Chicago, IL, USA) for Windows® version 29. For demographic data, quantitative variables with a normal distribution were summarized as the mean ± standard deviation, while those with a nonnormal distribution were expressed as the median and interquartile range. Group comparisons of these variables were conducted using the independent t test and the Mann–Whitney U test. Categorical variables are reported as frequencies and percentages and were analyzed using either the chi-square test or Fisher's exact test, depending on appropriateness. The Kaplan–Meier method was employed to estimate PFS and OS. Statistical significance was defined as p-values less than 0.05.

Results

Initially, data from 444 patients were gathered. However, 18 of these patients were excluded due to missing data or the presence of dual primary cancers, resulting in a final cohort of 426 patients. The demographic and clinical details of the participants are summarized in Table 1.

The study included 93 (21.9%) patients with obesity and 333 (78.1%) patients without obesity. The groups were similar in terms of age, age at diagnosis, disease stage, and initial CA 125 concentration. However, the patients with obesity had a higher prevalence of diabetes mellitus (21.5% vs 8.4%, $p < 0.001$), hypertension (37.6% vs 22.2%, $p = 0.003$), and dyslipidemia (18.3% vs 9.9%, $p = 0.027$) (Table 1).

The patients with obesity and patients without obesity showed no significant differences in histopathological characteristics. These included histology, grade, lymph node counts, positive lymph nodes harvested, omental involvement, and malignant cells in peritoneal washings (Table 1).

Table 1. Demographic and clinical data of patients undergoing epithelial ovarian cancer surgery of 426 patients.

	Total Number	Patients without obesity (n = 333)	Patients with obesity (n = 93)	p value
Mean age at diagnosis (year)	54.18 ± 10.71	54.91 ± 10.60	54.33 ± 11.18	0.649
BMI (kg/m^2)	23.58 ± 0.35	20.49 ± 0.35	28.74 ± 0.17	< 0.0001
Underlying diseases				
Cardiovascular	20 (4.7%)	16 (4.8%)	4 (4.3%)	1.000
Diabetes mellitus	48 (11.3%)	28 (8.4%)	20 (21.5%)	< 0.001
Hypertension	109 (25.6%)	74 (22.2%)	35 (37.6%)	0.003
Dyslipidemia	50 (11.7%)	33 (9.9%)	17 (18.3%)	0.027
FIGO stage				0.555
I	183 (43%)	140 (42%)	43 (46.2%)	
II	38 (8.9%)	28 (8.4%)	10 (10.8%)	
III	153 (35.9%)	121 (36.3%)	32 (34.4%)	
IV	52 (12.2%)	44 (13.2%)	8 (8.6%)	
Initial CA 125 (units/mL)	206.5 [67.6–833.5]	201.8 [68.1–832]	226 [63.7–1025.5]	0.892
Histology				0.703
Clear cell	159 (37.3%)	123 (36.9%)	36 (38.7%)	
Serous	136 (31.9%)	105 (31.5%)	31 (33.3%)	
Endometrioid	53 (12.4%)	42 (12.6%)	11 (11.8%)	
Mucinous	36 (8.5%)	26 (7.8%)	10 (10.8%)	
Adenocarcinoma	23 (5.4%)	21 (6.3%)	2 (2.2%)	
Others	19 (4.4%)	16 (4.8%)	3 (3.2%)	
Grading				0.072
1	36 (15.3%)	23 (12.5%)	13 (25.5%)	
2	59 (25.1%)	47 (25.5%)	12 (23.5%)	
3	140 (59.6%)	114 (62.0%)	26 (51%)	
No. of LN harvested	10 [4–17.5]	10 [3.25–17]	12 [5–18]	0.446
No. of positive LNs	0 [0–0]	0 [0–0]	0 [0–0]	0.318
Omental involvement	141 (36%)	112 (36.1%)	29 (35.4%)	0.898
Presence of malignant cells in peritoneal washing	118 (42.3%)	90 (41.3%)	28 (45.9%)	0.519

BMI: body mass index, FIGO: International Federation of Gynecology and Obstetrics, CA: cancer antigen, LN: lymph node

Regarding surgical treatment, no significant differences were observed between the groups in hospital stay duration, operation time, estimated blood loss, optimal debulking rates, or intraoperative complications. Nevertheless, the patients with obesity exhibited a greater incidence of wound complications (21.5% vs 4.2%, p < 0.001) and venous thromboembolism (4.3% vs 0.6%, p = 0.022) (Table 2). After adjusting for comorbidities and operation time, patients with obesity were independently associated with an increased risk of wound complications (adjusted odds ratio (OR) 6.175, 95% confidence interval (CI) 1.891–13.191; p < 0.001) and venous thromboembolism (aOR 5.991, 95% CI 2.848–12.605; p < 0.001).

