Depression and appetite: predictors of malnutrition in gynecologic cancer

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Abstract

Purpose The reported prevalence of malnutrition and related factors in gynecologic cancer varies. We aimed to describe nutritional status and to identify demographic, clinical, psychological, and nutritional factors contributing to malnutrition in gynecologic cancer patients.

Methods We used a descriptive cross-sectional design. A total of 129 subjects were enrolled. Subjects agreed to undergo a face-to-face interview, including measurement of body mass index (BMI) and administration of structured questionnaires including the Patient-Generated Subjective Global Assessment (PG-SGA), the Beck Depression Inventory (BDI), and the Simplified Nutritional Appetite Questionnaire (SNAQ).

Results Mean BMI was 23.4 kg/m² (range, 14.6–36.7 kg/m²) and median body weight was 55.0 kg (range, 38.5–91.3 kg). Sixty-nine (53.5 %) of 129 patients reported severe malnutrition according to the PG-SGA. Malnutrition among patients who had received chemotherapy was more common than among patients who had not received chemotherapy within 6 months. Depression and appetite were significant factors predicting malnutrition in patients with gynecologic cancer. However, malnutrition was not related to age, marital status, level of education, or annual income among demographic

factors, nor age at onset of cancer, cancer type, stage, or duration of cancer among clinical factors.

Conclusions Assessment of nutritional status should be considered along with depression and appetite in patients with gynecologic cancer. In addition, regular and consistent nutritional assessment is essential in gynecologic cancer patients because of the high prevalence of malnutrition in these patients.

Keywords Gynecologic cancer · Malnutrition · Depression · Appetite

Introduction

Gynecologic cancer accounts for 19 % of new cases of female cancer worldwide [1]. In South Korea, the incidence of gynecologic cancer, including cervical, endometrial, and ovarian cancer, has increased steadily, reaching 15 % in 2009, and the incidence of endometrial cancer has increased more than sixfold in one decade [2]. Symptoms experienced by cancer patients include those caused by the cancer itself, as well as symptoms caused by surgery for cancer, chemotherapy, and radiation therapy, and may take a variety of forms. Common symptoms include pain, fatigue, depression, and sleep disorders. Among these symptoms, malnutrition is a prominent and serious health problem [3].

Malnutrition is defined as an “inadequate intake of protein and/or energy over prolonged periods of time resulting in loss of fat stores and/or muscle wasting including starvation-related malnutrition, chronic disease-related malnutrition, and acute disease or injury-related malnutrition” [4]. Malnutrition in cancer patients is more serious than in patients with other chronic diseases [3], and the prevalence of malnutrition in cancer patients has been reported to range from 40 to 80 % [5].

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Although the complete etiology is not yet known, there are several reasons why malnutrition is more prevalent in patients with cancer. First of all, factors related to cancer itself [6–8] such as systemic tumor effects that alter food intake via anorexia, cachexia, nausea/vomiting, and taste/smell changes may lead to malnutrition. Alterations in the central nervous system control of food intake, and the perception of taste and smell, coupled with the production of multiple cytokines by host monocytes and tumor cells, have been implicated in the development of anorexia and cachexia [6–8].

Secondly, factors related to cancer treatment, such as surgery, chemotherapy, and radiotherapy cachexia [7, 9] may contribute to malnutrition. Cancer treatments can require the intake of additional nutrition. The adverse effects of treatment which negatively impact nutritional status include anorexia, nausea and vomiting, mucositis, constipation, and diarrhea [7, 9].

Finally, psychological factors in cancer patients may contribute to malnutrition. Psychological factors have been associated with nutritional status in cancer populations that are at significant nutritional risk, such as patients with head and neck cancer [10]. Loss of appetite may be a common feature of depression and anxiety, leading directly to malnutrition [11].

Malnutrition in cancer may lead to infection, electrolyte imbalance, altered skin integrity, anemia, anorexia, fatigue [12], and immune deficiency [6]. In addition, changes in protein metabolism may provoke loss of appetite and body weight as well as cachexia [5]. As a result, malnutrition results in poor clinical outcomes, such as prolonged length of hospital stay [13] and high mortality in cancer patients [14]. Therefore, malnutrition is a major problem for cancer patients in general, and the same is true for gynecologic cancer patients.

