RESEARCH ARTICLE

Editorial Process: Submission:10/24/2023 Acceptance:02/16/2024

Evaluating the Prognostic Factors and Survival Rates of Endometrial Cancer Patients in a Tertiary Referral Hospital in Northeast Thailand

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Abstract

Objectives: This study aims to determine the 5-year and 10-year overall survival rates, mortality incidence, median survival time, and factors influencing the survival of endometrial cancer (EC) patients' post-diagnosis at the largest hospital in northeast Thailand. We particularly focus on the impact of access to health insurance schemes. **Methods:** We conducted a retrospective analysis of data from EC patients admitted to Srinagarind Hospital between 2010 and 2019. Overall survival was estimated using the Kaplan-Meier method. Multivariate Cox regression analysis identified factors associated with survival, with results expressed as adjusted hazard ratios (AHR) and 95% confidence intervals (CI). **Results:** Among the 673 patients, the 5-year overall survival rate stood at 76.43% (95% CI: 72.72-79.70), and the 10-year rate at 67.86% (95% CI: 62.98-72.25). Notably, advanced age (≥60 years), stage III and IV cancer, and non-endometrioid histopathology were found to significantly increase post-diagnosis mortality risk (AHR = 2.39, 3.13, 4.62; 95% CI: 1.03-5.53, 2.07-4.74, 2.66-8.04; p-value <0.05, <0.001, <0.001). Surprisingly, we observed no significant correlation between health insurance schemes and mortality risk, suggesting that different insurance programs did not significantly affect EC patient survival in this study. **Conclusion:** health insurance schemes had no significant impact on endometrial cancer patient outcomes in Thailand, likely due to comprehensive coverage. Treatment modalities, notably surgery, showed no statistically significant differences, possibly due to early diagnosis. High-risk groups may benefit from adjuvant therapy. Early surgical intervention is crucial, with its association with disease stage emphasized. These findings inform cancer care decisions and healthcare policy development.

Keywords: Endometrial cancer- survival rate- risk factor- referral hospital- Northeast

Asian Pac J Cancer Prev, **25 (2)**, 671-679

Introduction

Globally, endometrial cancer (EC) ranks as the 6th most prevalent malignancy in women and the 14th leading cause of female mortality [1]. The incidence rates of this cancer differ notably between high-income countries, with a higher occurrence of 11.1 per 100,000 females, and low-resource countries, where the incidence rate is lower at 3.3 per 100,000 females [2]. In low and middle-income countries (LMICs), women with EC are often faced with limited availability of treatment options and access to healthcare facilities, potentially impacting both their survival and quality of life [3].

Accurately predicting EC's clinical behavior and prognosis requires its classification into distinct subgroups: endometrioid and non-endometrioid. Endometrioid cancer, the most prevalent type, often exhibit a more favorable prognosis. They frequently present as early-stage grade 1-2 diseases and are characterized by their hormone-dependent nature. Conversely, grade 3 endometrioid cancer demonstrate greater diversity and generally have a worse prognosis than their lower-grade counterparts. In contrast, non-endometrioid subtypes of EC, such as serous tumors, clear cell cancers, and carcinosarcomas, are known for their aggressiveness. These subtypes manifest at advanced stages of the disease and carry a higher risk of early distant spread, leading to poorer outcomes [4]. EC is generally associated with a favorable prognosis,

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primarily due to detecting many cases at an early stage, allowing for successful treatment through surgery alone. In developed countries, the 5-year overall survival rate of 80% is largely attributed to early-stage diagnoses and the use of surgery as the primary treatment, resulting in a low risk of recurrence [5].

In Thailand, EC is the 9th most common form of female cancer, with a standardized incidence rate of 4.3 per 100,000 women per year [6], and it is the third most common female genital cancer [7]. The current standard of treatment for EC is surgery. The postoperative complication rate among patients with EC undergoing primary surgery is 16.2-37.9% [8]. Thailand boasts impressive health insurance schemes for its citizens. This comprehensive healthcare system comprises three significant public health insurance schemes [9]. First, the Civil Servant Medical Benefit Scheme (CSMBS, covering 9%), which extends its services to government employees, pensioners, and their families. Second, the Universal Coverage Scheme (UCS, covering 70%), also known as the 'gold card' or '30-baht scheme,' serves as Thailand's primary health insurance initiative, striving for universal coverage. Its financing primarily relies on government tax revenue [10]. Third, the Social Security Scheme (SSS, covering 16%) is funded through tri-partite contributions, consisting of a 5% deduction from the employee's salary, a corresponding 5% subsidy from the employer, and an additional 2.75% contribution from the government [11].

