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The effect of waiting time on ovarian cancer survival in oncology centres, Addis Ababa, Ethiopia: a retrospective cohort study

Abrham Tesfaye Habteyes[1*], Jembere Tesfaye Deressa[2] and Roza Teshome Kassa[2]

Abstract

Background Ovarian cancer is a leading cause of mortality worldwide. The third most prevalent gynecological cancer globally, following cervical and uterine cancer, and the third leading cause of cancer-related mortality among women in Sub-Saharan Africa, including Ethiopia. The time ovarian cancer patients have to wait between diagnosis and initiation of treatment are the indicators of quality in cancer care and influence patient outcomes. Despite extensive studies in the field, little is known about the strength of the association between ovarian cancer survival and waiting time. So, the main purpose of this study is to assess the effect of waiting time on ovarian cancer survival in oncology centers in Addis Ababa, Ethiopia.

Methods A facility-based retrospective cohort study was conducted with a total of 561 study participants included. The main outcome of interest for this study was death due to ovarian cancer. The authors compared the ovarian cancer patients with waiting times ≤ 10 weeks and waiting times > 10 weeks for overall survival rate using the log rank test. The incidence density rate of mortality was calculated for each group variable. The effect of waiting time on ovarian cancer mortality was estimated using the Cox proportional hazards model at the 5% level of significance.

Results The incidence density rate of mortality among ovarian cancer patients for waiting time ≤ 10 weeks was found to be 10.85 (95%CI, 9.10-12.98) per 1,000 person years observation, while for waiting time > 10 weeks the mortality rate was found to be 18.05 (95%CI, 15.33–21.23) per 1,000 person years observation. In the Cox regression analysis after full adjustments for confounder variables, the mortality event risk was 36% higher among waiting time > 10 weeks women (AHR = 1.36; 95%CI = 1.05–1.75) as compared to waiting time ≤ 10 weeks.

Conclusions We have found that the incidence density rate of mortality among ovarian cancer patients was significantly higher in waiting time > 10 weeks groups. Therefore, future policy and clinician programmers should consider the impact of waiting time from diagnosis until to get the first treatment more carefully.

Keywords Waiting time, Survival, Mortality, Ovarian cancer, Addis ababa, Ethiopia

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Background

Ovarian cancer is a leading cause of mortality worldwide and the seventh most commonly diagnosed malignancy among all forms of cancer in women [1, 2] and the third most prevalent gynaecological cancer globally, following cervical and uterine cancer [3]. Approximately 207, 252 new deaths from ovarian cancer were reported globally in 2020 [4], account for 4.4% of all cancer-related mortality among women [5]. Similarly, in Sub-Saharan Africa, including Ethiopia, ovarian cancer is the third leading cause of cancer-related mortality among women. The incidence has been increasing over the past decade [6, 7].

Early detection and treatment have considerably improved the survival rates of patients with ovarian cancer, but the survival rate of ovarian cancer patients is still low and prone to high mortality [7, 8]. This is due to uncertain disease symptoms, a lack of feasible early-stage diagnostic tools, and a delay in the early initiation of treatment. The majority of patients arrive with advanced disease [5, 9–12]. Globally, patients with ovarian cancer have only a 45.6% cumulative five-year survival rate [12]. Survival is highly dependent on stage of disease and age of the patient. Patients with early-stage disease had a five-year overall survival rate of 80–90%, compared to 25% with advanced-stage disease [10].

According to Global Burden of Cancer 2020, ovarian cancer accounts for 3.4% of cancer cases and 3.6% of cancer mortality among women in Ethiopia [13]. Based on a report from the Addis Ababa cancer registry, Ethiopia has an age-standardized incidence rate of ovarian cancer of 8.5 per 100,000 person-years, which is approximately double that of other Sub-Saharan countries as evidenced by global data [14]. In order to reduce this burden, the Ethiopian Federal Ministry of Health has started assembling a task force to combat cancer and other non-communicable diseases. One of the strategic framework is to minimize cancer incidence and mortality while also improving the quality of life of cancer patients [15]. In spite of that ovarian cancer is still one of the leading cause of gynecologic cancer-related mortality and the survival tends to be low among women in Ethiopia, this due to multifactorial problems such as lack of effective screening, late cancer diagnosis and limited access to timely and standard treatment [5, 7, 10].

