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Original Article

Correlation of nutritional status and anxiety with quality of life among ovarian cancer patients undergoing chemotherapy: A cross-sectional study at a provincial referral hospital in Indonesia

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Abstract

Ovarian cancer and its treatment are associated with substantial physical and psychological burden, which may adversely affect patients' quality of life (QoL). While nutritional status and psychological factors are both considered important determinants of QoL, their contributions in patients undergoing chemotherapy remain unclear. This study aimed to evaluate the correlation between nutritional status and anxiety level with QoL among patients with ovarian cancer undergoing chemotherapy. A cross-sectional study was conducted at Dr. Zainoel Abidin Hospital, Banda Aceh, Indonesia, in 2025. Nutritional status was assessed using body mass index (BMI) and serum albumin levels; anxiety was measured using the Zung Self-Rating Anxiety Scale (SAS); and QoL was evaluated using the EORTC QLQ-C30 questionnaire. Data were analyzed using Pearson correlation tests followed with multivariate linear regression test. A total of 101 patients with ovarian cancer undergoing chemotherapy were included in this study. Nutritional status indicators, BMI and serum albumin, were not significantly correlated with QoL across all domains, with very weak correlation coefficients (r=−0.165 to 0.097). In contrast, anxiety level demonstrated significant negative correlations with global health status (r=−0.426), physical function (r=−0.449), emotional function (r=−0.427), cognitive function (r=−0.337), and social function (r=−0.466) (all p<0.05), but not with role function. Multivariate analysis confirmed that anxiety was the only independent predictor of QoL across these domains, whereas BMI and serum albumin showed no significant association. These findings indicate that anxiety plays a more prominent role than nutritional status in determining QoL among patients with ovarian cancer undergoing chemotherapy. Routine screening and management of anxiety could be beneficial to be integrated into oncologic care to improve patient outcomes.

Keywords: Ovarian cancer, quality of life, anxiety, body mass index, serum albumin

Introduction

Ovarian cancer is one of the most lethal gynecological malignancies and remains a major contributor to cancer-related mortality among women worldwide [1]. According to GLOBOCAN 2020, there are more than 313,959 new cases and 207,252 deaths annually [2]. In Indonesia,

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Received: March 13, 2026 - Accepted: May 18, 2026 - Published online: May 21, 2026

ovarian cancer ranks among the most common gynecological cancers, with increasing incidence and a high proportion of patients presenting at advanced stages, resulting in poor prognosis and high mortality [3-5].

Ovarian cancer develops through genetic mutations and dysregulation of cellular signaling pathways that promote uncontrolled proliferation and inhibit apoptosis [6-8]. Chemotherapy, particularly platinum-based regimens such as carboplatin and paclitaxel, remains the standard treatment for advanced disease [9]. However, its non-selective cytotoxic effects also damage normal cells, including ovarian tissue, leading to systemic consequences that affect metabolic balance and physiological function [10]. In addition to physical effects, patients undergoing chemotherapy frequently experience psychological distress, including anxiety, as a response to disease burden and treatment-related challenges [11].

Nutritional status reflects the balance between nutrient intake and the body's metabolic demands and plays a crucial role in determining patients' ability to tolerate cancer and its treatment [12]. In ovarian cancer, nutritional status is influenced by the disease process, chemotherapy-related effects, and metabolic stress responses [13]. Previous studies have shown that poor nutritional status has been associated with reduced treatment tolerance, increased complications, and impaired functional capacity, all of which contribute to decreased quality of life (QoL) [14-16]. Anxiety, as a common psychological response in cancer patients, also negatively affects multiple domains of QoL, including physical, emotional, and social functioning [17].