Although it is well known that malnutrition is most prevalent in patients with gastric, lung, pancreatic, and colon cancer, the reported prevalence of malnutrition and related factors in gynecologic cancer varies [15–18]. Approximately 20–26 % of gynecologic cancer patients were found to have a nutritional disorder [13, 16, 18], while 50–67 % of ovarian cancer patients were reported to have a nutritional disorder [16, 17]. The incidence of malnutrition in gynecologic cancer is 19 times higher than that in patients with benign conditions [16]. There are several established clinical risk factors for poor nutritional status in gynecologic cancer patients, including BMI, body weight, weight loss [16], and length of time after diagnosis [18].

Multiple factors influence nutritional status and contribute to malnutrition in gynecologic cancers. However, the relationship between malnutrition and psychological factors in gynecologic cancer is not clear. In previous studies, gynecologic cancer patients have been found to have significant levels of psychological disorders, particularly depression and anxiety [19, 20]. Therefore, identification of the association between psychological factors and malnutrition could have important implications for treatment of patients with gynecologic cancer.

Assessment of nutritional status and identification of relevant factors form the basis of intervention for nutritional management and prevention of malnutrition in cancer patients. We therefore conducted this study to evaluate nutritional status and to identify factors, including demographic, clinical, psychological, and nutritional factors that may contribute to malnutrition in gynecologic cancer patients in Korea.

Methods

Study design

We used a descriptive, cross-sectional design to examine nutritional status and to identify demographic, clinical, psychological, and nutritional factors contributing to malnutrition in Korean gynecologic cancer patients.

Participants

Subjects were recruited from a tertiary hospital in Ulsan, Korea. Convenience sampling was used to select subjects. Eligibility criteria included: (i) age over 20 years; (ii) diagnosis of gynecologic cancer; (iii) absence of any other major health problem that could potentially influence nutritional status, such as uncontrolled diabetes mellitus, infection and inflammation, liver failure, renal failure, and so on. A total of 129 patients were eligible for this study.

Measurements

Patient-Generated Subjective Global Assessment

The Patient-Generated Subjective Global Assessment (PG-SGA) is a sensitive, specific tool with established reliability and validity that has been used to measure nutritional status and identify malnutrition in cancer patients [5, 21]. It can feasibly be used to assess malnutrition in gynecologic cancer patients [16, 22]. In the current study, nutritional status was measured using the Korean version of the PG-SGA, which has well-established reliability and validity [23]. The PG-SGA uses weight, food intake, symptoms, activities and function, metabolic demand and stress, and physical examination to produce a global assessment of malnutrition. The PG-SGA also incorporates a numerical score, with typical scores achieved by gynecologic cancer patients ranging from 0 to 28 [16]. A higher score reflects a greater risk of malnutrition. In our study, we interpreted scores of nine or higher to indicate malnutrition [24].

Simplified Nutritional Appetite Questionnaire

Appetite was measured using the Simplified Nutritional Appetite Questionnaire (SNAQ) [25]. The SNAQ includes four questions, and scores on the SNAQ range from 4 to 20. Higher scores demonstrate a better appetite. The reliability and validity of the Korean version of the SNAQ have been established [26].

Beck Depression Inventory

Depression was measured using the Korean version of the Beck Depression Inventory (BDI) [27, 28]. The BDI is one of the most commonly used self-rating scales for measuring depression [29]. The Korean version of the BDI has well-established reliability and validity [29, 30]. Items on the BDI include emotional, behavioral, and somatic symptoms. The BDI includes 21 questions, and scores on the BDI range from 0 to 63. Higher scores reflect greater levels of depression. In this study, clinically significant depression was defined as a BDI score ≥ 16 , because this score has been shown to have high sensitivity and specificity in Korean populations [29, 30].

Other variables

Demographic characteristics included age, age at onset of cancer, marital status, level of education, and annual income. Clinical characteristics included cancer type, cancer stage, treatment modality, recurrence, and length of time after diagnosis. Nutritional characteristics included body weight (present), body weight at onset of cancer, and body mass index (BMI).

