International Journal of Women's Health

Dovepress
open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Identifying Factors Contributing to Delayed Diagnosis of Ovarian Cancer: A Comprehensive Analysis

Kai Hong[1,*], Yan Liu[1,*], Hao Yin[2], Ke Huang[2], Xiao-Li Pu[1], Zhuan-Xu Zhu[1]

[1]Department of Gynaecology, Taihe Hospital, Hubei University of Medicine, Shiyan, Hubei, 442000, People's Republic of China; [2]Department of Obstetrics, Taihe Hospital, Hubei University of Medicine, Shiyan, Hubei, 442000, People's Republic of China

*These authors contributed equally to this work

Correspondence: Zhuan-Xu Zhu, Email 13636196733@163.com

Background: Ovarian cancer (OC) remains the deadliest gynecologic malignancy worldwide due to delayed diagnosis, recurrence, and drug resistance. This study aimed to identify key factors affecting delayed diagnosis in OC patients.

Methods: A retrospective analysis was conducted on OC patients treated at Taihe Hospital, Hubei University of Medicine from June 2023 to September 2023. Patients were categorized based on a three-months cut-off point for delayed diagnosis. Collected data included demographics, tumor incidence, and disease cognition. The analysis of variance and the chi-squared test was used for comparison between groups.

Results: The significant differences were found in age, residence, education level, family income, family history of tumor, histology, FIGO stage, and tumor location between groups ($P<0.05$). Multifactorial logistic regression analysis identified education level [odds ratio (OR) = 0.606; 95% confidence interval (CI): 0.440, 0.833; $P = 0.002$], family history of tumor (OR = 0.462; 95% CI: 0.214, 0.997; $P = 0.049$), emotional barriers (OR = 1.332; 95% CI: 1.081, 1.642; $P = 0.007$), and practical barriers (OR = 2.964; 95% CI: 2.195, 4.004; $P < 0.001$) as risk factors for delayed diagnosis of OC.

Conclusion: Patient cognition is crucial in OC diagnosis delay. Enhancing public awareness and understanding of OC is essential to eliminate fear and improve early diagnosis.

Keywords: ovarian cancer, delayed diagnosis, disease awareness, emotional barriers

Background

Ovarian cancer (OC) is one of the gynecological tumors with high mortality. In 2020, approximately 300,000 women worldwide were newly diagnosed and more than 200,000 died of the disease.[1] The onset of OC is occult with no special symptoms in the early stage. Most patients have developed to the advanced stage when they are diagnosed. The five-year survival rate is less than 45%, and the mortality rate is the first of in female reproductive system tumors.[2]

Delayed diagnosis is one of the key factors affecting the prognosis of OC.[3] The OC patients usually have no obvious symptoms in the early stage. The OC patients do not seek medical treatment until the obvious symptoms appear. Unluckily, when they are confirmed, the disease has usually already developed to the middle or advanced stage. Such a process is often referred to as patient-derived diagnostic delay.[4] In addition, diagnostic delay can occur due to factors such as the inexperience of healthcare providers, which is called iatrogenic delay. When OC is diagnosed at an advanced stage, the main treatment modalities, including surgery and chemotherapy, focus on controlling disease progression.[5] However, advanced tumors usually invade and damage normal ovarian tissues, and surgical interventions using of electrocoagulation or electrocautery can further harm healthy tissues. Chemotherapy, while targeting malignant cells, also causes significant side effects, including myelosuppression, gastrointestinal reactions, liver and kidney toxicity, and peripheral neuropathy.[6–8] These treatment-related adverse effects impact patient outcomes and quality of life, therefore, underscoring the importance of early detection and timely intervention.

Received: 11 April 2024
Accepted: 24 August 2024
Published: 5 September 2024

The challenge of routine screening or early diagnosis of OC may be attributed to several factors. Firstly, the ovary's deep location within the abdominal cavity, lacking surrounding protective structures like muscles and bones, makes early detection difficult. Secondly, current screening methods for early-stage OC are limited and lack clear, effective early detection protocols. Furthermore, patients are often unfamiliar with the symptoms of the disease and may not be aware of the psychological risk factors, leading to limited attention to early signs.[1] In this context, it is also valuable to consider advances in related fields, such as new treatment strategies for pelvic organ conditions. For example, recent studies on vaginal native tissue repair for posterior compartment prolapse have provided insights into treatment outcomes, including long-term effects on sexual function and quality of life.[9]

Therefore, this study aimed to analyze the correlation between various causes, patient characteristics, and delayed diagnosis of OC from the patient's perspective. By clarifying the key factors affecting the diagnosis and treatment, our findings aim to provide a foundation for improving the prevention and early diagnosis of OC.