Previous studies on EC survival in Thailand have mostly concentrated on variables such as age [12], stage [13], histopathology [14], adjuvant treatment [15], and medical morbidities [16]. Although previous research has explored various factors influencing the survival of patients with EC there has been a lack of research into the specific effects of health insurance schemes on the survival of EC patients [6, 17, 18]. Therefore, the primary objectives of our study were to investigate and analyze the survival rates and median survival time of EC patients, with a particular focus on understanding the potential relationship between health insurance schemes and patient outcomes at Srinagarind Hospital, the largest public hospital in northeastern Thailand and an important tertiary referral facility affiliated with Khon Kaen University's Faculty of Medicine. By addressing this research gap, we aimed to provide valuable insights into the influence of health insurance schemes on the survival outcomes of EC patients, which can have implications for improving healthcare policies and interventions in this context.

Materials and Methods

Patient recruitment and study design

Our retrospective chart study took place at Srinagarind Hospital. The study included 673 patients diagnosed with EC whose diagnostic dates were recorded during chart checks conducted between 2010 and 2019. Patients not receiving surgery as part of their initial treatment were excluded from the study sample.

Primary outcome and study factors

Our study's primary focus was to determine the duration in years from the initial diagnosis of EC (begin date) to either the event of death or the last follow-up (end-date). To comprehensively capture the long-term survival trends among EC patients, we established a maximum follow-up period of 10 years. We recorded the time elapsed in years from the date of diagnosis until the occurrence of death for each participant in our study. The factors under scrutiny in our research were categorized into three distinct groups. The first category of information encompasses demographic details such as age at the time of diagnosis, occupation, and type of health insurance schemes (CSMBS, UCS, SSS and self-payment). The second category pertains to clinical diagnosis, which comprises staging referencing the International FIGO 2009 stage classification (ranging from stage I to IV) and histopathology (categorized as endometrioid and non-endometrioid). The third category involves treatment modalities, which encompass various options including surgery, surgery combined with radiotherapy, surgery combined with chemotherapy, and surgery combined with radiotherapy and chemotherapy.

Statistical methods

We analyzed the baseline characteristics of EC patients using descriptive statistics. Categorical data were presented through frequency and percentage distributions, while continuous data were summarized using mean, standard deviation (SD), median, and range (including minimum and maximum values). Additionally, we calculated the incidence rate of deaths related to EC per 100 person-years following diagnosis, along with the corresponding 95% CI, using the Poisson distribution assumption.

Survival rate and median survival time from EC diagnosis until death were assessed using Kaplan-Meier techniques. The association between each factor and EC survival was evaluated using bivariate Cox regression analysis, presenting results as crude hazard ratios (HR), and multivariate Cox regression analysis, adjusting for all factors. The results reported adjusted hazard ratios (AHR) with their 95% CI and corresponding p-value. All tests were two-sided, with statistical significance set at a p-value less than 0.05. STATA version 18 (StataCorp, College Station, TX) was utilized for all analyses [19].

Ethical considerations

This study received ethical approval from the Khon Kaen University Ethics Committee for Human Research, under the reference number HE651138. The study was conducted in compliance with the principles outlined in the Declaration of Helsinki.

Results

Characteristics of EC patients

Our analysis comprised 673 patients diagnosed with EC. The average age at diagnosis was 58.06 years, with a standard deviation of 9.13 years. The age of patients in the study ranged from 22 to 86 years. Notably, the most significant proportion of patients fell within the age group of 45–59 (51.71%) of the total sample. The majority

Table 1. Demographic, Clinical, and Treatment Modalities Characteristics of Endometrial Cancer Patients.

