

The Clinicopathological Landscape of Endometrial Cancer: A Five-Year Retrospective Descriptive Study at Universitas Airlangga Hospital Surabaya

Alvina Serafina¹, Brahmana Askandar Tjokroprawiro², Aditya Sita Sari^{3*}

¹Medical Program, Faculty of Medicine, Universitas Airlangga, Surabaya, East Java, Indonesia

²Department of Obstetrics and Gynecology, Faculty of Medicine,
Universitas Airlangga, Surabaya, East Java, Indonesia

³Department of Anatomical Pathology, Faculty of Medicine,
Universitas Airlangga, Surabaya, East Java, Indonesia

E-mail: alvina.serafina-2023@fk.unair.ac.id

*Corresponding author details: Aditya Sita Sari; adityasitasari@fk.unair.ac.id

ABSTRACT

Endometrial cancer is among the most common gynecological malignancies, yet institution-based data from Indonesia remain limited. This retrospective descriptive study described the demographic, clinical, histopathological, and treatment characteristics of patients with endometrial cancer treated surgically at Universitas Airlangga Hospital, Surabaya, between 2021 and 2025. Of 104 medical records identified, 61 patients who underwent surgery with available postoperative histopathology were included by total sampling and analyzed descriptively. The mean age was 56.07 ± 9.59 years; 78.7% of patients were aged ≥ 50 years and 77.0% were postmenopausal. Among patients with recorded data, the mean body mass index was 25.65 ± 5.31 kg/m², hypertension was documented in 63.0% (34/54), and diabetes mellitus in 35.2% (19/54). Postoperatively, 98.4% of tumors were Type I and 67.2% were grade 1. FIGO stage I predominated (58.0% of 50 staged patients), followed by stage III (28.0%) and stage II (14.0%); no stage IV disease was recorded. Among 43 patients with paired grading, the grade changed after surgery in 16 (37.2%): 10 upgraded and 6 downgraded. Lymphovascular space invasion and perineural invasion were present in 18.0% and 3.3% of patients, respectively, and myometrial invasion of $\geq 50\%$ in 67.2%. Surgery alone was the most frequent treatment (57.4%), followed by surgery with chemotherapy (41.0%) and surgery with chemoradiotherapy (1.6%). Endometrial cancer at this hospital mainly affected postmenopausal women aged ≥ 50 years with frequent hypertension and diabetes, and was predominantly Type I, low-grade, and stage I. The frequent change in grade between curettage and the hysterectomy specimen supports the role of postoperative pathology in final risk assessment.

Keywords: Endometrial cancer; clinicopathological characteristics; FIGO stage; histopathology; myometrial invasion; retrospective descriptive study

INTRODUCTION

Endometrial cancer (EC) is a malignancy arising from the epithelial lining of the uterus. According to GLOBOCAN 2022, cancer of the corpus uteri ranked sixth worldwide, with 420,368 new cases and 97,723 deaths, and it is the most common gynecological cancer in high-income countries. In Indonesia, 29,904 five-year prevalent cases were reported, the fifth-highest number in Asia, and corpus uteri cancer is among the ten most frequent cancers in women [1].

Endometrial cancer has traditionally been divided into Type I, estrogen-related tumors that account for about 80% of cases, and Type II, which are not

estrogen-related [2]. Type I tumors are usually low-grade endometrioid carcinomas diagnosed at an early stage and carry a favorable prognosis [3], whereas Type II tumors, such as serous and clear cell carcinomas, behave more aggressively [4].

Surgery is the mainstay of treatment. It removes the tumor, permits pathological staging, and determines the need for adjuvant therapy, which is tailored to the risk of recurrence [5, 6]. The 2023 FIGO staging system now integrates histological type, grade, and lymphovascular space invasion (LVSI) with anatomical extent [7], so the postoperative pathology report carries considerable weight.

Hospital-based profiles of EC have been published from Bandung, Surabaya, Denpasar, and Padang [8–11]. Still, contemporary institution-based data remain limited, and few reports describe how curettage findings compare with the final hysterectomy specimen. Local data are needed to align management with the patient population actually seen. This study therefore aimed to describe the demographic, clinical, histopathological, and treatment characteristics of patients with EC at Universitas Airlangga Hospital, Surabaya, during 2021–2025.