One of the major challenge of cancer care is Ethiopia is delays in treatment [16], and delay in diagnosis, since most of the patients seek medical care at advanced stage of the disease including ovarian cancer [17]. The number of ovarian patients is continuously increasing from year to year, which makes the waiting time for receipt of treatment to be very long [18], which can negatively impact clinical and psychosocial outcomes [19] potentially both to induce worry and anxiety, which worsens patient disease experience [20].

Intervals between confirmation of diagnosis and beginning of treatment are also indicators of quality in cancer care [21]. The time patients have to wait between diagnosis and initiation of the first treatment has been scrutinized for many months [22], and influences patient outcomes [23]. Research has evaluated the association of waiting time intervals with the outcomes of gynaecological cancer patients [24–26]. So far, however, little is known about the association of patients' survival from cancer with meeting the official waiting time [27], while there is a general temptation to use these published targets in association with cancer survival. Delaying treatment affects the clinical outcome and survival of ovarian cancer is currently unclear [28]. In Ethiopia where oncology practice is so young, awareness' even among medical professionals about oncology is much inferior than expected [17]. As far as we know there is no study or report done mentioning the magnitude and effect of waiting time on ovarian cancer patients' survival in Ethiopia. The current study designed to fill the gap and assess the effect of waiting time on ovarian cancer survival in oncology centers, Addis Ababa, Ethiopia.

Methods

Study design, area and period

An institutional-based retrospective cohort study was conducted at St.' Paul's Hospital Millennium Medical College (SPHMMC) and Tikur Anbessa Specialized Hospital (TASH) oncology centers in Addis Ababa from January 24 and February 28, 2024. The study was conducted in Addis Ababa, the capital and largest city of Ethiopia [29]. The city has twelve public and more than forty private hospitals; among these, only SPHMMC and TASH were given a service for more than five years, so the study was conducted among ovarian cancer patients in those two tertiary referral hospitals oncology units between January 24 and February 28, 2024, in Addis Ababa, Ethiopia.

The TASH oncology center serves an estimated 60,000 patients per year. Service is given in both inpatient and outpatient departments. The inpatient department has a bed capacity of 33 patients, and the outpatient department provides service for more than 850 patients per month in 2 clinics. Moreover, the hospital is the sole cancer referral center in the country, with access to chemotherapy, radiotherapy, and surgical treatment options. SPHMMC opened its oncology department in the year 2018. The center is providing all oncology services next to TASH, except for radiation treatment [30, 31].

Population

All patients diagnosed with ovarian cancer in the SPHMMC and TASH oncology centers were the source population, and the study populations were all newly diagnosed ovarian cancer patients at SPHMMC and

TASH from January 1st, 2018 to January 1st, 2023. All ovarian cancer patients who were newly diagnosed and enrolled in SPHMMC and TASH during the required time (i.e., January 1st, 2018 to January 1st, 2023) were included; while those medical charts were incomplete, patients whose medical charts were not found, clients who had a previous history of treating ovarian cancer, and a patient who had a diagnosis at other hospitals and was referred to the selected hospitals for further treatment were excluded.

Sample size, sampling technique and procedure

A total of 904 ovarian cancer patients were registered in SPHMMC (375) and TASH (529) during the required period (i.e., January 1st, 2018 to January 1st, 2023). Study participants who fulfilled the inclusion criteria in the study were identified by data collectors from the list of ovarian cancer charts who were on cancer care or treatment follow-up from SPHMMC and TASH oncology units. Finally, after exclusion based on the given criteria, 561 study participants were included in the study using the census sampling procedure. To obtain the necessary information about the date of diagnosis and treatment initiation, the investigators used the medical registration number of patients from the registration book.

Outcome measures and variable definition

The main outcome of interest in this study was death due to ovarian cancer. Survival time was calculated in months by using the time from the first date of ovarian cancer diagnosis to the date of death, the date last known to be alive, the date of lost to follow-up (censored), or the end of the study (until January 1st, 2023), whichever came first. The overall survival (OS) time of patients was defined as the time from diagnosis until the time of death. Vital status was provided by the clinician affiliated with the center for the subject after review of hospital medical records. The main independent variable was waiting time to initiate treatment, defined as the number of weeks between the date of diagnosis and treatment initiation date.