Characteristics	Number	Percentage
Age at diagnosis		
<45	47	6.98
45–59	348	51.71
≥ 60	278	41.31
Mean (Standard deviation)	58.06 (9.13)	
Range	22–86	
Occupation		
Agriculturist	192	45.39
Freelance	26	6.15
Merchant	47	11.11
Government officer	71	16.78
Unemployed	337	50.07
Health insurance		
Civil Servant Medical Benefit Scheme	258	38.34
Universal Health Coverage Scheme	361	53.64
Social Security Scheme	21	3.12
Self-payment	33	4.9
Stage		
Stage I	387	57.5
Stage II	112	16.64
Stage III	136	20.21
Stage IV	38	5.65
Histopathology		
Endometrioid	584	86.78
Non-endometrioid	89	13.22
Treatment		
Surgery	295	43.83
Surgery + Radiotherapy	175	26
Surgery + Chemotherapy	103	15.3
Surgery + Radiotherapy + Chemotherapy	100	14.86

of patients (50.07%) were unemployed. Regarding health insurance schemes, 53.64% of the patients were covered by UCS, 38.34% by CSMBS, 4.90% were self–payment patients, and SSS covered 3.12%. In terms of disease characteristics, a significant proportion of patients (57.50%) were diagnosed at stage I of the disease. Additionally, the majority of patients (86.78%) had endometrioid histopathology. Surgery was the most common option regarding primary treatment received, with 43.83% of patients undergoing this procedure (Table 1).

Survival Analysis

Out of the 673 EC patients in the study, we observed a cumulative follow-up duration of 3,413 person-years after diagnosis. During this period, 164 patients had died by the end of the observation period. The overall incidence rate of death from EC was calculated to be 4.80 per 100 patients per year, with 95% CI: 4.12–5.60. This rate represents the estimated number of deaths per 100 EC patients per year since their initial diagnosis (Table 2).

The overall survival rates for patients with EC at 1, 5, and 10 years were 92.33% (95% CI: 90.04–94.12), 76.43% (95% CI: 72.72–79.70), and 67.86% (95% CI: 62.98–72.25), respectively (Figure 1A and Table 3). Among the different health insurance schemes, the SSS exhibited the highest survival rates at 10 years, with rates of 78.85% (95% CI: 52.68–91.57), followed by self-payment 74.73% (95% CI: 42.07–90.67), CSMBS 70.68% (95% CI: 62.46–77.42), and UCS 65.26% (95% CI: 58.74–71.01), respectively (Figure 1B). Furthermore, the log-rank test yielded a statistically significant p-value of less than 0.001, indicating substantial differences in the survival times among the different groups.

Association between factors and survival of EC patients

Factors associated with survival in this study are presented in Table 4. In the multivariable analysis using multivariate Cox regression, factors associated with a significantly higher risk of mortality included being in the age group ≥ 60 years (AHR = 2.39; 95% CI: 1.03–5.53), compared to those age group <45 years (p-value <0.05), stage III (AHR = 3.13; 95% CI: 2.07–4.74) and stage IV (AHR = 4.62; 95% CI: 2.66–8.04) compared to stage I (p-value <0.001), histopathology with non-endometrioid (AHR = 2.19; 95% CI: 1.50–3.18) compared to endometrioid (p-value <0.001).