MATERIALS AND METHODS

Study design and setting

This was a retrospective descriptive study using secondary data from the medical records of patients with EC at Universitas Airlangga Hospital, Surabaya, Indonesia, covering the period 2021–2025. The research was conducted from July 2025 to October 2026.

Study population

The source population was all patients with EC at the hospital during 2021–2025, and total sampling was used. Patients were eligible if they had a clinical diagnosis of EC, underwent surgery, and had a postoperative histopathological result. Patients with incomplete or unavailable postoperative histopathology were excluded. Patients with missing data on other variables were retained, and the number with available data is reported for each variable.

Variables and data collection

Data were abstracted from the records into a spreadsheet after editing, coding, and cleaning. Age was grouped as ≤ 39 , 40–49, and ≥ 50 years. Body mass index (BMI) was categorized as underweight (< 18.5 kg/m²), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥ 30.0). Parity was classified as nullipara, primipara, or multipara. Menopausal status, diabetes mellitus, hypertension, and obesity were recorded as documented in the chart.

Histological type was recorded from curettage and from the postoperative specimen as Type I (endometrioid, mucinous) or Type II (serous, clear cell, undifferentiated, carcinosarcoma, others), and the two were compared for concordance. Pathological FIGO stage (I–IV) and grade (1–3) were recorded; grade on curettage was compared with postoperative

grade and classified as no discrepancy, upgrade, or downgrade. LVSI, perineural invasion (PNI), and depth of myometrial invasion ($< 50\%$ or $\geq 50\%$) were taken from the postoperative report. Treatment was classified as surgery alone, surgery with chemotherapy, or surgery with chemotherapy and radiotherapy.

Statistical analysis

Analysis was descriptive. Categorical variables are presented as frequencies and percentages, and numerical variables as mean $\pm$ standard deviation (SD). Percentages are given both for the total cohort ($n = 61$) and for patients with available data. No inferential tests were performed.

Ethical considerations

The study was approved by the Research Ethics Committee of Universitas Airlangga Hospital (No. 6066/B/DST/UN3.RSUA/PT/2026; protocol UA-02-25215; 20 August 2026). Patient identities were not recorded, and data was used only for this study.

RESULTS

Study population and data completeness

A total of 104 records were identified, and 61 patients met the inclusion criteria and were analyzed. Age, menopausal status, postoperative histological type and grade, LVSI, PNI, myometrial invasion, and treatment were available for all 61 patients. Data were available for BMI in 40 (65.6%), parity in 48 (78.7%), comorbidities in 54 (88.5%), curettage histology in 47 (77.0%), curettage grade in 43 (70.5%), and pathological stage in 50 (82.0%).

Demographic, reproductive, and comorbidity characteristics

The mean age was 56.07 ± 9.59 years. Most patients (48; 78.7%) were aged ≥ 50 years, 9 (14.8%) were 40–49 years, and 4 (6.6%) were ≤ 39 years (Table 1). Forty-seven patients (77.0%) were postmenopausal. Among the 40 patients with BMI data, the mean BMI was 25.65 ± 5.31 kg/m²; 18 (45.0%) had a normal BMI, while 19 (47.5%) were overweight or obese. Multiparous women formed the largest parity group (23 of 48; 47.9%).

Hypertension was documented in 34 of 54 patients (63.0%), diabetes mellitus in 19 (35.2%), and obesity in 8 (14.8%). None of the four patients aged ≤ 39 years had recorded hypertension, diabetes mellitus, or obesity.

TABLE 1: Demographic, Reproductive, and Comorbidity Characteristics of Patients with Endometrial Cancer (N = 61).

Characteristic	n	% of total (N = 61)	% of available data
Age group (years)			
≤ 39	4	6.6	6.6
40–49	9	14.8	14.8
≥ 50	48	78.7	78.7
Mean $\pm$ SD	56.07 $\pm$ 9.59		

Characteristic	n	% of total (N = 61)	% of available data
Body mass index (kg/m²)			
Underweight (<18.5)	3	4.9	7.5
Normal (18.5–24.9)	18	29.5	45.0
Overweight (25.0–29.9)	11	18.0	27.5
Obese (≥30.0)	8	13.1	20.0
Data unavailable	21	34.4	–
Mean ± SD (n = 40)	25.65 ± 5.31		
Parity			
Nullipara	14	23.0	29.2
Primipara	11	18.0	22.9
Multipara	23	37.7	47.9
Data unavailable	13	21.3	–
Menopausal status			
Postmenopausal	47	77.0	77.0
Premenopausal	14	23.0	23.0
Diabetes mellitus			
Yes	19	31.1	35.2
No	35	57.4	64.8
Data unavailable	7	11.5	–
Hypertension			
Yes	34	55.7	63.0
No	20	32.8	37.0
Data unavailable	7	11.5	–
Obesity (documented comorbidity)			
Yes	8	13.1	14.8
No	46	75.4	85.2
Data unavailable	7	11.5	–

Note: “% of available data” excludes patients with unavailable data; for variables with complete data it equals “% of total”. SD, standard deviation.