Methods

General Information

This study retrospectively analyzed the OC patients who were treated in Taihe Hospital, Hubei University of Medicine from June 2023 to September 2023. The inclusion criteria were as follows: (1) primary OC, surgical-pathological staging according to the revised surgical pathological staging of the International Federation of Gynecologists and Obstetrics (FIGO) revision[10] (Table S1); (2) no previous cancerous lesions; (3) able to communicate normally and cooperate to complete the assessment of the scale. This study was approved by the Ethics Committee of Taihe Hospital, Hubei University of Medicine, and complies with the Declaration of Helsinki.

After fully informing the patients and obtaining informed consent of the patients and their families, a professional evaluating physician made inquiries with the patients and their families. Then, the patients filled in the assessment scale by themselves. The content of the scale included: the basic information of the patients [age, body mass index (BMI), marital status, menstruation, place of residence, education level, occupation, family income, mode of medical payment, family history of tumor, histology, FIGO stage, tumor size, tumor location], first symptom, diagnostic delay, knowledge of OC, willingness to medical treatments, the period from first symptom to the first medical consultation, and the department of the first consultation.

Observation Index

First Symptom and Diagnostic Delay in Patients

The cut-off point of diagnostic delay was 3 months, where a delay of ≥ 3 months was considered as diagnostic delay.[11] Patients were divided into two groups: < 3 months group and ≥ 3 months group. The first symptoms recorded included abdominal distension, self-perceived abdominal mass, abdominal pain, increased abdominal circumference, urinary and intestinal symptoms, weight loss, fatigue, nausea, fever, loss of appetite, irregular vaginal bleeding, and other symptoms.

Awareness of Ovarian Cancer in Patients

(1) OC Symptom Awareness Score:[12] This score includes symptoms such as persistent abdominal pain, persistent pelvic pain, post-menopausal vaginal bleeding, persistent abdominal distension, increased abdominal size, persistent satiety, difficulty eating, urinating more than usual, change in bowel habits, extreme tiredness, and back pain, with a total score of 11.

(2) OC Worry Scale Score:[12,13] The scale consists of three items: frequency of worry ("How often do you worry about getting OC someday?"), the effect of worry on mood ("How often will you worry about having OC one day affect your mood?"), and the impact of worry on daily activities ("How often, if at all, does you worry about someday having OC affect your ability to perform daily activities?"). Items were rated from 1 (not at all) to 5 (almost all the time), with a score range of 1–15.

(3) Health beliefs:[12,14] Perceived susceptibility [An open-ended question was used to assess the expected time to symptom onset: "If you have a symptom that you think may be a sign of OC, please tell me how long it will take you to go to the doctors from the time you first noticed the symptom?". The responses were coded according to a number of predefined categories (eg, "I will go as soon as I notice", "up to one week", and "more than a month",). A dichotomous delayed variable (< 3 weeks, > 3 weeks) was created to reflect guidelines regarding the

frequency and persistence of symptoms such as bloating and pain, and the three-week symptom timeline currently used in the UK OC awareness campaign. The sensitivity analyses were used to test the effect of using different delay thresholds (1 and 2 weeks)], perceived benefits (five items), emotional barriers (four items), practical barriers (three items), and confidence in symptom detection.

Situations Related to Medical Treatments

(1) Willingness to medical treatments: Whether patients were active and passive.
(2) The period from the first symptom to the first medical consultation.
(3) The department of the first consultation, including internal medicine, obstetrics and gynecology, gastroenterology, urology, and emergency.

Statistical Processing

The SPSS 18.0 was used to perform the statistical analysis. Categorical variables were expressed as the cases and percentages. The chi-squared test was used to compare the data on the percentage of delayed diagnosis among different factors. Continuous variables were expressed as mean ± standard deviation, and a *t*-test was used to compare the data of different OC patients with delayed diagnosis. Logistic regression was utilized to analyze the factors associated with delayed diagnosis of OC. $P < 0.05$ was considered statistical significance.

Results

Factors Influencing Delayed Diagnosis of Ovarian Cancer

Using 3 months as the cut-off point for delayed diagnosis, a total of 403 patients were included in this study. Of these, 297 patients had no delay in diagnosis, while 106 experienced a delay. No significant differences were found in BMI, marital status, menstruation, occupation, mode of medical payment, and tumor size between the two groups of patients ($P > 0.05$). However, there were significant differences in age, place of residence, education level, family income, family history of tumor, histology, FIGO stage, and tumor location ($P < 0.05$) (Table 1).