Data collection

Between June and October 2013, subjects were enrolled in the study only if fully informed written consent was obtained from the patient. A clinical nurse specialist explained the aims and procedures of the study. Patients with gynecologic cancer who agreed to face-to-face interviews were administered structured questionnaires. When appropriate, the questionnaire and interview were supplemented with information from the patient. Following the interviews, we confirmed patient information with medical records.

Data analysis

Data were analyzed with SPSS version 20.0 (IBM SPSS Statistics, IBM Corporation, Armonk, NY, USA). Characteristics of all patients are presented as numbers (percentages), means $\pm$ SDs, and ranges. To compare clinical, psychological, and nutritional characteristics between patients with malnutrition and those without, the chi-square test, *t* test, and Mann–

Whitney *U* test were used when appropriate. The Kolmogorov–Smirnov test was used to examine the normality of continuous variables. In addition, to identify significant factors contributing to malnutrition, multiple logistic regression analysis was used and odds ratios (ORs) and 95 % confidence intervals (CIs) were calculated. A two-tailed $P < 0.05$ was considered statistically significant.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of Ulsan University Hospital in Korea. We obtained written informed consent from all patients after the clinical nurse specialist had explained the aims and procedures of the study. Patients were informed that they were free to withdraw at any time during the study and that their responses would be kept confidential.

Results

Demographic, clinical, and psychological characteristics

Demographic, clinical, and psychological characteristics of the patients are summarized in Table 1. A total of 129 patients were included in this study. The age range of subjects was 26–82 years (mean $\pm$ SD, 52.9 $\pm$ 11.7 years). Mean age at onset of cancer was 51.0 years (range, 26.0–75.0 years), and the median duration of cancer was 7.0 months (range, 1.0–156.0 months). About 41 % of participants had ovarian cancer and 38.8 % percent were stage 1. In addition, 48.1 % of participants received surgery for cancer, 69.8 % received chemotherapy, and 8.5 % received radiation therapy within 6 months. Mean BDI score was 11.2 and the prevalence of depression was 26.4 %.

Nutritional status and characteristics

Nutritional characteristics of the patients are described in Table 2. Mean BMI was 23.4 kg/m² (range, 14.6–36.7 kg/m²), median body weight was 55.0 kg (range, 38.5–91.3 kg), and mean body weight at disease onset was 57.9 kg (range, 39.0–91.5 kg). Mean score on the SNAQ was 13.3. Sixty-nine (53.5 %) of 129 patients reported severe malnutrition using the PG-SGA.

Demographic, clinical, psychological, and nutritional characteristics related to malnutrition

Differences in demographic, clinical, psychological, and nutritional characteristics between patients with malnutrition and those without are presented in Table 3.

Table 1 Demographic, clinical, psychological, and nutritional characteristics in patients with gynecologic cancer ($N=129$)

Variable	n (%) or mean $\pm$ SD	Range
Demographic characteristics		
Age (years)	52.9 $\pm$ 11.7	26–82
Marital status		
Married	79 (61.2)	
Single	13 (10.1)	
Widowed	27 (20.9)	
Divorced	10 (7.8)	
Level of education		
$\leq$ Middle school	46 (35.7)	
High school	59 (45.7)	
$\geq$ College	24 (18.6)	
Annual income (\$)		
<25,000	45 (34.9)	
25,000–49,999	65 (50.4)	
$\geq$ 50,000	19 (14.7)	
Clinical characteristics		
Age at onset (years)	51.0 $\pm$ 11.4	26–75
Duration of cancer (months)	23.3 $\pm$ 31.2	1–156
Cancer type		
Cervix	48 (37.2)	
Ovary	53 (41.1)	
Endometrium	25 (19.4)	
Other	3 (2.3)	
Recurrence (yes)	53 (41.1)	
Stage		
1	50 (38.8)	
2	21 (16.3)	
3	40 (31.0)	
4	18 (14.0)	
Surgery within 6 months (yes)	62 (48.1)	
Chemotherapy within 6 months (yes)	90 (69.8)	
Radiation within 6 months (yes)	11 (8.5)	
Psychological characteristics		
BDI	11.2 $\pm$ 7.0	0–32
<16	95 (73.6)	
$\geq$ 16	34 (26.4)	

BDI Beck Depression Inventory

Malnutrition was present in 47.9 % of patients with cervical cancer, 52.8 % of patients with ovarian cancer, and 60.0 % of patients with endometrial cancer. Malnutrition was present in 48.0 % of patients with stage 1 cancer, 42.9 % with stage 2, 65.0 % with stage 3, and 55.6 % with stage 4.