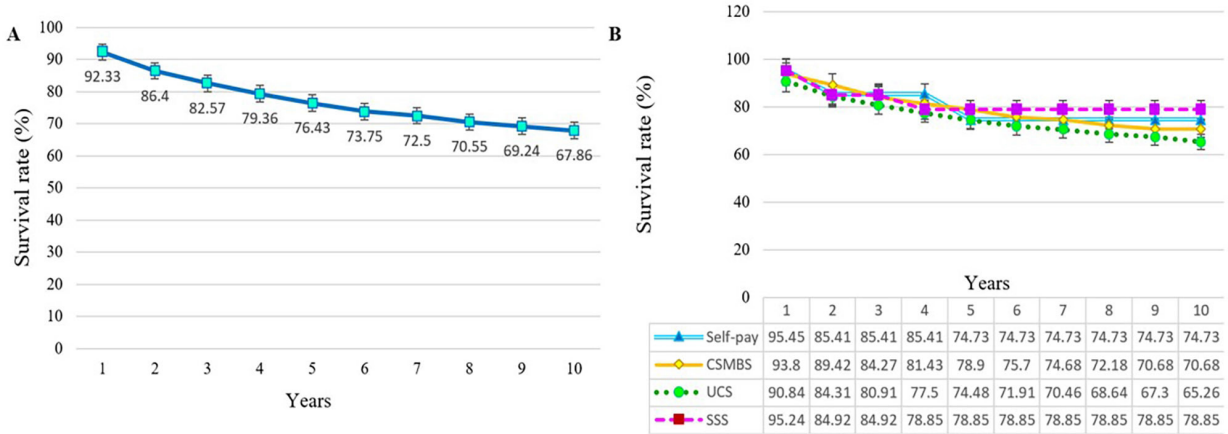

Figure 1. The 10-Year Survival Rate of EC Patients. (A) Overall survival rate. (B) The health insurance schemes are separated by survival rate.

Table 2. Incidence Rate of Mortality (IR)/100 Person-Years and Median Time of EC Patients

Factors	Number (Person-year)	IR/100 (95% CI)	Median time (95% CI)
Overall	3,413	4.80 (4.12–5.60)	-
Age at diagnosis			
<45	300	2.00 (1.00–4.45)	-
45–59	1,851	3.94 (3.14–4.96)	-
≥ 60	1,263	6.73(5.44–8.33)	-
Health insurance			
Civil Servant Medical Benefit Scheme	1,226	4.49 (3.44–5.84)	-
Universal Health Coverage Scheme	1,962	5.15 (4.24–6.26)	-
Social Security Scheme	122	3.29 (1.23–8.76)	-
Self-payment	104	3.86 (1.45–10.29)	-
Stage			
Stage I	2,109	2.66 (2.04–3.45)	-
Stage II	600	4.00 (2.68–5.97)	-
Stage III	596	10.24 (7.97–13.16)	7.94 (4.05–11.09)
Stage IV	109	21.12 (14.03–31.78)	2.41 (1.09–9.42)
Histopathology			
Endometrioid	3,092	3.91 (3.28–4.68)	-
Non-endometrioid	322	13.36 (9.91–18.02)	5.75 (2.01–9.49)
Treatment			
Surgery	1,594	3.58 (2.76–4.64)	-
Surgery + Radiotherapy	1,046	3.15 (2.24–4.44)	-
Surgery + Chemotherapy	384	11.70 (8.74–15.68)	7.67 (3.46–10.54)
Surgery + Radiotherapy + Chemotherapy	389	7.46 (5.19–10.74)	-

Table 3. The Survival Rate at 1, 5, and 10- Year of Endometrial Cancer Patients

Factors	Survival rate (95% CI)		
	1-year	5-year	10-year
Overall	92.33 (90.04-94.12)	76.43 (72.72-79.70)	67.86 (62.98-72.25)
Age at diagnosis			
<45	91.30 (78.47-96.64)	88.62 (74.67-95.13)	83.70 (65.41-92.81)
45-59	92.99 (89.72-95.25)	80.68 (75.80-84.67)	73.28 (67.05-78.52)
≥ 60	91.70 (87.78-94.41)	68.63 (62.04-74.32)	57.22 (48.16-65.27)
Health insurance			
Civil Servant Medical Benefit Scheme	93.80 (90.08-96.15)	78.90 (72.75-83.82)	70.68 (62.46-77.42)
Universal Health Coverage Scheme	90.84 (87.35-93.40)	77.48 (69.36-78.88)	65.26 (58.74-71.01)
Social Security Scheme	95.24 (70.72-99.32)	78.85 (52.68-91.57)	78.85 (52.68-91.57)
Self-payment	95.45 (71.87-99.35)	74.73 (42.07-90.67)	74.73 (42.07-90.67)
Stage			
Stage I	96.58 (94.18-98.00)	87.45 (83.33-90.61)	78.42 (72.03-83.51)
Stage II	94.63 (88.43-97.55)	81.73 (72.39-88.16)	70.90 (58.74-80.08)
Stage III	85.29 (78.14-90.25)	53.34(43.93-61.87)	49.11 (39.26-58.22)
Stage IV	68.06 (50.63-80.45)	35.27 (18.76-52.25)	17.63 (10.74-47.55)
Histopathology			
Endometrioid	94.28 (92.05-95.90)	80.02 (76.19-83.30)	72.60 (67.67-76.91)
Non-endometrioid	79.71 (69.75-86.70)	52.28 (40.31-62.95)	35.27 (20.11-50.80)
Treatment			
Surgery	92.47 (88.78-94.97)	82.72 (77.42-86.87)	73.42 (65.85-79.57)
Surgery + Radiotherapy	95.91 (91.61-98.03)	83.30 (76.37-88.35)	75.20 (66.17-82.14)
Surgery + Chemotherapy	83.40 (74.66-89.34)	53.25 (42.16-63.14)	47.84 (35.53-59.13)
Surgery + Radiotherapy + Chemotherapy	94.96 (88.31-97.87)	69.10 (57.49-78.13)	56.49 (38.16-71.28)