QoL is a multidimensional construct encompassing physical, psychological, social, and functional well-being, and has become a key outcome in oncology care [18]. Previous studies have demonstrated associations between nutritional status, psychological distress, and QoL; however, findings remain inconsistent, particularly regarding the relationship between nutritional indicators and QoL [14, 19]. Furthermore, evidence specifically focusing on ovarian cancer patients undergoing chemotherapy is still limited, especially in Southeast Asian populations. The combined influence of nutritional status and anxiety on QoL has not been well established in the local clinical context. Therefore, the aim of this study was to analyze the association between nutritional status and anxiety with QoL in ovarian cancer patients undergoing chemotherapy.

Methods

Study design and sampling

A cross-sectional study was conducted at Dr. Zainoel Abidin Hospital, Banda Aceh, Indonesia, between October and December 2025 among ovarian cancer patients. Sample size was calculated using a correlation formula with a significance level of 5% ($Z\alpha=1.96$), power of 80% ($Z\beta=0.84$), and an expected correlation coefficient (r) of 0.32, resulting in a minimum required sample of 99 patients. Consecutive sampling was employed.

Patients and criteria

This study included adult patients (aged ≥18 years) diagnosed with epithelial ovarian cancer based on histopathological examination who were undergoing chemotherapy at the hospital during the study period. Patients were enrolled after providing informed consent. Patients with recurrent ovarian cancer, impaired liver or renal function, comorbid diseases other than ovarian cancer, a history of radiotherapy, cognitive impairment, or those who were uncooperative due to severe clinical conditions were excluded from the study.

Data collection and study variables

Data collection was conducted at the Chemotherapy Outpatient Clinic and Oncology Ward of Dr. Zainoel Abidin Hospital during patients' chemotherapy visits. Demographic and clinical characteristics, including age, duration from diagnosis to chemotherapy, histopathological type, education level, place of residence, monthly income, chemotherapy regimen, and marital status, were recorded at baseline.

Nutritional status was assessed using body mass index (BMI) and serum albumin levels. Body weight and height were measured using a calibrated digital scale and stadiometer, and BMI

was calculated as weight in kilograms divided by the square of height in meters (kg/m²), categorized according to Asian classification as underweight (<18.5 kg/m²), normal (18.5–22.9 kg/m²), at risk (23.0–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (≥30.0 kg/m²). Serum albumin levels were obtained from medical records at the initiation of chemotherapy and categorized as low (<3.5 g/dL) or normal (≥3.5 g/dL).

Anxiety level was evaluated using the Zung Self-Rating Anxiety Scale (SAS), Indonesian version [20], consisting of 20 items assessing psychological and somatic symptoms, each scored on a 4-point Likert scale. Total scores were categorized as normal (20–44), mild to moderate anxiety (45–59), marked to severe anxiety (60–74), and extreme anxiety (≥75).

QoL was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30), Indonesian version. The questionnaire consists of 30 items comprising five functional scales (physical, role, emotional, cognitive, and social), a global health status scale, and symptom scales. Scores were linearly transformed to a 0–100 scale, with higher scores indicating better QoL for global health and functional scales and worse symptoms for symptom scales. Global health status was considered the primary outcome, while functional domains (physical, role, emotional, cognitive, and social functioning) were analyzed as secondary outcomes to provide a multidimensional assessment of QoL.

Statistical analysis

Univariate analysis was performed to describe the distribution of demographic and clinical characteristics. Inferential analysis was restricted to the study's prespecified main independent variables, namely body mass index, serum albumin level, and anxiety score, because these variables directly represented the primary exposures of interest: nutritional status and anxiety. Other baseline variables were collected for descriptive purposes to characterize the study population and were not included in the main correlation and regression models. Data normality was assessed using the Kolmogorov–Smirnov test. Pearson correlation test was used to examine the correlation between each independent variable (BMI, serum albumin, and anxiety level) and QoL across global health status and functional domains. Multivariate linear regression analysis was subsequently performed to evaluate the simultaneous association of BMI, serum albumin, and anxiety level with QoL, including global health status and functional domains. A p-value of <0.05 was considered statistically significant. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA).