Malnutrition was more frequent among patients who had received chemotherapy than among patients who had not received chemotherapy within 6 months ($P=0.012$). BDI scores of patients with malnutrition were significantly higher than those of patients without malnutrition ($P<0.001$).

Table 2 Nutritional characteristics in patients with gynecologic cancer ($N=129$)

Variable	n (%) or mean $\pm$ SD	Range
Body weight (kg)	56.8 $\pm$ 9.3	38.5–91.3
Body weight at disease onset (kg)	57.9 $\pm$ 9.0	39–91.5
BMI (kg/m ²)	23.4 $\pm$ 3.8	14.6–36.7
<18.5	14 (10.9)	
18.5–24.9	70 (54.3)	
$\geq$ 25	45 (34.9)	
SNAQ	13.3 $\pm$ 2.5	4–19
PG-SGA	10.3 $\pm$ 4.6	3–24
Malnutrition ($\geq$ 9)	69 (53.5)	
Malnutrition (<9)	60 (46.5)	

BMI body mass index, SNAQ Simplified Nutritional Appetite Questionnaire, PG-SGA Patient-Generated Subjective Global Assessment

Considering the relationship between malnutrition and nutritional factors, appetite scores were significantly lower in patients with malnutrition than patients without malnutrition ($P<0.001$). However, malnutrition was not related to age, marital status, level of education, or annual income among demographic factors, nor age at onset of cancer, cancer type, stage, surgery and radiation therapy within 6 months, or length of time after diagnosis among clinical factors. In addition, malnutrition was not related to body weight, body weight at disease onset, or BMI among nutritional factors.

Factors predicting malnutrition in patients with gynecologic cancer

In a multiple logistic regression analysis, depression and appetite were significant factors predicting malnutrition in patients with gynecologic cancer (depression OR=1.087, 95 % CI=1.020–1.158, $P=0.010$; appetite OR=0.749, 95 % CI=0.626–0.898, $P=0.002$) (Table 4).

Discussion

Because the causes of malnutrition are multifactorial, we conducted this study to identify demographic, clinical, psychosocial, and nutritional factors contributing to malnutrition in gynecologic cancer patients.

The prevalence of malnutrition in gynecologic cancer patients was 53.5 % in our study, which is somewhat higher than the incidence reported in previous studies using the PG-SGA as a nutritional assessment tool [16, 18]. This suggests that most of the patients in our study were recurrent cancer patients or were undergoing treatment such as chemotherapy and radiotherapy, unlike previous studies, which included newly diagnosed patients [16, 18].

Table 3 Comparison of demographic, clinical, psychological, and nutritional characteristics between patients with malnutrition and those without malnutrition ($N=129$)