CI, Confidence interval

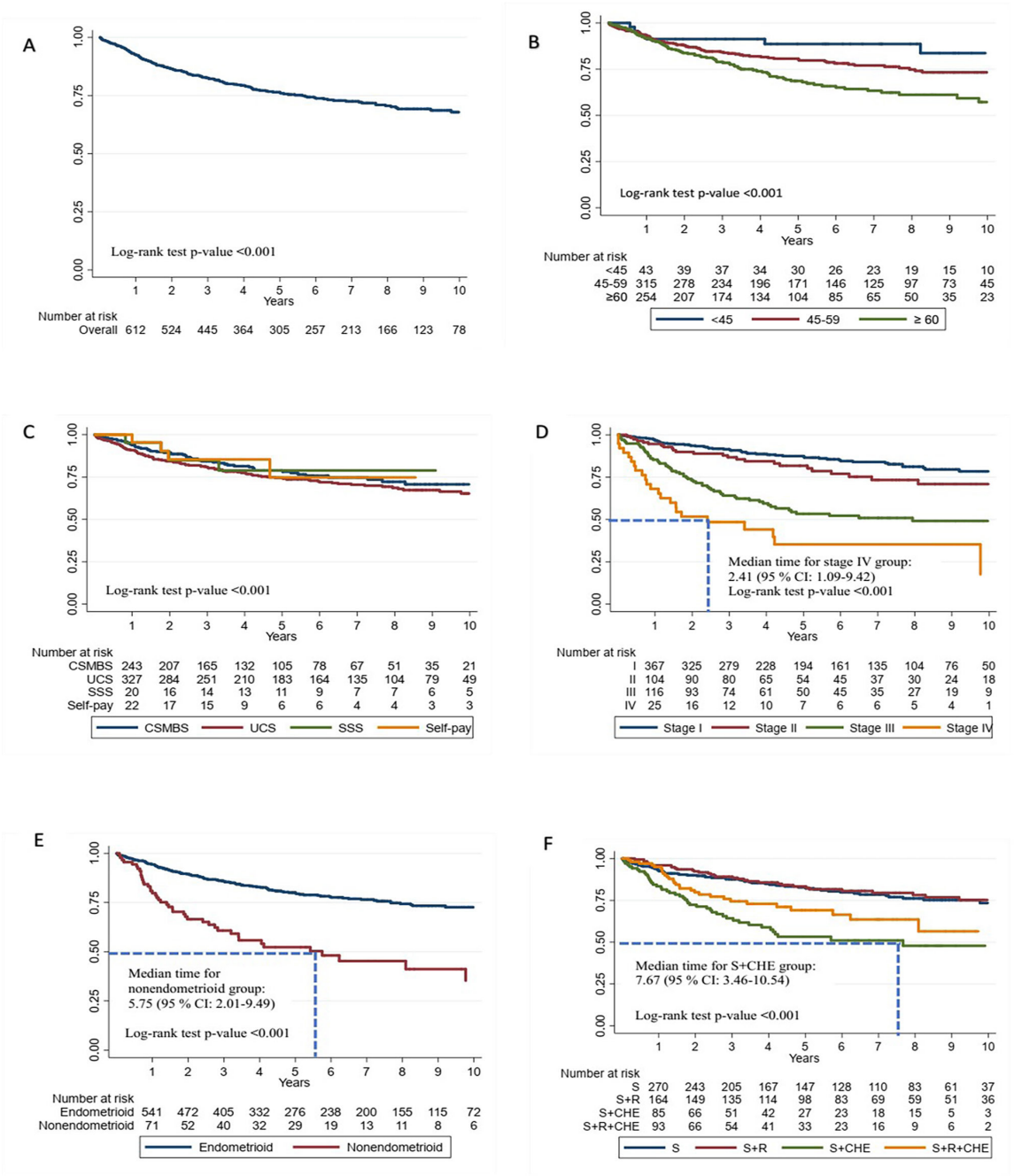

Figure 2. Kaplan-Meier Curve of EC Patients. (A) Overall. (B) Separated by age groups. (C) Separated by health insurance schemes. (D) Separated by stage. (e) Separated by histopathology. (F) Separated by treatments.

Discussion

This study assessed the survival rate and median survival time of 673 patients diagnosed with EC from diagnosis to death. The findings revealed that EC patients' overall median survival time (Figure 2A) and median survival time for specific subgroups, such as age at diagnosis (Figure 2B), health insurance schemes (Figure 2C), stage I–II (Figure 2D), endometrioid histopathology (Figure 2E), and treatment modalities groups (surgery, surgery + radiotherapy, and surgery + radiotherapy + chemotherapy) (Figure 2F) could not be determined. This absence occurred because the estimated survival rates for these subgroups were above 50% at the last time point, as demonstrated by the Kaplan–Meier survival curve (Figure 2), which aligns with similar observations from a study conducted in Malaysia [20]. Our study found a 22-year-old endometrial cancer patient who received surgery, which is an infrequent case. However, the next youngest endometrial cancer patient was 27 years old, which is quite a different age gap from the first patient.

In our study, the five-year overall survival rate of EC was 76.43%. This rate closely paralleled the findings of a 2015 study involving European women diagnosed with EC (76%) [21]. However, it was lower than the 5-year survival rates reported in studies conducted in Japan (96.4%) [22], Korea (89.0%) [5], China (82.1%) [23], and developed countries (80%) [24]. In this study, the