Histopathological type and concordance

On postoperative examination, 60 of 61 tumors (98.4%) were Type I and one (1.6%) was Type II (Table 2). Curettage histology was available for 47 patients, of whom 45 (95.7%) had Type I and 2 (4.3%) had Type II tumors. Curettage and postoperative types were concordant in 46 of 47 patients (97.9%). The single discordant case was a grade 3 clear cell carcinoma on curettage that was reclassified as a grade 2 endometrioid carcinoma on the hysterectomy specimen, with myometrial invasion <50%, no LVSI, and no tumor in the cervix, lower uterine segment, or adnexa.

FIGO stage and grade

Pathological stage was available for 50 patients: 29 (58.0%) had stage I, 7 (14.0%) stage II, and 14 (28.0%) stage III, and none had stage IV disease (Figure 2a). Postoperatively, 41 tumors (67.2%) were grade 1, 11 (18.0%) grade 2, and 9 (14.8%) grade 3. On curettage (n = 43), 31 (72.1%) were grade 1, 7 (16.3%) grade 2, and 5 (11.6%) grade 3 (Figure 1).

Among the 43 patients with paired grades, 27 (62.8%) showed no discrepancy, 10 (23.3%) were upgraded, and 6 (14.0%) were downgraded after

surgery, so the grade changed in 16 patients (37.2%) (Figure 2b).

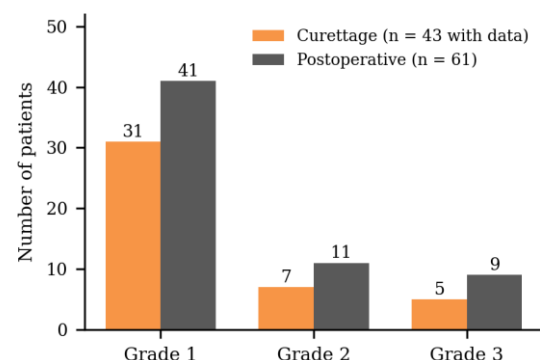


FIGURE 1: Tumor Grade on Curettage and on The Postoperative Specimen.

Lymphovascular, perineural, and myometrial invasion

LVSI was positive in 11 patients (18.0%) and PNI in 2 (3.3%) (Table 3). Of the 11 LVSI-positive tumors, 7 (63.6%) were postoperative grade 3, and 2 each were grade 1 and grade 2. Among the 10 LVSI-positive patients with staging data, 6 (60.0%) had

stage III disease. Both PNI-positive patients had grade 3 tumors and positive LVSI, and were stage II and stage III, respectively.

Myometrial invasion of $\geq 50\%$ was present in 41 patients (67.2%) and $< 50\%$ in 20 (32.8%). All 11 LVSI-positive patients had invasion of $\geq 50\%$, but LVSI was present in only 11 of the 41 patients (26.8%) with deep invasion.

Management

All patients underwent surgery (Table 3). Surgery alone was given to 35 patients (57.4%), surgery with chemotherapy to 25 (41.0%), and surgery with chemotherapy and radiotherapy to 1 (1.6%). Surgery alone was used in 23 of 29 patients with stage I disease (79.3%), whereas surgery with chemotherapy was used in 5 of 7 patients with stage II (71.4%) and 12 of 14 with stage III disease (85.7%).

TABLE 2: Histopathological Type, FIGO Stage, and Tumor Grade (N = 61).

