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ORIGINAL ARTICLE

Malnutrition among gynaecological cancer patients

B Laky[1], M Janda[2], J Bauer[3], C Vavra[4], G Cleghorn[5] and A Obermair[1]

[1]*Queensland Centre for Gynaecological Cancer, The Royal Brisbane and Women's Hospital, Brisbane, Australia;* [2]*Queensland Cancer Fund, Spring Hill, QLD, Australia;* [3]*The Wesley Research Institute, Brisbane, Australia;* [4]*University Hospital, School of Medicine, Vienna, Austria and* [5]*The Children's Nutrition Research Centre, Royal Children's Hospital, Brisbane, Australia*

Objective: To assess the nutritional status of patients with gynaecological cancer.
Design: A prospective study assessing the nutritional status of gynaecological patients with suspected or proven gynaecological cancer.
Setting: Queensland Centre for Gynaecological Cancer, Brisbane, Australia; a tertiary referral centre for gynaecological cancer.
Subjects: One hundred forty-five patients with suspected or proven gynaecological cancer aged 20–91 years.
Intervention: Scored patient-generated subjective global assessment (PG-SGA) and serum albumin before treatment.
Results: One hundred and sixteen (80%) patients were categorized as PG-SGA class A, 29 (20%) patients were PG-SGA B and none of the patients were PG-SGA C. Ovarian cancer patients had significantly lower serum albumin levels ($P=0.003$) and higher PG-SGA scores ($P<0.001$) than patients with other types of cancer and benign conditions. Sixty-seven per cent of patients with ovarian cancer were classified as PG-SGA B. After adjusting for patient's age, body mass index and albumin level, ovarian cancer patients were 19 times more likely to be categorized as PG-SGA class B compared to patients with benign conditions (95% confidence interval: 3.03–129.8; $P=0.002$).
Conclusion: Malnutrition in gynaecological cancer patients is a significant problem, especially among those patients diagnosed with ovarian cancer.
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Keywords: nutritional assessment; nutritional status; scored patient-generated subjective global assessment; malnutrition; gynaecological cancer; albumin

Introduction

Malnutrition is common in all hospitalized patients, but especially so in patients with malignant diseases and the elderly (Lochs and Dervenis, 2003). In patients requiring surgery, the clinical impact of malnutrition includes an increased risk of peri-operative complications (Terada *et al*., 1988; Burnett *et al*., 1993; Obermair *et al*., 2001), increased postoperative residual tumour after initial surgery (Obermair *et al*., 2001) and increased length of hospital stay (Massad *et al*., 1993). A significant proportion of patients with gynaecological malignancies seem to experience malnutrition (Orr *et al*., 1985a, b; Spirtos and Ballon, 1988; Santoso *et al*., 2000; Gadducci *et al*., 2001) and patients with advanced ovarian cancer are particularly at risk (Tunca, 1983; Dickerson *et al*., 1995). Research by Orr *et al*. (1985a, b) reported a wide range of prevalence of malnutrition: from 4% in stage I cervical cancer patients, up to 60% in stage IV cervical cancer patients, whereas contrasting results published by Tunca (1983) showed nearly normal nutrition parameters in patients with all stages of cervical cancer.

Various nutritional parameters such as Prognostic Nutritional Indices (Santoso *et al*., 2000), serum albumin, total protein, transferrin (Spirtos and Ballon, 1988; Obermair *et al*., 2001), haemoglobin (Massad *et al*., 1993) and anthropometric measurements including weight (Spirtos and Ballon, 1988; Donato *et al*., 1992; Santoso *et al*., 2000) have been used to assess the nutritional status in gynaecological cancer patients. The subjective global assessment (SGA) is a validated nutrition assessment tool that is commonly used to assess nutritional status of patients with a number of different conditions (Baker *et al*., 1982; Detsky