Table 4. Bivariate and Multivariable Analysis of Influencing Factors Associated with Mortality of Endometrial Cancer Patients

Factors	Crude HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value
Age at diagnosis		0.001		0.042
<45	Reference		Reference	
45–59	1.86 (0.81–4.28)		1.79 (0.77–4.18)	
≥ 60	2.96 (1.29–6.79)		2.39 (1.03–5.53)	
Health insurance		0.461		0.794
Self-payment	Reference		Reference	
Civil Servant Medical Benefit Scheme	1.22 (0.44–3.37)		1.07 (0.38–2.98)	
Universal Coverage Scheme	1.5 (0.55–4.10)		1.25 (0.45–3.43)	
Social Security Scheme	0.98 (0.25–3.92)		1.02 (0.25–4.15)	
Stage		<0.001		<0.001
Stage I	Reference		Reference	
Stage II	1.51 (0.94–2.44)		1.47 (0.86–2.52)	
Stage III	3.69 (2.57–5.31)		3.13 (2.07–4.74)	
Stage IV	7.11 (4.36–11.57)		4.62 (2.66–8.04)	
Histopathology		<0.001		<0.001
Endometrioid	Reference		Reference	
Non-endometrioid	3.10 (2.18–4.39)		2.19 (1.50–3.18)	
Treatment		<0.001		0.140
Surgery	Reference		Reference	
Surgery + Radiotherapy	0.91 (0.59–1.39)		0.80 (0.51–1.25)	
Surgery + Chemotherapy	2.91 (1.97–4.31)		1.34 (0.86–2.09)	
Surgery + Radiotherapy + Chemotherapy	1.85 (1.18–2.90)		0.82 (0.48–1.39)	

HR, Hazard ratios; CI, Confidence interval

10-year survival rate was determined to be 67.86%, which was lower than the rates reported in studies conducted in Sweden (80.70%) [25]. These findings underscore the variability in 5-year survival rates for patients with EC across different geographical regions and healthcare systems. Various factors, including access to healthcare services, treatment modalities, disease stage at diagnosis, and overall management approaches may influence the observed differences [26].