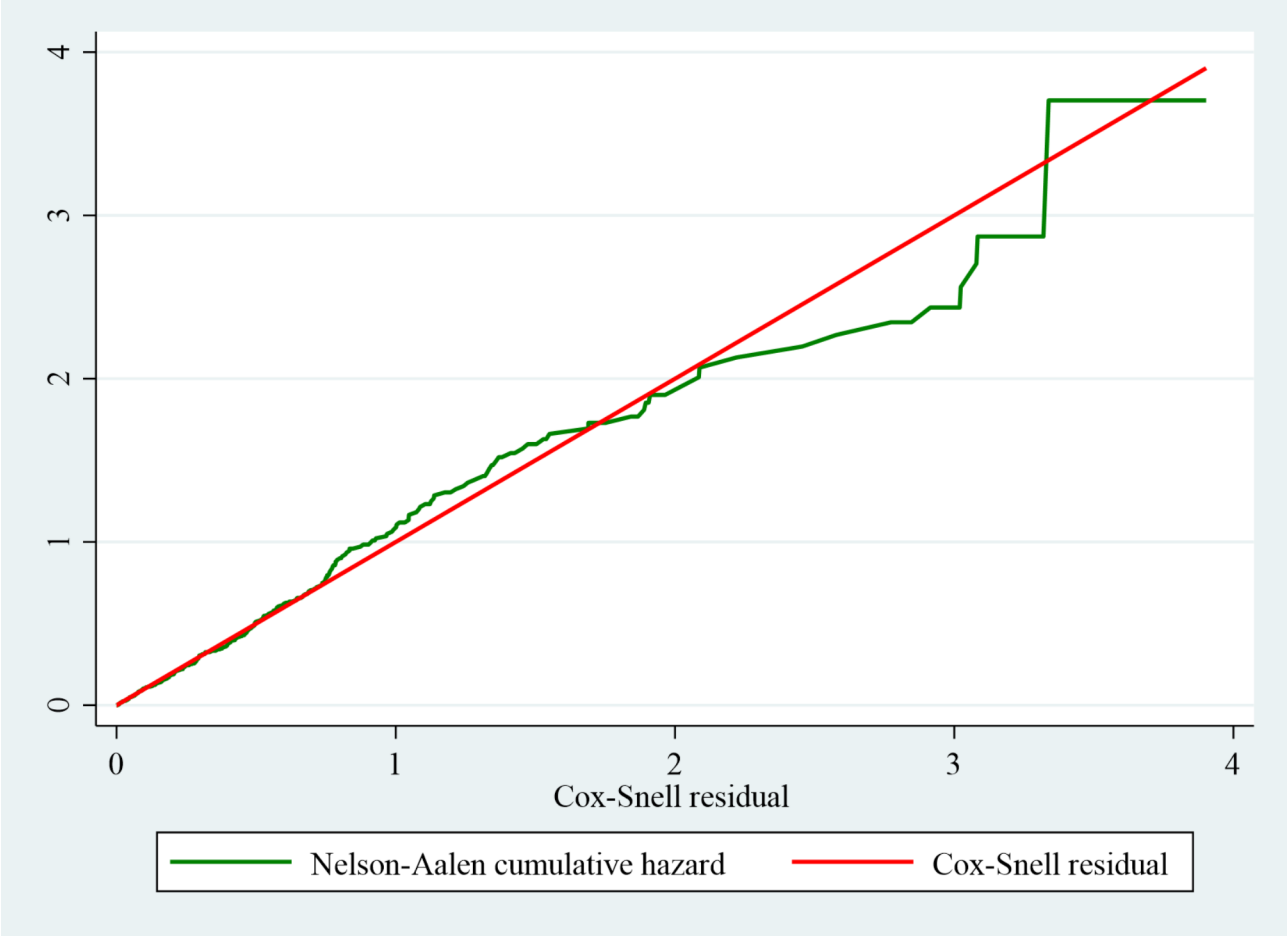

Fig. 1 Cox-Snell residual Nelson -Aalen cumulative hazard graph on ovarian cancer patients in TASH and SPHMMC, Addis Ababa, Ethiopia, 2023

Table 1 Socio-demographic and reproductive health characteristics of ovarian cancer patients at TASH and SPHMMC, Addis Ababa, Ethiopia ($n=561$)