Correspondence: Dr A Obermair, Queensland Centre for Gynaecological Cancer, The Royal Brisbane and Women's Hospital, 6th Floor Ned Hanlon Building, HERSTON QLD 4029, Brisbane, Australia.
E-mail: Andreas_Obermair@health.qld.gov.au
Guarantor: A Obermair.
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et al., 1987; Hirsch *et al*., 1991). The patient-generated SGA (PG-SGA) is a further modification of the SGA and has been specifically developed for patients with cancer (Ottery, 1996). The PG-SGA has been used for nutritional assessment in patients with various types of cancer such as cancer of the oesophagus, stomach, pancreas, lung, colorectum, breast and head and neck (Bauer *et al*., 2002; Persson *et al*., 2002; Isenring *et al*., 2003; Ravasco *et al*., 2003, 2005; Bauer and Capra, 2005; Desbrow *et al*., 2005; Horsley *et al*., 2005; Segura *et al*., 2005). Bauer *et al*. (2002) compared the scored PG-SGA with the SGA for patients with cancer and suggested the PG-SGA be used for further studies to detect malnutrition in cancer populations.

The aim of this study was to assess the nutritional status of patients with suspected or proven gynaecological cancer at diagnosis to establish the prevalence of malnutrition in this patient population, and to assess the association of malnutrition measured by the PG-SGA and other indicators of nutritional status.

Patients and methods

Patients

This prospective study has been approved by The Royal Brisbane Hospital Human Research Ethics Committee (Brisbane, Australia). Eligibility criteria include patients with presumed or proven primary gynaecological cancer. Patients with suspicious ovarian masses in whom final histopathology revealed a benign tumour served as benign controls. Patients with recurrent cancer, patients who had received treatment for another cancer less than 5 years ago, patients with cognitive impairments (e.g. schizophrenic, dementia) and non-English-speaking patients were excluded.

Of 298 (100%) eligible patients, informed written consent was obtained from 161 (54%) patients between March 2004 and July 2005 from the gynaecological oncology clinic at The Royal Brisbane and Women's Hospital (RBWH). Eighteen patients (6%) refused to participate in the study and 119 (40%) patients were unable to be recruited owing to limited human resources. Sixteen patients (5%) were excluded for various reasons such as missing data or diagnosis other than gynaecological diseases. Analysis is based on 145 patients who participated in the study.

All patients were seen by a gynaecological oncologist. A full medical and surgical history was taken, the patient was examined and a decision on treatment was made. The 145 patients who agreed to take part in the study completed the scored PG-SGA. A retrospective review of medical records provided information on patient's details and histopathological diagnosis.

Nutritional assessment

All nutritional assessments, using the scored PG-SGA were performed 2–6 weeks before treatment. The PG-SGA was developed by Ottery (1996) as a modification of the SGA, specifically for oncology patients. In common with SGA, the PG-SGA allows a global assessment of the patient's nutrition status based on subjective and objective aspects.

The patient's medical history components of the PG-SGA include weight change, dietary intake, symptoms (such as nausea, vomiting and diarrhoea that have persisted for 2 weeks) and changes in functional capacity. The weight section provides information about the current body weight and the body weight 1 and 6 months ago. The percentage of weight loss in the past month is calculated as follows: 100/weight 1 month ago × (weight 1 month ago−current weight). The same calculation is applied for the calculation of percentage weight loss in the past 6 months. The physical examination considers loss of subcutaneous fat, muscle wasting, ankle or sacral oedema, and ascites. Based on the overall assessment, the patient is categorized into stage A, stage B or stage C. A patients staged with a global rating PG-SGA A is assumed to be well nourished, with a PG-SGA B moderately or suspected malnourished and with a PG-SGA C severely malnourished (Ottery, 1996).