Results

Characteristics of the patients

A total of 101 patients with ovarian cancer undergoing chemotherapy were included in this study, as presented in **Table 1**. The majority of patients were aged 46–60 years (54.5%), followed by those aged >60 years (33.7%). Most patients had completed secondary education (37.6%), with a relatively balanced distribution across higher education levels. In terms of treatment status, patients were distributed across different chemotherapy phases, with the largest proportion undergoing ≥3 cycles (41.6%), followed by those who had completed six cycles (33.7%). Nutritional status assessment showed that most patients had a normal BMI (43.6%), while 20.8% were overweight and 12.9% were underweight. The majority of patients had normal serum albumin levels (76.2%). Regarding psychological status, most patients had normal anxiety levels (62.4%), while 31.7% experienced mild to moderate anxiety, and 5.9% had severe anxiety.

Table 1. Characteristics of patients with ovarian cancer undergoing chemotherapy included in the study (n=101)

Characteristics	Frequency (percentage)
Age (years)	
<25	2 (2.0)
25–45	10 (9.9)
46–60	55 (54.5)
>60	34 (33.7)
Education level	

Characteristics	Frequency (percentage)
Primary school	2 (2.0)
Junior high school	13 (12.9)
Senior high school	38 (37.6)
Diploma	22 (21.8)
Bachelor's degree	26 (25.7)
Chemotherapy phase	
<3 cycles	25 (24.8)
≥3 cycles	42 (41.6)
Completed 6 cycles	34 (33.7)
Body mass index (kg/m²)	
Underweight (<18.5)	13 (12.9)
Normal (18.5–22.9)	44 (43.6)
At risk (23.0–24.9)	19 (18.8)
Overweight (25.0–29.9)	21 (20.8)
Obese (≥30.0)	4 (4.0)
Serum albumin (g/dL)	
<3.5	24 (23.8)
≥3.5	77 (76.2)
Anxiety level (SAS)	
Normal (20–44)	63 (62.4)
Mild to moderate (45–59)	32 (31.7)
Severe (60–74)	6 (5.9)
Extreme (≥75)	0 (0)

Correlation between nutritional status and quality of life (QoL)

The correlations between nutritional status, as measured by BMI and serum albumin, and QoL across global health status and functional domains are presented in **Table 2**. No significant correlation was observed between BMI or serum albumin with any QoL domain. Correlation coefficients were very weak, ranging from −0.165 to 0.097, indicating minimal association between nutritional status and QoL in this population (**Table 2**).

Table 2. Correlation between nutritional status and quality-of-life (QoL) domains in patients with ovarian cancer undergoing chemotherapy (n=101)

Variables	Global health	Functional domains				
		Physical function	Role function	Emotional function	Cognitive function	Social function
Serum albumin						
p-value [a]	0.584	0.349	0.550	0.670	0.335	0.747
r	0.055	0.094	0.060	0.043	0.097	0.032
Body mass index						
p-value [a]	0.680	0.244	0.498	0.261	0.098	0.205
r	-0.041	-0.117	0.068	-0.113	-0.165	-0.127

[a] Analyzed using the Pearson correlation test

Correlation between anxiety and quality of life (QoL)

Anxiety level was significantly correlated with QoL across most domains, as presented in **Table 3**. Significant negative correlations were observed between anxiety and global health status (r=−0.426, p<0.001), physical function (r=−0.449, p<0.001), emotional function (r=−0.427, p<0.001), cognitive function (r=−0.337, p<0.001), and social function (r=−0.466, p<0.001) (**Table 3**). No significant correlation was found between anxiety and role function. These findings indicate that higher anxiety levels are associated with poorer QoL across multiple domains.