Table 1 Characterization of Factors Influencing Delayed Diagnosis of Ovarian Cancer

	<3 Months Group (n = 297)	**≥3 Months Group (n = 106)**	χ^2/t	***P***
Age (years)	61.71 ± 7.90	64.31 ± 7.83	−2.921	0.004
BMI (kg/m^2)	23.1 ± 1.98	23.38 ± 2.01	−1.235	0.217
Marital status (%)			1.463	0.226
Married	238 (80.1)	79 (74.5)		
Divorced, widowed, single	59 (19.9)	27 (25.5)		
Menstruation (%)			0.049	0.824
Normal	59 (19.9)	20 (18.9)		
Menopausal	238 (80.1)	86 (81.1)		
Place of residence (%)			4.573	0.032
Urban	162 (54.5)	45 (42.5)		
Rural	135 (45.5)	61 (57.5)		
Education level (%)			33.456	0.000
Non-formal education	19 (6.4)	21 (19.8)		
Elementary and middle school	86 (29)	45 (42.5)		
High school	145 (48.8)	22 (20.8)		
University	39 (13.1)	15 (14.2)		
Postgraduate and above	8 (2.7)	3 (2.8)		

(*Continued*)

Table 1 (Continued).

	<3 Months Group (n = 297)	≥3 Months Group (n = 106)	χ^2/t	*P*
Occupation (%)			1.248	0.536
Farmer	50 (16.8)	23 (21.7)		
Employee	203 (68.4)	68 (64.2)		
Others	44 (14.8)	15 (14.2)		
Family Income (%)			4.918	0.027
≤ 50,000/year	168 (56.6)	73 (68.9)		
> 50,000/year	129 (43.4)	33 (31.1)		
Mode of medical payment (%)			3.801	0.149
Self-pay	79 (26.6)	36 (34)		
Cooperative medical care	77 (25.9)	31 (29.2)		
Medical insurance	141 (47.5)	39 (36.8)		
Family history of tumor (%)			5.968	0.015
No	224 (75.4)	92 (86.8)		
Yes	73 (24.6)	14 (13.2)		
Histology (%)			13.055	0.011
Serous	38 (12.8)	16 (15.1)		
Endometrioid	84 (28.3)	32 (30.2)		
Mucinous	46 (15.5)	13 (12.3)		
Clear cell	87 (29.3)	17 (16)		
Other/unknown	42 (14.1)	28 (26.4)		
FIGO stage (%)			9.274	0.026
I	40 (13.5)	10 (9.4)		
II	105 (35.4)	26 (24.5)		
III	116 (39.1)	47 (44.3)		
IV	36 (12.1)	23 (21.7)		
Tumor size	4.49 ± 1.04	4.64 ± 1.15	−1.207	0.228
Tumor location (%)			6.395	0.041
Left side	119 (40.1)	28 (26.4)		
Right side	111 (37.4)	47 (44.3)		
Bilateral	67 (22.6)	31 (29.2)		

Notes: Data were expressed as mean ± standard deviation or n (%). BMI, body mass index; FIGO, Federation of Gynecologists and Obstetrics; χ^2, chi-squared test; t, independent *t*-test.

Patients with delayed diagnosis were older, aged 56–72, with a median age of 64 years. They were more likely to live in rural areas (57.5%), receive education below primary and junior high school education (62.3%), and have a lower annual family income (less than ¥50,000) (68.9%). Besides, they were more likely to have no family history of tumor (86.8%), endometrioid OC (30.2%), FIGO stage III and IV (66%), and right-sided tumors (44.3%) (Table 1).

Situations Related to Patient Medical Treatments

As shown in Table 2, the first symptoms of the two groups of patients were abdominal distension (172 patients), self-perceived abdominal mass (150), abdominal pain (229), increased abdominal circumference (74), urinary and intestinal symptoms (139), weight loss (219), and other symptoms (fatigue, nausea, fever, loss of appetite, and irregular vaginal bleeding, etc). (59). Abdominal pain was significantly more common in the ≥ 3 months group compared to the < 3 months group ($P = 0.045$). There were 186 active patients in the < 3 months group and 214 passive patients in the ≥ 3 months group. The number of active patients in the ≥ 3 months group was notably higher than that in the < 3 months group ($P = 0.024$). The period from the first medical consultation was 6.87 ± 1.78 days for the < 3 months group and 7.29 ± 1.99 days for the ≥ 3 months group, with the period being remarkably longer in the ≥ 3 months group ($P = 0.04$). The proportion of patients visiting the internal medicine department was similar between the two groups ($P > 0.05$).

Table 2 Situations Related to Patient's Medical Treatments

	<3 Months Group (n = 297)	≥3 Months Group (n = 106)	χ^2	*P*
Abdominal distension (%)	129 (43.4)	43 (40.6)	0.263	0.608
Self-perceived abdominal mass	115 (38.7)	35 (33)	1.087	0.297
Abdominal pain (%)	160 (53.9)	69 (65.1)	4.01	0.045
Increased abdominal circumference (%)	54 (18.2)	20 (18.9)	0.025	0.876
Urinary and intestinal symptoms (%)	97 (32.7)	42 (39.6)	1.676	0.195
Weight loss (%)	168 (56.6)	51 (48.1)	2.249	0.134
Other symptoms (%)	41 (13.8)	18 (17)	0.631	0.427
Willingness to medical treatments (%)			5.072	0.024
Active consultation	147 (49.5)	39 (36.8)		
Passive consultation	150 (50.5)	67 (63.2)		
The first medical consultation, days	6.87 ± 1.78	7.29 ± 1.99	−2.057	0.04
The department of the first consultation			7.22	0.125
Internal medicine department	33 (11.1)	12 (11.3)		
Obstetrics and Gynecology department	82 (27.6)	17 (16.0)		
Gastroenterology department	72 (24.2)	35 (33.0)		
Urology department	75 (25.3)	26 (24.5)		
Emergency medicine department	35 (11.8)	16 (15.1)		