Characteristic	n	% of total (N = 61)	% of available data
Histological type, curettage			
Type I	45	73.8	95.7
Type II	2	3.3	4.3
Data unavailable (no curettage result)	14	23.0	–
Histological type, postoperative			
Type I	60	98.4	98.4
Type II	1	1.6	1.6
Concordance of type (curettage vs. postoperative)			
Concordant	46	75.4	97.9
Discordant	1	1.6	2.1
Data unavailable	14	23.0	–
Pathological FIGO stage			
Stage I	29	47.5	58.0
Stage II	7	11.5	14.0
Stage III	14	23.0	28.0
Stage IV	0	0.0	0.0
Data unavailable	11	18.0	–
Tumor grade, curettage			
Grade 1	31	50.8	72.1
Grade 2	7	11.5	16.3
Grade 3	5	8.2	11.6
Data unavailable	18	29.5	–
Tumor grade, postoperative			
Grade 1	41	67.2	67.2
Grade 2	11	18.0	18.0
Grade 3	9	14.8	14.8
Grade discrepancy (curettage vs. postoperative)			
No discrepancy	27	44.3	62.8
Upgrade	10	16.4	23.3
Downgrade	6	9.8	14.0
Data unavailable (no curettage grade)	18	29.5	–

Note: For concordance, the denominator of “% of available data” is the 47 patients with a curettage result; for curettage grade and grade discrepancy, it is the 43 patients with a curettage grade; for stage it is the 50 patients with staging data.

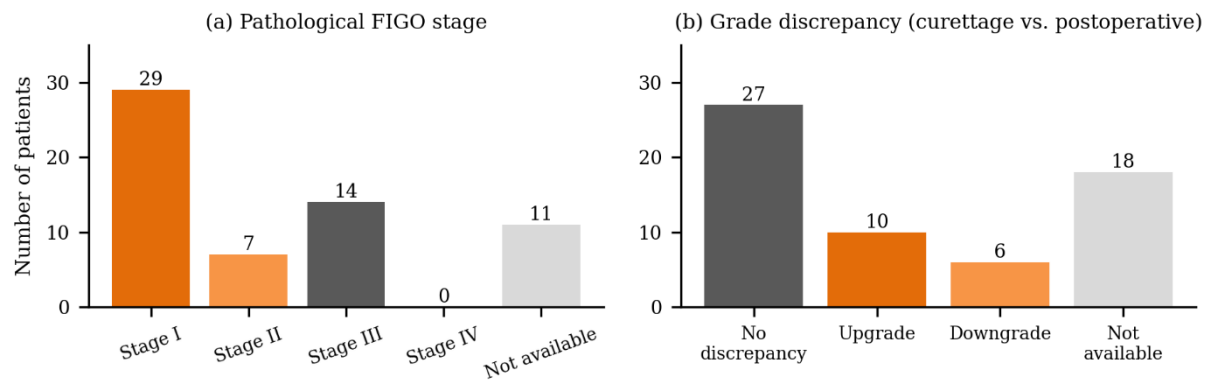


FIGURE 2: (a) Distribution of Pathological FIGO Stage and (b) Grade Discrepancy Between Curettage and Postoperative Specimens.

TABLE 3: Invasion Patterns and Management (N = 61).

Characteristic	n	% of total (N = 61)	% of available data
Lymphovascular space invasion (LVSI)			
Positive	11	18.0	18.0
Negative	50	82.0	82.0
Perineural invasion (PNI)			
Positive	2	3.3	3.3
Negative	59	96.7	96.7
Depth of myometrial invasion			
<50%	20	32.8	32.8
≥50%	41	67.2	67.2
Management			
Surgery only	35	57.4	57.4
Surgery + chemotherapy	25	41.0	41.0
Surgery + chemotherapy + radiotherapy	1	1.6	1.6

Note: Data were complete for all variables in this table

DISCUSSION

Age, menopausal status, and body weight

Nearly four in five patients were aged ≥ 50 years, consistent with Indonesian series from Bandung, where 62.0% were older than 50 years [8], and from Dr. Soetomo Hospital, Surabaya, where most patients were 51–60 years old [9]. A Brazilian cohort reported a median age of 63 years, with 94.0% older than 50 years [12], and a Thai tertiary-hospital cohort found that 83.1% of patients were older than 45 years [13]. Type I tumors are estrogen-related [2], and cumulative estrogen exposure without adequate progesterone opposition is a commonly proposed explanation for their predominance in older women; a meta-analysis found a pooled relative risk of 1.89 for the highest versus the lowest age at menopause [14], although age at menopause was not recorded here. Older age also tracks with less favorable tumor features: in an Israeli multicentre cohort, women older than 80 years more often had deep myometrial invasion, LVSI, and high-risk histology [15]. Postmenopausal women were also the majority at Dr. Soetomo Hospital (61.1%) [16], whereas premenopausal women

made up 44.8% of a Malaysian series [17] compared with 23.0% here.