Table 2. Clinical outcomes following epithelial ovarian cancer surgery of 426 patients.

	Total Number	**Patients without obesity (n = 333)**	**Patients with obesity (n = 93)**	**p value**
Hospital stays (days)	7 [6–11]	8 [6–11]	8 [6-11]	0.352
Operative time (hours)	2.99 ± 1.2	2.97 ± 1.2	3.04 ± 1.2	0.650
EBL (ml)	500 [300–1,000]	500 [300–1,000]	500 [300–1,000]	0.880
Optimal debulking	307 (72.1%)	240 (72.1%)	67 (72.1%)	0.811
Intraoperative complications				
- Tumor rupture	247 (58%)	188 (56.5%)	59 (63.4%)	0.228
- Blood transfusion	120 (28.2%)	94 (28.2%)	26 (28%)	0.959
- Bowel injury	27 (6.3%)	23 (6.9%)	4 (4.3%)	0.362
- Urological injury	7 (1.6%)	5 (1.5%)	2 (2.2%)	0.650
Postoperative complications				
- Wound problems	34 (8%)	14 (4.2%)	20 (21.5%)	< 0.001
- Fever	50 (11.7%)	35 (10.5%)	15 (16.1%)	0.137
- Gastrointestinal problems (ileus, gut obstruction)	8 (1.8%)	3 (4%)	1 (1%)	1.000
- Respiratory problems (atelectasis, pneumonia)	8 (1.8%)	7 (2.1%)	1 (1%)	1.000
- VTE (pulmonary embolism, deep vein thrombosis)	6 (1.4%)	2 (0.6%)	4 (4.3%)	0.022

EBL: estimated blood loss, VTE: venous thromboembolism

Data presented as mean ± standard deviation, median [interquartile range] or n (%)

For chemotherapy outcomes, the total number of chemotherapy cycles, the need for neoadjuvant therapy, and the incidence of side effects such as thrombocytopenia, anemia, liver toxicity, and neuropathy were similar in both groups. However, the patients with obesity group had a significantly lower incidence of neutropenia (30.1% vs 48.5%, p = 0.002) and significantly fewer chemotherapy delays (38.7% vs 53%, p = 0.015) (Table 3).

Of the 426 patients, 107 (25.1%) experienced disease recurrence, and 117 (27.4%) died. The median follow-up period was 49 months (interquartile range (IQR) 22.5–95.5) for the patients with obesity group and 53 months (IQR 21–107.5) for the patients without obesity group. There were no significant differences between the groups in five-year PFS (59.9% vs 70.6%, p = 0.135) or OS (68.3% vs 69.3%, p = 0.923). After adjusting for confounders (comorbidities, cancer stage, histopathology, intra- and postoperative complications, and total chemotherapy courses), patients with obesity were not a significant factor for five-year OS or PFS. The adjusted hazard ratio (HR) were 1.074 (95% CI 0.677–1.704, p = 0.762) for OS and 1.430 (95% CI 0.894–2.289, p = 0.136) for PFS (Fig. 1 and 2).

Table 3. Chemotherapy outcomes following epithelial ovarian cancer surgery of 426 patients.

	Total	Patients without obesity (n = 333)	Patients with obesity (n = 93)	p value
Total chemotherapy cycles	6 (6–14.5)	6 (6-15)	6 (6–14)	0.598
Number of patients needing neoadjuvant chemotherapy	51 (12%)	44 (13.2%)	7 (7.5%)	0.135
Side effects				
- Neutropenia	189 (44.5%)	161 (48.5%)	28 (30.1%)	0.002
- Thrombocytopenia	61 (14.4%)	52 (15.7%)	9 (9.7%)	0.146
- Anemia	126 (29.6%)	105 (31.6%)	21 (22.6%)	0.091
- Liver toxicity	33 (7.8%)	28 (8.4%)	5 (5.4%)	0.330
- Neuropathy	320 (75.3%)	248 (74.7%)	72 (77.4%)	0.591
Modification of treatment				
- Delay in administration	212 (49.9%)	176 (53.0%)	36 (38.7%)	0.015
- Dose reduction	35 (8.2%)	28 (8.4%)	7 (7.5%)	0.779
- Discontinuation of therapy	15 (3.5%)	14 (4.2%)	1 (1.1%)	0.208