We assume our survival rate was lower than in previous studies, possibly for many reasons. For example, Srinagarind Hospital, a tertiary hospital, usually receives patients with more advanced stages of EC, leading to higher staging II-IV than in other studies. Furthermore, this region's geographic and socioeconomic status is lower than other regions, which might lead to difficulty accessing healthcare and delays in receiving treatment for early-stage disease. The findings of our study showed a noticeable trend in the 5-year survival rate based on patients' age at the time of diagnosis. Specifically, the highest 5-year survival rate was observed among patients aged less than 45 years (88.62%), while the lowest rate was seen in those aged ≥60 (68.63%). These results align with previous research conducted in different countries, including China [23] and Malaysia [20]. The 5- and 10-year survival rates within the youngest age groups have consistently maintained a high level throughout the entire study period, consistent with findings from research conducted in Sweden [25].

Our study uncovered differences in the survival rates for EC in Thailand among various health insurance schemes. Interestingly, patients covered by those under the CSMBS (78.90%) exhibited the highest 5-year survival rate, followed by SSS (78.85%), UCS (77.48%), and self-payment (74.73%), respectively. The findings of this study emphasize the importance of considering the country's health insurance schemes when assessing the survival rates for EC in Thailand. Understanding the impact of different health insurance schemes on patient outcomes is crucial for improving healthcare policies and ensuring better access to quality care.

As well, our study found that patients diagnosed with stage I EC displayed the highest 5-year survival rate (87.45%). These findings align with research conducted in China (90.9%) [23], the Netherlands (86.3%) [27], and Thailand (91.6%) [14]. Together, these findings strongly emphasize that patients diagnosed with advanced stages of EC tend to have significantly lower chances of survival than those diagnosed at an early stage. This is because most patients diagnosed in the early stage tend to have a favorable prognosis [5].

Furthermore, our result showed that the patients with endometrioid histopathology (80.02%) exhibited a higher 5-year survival rate than non-endometrioid group. These findings are in line with previous research conducted in Thailand (79.6%) [14] and China (85.2%) [23]. On the contrary, non-endometrioid histopathology may be associated with a higher mortality rate due to the

aggressive nature of these tumor subtypes [28].

Moreover, our recent study revealed that the five-year overall survival rate of EC patients who underwent surgery alone was 82.72%. This result was higher than research conducted in China (76.5%) [23] but were lower than the figures reported for Korea (95.2%) Korea (95.2%) [5]. This higher survival rate for surgery patients can be attributed to surgery being the primary and one of the most effective treatments for EC [29]. We conducted a multivariate Cox regression analysis, encompassing age at diagnosis, health insurance schemes, stage of the condition, histopathology, and various treatment modalities. Our multivariable model analysis revealed a notable trend were associated with risk of death: among EC patients, those in the older age group (≥ 60 years) exhibited a significantly higher probability of death than their younger counterparts (p-value <0.05). This discovery aligns with similar to the results of previous studies conducted in the US [30], China [31] and Korea [5]. Furthermore, when comparing older women to their younger counterparts, we observed that they are often diagnosed with more advanced stages and grades of EC, exhibit more aggressive histology, experience deeper myometrial invasion, and face poorer recurrence-free survival rates [32]. The relatively poorer prognosis in older patients might be attributed to their reduced tolerance to toxic treatments and the higher incidence of comorbidities [33]. Patients with advanced-stage EC (stage III-IV), there was a significantly higher probability of death, considering stage I as a reference (p-value <0.001). This correlation aligns with the findings of studies conducted in Korea [5] and the USA [34]. Consequently, these results indicate a strong association between advanced stages (stage III-IV) and a significantly higher likelihood of disease progression. Remarkably, our findings reveal that EC patients with non-endometrioid histopathology had a significantly higher risk of death than those in the endometrioid group (p-value <0.001). This finding is consistent with studies conducted in the USA [34]. Our research encompasses the histopathology of endometrioid are associated with a favorable prognosis. In contrast, non-endometrioid disease is associated with fatalities attributed to aggressive biological characteristics, advanced metastatic stage at the time of diagnosis, and inherent chemo-resistance [35].