Younger women deserve separate mention. In Malaysian and Thai cohorts, younger patients were more often nulliparous than older ones (46.8% vs. 19.4% in Malaysia [17]; 74.5% vs. 36.7% in Thailand [13]), and obesity, polycystic ovary syndrome, and Lynch syndrome have also been implicated in reproductive-aged women [18]. Because the four youngest patients here had no recorded hypertension, diabetes, or obesity, such factors may be relevant, although the available data cannot address this.

A normal BMI was the largest single category (45.0%), but 47.5% of patients with BMI data were overweight or obese. Similar distributions were reported in Surabaya, where 35.8% had a normal BMI and 52.6% were overweight or obese [16], and in Bandung, where 41.0% had a normal BMI [8]. Obesity was far less frequent here (20.0%) than in US cohorts, where 69% of 665 patients [19] and 57.2% of 1,383 patients [20] were obese.

Excess weight nevertheless remains the most consistent risk factor: in a Norwegian cohort of 151,537 women, each 2 kg/m² increase in BMI raised the incidence of Type I and Type II cancer by 21% and 10%, respectively [21]. Obesity defined by BMI (20.0% of 40 patients) and obesity documented as a comorbidity (14.8% of 54 patients) differ in source and denominator and should not be treated as interchangeable.

Multiparous women were the largest parity group (47.9%), as in Denpasar (65.4%), Bandung (54.0%), and Dr. Soetomo Hospital (51.5%) [8–10]. A meta-analysis of 46 studies found a pooled relative risk of 0.69 for parous versus nulliparous women [22], but without a comparison group, the present distribution says nothing about the effect of parity on risk.

Comorbidities

Hypertension was documented in 63.0% of patients with data, far more than in Denpasar (11.5%) [10] or Padang (35.7%) [11], but close to the 61.9% reported in postmenopausal Malaysian patients [17]. A meta-analysis found a 61% higher risk of EC in women with hypertension [23], and a pooled analysis reported that the association persisted after adjustment for BMI and diabetes [24]. Diabetes mellitus was documented in 35.2%, compared with 16.1% in Padang [11], 7.0% in Bandung [8], and 36.8% in postmenopausal Malaysian patients [17]. Type 2 diabetes roughly doubles the risk of developing EC (summary relative risk 1.97) [25], and it has also been linked to outcomes: an Australian cohort reported a hazard ratio of 2.09 for EC-specific death [26], and a prospective database analysis reported higher mortality and recurrence [27]. In a Chinese cohort, metabolic syndrome was associated with higher grade, advanced stage, LVSI, and deep myometrial invasion [28]. Differences in age structure, referral patterns, and chart documentation probably explain part of this variation, and survival and recurrence were not assessed here.

Histopathology, concordance, and grade

Type I carcinoma accounted for 98.4% of tumors, higher than in Bandung (82%) [8] and at Dr. Soetomo Hospital (93.9%) [9]. Type I tumors are typically low-grade and detected early, with a favorable prognosis [3], which fits the predominance of grade 1 and stage I disease here. Agreement between curettage and final histological type was 97.9%, higher than the 82.4% reported in a Turkish series [29] and comparable to the 94.1% in a Greek series of 203 patients [30]. Curettage samples only part of the tumor, and the hysterectomy specimen remains the reference standard [31]; the one discordant case, a clear cell tumor on curettage that proved endometrioid at hysterectomy, illustrates this limitation.

Grade changed after surgery in 37.2% of patients with paired grades, with exact agreement of 62.8%. This is lower than the 89.1% in the Greek series of endometrioid cancers [30] and the 70.7% at Dr.

Soetomo Hospital [9], but higher than the 56.4% in the Turkish series, where weighted kappa indicated only weak agreement [29]. Limited sampling, intratumoral heterogeneity, and interobserver variability are plausible explanations [29]. Higher grades are associated with deeper invasion, LVSI, nodal metastasis, and recurrence [32, 33], so an upgraded grade may change adjuvant treatment decisions.

Stage, invasion patterns, and treatment

Stage I was the most frequent stage (58.0%), in line with Bandung (47.5%) [8] and Brazil (63.9%) [12], although stage II predominated at Dr. Soetomo Hospital (36.4%) [9]. Stage III accounted for 28.0% of staged patients, and the absence of stage IV disease should be read cautiously given the small cohort and the 11 patients without staging data. Stage assignment under FIGO 2023 also depends on histological type, grade, and LVSI [7].