Data presented as median (interquartile range) or n (%)

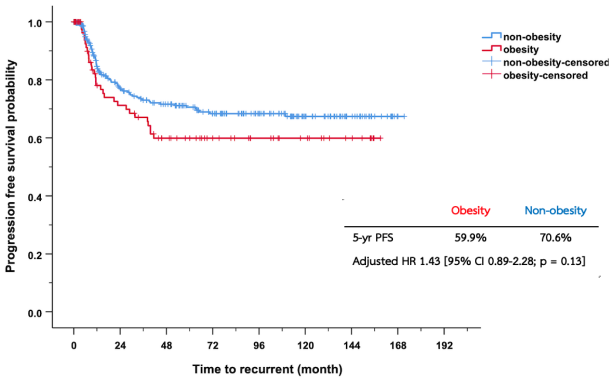

Fig. 1. Kaplan–Meier survival curve demonstrating the progression free survival of patients in both obesity and non-obesity groups.

PFS: progression-free survival, HR: hazard ratio, CI: confidence interval

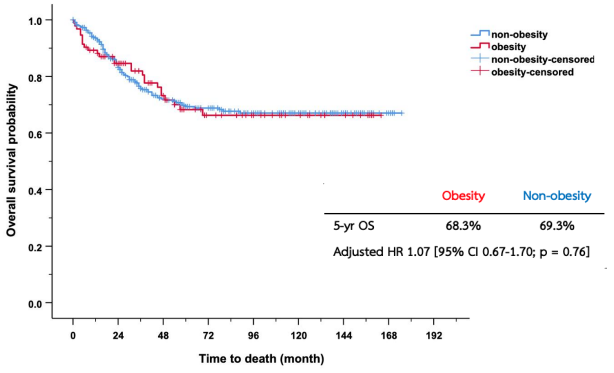

Fig. 2. Kaplan–Meier survival curve demonstrating the overall survival of patients in both obesity and non-obesity groups.

OS: overall survival, HR: hazard ratio, CI: confidence interval

Discussion

The global increase in women with obesity, often referred to as a worldwide epidemic, is mirrored in our study's findings, where 21.9% of patients with ovarian cancer were with obesity. This prevalence was consistent with recent Thai data reporting similar obesity trends among gynecologic cancer patients[18]. The unique challenges presented by individuals with obesity in oncological surgeries, such as increased subcutaneous fat and a thicker adipose layer, can complicate procedures by hindering visibility and access and elevating comorbidity risks.

Hughes et al's systematic review highlighted that 60% of studies reported prolonged operation times, while 35.8% of studies reported an increase in morbidity among patients with obesity who underwent major abdominal cancer surgeries[19]. Similarly, Lv and Wu's 2019 study involving 326 patients with ovarian cancer showed that those in the patients with obesity group underwent longer surgeries, had more blood loss, had longer hospital stays, and had a 50% rate of postoperative complications[20].

In contrast, our study revealed no significant differences in intraoperative outcomes, such as surgical duration, blood loss, lymph node retrieval, or optimal debulking rates, between two groups. However, women with obesity were significantly associated with increased postoperative complications, specifically, wound problems and venous thromboembolism. These findings were in line with the findings of the 2022 meta-analysis by Cai et al, which reported a heightened risk of wound complications in individuals with obesity[21]. Our findings were also consistent with Xu et al's review, which revealed an increased occurrence of postoperative venous thromboembolism in patients with epithelial ovarian cancer and a BMI exceeding 30 kg/m^2 [22].

Postoperative wound complications in patients with obesity may be attributed to the distinct characteristics of adipose tissue. In individuals with obesity, the expansion of adipose tissue is not accompanied by a proportional increase in capillary density, resulting in larger but less efficient blood vessels. This leads to reduced tissue perfusion and a consequent predisposition to hypoxic conditions. Surgical procedures can further exacerbate hypoxia, which negatively impacts the healing process. Moreover, women with obesity-associated comorbidities, such as diabetes, elevate the risk of postoperative infections, further impeding wound healing[23, 24].