Covariates	Category	Waiting time ≤ 10 weeks No. (%)	Waiting time > 10 weeks No. (%)	Total No. (%)	Chi2 (χ^2)	*P*-value
Age in years at time of diagnosis	< 30	50(68.49%)	23(31.51%)	73(13.01%)	11.56	0.021
	30–39	47(54.65%)	39(45.35%)	86(15.33%)		
	40–49	76(59.84%)	51(40.16%)	127(22.64%)		
	50–59	57(60.64%)	37(39.36%)	94(16.76%)		
	≥ 60	86(47.51%)	95(52.49%)	181(32.26%)		
Region	Addis Ababa	114(57.00%)	86(43.00%)	200(35.65%)	2.36	0.502
	Oromia	112(58.33%)	80(41.67%)	192(34.22%)		
	Amhara	55(50.00%)	55(50.00%)	110(19.61%)		
	Other*	35(59.32%)	24(40.68%)	59(10.52%)		
Number of parity	0–1	106(61.99%)	65(38.01%)	171(30.48%)	3.61	0.165
	2–3	74(56.06%)	58(43.94%)	132(23.53%)		
	≥ 4+	136(52.71%)	122(47.29%)	258(45.99%)		
Combined oral contraceptive (COC) use	User	23(54.76%)	19(45.24%)	42(7.49%)	0.41	0.813
	Non user	175(57.57%)	129(42.43%)	304(54.19%)		
	Unknown	118(54.88%)	97(45.12%)	215(38.32%)		
Menopause status	Premenopausal	132(60.83%)	85(39.17%)	217(38.68%)	2.92	0.088
	Postmenopausal	184(53.49%)	160(46.51%)	344(61.32%)		
Family History of ovarian	Yes	24(48.98%)	25(51.02%)	49(8.73%)	3.51	0.173
	No	91(62.33%)	55(37.67%)	146(26.02%)		
	Unknown	201(54.92%)	165(45.08%)	366(65.24%)		

* indicates regions such as, Tigray, Somali, Diredewa, Gambela, Harari, South nations nationalities

Data collection tools and procedure

A data abstraction format developed from different literatures was used to collect data [32–44]. The data abstraction format was pretested, and some of sociodemographic and reproductive health related variable were not complete on all charts then remove those variables and the content of the included variables was examined by senior experts in the area of study (three oncologists in TASH). An appropriate data extraction format was adopted in English in order to extract all the relevant variables to meet the study objectives from patient charts. All charts of ovarian cancer patients newly diagnosed between January1st, 2018 and January1st, 2023 at TASH and SPHMMC oncology units were reviewed from cancer registries. The records of all study participants were selected according to the eligibility criteria. The status of patients was obtained from the medical record. Data collectors were four trained nurses who are working at the cancer treatment center and supervised by one BSc midwife with previous experience in data collection.

Data quality control

Data quality was assured by designing proper data abstraction tools through continued supervision. The developed checklist content validity was examined by senior experts. A pre-test was conducted on 5% of the sample size. Language clarity, appropriateness of data collection tools, estimated time to completion, and the necessary amendments were considered based on the pre-test. Intensive training on record review was given to data collectors and supervisors on the existing records. The daily evaluation of the data for completeness encountered difficulties at the time of data collection and was attended accordingly. All completed data collection forms were examined for completeness and consistency during data management, storage, cleaning, and analysis.

Data processing and analysis

In our study, waiting times were defined as a dichotomous variable on the basis of whether the patient-initiated treatment within 10 weeks of diagnosis. The 10-week time point was identified because, on inspection of the data, a nonlinear relationship between waiting time and survival was observed. Then, waiting time was grouped into two categories of 0 to 10 and more than 10 weeks by using median as a cut-off point.

Data were coded and then cleaned, edited, and analyzed using STATA Version 17 statistical software [45]. Categorical variables were compared using the chi-square test as appropriate. The incidence density rate (IDR) was calculated for both waiting times below and above 10 weeks. A Kaplan-Meier survival curve together with a log rank test was used to test for the presence of differences in overall survival rate between waiting times below and above 10 weeks. The effect of waiting time on ovarian cancer mortality was estimated

Table 2 Clinical, and treatment related characteristics of ovarian cancer patients at TASH and SPHMMC, Addis Ababa, Ethiopia ($n=561$)