LVSI (18.0%) lay between the 14.6% reported in early-stage endometrioid cancer [34] and the 29.5% in a Brazilian cohort [12]. LVSI predicts nodal metastasis and survival [35], and in this series LVSI-positive tumors were concentrated among grade 3 and stage III cases, although the small numbers permit no inference. PNI (3.3%) was comparable to the 2.8% reported in a Romanian cohort [36]. Its prognostic value has been shown mainly in other tumors, including early cervical cancer [37], and evidence in EC remains limited [38]. Deep myometrial invasion (67.2%) was more frequent than in Turkey (31.0%) [29] and Brazil (48.8%) [12]. In a meta-analysis of 79 studies, deep invasion was associated with LVSI (pooled relative risk 3.07), lymph node metastasis (4.45), recurrence (2.06), and poorer survival [39], findings echoed in single-center data [40]. Because grade, depth of invasion, and stage describe different aspects of the tumor, deep invasion can coexist with low-grade, stage I disease, and FIGO 2023 uses depth to separate stages IA and IB [7, 41].

Surgery alone was the commonest management (57.4%), similar to Bandung (50.0%) [8] and Thailand (55.6% without adjuvant therapy) [42]. Surgery establishes the diagnosis, stage, and pathological risk that guide adjuvant therapy [43]. Chemotherapy was added in 41.0% of patients. Surgery alone predominated in stage I (79.3%), whereas chemotherapy was added in 71.4% of stage II and 85.7% of stage III patients, in keeping with the use of carboplatin–paclitaxel for high-risk and advanced disease [44, 45]; options for advanced disease have since broadened [46]. Regimens and outcomes were not analyzed, and the stage-specific proportions are descriptive.

Strengths and limitations

This study gives a complete descriptive picture of EC at a single institution, including LVSI, PNI, myometrial invasion, and the comparison of curettage with postoperative pathology. However, the retrospective use of records led to incomplete data, with sample sizes differing between variables.

The descriptive design precludes assessment of associations or causality; there was no comparison group, and without follow-up data, treatment outcomes, recurrence, and survival could not be evaluated. Inclusion was limited to surgically treated patients, so findings may not represent patients managed non-surgically, and results from a single center cannot be generalized.

CONCLUSIONS

Patients with EC at Universitas Airlangga Hospital during 2021–2025 were mostly postmenopausal women aged ≥ 50 years, with hypertension and diabetes frequently documented. Tumors were predominantly Type I, grade 1, and FIGO stage I, although stage III disease accounted for more than a quarter of staged patients and deep myometrial invasion was common. The grade differed between curettage and hysterectomy in more than one-third of patients, which supports final postoperative pathology for risk assessment. Surgery was the basis of treatment, with chemotherapy added mainly in more advanced stages. More complete and standardized records, an institutional registry, and multicenter analytic studies with outcome follow-up are recommended.