Several factors influence the risk of venous thromboembolism in patients with obesity postoperatively. These include increased levels of fibrinogen and certain clotting factors, the presence of systemic inflammation, and elevated intra-abdominal pressure that impairs venous return from the lower limbs[25]. Venous thromboembolism is a major cause of mortality in cancer patients and adversely affects patient prognosis. To mitigate this risk, the American College of Obstetricians and Gynecologists advocate for the routine evaluation of venous thromboembolism risk using the Caprini risk assessment model. The institution also recommends implementing prophylactic strategies tailored to each patient's risk level during gynecologic surgery[26].

The survival outcomes of women with obesity undergoing chemotherapy treatment may be affected by the practice of dose capping. This approach uses ideal or adjusted body weight instead of actual body weight for chemotherapy dose calculations in patients with a BMI of over 25 kg/m^2. This strategy is adopted to prevent the potential toxicities associated with fully dosing. At our center, chemotherapy doses for patients with obesity were calculated using adjusted body weight, which might result in suboptimal dosing. However, our study revealed no significant differences in five-year OS or PFS between the groups. Notably, the women with obesity group experienced significantly fewer incidences of delayed chemotherapy administration and neutropenia. These observations support prior research indicating that dosing chemotherapy based on actual body weight does not significantly increase side effects in patients with obesity, particularly in cases where the goal of treatment is cure[27, 28].

The well-established relationship between optimal cytoreductive surgery and improved survival in patients with ovarian cancer is widely recognized. However, achieving this goal in patients with obesity can pose challenges. Despite these potential challenges, recent systematic reviews have shown no significant difference in optimal debulking surgery rates between patients with or without obesity, even among those classified as patients with class III obesity (BMI ≥ 40 kg/m^2)[21, 29, 30]. These findings suggest that patients with obesity may not significantly impact the ability to perform optimal surgery. In line with these findings, our study revealed no significant differences in the optimal debulking rate or five-year OS or PFS between groups. Furthermore, after adjusting for confounders, patients with obesity did not emerge as a negative prognostic factor for five-year OS (aHR 1.074, 95% CI 0.677–1.704; p = 0.762) or PFS (aHR 1.430, 95% CI 0.894–2.289; p = 0.136). Our results were consistent with previously reported data showing no link between women with obesity and survival in patients with ovarian cancer[10, 11, 14, 31, 32].

The strengths of this study included the large sample size of patients with epithelial ovarian cancer and the long-term follow-up period. However, this study had several limitations that should be acknowledged. First, its retrospective single-institution design introduced the possibility of selection bias and limits the generalizability of the findings to broader populations. Second, missing or incomplete data may have influenced the accuracy of certain clinical variables. Third, the classification of patients into BMI categories at the time of diagnosis may not fully reflect lifetime obesity exposure, weight changes during treatment, or body composition differences such as sarcopenic obesity, which could also impact outcomes.

Additionally, variations in chemotherapy regimens were not accounted for, which may impact the consistency of the cohort and influence chemotherapy-related adverse effects and survival outcomes. Finally, this cohort reflects treatment practices over the past decade; thus, the introduction of novel therapies such as poly (ADP-ribose) polymerase (PARP) inhibitors, immune checkpoint inhibitors, and advances in minimally invasive or enhanced recovery surgery may alter survival outcomes in contemporary practice, and the findings may not fully capture the impact of these newer approaches.

Conclusion

In conclusion, in ovarian cancer patients with obesity, surgical management requires heightened attention to both perioperative complications and comorbidity optimization. Although operation time, blood loss, hospital stay, and optimal debulking rates were comparable to those in non-obese patients, individuals with obesity demonstrated a substantially increased risk of wound complications and venous thromboembolism. These findings underscored the importance of implementing comprehensive perioperative strategies, including meticulous wound care, advanced dressing techniques, glycemic control, and extended venous thromboembolism prophylaxis. Furthermore, the higher prevalence of diabetes mellitus, hypertension, and dyslipidemia in obese patients highlighted the critical role of prehabilitation programs. Multidisciplinary interventions aimed at optimizing cardiometabolic status, improving functional capacity, and stabilizing chronic conditions before surgery may mitigate perioperative risks and enhance overall surgical recovery.

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Author contributions

A.S.: conceptualization, data curation, formal analysis, investigation, methodology, writing – original draft; I.R.: conceptualization, writing- review & editing; N.J.: conceptualization, writing- review & editing; K.K.: conceptualization, research design, data curation & analysis, investigation, methodology, validation, visualization, writing – review & editing; V.A.: conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, visualization, writing – original draft, review & editing. All authors read and approval the final manuscript.

Potential conflicts of interest

The authors declare no conflicts of interest.

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