Covariates	Category	Waiting time ≤ 10 weeks No. (%)	Waiting time > 10 weeks No. (%)	Total No. (%)	Chi2 (χ^2)	*P*-Value
FIGO Stage at diagnosis	Stage I	41(64.06%)	23(35.94%)	64(11.41%)	7.18	0.028
	Stage II	78(64.46%)	43(35.54%)	121(21.57%)		
	Advanced (Stage III & IV)	197(52.4%)	179(47.6%)	376(67.02%)		
Histology type	Epithelial	256(54.8%)	211(45.2%)	467(83.24%)	3.39	0.335
	Germ cell	30(68.18%)	14(31.82%)	44(7.84%)		
	Sex cord-stromal	6(54.55%)	5(45.45%)	11(1.96%)		
	Others	24(61.54%)	15(38.46%)	39(6.95%)		
Metastasis at time of diagnosis	Yes	199(52.2%)	182(47.8%)	381(67.91%)	8.10	0.004
	No	117(65.0%)	63(35.0%)	180(32.09%)		
CA-125 elevated (> 35MIU/ml)	Yes	270(53.9%)	231(46.1%)	501(89.30%)	11.31	0.001
	No	46(76.67%)	14(23.33%)	60(10.70%)		
Comorbidity	Yes	80(52.29%)	73(47.71%)	153(27.27%)	1.39	0.237
	No	236(57.8%)	172(42.2%)	408(72.73%)		
HIV status	Positive	27(62.79%)	16(37.21%)	43(7.66%)	0.89	0.641
	Negative	272(55.9%)	214(44.1%)	486(86.63%)		
	Unknown	17(53.13%)	15(46.88%)	32(5.70%)		
Baseline anemia	Yes	132(57.2%)	99(42.86%)	231(41.18%)	0.110	0.745
	No	184(55.8%)	146(44.3%)	330(58.82%)		
Type of treatment	Chemo-surgery	211(52.6%)	190(47.4%)	401(71.48%)	10.59	0.032
	Surgery	78(63.93%)	44(36.07%)	122(21.75%)		
	Chemotherapy	12(60.00%)	8(40.00%)	20(3.57%)		
	Palliative care	6(85.71%)	1(14.29%)	7(1.25%)		
	Others	9(81.82%)	2(18.18%)	11(1.96%)		
Duration of treatment	< 19week	187(63.6%)	107(36.4%)	294(52.41%)	13.29	0.001
	≥ 19week	129(48.3%)	138(51.7%)	267(47.59%)		
Treatment completed	Yes	124(60.8%)	80(39.22%)	204(36.36%)	2.59	0.108
	No	192(53.8%)	165(46.2%)	357(63.64%)		
Residual tumor after surgery	Yes	177(52.1%)	163(47.9%)	340(64.52%)	5.95	0.051
	No	82(64.57%)	45(35.43%)	127(24.10%)		
	Unknown	32(53.33%)	28(46.67%)	60(11.39%)		
Pain medication received	Yes	136(56.4%)	105(43.6%)	241(42.96%)	0.01	0.966
	No	180(56.3%)	140(43.6%)	320(57.04%)		

FIGO: The International Federation of Gynecology and Obstetrics, CA-125: Cancer antigen 125

using the Cox proportional hazards model. A variable with a *p*-value ≤ 0.25 in bivariable cox-regression were selected for multivariable analysis. Lastly, variables with a *p*-value < 0.05 in multivariable cox-regression was considered statistically significant. Adjusted Hazard ratios (AHRs) with 95% CIs were used to determine the independent effect of waiting time on time to death of ovarian cancer patients. The Cox-proportional hazard model assumption was checked using the Schoenfeld residual test, and variables with a *P*-value > 0.05 were considered to fulfil the assumption and the overall global test was (chi2 = 18.12, df = 10 and Prob > chi2 = 0.053). Residuals were checked using the goodness-of-fit test by Cox Snell residuals, which satisfied the model test (Fig. 1).

Result

Socio-demographic and reproductive health characteristics of the study participants

In the present study, we did not find a significant difference between region category ($P=0.502$), parity ($P=0.165$), COC use status ($P=0.813$), menopausal status at diagnosis ($P=0.088$), and family history of ovarian cancer ($P=0.173$). However, more than half of the women after age 60 years had longer waiting time (> 10 weeks) (52.49% vs. 47.51%, $P=0.021$) (Table 1).