Notes: χ^2, chi-squared test;

Patients' Perception of Ovarian Cancer

Awareness of Ovarian Cancer Symptoms

Symptoms considered risk signs of OC were: persistent abdominal pain (304 patients), persistent pelvic pain (233), post-menopausal vaginal bleeding (52), increased abdominal size (338), persistent satiety (157); difficulty eating (129); urinating more than usual (218); extreme tiredness (83). No significant difference was observed in cases of patients with the above symptoms between the two groups ($P > 0.05$).

However, persistent abdominal distension, change in bowel habits, and back pain were reported as risk signs in the ≥ 3 months group compared to the < 3 months group ($P < 0.05$). Overall, the total OC symptom awareness score was significantly lower in the ≥ 3 months group ($P < 0.05$) (Table 3).

Table 3 Symptom Awareness Assessment of Patients in Two Groups

	<3 Months Group (n = 297)	≥3 Months Group (n = 106)	χ^2/t	*P*
Persistent abdominal pain (%)	226 (76.1)	78 (73.6)	0.265	0.606
Persistent pelvic pain (%)	173 (58.2)	60 (56.6)	0.087	0.768
Post-menopausal vaginal bleeding (%)	36 (12.1)	16 (15.1)	0.614	0.433
Persistent abdominal distension (%)	177 (59.6)	48 (45.3)	6.490	0.011
Increased abdominal size (%)	252 (84.8)	86 (81.1)	0.798	0.372
Persistent satiety (%)	117 (39.4)	40 (37.7)	0.090	0.764
Difficulty eating (%)	96 (32.3)	33 (31.1)	0.051	0.821
Urinating more than usual (%)	160 (53.9)	58 (54.7)	0.022	0.881
Change in bowel habits (%)	123 (41.4)	30 (28.3)	5.703	0.017
Extreme tiredness extreme tiredness	63 (21.2)	20 (18.9)	0.262	0.608
Back pain (%)	186 (62.6)	54 (50.9)	4.427	0.035
Total Score	5.42 ± 1.49	4.93 ± 1.71	2.75	0.006

Notes: χ^2, chi-squared test; t, independent *t*-test.

Patients' Worry About Ovarian Cancer

The scores for the < 3 months and ≥ 3 months groups were 1.25 ± 0.43 as well as 1.27 ± 0.45, respectively. There was no significant difference between the two groups ($P > 0.05$) (Table 4).

Assessment of Patients' Health Beliefs About Ovarian Cancer

Score for perceived susceptibility and confidence in symptom detection were significantly lower in the ≥ 3 months group compared to the < 3 months group ($P = 0.026$). No significant difference was observed in perceived benefits between the two groups. In terms of emotional barriers and practical barriers, the scores of the ≥ 3 months group were notably higher than those of the < 3 months group (Table 5).

Logistic Regression Analysis of Factors Associated with Delayed Diagnosis of Ovarian Cancer

Univariate analysis identified age, place of residence, education level, family income, family history of tumor, histology, FIGO stage, emotional barriers, practical barriers, and confidence in symptom detection as risk factors for delayed diagnosis of OC (Table 6). Multivariate analysis further revealed that education level [odds ratio (OR) = 0.606; 95% confidence interval (CI): 0.440, 0.833; $P = 0.002$), family history of tumor (OR = 0.462; 95% CI: 0.214, 0.997; $P = 0.049$), emotional barriers (OR = 1.332; 95% CI: 1.081, 1.642; $P = 0.007$), and practical barriers (OR = 2.964; 95% CI: 2.195, 4.004; $P < 0.001$) were significant risk factors for delayed diagnosis of OC (Table 7).

Table 4 Assessment of Patient Worry in Both Group

	<3 Months Group (n = 297)	≥3 Months Group (n = 106)	t	*P*
Ovarian Cancer Worry Scale	1.25 ± 0.43	1.27 ± 0.45	−0.494	0.622

Notes: t, independent *t*-test.

Table 5 Assessment of Health Beliefs in Two Groups

	<3 Months Group (n = 297)	≥3 Months Group (n = 106)	t	P
Perceived susceptibility	2.44 ± 0.96	2.20 ± 0.92	2.235	0.026
Perceived benefits	17.39 ± 2.20	17.22 ± 2.16	0.686	0.493
Emotional barriers	4.65 ± 1.25	5.28 ± 1.49	−4.245	<0.001
Practical barriers	3.29 ± 0.88	4.47 ± 1.20	−10.704	<0.001
Confidence in symptom detection	2.43 ± 0.85	2.23 ± 0.88	2.114	0.035

Notes: t, independent *t*-test.