Variable	Malnutrition (<i>n</i> =69) <i>n</i> (%) or mean±SD	Non-malnutrition (<i>n</i> =60) <i>n</i> (%) or mean±SD	<i>p</i>
Demographic characteristics			
Age (years)	53.2±12.0	52.4±11.4	0.695
Marital status			
Married	41 (59.4)	38 (63.3)	0.752
Single	7 (10.1)	6 (10.0)	
Widowed	14 (20.3)	13 (21.7)	
Divorced	7 (10.2)	3 (5.0)	
Level of education			
≤Middle school	25 (36.2)	21 (35.0)	0.695
High school	30 (43.5)	29 (48.3)	
≥College	14 (20.3)	10 (16.7)	
Annual income (\$)			
<25.000	24 (34.8)	21 (35.0)	1.000
25.000–49.999	35 (50.7)	30 (50.0)	
≥50.000	10 (14.5)	9 (15.0)	
Clinical characteristics			
Age at onset (years)	50.8±13.0	50.5±10.9	0.861
Cancer type			
Cervix	23 (47.9)	25 (52.1)	0.303
Ovary	28 (52.8)	25 (47.2)	
Endometrium	15 (60.0)	10 (40.0)	
Other	3 (100.0)	0 (0.0)	
Recurrence			
Yes	31 (44.9)	22 (36.7)	0.341
No	38 (55.1)	38 (63.3)	
Stage			
1	24 (48.0)	26 (52.0)	0.293
2	9 (42.9)	12 (57.1)	
3	26 (65.0)	14 (35.0)	
4	10 (55.6)	8 (44.4)	
Surgery within 6 months	31 (44.9)	31 (51.7)	0.482
Chemotherapy within 6 months	55 (79.7)	35 (58.3)	0.012
Radiation within 6 months	9 (13.0)	2 (3.3)	0.061
Length of time after diagnosis (months)	21.4±27.0	25.6±35.5	0.562 ^a
Psychological characteristics			
BDI	13.3±7.4	8.7±5.6	<0.001 ^a
Nutritional characteristics			
Body weight (kg)	55.5±9.4	58.3±9.0	0.070 ^a
Body weight at disease onset (kg)	57.6±9.4	58.3±8.7	0.645
BMI (kg/m ²)	23.0±3.8	24.0±3.8	0.128
SNAQ	12.5±2.7	14.3±2.0	<0.001 ^a
PG-SGA	13.4±4.2	8.7±5.6	<0.001 ^a

BDI Beck Depression Inventory, BMI body mass index, SNAQ Simplified Nutritional Appetite Questionnaire, PG-SGA Patient-Generated Subjective Global Assessment

^a Tested Mann–Whitney U test

Table 4 Predictors of malnutrition in patients with gynecologic cancer

Variables	<i>B</i>	Odds ratio	95 % CI	<i>p</i>
BDI	−0.289	1.087	1.020–1.158	0.010
SNAQ	0.083	0.749	0.626–0.898	0.002

BDI Beck Depression Inventory, *SNAQ* Simplified Nutritional Appetite Questionnaire, *CI* confidence interval

The nutritional status of patients with gynecologic cancer has been evaluated primarily by using various body compositions (e.g., serum albumin, transferrin, prealbumin, and protein) and anthropometrics (body weight, body mass index, skinfold-thickness measurements, and body density measurements) either alone or in combination [22, 31, 32].

PG-SGA consists of various nutritional parameters including a medical history component, which provides information about weight change, dietary intake, gastrointestinal symptoms (e.g., nausea, vomiting, and constipation that have persisted for 2 weeks), and changes in functional capacity. Subcutaneous fat, muscle wasting, edema, and ascites are considered in the physical examination [16, 17, 21, 24, 33]. In a previous study, the PG-SGA was significantly associated with subjective and objective parameters, such as serum albumin levels and triceps skinfold thickness [22]. Therefore, considering that the PG-SGA is most appropriate for identifying malnutrition in gynecologic cancer patients [22], we used the PG-SGA as a tool for nutritional assessment in our study. Our findings provide additional evidence that the PG-SGA is a clinically relevant method and useful tool in gynecologic cancer patients.

In our study, age, marital status, level of education, and annual income were included as demographic factors; however, malnutrition was not associated with these factors. Especially, the lack of association between age and malnutrition was consistent with the finding of Laky et al. [16], but was not consistent with the finding of Laky et al. [22], further studies are warranted to elucidate the association between age and malnutrition in gynecologic cancer.

Marital status, which assessed the family support system, was also not related with malnutrition in our study. Therefore, we suggest further studies which include family support or social support as a sociodemographic factor because social support is reported as a significant factor correlated with nutritional risks [34, 35].

We found no significant difference in the prevalence of malnutrition according to cancer type, with rates for ovarian cancer, endometrial cancer, and cervical cancer of 52.8 %, 60.0 %, and 47.9 %, respectively. These findings are consistent with a previous report for ovarian cancer [17]; however, they are not consistent with the study of Laky and colleagues, who reported that the prevalence of malnutrition varied depending on cancer type [16]. These features may be different among different cultures and regions, and need to be investigated further.