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REFERENCES

- [1] International Agency for Research on Cancer. (2022). *Global Cancer Observatory: Cancer Today (GLOBOCAN 2022)*. Lyon, France: IARC.
- [2] Coada, C. A., et al. (2021). Classification systems of endometrial cancer: A comparative study about old and new. *Diagnostics*, 12(1), 33.
- [3] Murali, R., et al. (2019). High-grade endometrial carcinomas: Morphologic and immunohistochemical features, diagnostic challenges and recommendations. *International Journal of Gynecological Pathology*, 38(Suppl 1), S40–S63.
- [4] Ray, I., et al. (2022). Adipocytokines and disease progression in endometrial cancer: a systematic review. *Cancer Metastasis Reviews*, 41(1), 211–242.
- [5] Oaknin, A., et al. (2022). Endometrial cancer: ESMO Clinical Practice Guideline for diagnosis, treatment and follow-up. *Annals of Oncology*, 33(9), 860–877.
- [6] Baker-Rand, H., & Kitson, S. J. (2024). Recent advances in endometrial cancer prevention, early diagnosis and treatment. *Cancers*, 16(5), 1028.
- [7] Berek, J. S., et al. (2023). FIGO staging of endometrial cancer: 2023. *International Journal of Gynecology & Obstetrics*, 162(2), 383–394.
- [8] Salima, S. (2022). Profil penderita kanker endometrium di RSUP Dr. Hasan Sadikin Bandung periode tahun 2017–2020. *Indonesian Journal of Obstetrics & Gynecology Science*, 5(2), 234–243.
- [9] Alim, K. D., Tjokroprawiro, B. A., & Kusumastuti, E. H. (2023). Profile of endometrial cancer patients in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. *JUXTA: Jurnal Ilmiah Mahasiswa Kedokteran Universitas Airlangga*, 14(2), 83–88.
- [10] Dewi, P. P. P., & Budiana, I. N. G. (2017). Profil pasien kanker endometrium di RSUP Sanglah Denpasar periode Agustus 2012–Juli 2014. *E-Jurnal Medika Udayana*, 6(8).
- [11] Helmanda, S., & Yusrawati, Y. (2019). Factors related to type of endometrial cancer in RSUP Dr. M. Djamil Padang. *Indonesian Journal of Obstetrics & Gynecology Science*, 2(2), 157.
- [12] Anton, C., et al. (2020). Ten years of experience with endometrial cancer treatment in a single Brazilian institution: Patient characteristics and outcomes. *PLoS ONE*, 15(3), e0229543.
- [13] Panyavaranant, P., Rattanachaipipat, J., & Manchana, T. (2025). Clinicopathological characteristics and survival outcomes of women aged ≤ 45 and >45 years with endometrial adenocarcinoma in tertiary referral hospital: a 21-year cohort study. *BMJ Open*, 15, e089434.
- [14] Wu, Y., Sun, W., Liu, H., & Zhang, D. (2019). Age at menopause and risk of developing endometrial cancer: A meta-analysis. *BioMed Research International*, 2019, 8584130.
- [15] Hag-Yahia, N., et al. (2021). Age is an independent predictor of outcome in endometrial cancer patients: An Israeli Gynecology Oncology Group cohort study. *Acta Obstetrica et Gynecologica Scandinavica*, 100(3), 444–452.
- [16] Sofyan, N., Sudiana, I. K., & Askandar, B. (2020). Profile of endometrial cancer patients in the third referral hospital in Surabaya based on known risk factors. *Biomolecular and Health Science Journal*, 3(2).
- [17] Abdol Manap, N., et al. (2022). Endometrial cancer in pre-menopausal women and younger: Risk factors and outcome. *International Journal of Environmental Research and Public Health*, 19(15), 9059.