Table 6 Univariate Analysis of Factors Associated with Delayed Diagnosis of Ovarian Cancer

	B	S.E.	Wald	*P*	OR	95% CI	
						Lower	Upper
Age	0.042	0.015	8.227	0.004	1.043	1.013	1.073
Menstruation	0.064	0.288	0.049	0.824	1.066	0.607	1.873
BMI	0.071	0.058	1.522	0.217	1.074	0.959	1.202
Marital status	0.321	0.266	1.456	0.228	1.379	0.818	2.323
Place of residence	0.487	0.228	4.535	0.033	1.627	1.040	2.545
Education level	−0.481	0.131	13.508	0.000	0.618	0.478	0.799

(*Continued*)

Table 6 (Continued).

	B	S.E.	Wald	*P*	OR	95% CI	
						Lower	Upper
Occupation							
Farmer					1.000		
Employee	−0.317	0.288	1.21	0.271	0.728	0.414	1.281
Others	−0.300	0.391	0.587	0.444	0.741	0.344	1.595
Family Income	−0.53	0.24	4.864	0.027	0.589	0.368	0.943
Mode of medical payment	−0.253	0.134	3.578	0.059	0.776	0.597	1.009
Family history of tumor	−0.762	0.317	5.773	0.016	0.467	0.251	0.869
Histology							
Serous					1.000		
Endometrioid	−0.1	0.363	0.076	0.783	0.905	0.444	1.844
Mucinous	−0.399	0.433	0.848	0.357	0.671	0.287	1.568
Clear cell	−0.768	0.399	3.704	0.054	0.464	0.212	1.014
Other/unknown	0.46	0.385	1.424	0.233	1.583	0.744	3.368
FIGO stage	0.373	0.133	7.912	0.005	1.452	1.12	1.883
Tumor size	0.129	0.107	1.454	0.228	1.137	0.923	1.402
Tumor location							
Left side					1.000		
Right side	0.588	0.273	4.64	0.031	1.8	1.054	3.071
Bilateral	0.676	0.302	5.008	0.025	1.966	1.088	3.555
Abdominal distension	−0.118	0.23	0.263	0.608	0.889	0.566	1.395
Self-perceived abdominal mass	−0.248	0.238	1.084	0.298	0.78	0.489	1.245
Abdominal pain	0.468	0.235	3.977	0.046	1.597	1.008	2.529
Increased abdominal circumference	0.045	0.29	0.025	0.876	1.047	0.592	1.849
Urinary and intestinal symptoms	0.302	0.234	1.670	0.196	1.353	0.855	2.140
Weight loss	−0.34	0.227	2.240	0.134	0.712	0.456	1.111
Other symptoms	0.245	0.309	0.629	0.428	1.277	0.698	2.338
Total score	−0.199	0.074	7.320	0.007	0.819	0.709	0.947
Ovarian Cancer Worry Scale Score	0.127	0.256	0.245	0.621	1.135	0.687	1.874
Perceived susceptibility	−0.268	0.121	4.901	0.027	0.765	0.604	0.970
Perceived benefits	−0.036	0.052	0.472	0.492	0.965	0.872	1.068
Emotional barriers	0.36	0.088	16.572	0.000	1.433	1.205	1.704
Practical barriers	1.166	0.139	70.000	0.000	3.21	2.442	4.218
Confidence in symptom detection	−0.281	0.134	4.394	0.036	0.755	0.580	0.982
Willingness to medical treatments	0.521	0.232	5.022	0.025	1.684	1.068	2.655
The medical consultation time	0.126	0.062	4.165	0.041	1.134	1.005	1.28
The department of the first consultation							
Internal medicine department					1.000		
Obstetrics and Gynecology department	−0.562	0.43	1.710	0.191	0.570	0.246	1.324
Gastroenterology department	0.29	0.395	0.54	0.463	1.337	0.616	2.900
Urology department	−0.048	0.407	0.014	0.906	0.953	0.430	2.116
Emergency medicine department	0.229	0.452	0.256	0.613	1.257	0.518	3.051

Abbreviations: OR, odds ratio; CI, confidence interval; BMI, body mass index; FIGO, the International Federation of Gynecologists and Obstetrics.

Discussion

Current research on delayed diagnosis of OC is insufficient and lacks a clear consensus. To validate the novelty of our study, we conducted a comprehensive literature search using PubMed, Web of Science, and Google Scholar with search terms “ovarian cancer”, “delayed diagnosis”, “risk factors”, and “patient characteristics”, covering the years 2000–2023. No studies were found that comprehensively analyzed these variables from the patient’s perspective.