In our study, most patients (69.8 %) received chemotherapy within 6 months of diagnosis. We showed that chemotherapy was associated with malnutrition in gynecologic cancer patients. Some chemotherapeutic agents have the potential to cause side-effects that can induce nutritional problems including anorexia, nausea, vomiting, diarrhea, and mucositis [5, 9, 36]. Patients undergoing chemotherapy report that food tastes metallic, bitter, or has no taste at all; this may lead to loss of appetite [36]. Chemotherapy can also affect nutrient uptake and cause metabolic abnormalities, such as nutrient deficiencies [7]. These side-effects of chemotherapy may negatively impact the nutritional status of cancer patients. Therefore, malnutrition in gynecologic cancer patients undergoing chemotherapy must be taken into account in a clinical setting.

It is known that radiation therapy has an influential negative effect on nutritional status in cancer patients [9, 37]. Although radiation therapy was not correlated with nutritional status, the number of patients receiving radiation therapy was too small in this study. Therefore, further studies are needed to identify the influence of radiation therapy on the nutritional status of gynecologic cancer patients.

The prevalence of depression of gynecologic cancer patients has been reported to range from 12 % to 55 %, and major depression has been observed to be much more common in cancer patients than in women with benign disease [19, 20]. In our study, the prevalence of depression was 26.4 %. It is well known that depression, among psychological factors, is associated with malnutrition in cancer patients [10, 38]. This is consistent with our finding that depression was associated with malnutrition. Such findings indicate that the psychological status of gynecologic cancer patients should be appropriately evaluated.

Various treatment modalities, in addition to the systemic and local effects of the cancer itself, result in loss of appetite [7]. Psychological factors, such as depression, may also negatively impact appetite and food intake [11]. Depression affects appetite indirectly, which can aggravate malnutrition. However, the appetite of gynecologic cancer patients has not been documented consistently [20], and thorough active evaluation and assessment are required. Our study results indicate that loss of appetite is associated with malnutrition.

In the present study, the body weight and BMI of patients were assessed to reflect nutritional characteristics in detail. Body weight and BMI in patients with malnutrition were lower than those in patients without malnutrition, but this was not statistically significant. Although body weight and BMI are widely used tools as anthropometrics [22], they have limitations in reflecting nutritional status. This finding is consistent with results of previous studies in which weight loss alone was not an accurate indicator of malnutrition and BMI failed to detect malnutrition in patients with gynecologic cancer [16, 22].

The findings of our study demonstrate that a nutritional assessment tool which includes various nutritional parameters is adequate for nutritional assessment in gynecologic cancer.

This study has some limitations. First, our study did not show the changes of nutritional status and prevalence of malnutrition according to length of time after diagnosis because a cross-sectional study design was used. Second, our study sample size was small to statistically analyze. This led to difficulty in analyses considering cancer type and disease stage together, and cancer type and treatment modalities together. Nevertheless, our study demonstrated overall nutritional status in various types of gynecologic cancer patients, including recurrent cancer patients and patients receiving chemotherapy/radiation.

Appropriate screening and assessment of nutritional status should guide nutritional interventions for nutritionally vulnerable patients with gynecologic cancer. These may lead to improve health-related outcomes, as mentioned earlier. In addition, patients who are already experiencing malnutrition require nutritional support such as oral supplementation, enteral tube feeding, total parenteral nutrition (TPN), and patient and family education regarding malnutrition, as well as regular and consistent assessment.

In summary, we found that over half of patients with gynecologic cancer had nutritional problems, and the prevalence of malnutrition was not associated with cancer type. Malnutrition in gynecologic cancer was strongly correlated with depression and appetite. Because depression and appetite contribute to malnutrition, intervention for depression and appetite is required in gynecologic cancer patients with high levels of depression and loss of appetite. In addition, the high prevalence of malnutrition indicates that regular and consistent nutritional assessment is important to improve health-related outcomes in gynecologic cancer patients.

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Conflict of interest The authors declare that no conflict of interest exists.

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