Clinical and treatment related characteristics of the study participants

Waiting time ≤ 10 weeks was higher in early stage (FIGO stage I) (64.06% vs. 35.94%, $P=0.028$), women who had

no metastasis at time of diagnosis (65.0% vs. 35.0%, $P = 0.004$), women with CA-125 < 35 MIU/ml (76.67% vs. 23.33%, $P = 0.001$), and women who received treatment for less than 19 weeks of duration (63.6% vs. 36.4%, 0.001) compared to waiting time > 10 weeks. There was no difference in comorbidity between women with waiting times ≤ 10 weeks and waiting times > 10 weeks. However, women with waiting time ≤ 10 weeks were more likely to have baseline comorbidity (52.29% vs. 47.71%) (Table 2).

The effect of waiting time on ovarian cancer survival

We found that the incidence density rates of mortality among ovarian cancer patients were varied due to waiting time to get treatment since diagnosis. The waiting time ≤ 10 weeks with the total observation of 10,968.68 person-years, the mortality rate of ovarian cancer patients was found to be 10.85 (95%CI, 9.10-12.98) per 1,000 person-years observation. Whereas the mortality rate of waiting time > 10 weeks for ovarian cancer patients was found to be 18.05 (95%CI, 15.33–21.23) per 1,000 person-year observation with the total observation of 8,035.56 person-years. Besides, the overall survival rate of ovarian cancer patients on waiting time ≤ 10 weeks was 50.22% (95%CI, 43.44–56.62) at 5 years follow-up. However, waiting time > 10 weeks patients overall survival rate was found to be 25.32% (95%CI, 19.07–32.03) at 5 years follow-up. Median follow-up time for waiting time > 10 weeks for women was 35.72 months (95%CI, 31.58–41.68). Overall median survival for the entire cohort was 43.36 months (95%CI, 40.39–47.37) (Fig. 2).

Predictors of ovarian Cancer death by waiting time

In the Cox regression analysis for the incidence of death, women with a waiting time > 10 weeks had a higher risk of mortality with an event risk of 69% (AHR = 1.69; 95%CI = 1.32–2.15) compared with waiting time ≤ 10 weeks in the unadjusted model. And after full adjustments for age at diagnosis, parity, menopausal status, family history of OC, FIGO stage at diagnosis, histologic type, comorbidity, COC use status, treatment completed, and pain medication received, the mortality event risk was 36% higher among waiting time > 10 weeks women (AHR = 1.36; 95%CI = 1.05–1.75) (Table 3).

Discussion

To the best of our knowledge, this is the first study to examine the effect of waiting time on ovarian cancer survival in oncology centers in Addis Ababa, Ethiopia. In this retrospective cohort study, the findings demonstrated that waiting time > 10 weeks is associated with an increased incidence of mortality rate in ovarian cancer patients. In waiting time ≤ 10 weeks, the overall 5-year survival rate was found to be 50.22%, lower compared to waiting time > 10 weeks (25.32%), and the difference was also statistically significant.

The reproductive characteristics of patients demonstrated waiting time ≤ 10 weeks women had a higher proportion of combined oral contraceptive users, had no family history of ovarian cancer, pre- and post-menopausal women compared to waiting time > 10 weeks women. The possible justification is that most combined