Table 7 Multivariate Analysis of Factors Associated with Delayed Diagnosis of Ovarian Cancer

	B	S.E.	Wald	*P*	OR	95% CI	
						Lower	Upper
Age	0.012	0.019	0.414	0.520	1.012	0.976	1.050
Place of residence	0.416	0.291	2.042	0.153	1.517	0.857	2.685
Education level	−0.501	0.163	9.476	0.002	0.606	0.440	0.833
Family Income	−0.462	0.301	2.353	0.125	0.630	0.349	1.137
Family history of tumor	−0.773	0.393	3.875	0.049	0.462	0.214	0.997
FIGO stage	0.171	0.167	1.051	0.305	1.187	0.856	1.646
Tumor location							
Left side					1.000		
Right side	0.294	0.345	0.726	0.394	1.342	0.682	2.638
Bilateral	0.607	0.377	2.588	0.108	1.835	0.876	3.845
Abdominal pain	0.333	0.292	1.303	0.254	1.395	0.788	2.472
Total score	−0.150	0.093	2.599	0.107	0.860	0.717	1.033
Perceived susceptibility	−0.230	0.157	2.142	0.143	0.794	0.583	1.081
Emotional barriers	0.287	0.107	7.236	0.007	1.332	1.081	1.642
Practical barriers	1.087	0.153	50.173	<0.001	2.964	2.195	4.004
Confidence in symptom detection	−0.238	0.172	1.915	0.166	0.788	0.563	1.104
Willingness to medical treatments	0.394	0.290	1.849	0.174	1.483	0.840	2.618
The medical consultation time	0.081	0.078	1.057	0.304	1.084	0.930	1.264

Abbreviations: OR, odds ratio; CI, confidence interval; FIGO, the International Federation of Gynecologists and Obstetrics.

A previous study reported that the clinical symptoms of tumors usually change most noticeably after 3 months of carcinogenesis.[15] Delayed diagnosis refers to the period from the onset of the first symptoms to the final diagnosis. Although the significance of this period has not been clearly defined in OC studies, it is speculated that delayed diagnosis has a substantial impact on cancer progression. Delayed diagnosis may result in patients not receiving appropriate treatment promptly, allowing the tumor to spread to other organs or tissues, causing more serious consequences. Therefore, three months was considered as the cut-off point for delayed diagnosis in this study.

Patient perception of the disease is a key factor in delayed diagnosis. Some patients, due to the limitations of living environment and economic conditions, lack access to knowledge about OC. This results in insufficient attention to the disease or an inability to accurately self-assess, leading to delays in seeking medical treatment until symptoms become obvious.[16] In this study, multivariate analysis suggested that the education level was the key factor for delayed diagnosis. Individuals with higher education level are more likely to have health knowledge, undergo regular health checks, and seek medical care. On the contrary, individuals with lower education level face limitations in resources and economic conditions, lack of knowledge about OC symptoms, and the importance of seeking medical care. They are more likely to ignore early symptoms and delay seeking medical attention. Additionally, individuals with lower education level may be more susceptible to social and cultural factors, such as disease concepts and religious beliefs, affecting their perception of OC symptoms and trust in healthcare care, thus delaying medical treatment. Language barriers and limited access to information can also hinder their understanding of medical terminology and effective information about OC.

Previous studies have pointed out that 20–25% of OC patients have a family history of the disease. Familial aggregation of OC, mainly epithelial cancers is significant;[17] Peutz-Jeghers syndrome occurs in 5–14% of women with OC, and basal cell nevus syndrome often coexists with ovarian fibroma.[18,19] In addition, a family history of breast cancer, endometrial cancer, and rectal cancer are major risk factors for OC. This study found that the number of patients without a family history of tumor was higher (86.8% of patients with delayed diagnosis). Besides, the multivariate analysis also showed that a family history of tumor was an influencing factor in delayed diagnosis of OC. These findings underscore the relevance of patient awareness to early diagnosis and treatment. People with a family history of tumor tend to be more cautious, paying closer attention to

changes in body functions and early symptoms, driven by psychological factors, leading to stronger motivation to seek medical treatment and aiding in early screening and diagnosis.

Notably, the association between the size of OC and delayed diagnosis was not found in this study, likely due to the location of the ovaries. Routine physical examination such as palpation cannot easily detect changes in ovarian size, resulting in delayed early-stage diagnosis. The number of patients with right-sided tumors was greater (44.3%). The higher occurrence of right-sided OC may be due to several factors, though no single cause is definite. Epithelial OC is the most common pathological type, and the delayed diagnosis group had a higher prevalence of endometrioid pathology. Symptoms of endometrioid tumors may resemble other gynecologic problems, leading to misdiagnose.[20] This study found a larger number of patients with FIGO stages III and IV in the delayed diagnosis group, indicating that patients often seek medical treatment only after symptoms spread, resulting in delayed diagnosis.