Table 3. Correlation between anxiety level and quality-of-life (QoL) domains in patients with ovarian cancer undergoing chemotherapy (n=101)

Variables	Global health	Functional domains				
		Physical function	Role function	Emotional function	Cognitive function	Social function
Anxiety level						
p-value [a]	<0.001*	<0.001*	0.940	<0.001*	<0.001*	<0.001*
r	-0.426	-0.449	0.008	-0.427	-0.337	-0.466

[a] Analyzed using the Pearson correlation test
* Statistically significant at p=0.05

Multivariate analysis of factors associated with quality of life (QoL)

Multivariate linear regression analysis was performed to evaluate the simultaneous correlation of nutritional status (BMI and serum albumin) and anxiety level with QoL across global health status and functional domains, as presented in **Table 4**. Anxiety level was consistently associated with poorer QoL in global health (β=−0.423, p=0.001), physical function (β=−0.423, p=0.001), emotional function (β=−0.420, p=0.001), cognitive function (β=−0.325, p=0.001), and social function (β=−0.122, p=0.001). No significant association was observed between anxiety and role function. In contrast, BMI and serum albumin were not significantly associated with QoL across all domains. These findings indicate that anxiety is the primary factor associated with QoL in this population, whereas nutritional status shows no significant contribution.

Table 4. Multivariate linear regression analysis showing the correlation between nutritional status and anxiety level with quality-of-life (QoL) domains in patients with ovarian cancer undergoing chemotherapy (n=101)

Outcome (QoL domain)	Variable	β	SE	p-value	95% confidence interval
Global health	Albumin	0.055	3.984	0.566	-5.615 to 10.199
	Body mass index (BMI	-0.037	0.630	0.696	-1.497 to 1.003
	Anxiety	-0.423	0.194	<0.001*	-1.276 to -0.507
Physical function	Albumin	0.120	3.746	0.203	-2.632 to 12.238
	BMI	-0.037	0.592	0.166	-2.002 to 0.348
	Anxiety	-0.423	0.182	<0.001*	-1.258 to -0.534
Role function	Albumin	0.045	161.527	0.672	-251.947 to 389.228
	BMI	0.055	25.536	0.602	-37.314 to 64.049
	Anxiety	0.006	7.859	0.951	-15.119 to 16.078
Emotional function	Albumin	0.064	3.275	0.505	-4.308 to 8.694
	BMI	-0.112	0.518	0.244	-1.635 to 0.420
	Anxiety	-0.420	0.159	<0.001*	-1.049 to -0.417
Cognitive function	Albumin	0.142	3.334	0.148	-1.751 to 11.481
	BMI	-0.190	0.527	0.054	-2.076 to 0.016
	Anxiety	-0.325	0.162	<0.001*	-0.885 to -0.241
Social function	Albumin	0.055	2.859	0.555	-3.982 to 7.368
	BMI	-0.122	0.452	0.194	-1.489 to 0.306
	Anxiety	-0.122	0.139	<0.001*	-0.992 to -0.440

* Statistically significant at p<0.05

Discussion

This study aimed to evaluate the association between nutritional status (BMI and serum albumin) and anxiety level with QoL among patients with ovarian cancer undergoing chemotherapy. The findings demonstrated that nutritional status was not significantly associated with QoL across all domains, whereas anxiety showed a significant negative association with QoL in five of six domains (global health, physical, emotional, cognitive, and social functioning). Multivariate analysis further confirmed that anxiety was the only independent factor consistently associated with poorer QoL, while BMI and serum albumin did not show significant contributions.

No significant association between nutritional status and QoL was observed in this study, in contrast to previous studies reporting that poor nutritional status is associated with reduced QoL in patients with gynecologic cancers [21, 22]. Several factors may explain this discrepancy. First, serum albumin is a relatively insensitive marker of nutritional status in cancer patients due to its long half-life and susceptibility to inflammatory and metabolic influences [23]. Second, BMI is a limited anthropometric indicator that does not distinguish between fat and lean body mass, reducing its sensitivity in detecting clinically relevant nutritional changes such as sarcopenia [24]. Additionally, the predominance of patients with normal or elevated BMI in this cohort may have reduced variability, limiting the ability to detect significant associations. QoL is inherently multidimensional and influenced by psychological, social, and clinical factors; therefore, nutritional status alone may not be a dominant determinant when assessed using simplified indicators. These findings suggest that more comprehensive tools, such as multidimensional nutritional assessments, may be required to better capture the relationship between nutrition and QoL.