A further development of the PG-SGA is the scored PG-SGA (McCallum and Polisena, 2000). In addition to the global ratings (PG-SGA A, PG-SGA B and PG-SGA C), the scored PG-SGA also facilitates calculation of a numerical score (PG-SGA score ranges from 0 to 47). The PG-SGA score is based upon the severity of each clinical feature. All sections (e.g. patient's history, physical examination) of the PG-SGA are included in the scoring system. The point values for each clinical feature of the PG-SGA are summed, and a mean PG-SGA score is calculated for each patient. The numerical score facilitates quantitative outcomes data collection. The Oncology Nutrition Dietetic Practice Group of the American Dietetic Association has accepted the scored PG-SGA as the standard for nutritional assessment for patients with cancer (McCallum and Polisena, 2000).

Body weight and height were measured at the gynaecological oncology consultation. Body weight was measured in kilograms using a digital scale (SECA model 770; SECA Corp., Hamburg, Germany) and height was measured in centimetres using a wall-mounted stadiometer (SECA model 222, SECA Corp., Hamburg, Germany). The body mass index (BMI) is a simple tool for indicating weight status in adults. It is calculated from the weight in kilograms divided by the square of the height in metres. Serum albumin in g/l was taken preoperatively.

Statistical analysis

All data were analysed using SPSS 11.5. (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to present patients characteristics. Independent *t*-tests were used to examine differences in means for age, height, weight, BMI, percentage of weight loss in the past month and in the past 6 months, serum albumin, and PG-SGA score between patients with a global rating well nourished (PG-SGA A) and malnourished

(PG-SGA B + C). χ^2 tests were used to examine the relationship between nutritional status (PG-SGA A or PG-SGA B) and patient's diagnosis (benign, low malignant potential (LMP), malignant and the primary cancer sites as extracted from histopathological reports). Analysis of variance was used to compare age, height, weight, BMI, percentage of weight loss in the past month and in the past 6 months, serum albumin, and PG-SGA score between patients diagnosed with endometrial cancer, ovarian cancer, cervical cancer and benign conditions. Multivariate logistic regression analysis was conducted to assess predictors of malnutrition while adjusting for patient's age, BMI and serum albumin level. Statistical significance was reported at the conventional $P<0.05$ level (two-sided).

Results

The mean age of the 145 patients was 59.1 ± 14.7 years. Overall, 44 (30%) patients were diagnosed with benign conditions, eight (6%) patients had ovarian tumours of LMP and 93 (64%) patients had histologically proven gynaecological malignancy. One hundred and twenty-eight patients recalled their weight 1 month ago. Less than half (40%) of them lost weight ($n=51$), 32% ($n=41$) reported no weight change and 28% ($n=36$) gained weight. Of the 145 patients, 126 patients remembered their weight 6 months ago. Forty per cent ($n=50$) lost weight, 33% ($n=42$) reported no weight change and 27% ($n=34$) put on weight. Detailed baseline characteristics of the study participants are shown in Table 1.

One hundred sixteen patients were classified as well nourished (PG-SGA A), 29 patients were moderately malnourished (PG-SGA B) and none of the patients were severely malnourished (PG-SGA C). There was no significant difference in nutritional status by diagnosis (benign, LMP and malignancies). Malnourished patients had a significantly higher mean percentage weight loss before treatment, lower mean weight, BMI and serum albumin level and higher mean PG-SGA score compared to those who were classified as well nourished (PG-SGA A) (Table 1).

Table 2 details nutritional characteristics in patients with benign conditions and different primary cancer sites. Twenty-one patients were classified as having ovarian cancer that also included patients with primary peritoneal cancer ($n=5$) and fallopian tube cancer ($n=2$). Patients with other gynaecological malignancies, including four patients with cancer of the vulva and vagina and one patient with pseudomyxoma peritonei and eight patients with tumours of LMP were excluded from further analysis owing to small numbers. Patients with endometrial cancer presented with significantly higher weight than patients with ovarian cancer and benign conditions ($P=0.05$) and had a significantly higher BMI compared to all other groups ($P=0.05$). Ovarian cancer patients had significantly lower serum albumin levels ($P=0.05$) and higher PG-SGA scores ($P<0.001$) than patients with benign conditions and endometrial cancer. Fourteen (67%) patients with ovarian cancer were categorized as moderately malnourished (PG-SGA B) (Table 2).