Cachexia is common in patients with malignant tumors, with weight loss (> 5% weight loss in 6 months), anorexia, and metabolic changes as core indicators.[21,22] Weight loss (56.6%) was more common in the group without delayed diagnosis, as patients are more likely to recognize cachexia. Besides, weight loss, anorexia and associated metabolic changes are easier to detect, prompting patients to seek medical treatment, reducing the probability of delayed diagnosis. Conversely, abdominal pain, the most common first symptom in patients with delayed diagnosis,[23] is often linked to gastrointestinal issues,[24] and may be masked by taking painkillers, leading to delayed medical care until the disease developed to an advanced stage.

This study revealed that patients in the delayed diagnosis group were more likely to visit the gastroenterology department, with no significant difference in visits to obstetrics and gynecology, urology, and emergency departments. Symptoms such as abdominal distension, pain, and mass typically prompt patients to seek care in gastroenterology, resulting in delayed OC diagnosis.

Awareness of symptoms like persistent abdominal distension, changes in bowel habits, and back pain was lower in the delayed diagnosis group. These symptoms are usually overlooked as they are common and attributed to other conditions,[25,26] resulting in delayed diagnosis. In addition, emotional and practical barriers were also significant factors,[27] as anxiety and fear about health can delay seeking medical treatment.

In summary, the current study is unique in that it comprehensively analyzes the factors influencing delayed diagnosis of OC from the patient's perspective, which has not been extensively explored in previous research. However, as a retrospective study, it is subject to the limitations of such designs, including potential recall bias and the accuracy of recorded information. Furthermore, this study was conducted over a relatively short period, which might not fully capture the long-term trends and variations in diagnostic delays. This short time frame might have been influenced by external factors such as seasonal, climatic, and economic conditions, potentially affecting the data collected. Future studies should consider a longer duration to minimize these influences.

Conclusion

In conclusion, delayed diagnosis of OC is affected by various factors, and early prevention and treatment improve disease prognosis. Factors related to patients (education level, family history of tumor, nutritional status, willingness to seek medical treatment, symptom awareness, and emotional barriers) and tumors (tumor location, pathological type, and FIGO stage) correlate with delayed diagnosis. Among them, education level, family history of tumors, emotional barriers, and practical barriers were the key factors. Future prevention and treatment of OC should focus on raising awareness, guiding symptom recognition, and encouraging timely medical care for early diagnosis and treatment.

Abbreviations

OC, Ovarian cancer; CI, confidence interval; OR, odds ratio; FIGO, Federation of Gynecologists and Obstetrics; BMI, body mass index.

Data Sharing Statement

Datasets used in this article are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

This study complies with the Declaration of Helsinki and was approved by the Ethics Committee of Taihe Hospital, Hubei University of Medicine. Informed consent was obtained from all individual participants included in the study.

Funding

There is no funding to report.

Disclosure

The authors declare that they have no competing interests.