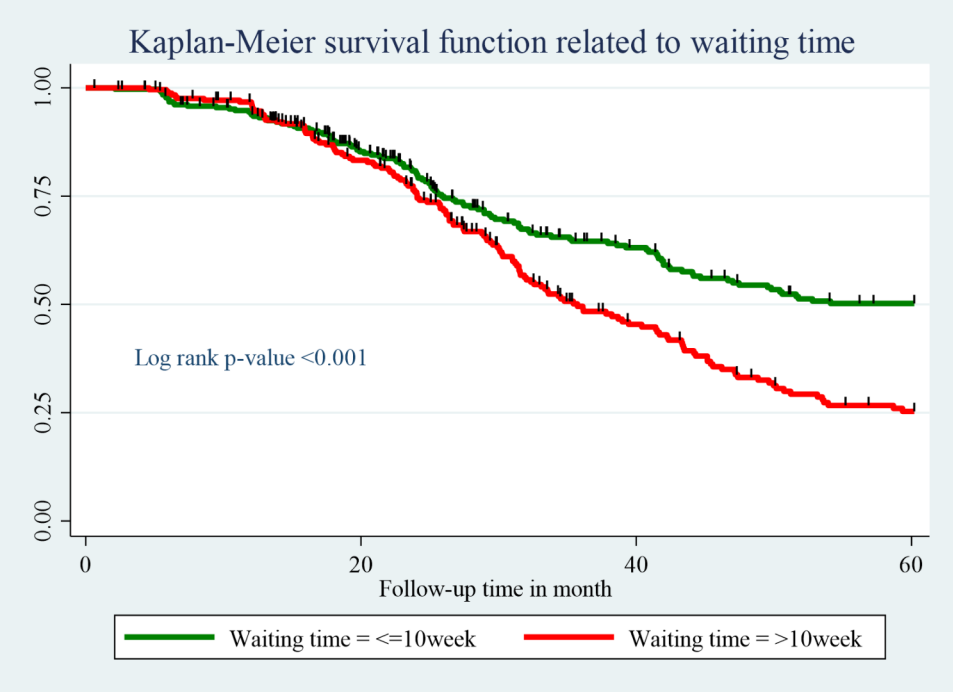

Fig. 2 The effect of waiting time on overall survival of ovarian cancer in Ethiopia

Table 3 Results of the bivariable and multivariable cox regression analysis of ovarian cancer patients' death according to waiting time

Covariates	Category	Bivariable CHR (95%CI)	Multivariable AHR (95%CI)	*P*-value
Waiting time	≤ 10 weeks	1	1	
	> 10 weeks	1.69(1.32–2.15)*	1.36(1.05–1.75)**	0.019
Age at diagnosis	< 30	1	1	
	30–39	1.72(0.79–3.72)	0.77(0.32–1.84)	0.550
	40–49	3.30(1.67–6.54)*	1.24(0.53–2.91)	0.626
	50–59	4.57(2.30–9.07)*	1.75(0.63–4.85)	0.281
	≥ 60	9.13(4.79–17.39)*	2.84(1.04–7.73)**	0.042
Number of parity	0–1	1	1	
	2–3	1.64(1.14–2.37)*	0.92(0.61–1.38)	0.686
	≥ 4+	1.92(1.41–2.62)*	0.69(0.47–1.01)	0.052
Menopausal status	Premenopausal	1	1	
	Postmenopausal	3.27(2.41–4.44)*	0.71(0.39–1.27)	0.246
Family history of ovarian cancer	Yes	1	1	
	No	0.49(0.27–0.89)*	0.71(0.37–1.34)	0.287
	Unknown	1.78(1.08–2.91)*	0.97(0.55–1.72)	0.924
FIGO stage at diagnosis	Stage I	1	1	
	Stage II	1.51(0.74–3.07)	1.51(0.74–3.09)	0.264
	Advanced (III & IV)	7.74(4.19–14.27)*	2.27(1.17–4.39)**	0.015
Histologic type	Sex-cord stromal	1	1	
	Epithelial	23.49(3.29–167.5)*	9.05(1.24–66.13)**	0.030
	Germ cell	3.37(0.39–28.86)	4.59(0.51–41.41)	0.175
	Others	2.51(0.16–40.19)	2.26(0.14–36.94)	0.568
Comorbidity	No	1	1	
	Yes	1.82(1.42–2.33)*	1.48(1.13–1.95)**	0.005
Combined oral contraceptive user status	Non-user	1	1	
	User	0.45(0.22–0.92)*	0.72(0.34–1.55)	0.405
	Unknown	2.06(1.61–2.64)*	1.81(1.38–2.37)**	< 0.001
Treatment completed	Yes	1	1	
	No	6.13(4.45–8.44)*	3.19(2.23–4.56)**	< 0.001
Pain medication received	Yes	1	1	
	No	0.55(0.43–0.70)*	0.86(0.65–1.13)	0.275

AHR; adjusted Hazard ratio, CI; confidence interval, CHR: crude hazard ratio, * and ** indicate: significantly associated variables in bivariable and multivariable analysis ($P < 0.05$).

oral contraceptive users and ovarian cancer patients who had no family history in this study were largely concentrated in early stage FIGO staging and would get early treatment (surgery). Moreover, the main effects of oral contraceptives are to suppress ovarian activity, so some protection against neoplastic change is plausible [46] and due to this reason, it was diagnosed in an early stage and would get early treatment after diagnosis to prevent metastasis. Besides, a lack of significant differences between waiting time and socio-demographic risk factors was observed.