In the multivariate logistic regression analysis adjusted for age, BMI and serum albumin level, patients with ovarian cancer were 19 times more likely to be classified as malnourished (PG-SGA B) compared to patients with benign conditions ($P=0.002$). There was a trend for cervical cancer patients to be classified as PG-SGA B. Patients with endometrial cancer did not differ from patients diagnosed with benign diseases in their PG-SGA rating (Table 3).

Discussion

Patients with ovarian cancer were 19 times more likely to present with malnutrition to a gynaecology oncology clinic

Table 1 Patient characteristics

	All patients (n = *145*)	*Well-nourished PG-SGA A* (n = *116*)	*Malnourished PG-SGA B + C* (n = *29*)	P-*value*
Diagnosis[a]				
Benign	44 (30.3)	39 (33.6)	5 (17.2)	0.163
LMP	8 (5.5)	7 (6.0)	1 (3.4)	
Malignancies	93 (64.1)	70 (60.3)	23 (79.3)	
Age (years)[b]	59.1 ± 14.7	58.4 ± 13.8	62.1 ± 17.9	0.230
Weight (kg)[b]	81.5 ± 24.4	84.0 ± 25.7	71.4 ± 14.6	0.013
BMI (kg/m^2)[b]	32.0 ± 9.4	33.1 ± 9.9	27.6 ± 5.1	0.005
Percentage weight loss past month ($n=51$)[b]	3.6 ± 2.9	2.7 ± 2.0	5.7 ± 3.7	<0.001
Percentage weight loss past 6 months ($n=50$)[b]	5.9 ± 5.1	4.6 ± 3.8	8.6 ± 6.4	0.008
Albumin (g/l) ($n=128$)[b]	41.1 ± 4.5	42.2 ± 3.4	36.9 ± 5.5	<0.001
PG-SGA score[b]	7.1 ± 5.6	5.3 ± 3.9	14.2 ± 5.7	<0.001

Abbreviations: BMI, body mass index; LMP, tumours of low malignant potential; PG-SGA, patient-generated subjective global assessment.
[a]Values are described as numbers of patients (percentage).
[b]Values are described as mean ± s.d.

Table 2 Characteristics of patients with ENCA, OVCA, CXCA and benign conditions

	Benign (n = *44*)	*ENCA* (n = *48*)	*OVCA* (n = *21*)	*CXCA* (n = *19*)	*ANOVA*	P-*value*
Age (years)	54.7 ± 15.8	66.6 ± 11.4	62.4 ± 11.6	49.7 ± 14.4	$F_{(3;128)} = 9.9$	< 0.001
Weight (kg)	77.6 ± 26.1	91.8 ± 28.0	73.2 ± 11.9	75.5 ± 15.7	$F_{(3;128)} = 4.6$	0.004
BMI (kg/m^2)	30.5 ± 9.8	36.4 ± 11.0	28.8 ± 4.3	28.9 ± 6.0	$F_{(3;128)} = 5.6$	< 0.001
Percentage weight loss past month	3.0 ± 2.0	3.4 ± 3.4	4.0 ± 3.9	5.9 ± 2.6	$F_{(3;41)} = 1.4$	0.253
Percentage weight loss past 6 months	5.7 ± 5.2	4.8 ± 3.5	5.4 ± 5.3	7.4 ± 4.3	$F_{(3;40)} = 0.5$	0.683
Albumin (g/l)	42.4 ± 3.7	41.3 ± 3.6	38.1 ± 5.4	40.4 ± 5.4	$F_{(3;112)} = 4.9$	0.003
PG-SGA score	5.7 ± 4.4	5.5 ± 4.9	12.5 ± 6.6	7.5 ± 5.0	$F_{(3;128)} = 10.8$	< 0.001
Malnourished (PG-SGA B) (%)	5 (11.4)	3 (6.3)	14 (66.7)	5 (26.3)	$\chi^2 = 36.2$	< 0.001

Abbreviations: ANOVA, analysis of variance; BMI, body mass index; CXCA, cervical cancer; ENCA, endometrial cancer; OVCA, ovarian cancer; PG-SGA, patient-generated subjective global assessment.