- [18] Bassette, E., & Ducie, J. A. (2024). Endometrial cancer in reproductive-aged females: Etiology and pathogenesis. *Biomedicine*, 12(4), 886.
- [19] Matsuo, K., et al. (2016). Weight change pattern and survival outcome of women with endometrial cancer. *Annals of Surgical Oncology*, 23(9), 2988–2997.
- [20] Rushton, T., et al. (2025). Weight trends among patients with endometrial cancer: Understanding and tackling a growing problem [Abstract 935]. *International Journal of Gynecological Cancer*, 35(2S1), 100.
- [21] Sollberger, T. L., Gavriluk, O., & Rylander, C. (2020). Excess body weight and incidence of type 1 and type 2 endometrial cancer: The Norwegian Women and Cancer Study. *Clinical Epidemiology*, 12, 815–824.
- [22] Wu, Q.-J., et al. (2015). Parity and endometrial cancer risk: a meta-analysis of epidemiological studies. *Scientific Reports*, 5, 14243.
- [23] Aune, D., Sen, A., & Vatten, L. J. (2017). Hypertension and the risk of endometrial cancer: a systematic review and meta-analysis of case-control and cohort studies. *Scientific Reports*, 7(1), 44808.
- [24] Habeshian, T. S., et al. (2024). Hypertension and risk of endometrial cancer: A pooled analysis in the Epidemiology of Endometrial Cancer Consortium (E2C2). *Cancer Epidemiology, Biomarkers & Prevention*, 33(6), 788–795.
- [25] Wang, Y., Zeng, X., Tan, J., Xu, Y., & Yi, C. (2022). Diabetes mellitus and endometrial carcinoma: Risk factors and etiological links. *Medicine*, 101(34), e30299.
- [26] Nagle, C. M., et al. (2018). The association between diabetes, comorbidities, body mass index and all-cause and cause-specific mortality among women with endometrial cancer. *Gynecologic Oncology*, 150, 99–105.
- [27] Njoku, K., Agnew, H. J., & Crosbie, E. J. (2022). Impact of type 2 diabetes mellitus on endometrial cancer survival: A prospective database analysis. *Frontiers in Oncology*, 12.
- [28] Yang, X., et al. (2021). Effects of metabolic syndrome and its components on the prognosis of endometrial cancer. *Frontiers in Endocrinology*, 12, 780769.
- [29] Turan Bakırcı, I., et al. (2025). Preoperative and postoperative histologic grade in endometrial cancer: correlation with myometrial invasion. *Journal of Medicine and Palliative Care*, 6(2), 143–147.
- [30] Liberis, A., et al. (2021). Dilatation and curettage in endometrial cancer. What is the correlation with hysterectomy histology? A 14 years retrospective cohort study. *JBUN*, 26(5), 1775–1781.
- [31] Laban, M., et al. (2021). Correlation between pre-operative diagnosis and final pathological diagnosis of endometrial malignancies; impact on primary surgical treatment. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 263, 100–105.
- [32] Soslow, R. A., et al. (2019). Endometrial carcinoma diagnosis: Use of FIGO grading and genomic subcategories in clinical practice: Recommendations of the International Society of Gynecological Pathologists. *International Journal of Gynecological Pathology*, 38(Suppl 1), S64–S74.
- [33] Sznurkowski, J. J., et al. (2025). Updated guidelines for the diagnosis and treatment of endometrial carcinoma: The Polish Society of Gynecological Oncology (2025v). *Current Oncology*, 32(6), 340.
- [34] Oliver-Perez, M. R., et al. (2023). Lymphovascular space invasion in early-stage endometrial cancer (LySEC): Patterns of recurrence and predictors. A multicentre retrospective cohort study of the Spain Gynecologic Oncology Group. *Cancers*, 15(9), 2612.
- [35] Stålberg, K., et al. (2019). Lymphovascular space invasion as a predictive factor for lymph node metastases and survival in endometrioid endometrial cancer – a Swedish Gynecologic Cancer Group (SweGCG) study. *Acta Oncologica*, 58(11), 1628–1633.
- [36] Muraru, A., et al. (2025). Epidemiological and histopathological characterization of endometrial carcinoma: A retrospective cohort from Romania. *Diagnostics*, 15(20), 2645.
- [37] Tang, M., et al. (2019). Perineural invasion as a prognostic risk factor in patients with early cervical cancer. *Oncology Letters*, 17(1), 1101–1107.
- [38] Bahmad, H. F., et al. (2023). Unraveling the mysteries of perineural invasion in benign and malignant conditions. *Current Oncology*, 30(10), 8948–8972.
- [39] Wang, J., et al. (2021). Association of myometrial invasion with lymphovascular space invasion, lymph node metastasis, recurrence, and overall survival in endometrial cancer: A meta-analysis of 79 studies with 68,870 patients. *Frontiers in Oncology*, 11.

- [40] Dane, C., & Bakir, S. (2019). The effect of myometrial invasion on prognostic factors and survival analysis in endometrial carcinoma. *African Health Sciences*, 19(4), 3235–3241.
- [41] Pasternak, M., et al. (2025). The prognostic importance of features of myometrial invasion in endometrial endometrioid carcinoma. *Archives of Gynecology and Obstetrics*, 312(4), 1215–1224.
- [42] Tangjitgamol, S., et al. (2015). Patterns of adjuvant therapy for endometrial cancer. *International Journal of Gynecological Cancer*, 25(4), 665–672.
- [43] Van Den Heerik, A. S. V. M., et al. (2021). Adjuvant therapy for endometrial cancer in the era of molecular classification: radiotherapy, chemoradiation and novel targets for therapy. *International Journal of Gynecological Cancer*, 31(4), 594–604.
- [44] Bestvina, C. M., & Fleming, G. F. (2016). Chemotherapy for endometrial cancer in adjuvant and advanced disease settings. *The Oncologist*, 21(10), 1250–1259.
- [45] Miller, D. S., et al. (2020). Carboplatin and paclitaxel for advanced endometrial cancer: Final overall survival and adverse event analysis of a phase III trial (NRG Oncology/GOG0209). *Journal of Clinical Oncology*, 38(33), 3841–3850.
- [46] Eskander, R. N., et al. (2023). Pembrolizumab plus chemotherapy in advanced endometrial cancer. *New England Journal of Medicine*, 388(23), 2159–2170.