References

1. Datta SS, Fraser L, Burnell M, et al. Association of adult attachment with delays in accessing specialist care in women with ovarian cancer. *J Psychosoc Oncol*. 2022;40(4):491–505. doi:10.1080/07347332.2022.2025510
2. Webb PM, Jordan SJ. Epidemiology of epithelial ovarian cancer. *Best Pract Res Clin Obstet Gynaecol*. 2017;41:3–14. doi:10.1016/j.bpobgyn.2016.08.006
3. Elshami M, Al-Madhoun S, Alser M, et al. Anticipated time to seek medical advice for possible ovarian cancer symptoms and perceived barriers to early presentation among Palestinian women: a national cross-sectional study. *BMC Cancer*. 2023;23(1):975. doi:10.1186/s12885-023-11484-z
4. Xie K, Fu C, Wang S, et al. Cancer-testis antigens in ovarian cancer: implication for biomarkers and therapeutic targets. *J Ovarian Res*. 2019;12(1):1. doi:10.1186/s13048-018-0475-z
5. Friedrich M, Friedrich D, Kraft C, Rogmans C. Multimodal treatment of primary advanced ovarian cancer. *Anticancer Res*. 2021;41(7):3253–3260. doi:10.21873/anticanres.15111
6. Gandin V, Hoeschele JD, Margiotta N. Special issue "Cisplatin in cancer therapy: molecular mechanisms of action 3.0". *Int J Mol Sci*. 2023;24(9):7917. doi:10.3390/ijms24097917
7. Froudarakis M, Hatzimichael E, Kyriazopoulou L, et al. Revisiting bleomycin from pathophysiology to safe clinical use. *Crit Rev Oncol Hematol*. 2013;87(1):90–100. doi:10.1016/j.critrevonc.2012.12.003
8. Maruyama Y, Sadahira T, Mitsui Y, et al. Prognostic impact of bleomycin pulmonary toxicity on the outcomes of patients with germ cell tumors. *Med Oncol*. 2018;35(6):80. doi:10.1007/s12032-018-1140-5
9. Schiavi MC, D'Oria O, Faiano P, et al. Vaginal native tissue repair for posterior compartment prolapse: long-term analysis of sexual function and quality of life in 151 patients. *Female Pelvic Med Reconstr Surg*. 2018;24(6):419–423. doi:10.1097/SPV.0000000000000463
10. Mutch DG, Prat J. 2014 FIGO staging for ovarian, fallopian tube and peritoneal cancer. *Gynecol Oncol*. 2014;133(3):401–404. doi:10.1016/j.ygyno.2014.04.013
11. Zhou FF. ea Investigation and analysis of diagnostic delay and disease cognition of cervical cancer patients. Shanghai Nursing. 2014.
12. Brain KE, Smits S, Simon AE, et al. Ovarian cancer symptom awareness and anticipated delayed presentation in a population sample. *BMC Cancer*. 2014;14:171. doi:10.1186/1471-2407-14-171
13. Andersen MR, Drescher CW, Zheng Y, et al. Changes in cancer worry associated with participation in ovarian cancer screening. *Psychooncology*. 2007;16(9):814–820. doi:10.1002/pon.1151
14. Smits S, Boivin J, Menon U, Brain K. Influences on anticipated time to ovarian cancer symptom presentation in women at increased risk compared to population risk of ovarian cancer. *BMC Cancer*. 2017;17(1):814. doi:10.1186/s12885-017-3835-y
15. Goy J, Hall SF, Feldman-Stewart D, Groome PA. Diagnostic delay and disease stage in head and neck cancer: a systematic review. *Laryngoscope*. 2009;119(5):889–898. doi:10.1002/lary.20185
16. Mosgaard BJ, Meaidi A, Hogdall C, Noer MC. Risk factors for early death among ovarian cancer patients: a nationwide cohort study. *J Gynecol Oncol*. 2020;31(3):e30. doi:10.3802/jgo.2020.31.e30
17. Zheng G, Yu H, Kanerva A, Forsti A, Sundquist K, Hemminki K. Familial Ovarian Cancer Clusters with Other Cancers. *Sci Rep*. 2018;8(1):11561. doi:10.1038/s41598-018-29888-4
18. Shimizu S, Kobayashi H, Suchi T, Torii Y, Narita K, Aoki S. Extramammary Paget's disease arising in mature cystic teratoma of the ovary. *Am J Surg Pathol*. 1991;15(10):1002–1006. doi:10.1097/00000478-199110000-00011
19. Zhu M, Li J, Duan J, Yang J, Gu W, Jiang W. Bilateral ovarian fibromas as the sole manifestation of Gorlin syndrome in a 22-year-old woman: a case report and literature review. *Diagn Pathol*. 2023;18(1):118. doi:10.1186/s13000-023-01406-9
20. Zhang W, Jia S, Xiang Y, Yang J, Jia C, Leng J. Comparative study of endometrioid borderline ovarian tumor with and without endometriosis. *J Ovarian Res*. 2018;11(1):67. doi:10.1186/s13048-018-0440-x
21. Fearon K, Strasser F, Anker SD, et al. Definition and classification of cancer cachexia: an international consensus. *Lancet Oncol*. 2011;12(5):489–495. doi:10.1016/S1470-2045(10)70218-7
22. Dev R. Measuring cachexia-diagnostic criteria. *Ann Palliat Med*. 2019;8(1):24–32. doi:10.21037/apm.2018.08.07
23. Martin ML, Halling K, Eek D, Reaney M. "Lower abdominal pains, as if I was being squeezed.in a clamp": a qualitative analysis of symptoms, patient-perceived side effects and impacts of ovarian cancer. *Patient*. 2020;13(2):189–200. doi:10.1007/s40271-019-00393-8
24. Chase DM, Neighbors J, Perhanidis J, Monk BJ. Gastrointestinal symptoms and diagnosis preceding ovarian cancer diagnosis: effects on treatment allocation and potential diagnostic delay. *Gynecol Oncol*. 2021;161(3):832–837. doi:10.1016/j.ygyno.2021.03.021
25. Kirwan JM, Tincello DG, Herod JJ, Frost O, Kingston RE. Effect of delays in primary care referral on survival of women with epithelial ovarian cancer: retrospective audit. *BMJ*. 2002;324(7330):148–151. doi:10.1136/bmj.324.7330.148
26. Austoker J. Diagnosis of ovarian cancer in primary care. *BMJ*. 2009;339:b3286. doi:10.1136/bmj.b3286
27. Osann K, Wenzel L, McKinney C, et al. Fear of recurrence, emotional well-being and quality of life among long-term advanced ovarian cancer survivors. *Gynecol Oncol*. 2023;171:151–158. doi:10.1016/j.ygyno.2023.02.015