In contrast, anxiety demonstrated a consistent and significant negative association with QoL across most domains. This finding is consistent with previous studies identifying psychological distress as a key determinant of QoL in cancer patients [25, 26]. The observed correlations indicate that higher anxiety levels are associated with poorer perceived health and functional outcomes. Biologically, chronic anxiety activates the hypothalamic–pituitary–adrenal axis and increases pro-inflammatory cytokines, contributing to fatigue and functional decline [27]. The significant association between anxiety and emotional and cognitive domains may be explained by neurobiological changes affecting brain regions involved in emotional regulation and cognition [28]. Furthermore, the observed relationship with social functioning supports the concept of social withdrawal, where anxiety leads to reduced interpersonal interaction and support [29].

Multivariate analysis reinforced the central role of anxiety, demonstrating that it remained an independent predictor of QoL after controlling for nutritional variables. Similar findings have been reported in a large cohort study previously, where psychological distress was the strongest determinant of QoL compared to clinical or nutritional factors [30]. The lack of significance of BMI and albumin does not negate their clinical importance but suggests their effects may be indirect or mediated through other pathways. From a clinical perspective, these findings highlight the importance of integrating psychological assessment into routine cancer care. Early detection and management of anxiety may significantly improve QoL outcomes. Current clinical guidelines recommend routine screening and appropriate psychosocial interventions, particularly in oncology settings [31].

This study has some limitations. The sample was derived from a single center, potentially affecting generalizability. Nutritional assessment was limited to BMI and albumin, which may not fully represent nutritional status. Additionally, important confounding factors such as disease stage, treatment toxicity, and social support were not included. Future studies should incorporate longitudinal designs and more comprehensive assessments.

Conclusion

Nutritional status, as measured by BMI and serum albumin, was not significantly associated with QoL across all domains in patients with ovarian cancer undergoing chemotherapy. In contrast, anxiety level demonstrated a consistent and significant negative association with QoL, and was identified as the only independent predictor in multivariate analysis. These findings highlight the predominant role of psychological factors over conventional nutritional indicators in determining QoL in this population. Routine screening and appropriate management of anxiety could be integrated into standard oncologic care to improve patient outcomes. Future studies incorporating longitudinal designs and more comprehensive assessments of nutritional and psychosocial factors are warranted to better understand determinants of QoL in patients with ovarian cancer.

Ethics approval

The study protocol was reviewed and approved by the Ethics Committee of the Dr. Zainoel Abidin Hospital, Banda Aceh, Indonesia (approval no.350/ETIK-RSUDZA/2025).

Acknowledgments

The authors express their sincere gratitude to the staff of Dr. Zainoel Abidin Hospital for their support throughout the study.

Competing interests

All the authors declare that there are no conflicts of interest.

Funding

This study received no external funding.

Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

This study utilized artificial intelligence (AI) tool, ChatGPT, was employed to improve grammar, sentence structure, and readability. The authors critically reviewed and revised all AI-generated outputs to ensure accuracy, coherence, and alignment with the study's objectives. The final decisions, interpretations, and manuscript content reflect the authors' independent judgment and intellectual contributions.

How to cite

Meutia II, Munizar M, Indirayani I, et al. Correlation of nutritional status and anxiety with quality of life among ovarian cancer patients undergoing chemotherapy: A cross-sectional study at a provincial referral hospital in Indonesia. Narra J 2026; 6 (2): e3086 - http://doi.org/10.52225/narra.v6i2.3086.

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