The baseline clinical and treatment-related characteristics of ovarian cancer patients demonstrated waiting time ≤ 10 weeks had a higher proportion of early FIGO stages (stage I&II), had no metastasis at the time of diagnosis, germ cell tumor histologic type, surgery, and palliative treatment mode compared to waiting time > 10 weeks for women. The possible justification is that waiting time ≤ 10 weeks would have early-stage tumors and would get early treatment to prevent distant metastasis. Additionally, most of ovarian cancer patients in Ethiopia seek medical care at advanced stage of the disease [17] because of asymptomatic nature of the disease on the early stages [10, 11], lack of effective screening, and limited access to timely and standard treatment in Ethiopia [5, 7, 10]. Moreover, ovarian cancer patients who had no metastasis at the time of diagnosis and germ cell tumor histologic type were managed early within a short period of diagnosis by surgery for fear of distant metastasis. Furthermore, the women diagnosed with advanced stages of the disease were put on palliative care and admitted at the time of diagnosis to start immediate intervention for life-threatening conditions.

In the Cox regression analyses, the risk of mortality was higher in waiting time > 10 weeks for women compared with waiting time ≤ 10 weeks after all the adjustments. The risk of mortality was 1.36 times higher in patients who had a waiting time > 10 weeks than a time ≤ 10 weeks. This finding is in agreement with a study in Israel, China [26, 28], and also the study in the United State [47]. This might be the fact that, ovarian cancer patients who had a longer waiting time to get treatment means the disease had time to advance its stage. So, delayed medical care can allow the tumor to grow and spread, reducing anti-tumor immunity, making it more difficult for the patient's immune system to fight the cancer, making them less susceptible to treatment, and increasing the probability of treatment failure, resulting in higher mortality. Longer waiting time in our finding, and also other countries such as Israel, China and United State have similar effect in the risk of mortality, which has higher risk of ovarian cancer patients' mortality than a patient who have shorter time to get treatment.

Conclusion

In this study, after adjustment for other reproductive, clinical, and treatment-related factors, women who had a waiting time > 10 weeks had worse short-term survival compared to women with a waiting time ≤ 10 weeks. Therefore, future policy and clinician programmers should consider to implement standardized referral protocols to ensure patients are prioritized based on clinical urgency/need and allocate also additional resources (staff, equipment, funding) to high-demand treatment areas to help decrease waiting times and improve access to care. Furthermore, further studies are required, that's focused on vulnerable populations and each subtype of ovarian cancer to identify unique challenges and tailored interventions to minimize waiting time effects on mortality and also recommended to conduct longitudinal studies that track patient outcomes over time, linking treatment delays to long-term health consequences beyond immediate mortality rates.

Limitations of the study

Our study has some limitations. First, some sociodemographic and reproductive health characteristics were not included in this study due to incomplete documentation on the chart. Second, due to the exclusion of patients with incomplete medical files during data collection, selection bias might be introduced. Furthermore, the quality of data was compromised by the fact that patient medical records were handwritten and stored manually, and the documentation was somewhat incomplete.

Abbreviations

AHRs	Adjusted hazard ratios
IDR	Incidence density rate
OS	Overall survival
SPHMMC	St.' paul's hospital millennium medical college
TASH	Tikur anbessa specialized hospital

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Author contributions

ATH contributed to the conception, study design, data acquisition, data interpretation, and writing of the original article. JTD and RTK were involved in the planning, conduct, and reporting of the work in the paper. ATH, JTD, and RTK contributed to the conception and design, data acquisition, critical revision, and data interpretation. All authors participated in the study design, interpretation of the data, and writing of the paper and made final approval of the paper.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study was approved by Institutional Review Boards (IRB) of Addis Ababa University, College of Health Science, Department of Midwifery (IRB protocol: SNM/MID/036/16) and Institutional Review Boards of St. Paul Hospital Millennium Medical College (IRB protocol: PM23/1002). Consent had been waived by the ethical board. They are conducted in compliance with the ethical guidelines for medical and health research involving human subjects and the ethical principles of the Declaration of Helsinki. Then, a permission letter has been obtained from Tikur Anbesa Specialized Hospital and St. Paul Hospital Millennium Medical College, oncology unit. The study was conducted without individual informed consent, as the study relied on retrospective data collected as part of routine patient care. In this retrospective study, no patient identifiers were used, and data were anonymized. To keep confidentiality, names and other personal identifiers were not included in the data collection tool. The data on the computer were secured by password and keep it a private document.

Consent for publication

Not required.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Competing interests

The authors declare no competing interests.

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