However, our findings reveal that health insurance schemes did not produce statistically significant outcomes when compared to self-payment. This may be due to the implementation of a three-scheme health insurance has greatly enhanced patients' access to cancer treatment health care services. These health insurance schemes comprehensively cover cancer care, including screening, curative treatments like surgery, chemotherapy, radiation, and supportive and palliative care [36]. Furthermore, our findings indicated that treatment modalities did not yield statistically significant outcomes when compared to surgery alone. This observation could be attributed to the fact that the majority of patients in this study were diagnosed at stage I of the disease, emphasizing early detection, and most patients exhibited endometrioid histopathology. These findings align with prior research conducted in Japan. Certain patients face an increased risk of recurrence and a less favorable prognosis, including individuals of older age, those with histology types other than endometrioid, higher tumor grades, lymphovascular space involvement, and peritoneal carcinomatosis. In such cases, it is recommended that these patients consider postoperative adjuvant chemotherapy or radiotherapy [37]. Patients who underwent surgery along with chemotherapy were more likely to have stage II disease, while those who received surgery in combination with chemotherapy and radiotherapy were more likely to have stage III disease. Conversely, individuals who received chemotherapy or radiotherapy without surgical intervention were most likely to be at stage IV of the disease [5].

Our study exhibits significant strengths. To begin with, it draws on a substantial patient sample of EC cases spanning a 10-year period. Moreover, we collected data from a considerable number of cases referred to Srinagarind Hospital, which boasts the most comprehensive database among public hospitals in the Northeast region. Finally, conducting the study at a single institution enabled us to minimize potential treatment variability, thereby further enhancing the reliability of our findings.

The study does have some limitations. The sample may not provide a complete representation of the entire Thai population, as it was limited to the northeastern region and sourced from just one hospital. Nevertheless, despite these limitations, our study has provided valuable insights that can serve as a foundation for future EC research. Consequently, it is imperative to conduct additional studies in various regions of Thailand to validate and reinforce these findings.

The findings of our study suggest that EC patients had the highest likelihood of attaining a 10-year overall survival rate when diagnosed before the age of 45, enrolled in the SSS of health insurance schemes, diagnosed with stage I cancer, confirmed with a histopathological diagnosis of endometrioid type, and subjected to a treatment approach that combined surgery and radiotherapy. Conversely, notable risk factors linked to increased mortality rates post-diagnosis included older age (≥ 60 years), advanced cancer stages (III-IV), and histopathological classifications falling under the non-endometrioid category. These findings have the potential to enhance our understanding of clinical outcomes, ultimately may be leading to improved survival rates for patients.

Author Contribution Statement

RW, NL, and KT played a central role in conceptualizing the idea, providing editing support for the manuscript drafts, managing the data, ensuring data quality assurance, conducting data analysis, and authoring the statistical methods and results sections of the manuscript. Moreover, RW, NL, KT, and MK made significant contributions by providing valuable feedback and actively engaging in the manuscript editing process, resulting in a comprehensive review and unanimous approval of the final version.

Acknowledgements

The authors wish to extend their heartfelt gratitude for the invaluable cooperation and support from the members of the Cancer Unit, the Medical Record Unit and Statistics Department of Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand, for contributing information to making this study a success.

Funding statement

The study did not receive a dedicated grant from any funding agency in the public, commercial, or nonprofit domains.

If it was approved by any scientific Body/ if it is part of an approved student thesis

This study is an integral component of an authorized student thesis derived from the work of a graduate student. The thesis approval statement attests to the committee chair, committee members, dean, department chair, and The Graduate School dean approving the thesis.

Any conflict of interest

All authors declare that they have no conflicts of interest. All authors affirm the absence of any financial support, commercial engagements, or affiliations that could create an appearance of a conflict of interest about the contribution of this study. Additionally, we confirm that we have not agreed with any research sponsor that restricts us from publishing both positive and negative results or prohibits the publication of this research without prior sponsor approval.

How the ethical issue was handled (name the ethical committee that approved the research)

This study received ethical approval from the Khon Kaen University Ethics Committee for Human Research under HE651138. The board of ethics committee approved this research, shown on the website https://eckku.kku.ac.th/about#section-2.

Availability of data (if apply to your research)

The corresponding author will be willing to share the datasets utilized and examined in the current study upon receiving a reasonable request.

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