Table 3 Adjusted multivariate logistic regression analysis of factors predicting moderate malnutrition (PG-SGA B) in patients with gynaecological cancers

	Adjusted OR	*(95% CI)*	P-*value*
Age	0.98	(0.93–1.03)	0.43
BMI	0.84	(0.73–0.97)	0.02
Albumin	0.73	(0.62–0.86)	< 0.001
Diagnosis			
Benign	1.00		
Endometrial cancer	0.99	(0.09–11.3)	0.99
Cervical cancer	3.44	(0.52–22.7)	0.20
Ovarian cancer	19.8	(3.03–129.8)	0.002

Abbreviations: BMI, body mass index; CI, confidence Interval; OR, odds ratio; PG-SGA, patient-generated subjective global assessment.
The variables in the model are adjusted for all other factors.

compared to patients with benign conditions. The PG-SGA and preoperative serum albumin are useful measures to diagnose malnutrition, whereas weight loss and BMI fail to detect malnutrition in patients with ovarian cancer. Patients with endometrial and cervical cancer are less likely to present malnourished at initial diagnosis.

The nutritional status of patients with gynaecological tumours lacks consistent documentation in the literature and various nutritional parameters have been used in the past to determine nutritional status and no accepted gold standard exists, making it difficult to compare the findings of different studies. Santoso *et al*. (2004) compared the subjective SGA and the objective Prognostic Nutritional Index (which includes laboratory data such as serum albumin level) among 67 women with gynaecological cancer. They described a fair to moderate agreement (57%) between the Prognostic Nutritional Index and the SGA. Bauer *et al*. (2002) pointed out several advantages of the scored PG-SGA as a nutritional assessment tool for cancer patients compared to the SGA. Identification of the impact of common nutritional symptoms and of the scoring system may allow triage of patients for nutritional support and could therefore be especially important to improve patients' well being. In our study, the PG-SGA corresponded with the SGA (data not shown) as well as with the serum albumin level (Table 1).

Other commonly used parameters of nutritional status such as weight loss and BMI have limitations as a measure of malnutrition in gynaecological cancer patients. Patients who are overweight and obese at the time of diagnosis may have a loss of lean muscle mass, which may be masked by excess body fat. Ascites in cancer patients may also mask weight loss; it may even result in weight gain. If weight loss alone had been used as an indicator of malnutrition, many ovarian cancer patients would not have been detected as malnourished in our study.

Albumin is an objective parameter often used in clinical studies to measure long-standing malnutrition. Donato *et al*. (1992) defined the nutritional status in patients with ovarian cancer as adequate versus poor on the basis of preoperative serum albumin, serum transferrin and weight loss during the preceding 3 to 4 months. The median value of serum albumin was 38.0 g/l. Our study found a similar mean albumin level (38.1 g/l) for ovarian cancer patients, and albumin correlated with the PG-SGA score. This indicates that albumin rather than weight loss would be a better indicator of malnutrition in gynaecological cancer patients, should a full nutritional assessment not be feasible. Obermair *et al*. (2001) indicated that surgically related complications such as wound defects and septicaemia were more frequent in ovarian cancer patients who had a serum albumin level of $\leqslant$30 g/l preoperatively compared to patients with higher albumin levels.

Recently, Bauer *et al*. (2002) documented that 76% of patients with various primary cancers (i.e. lymphoma, breast, prostate, oesophagus, lung, sarcoma and myeloma) were malnourished. However, gynaecological cancer patients were not included in this study. The present data show that women with gynaecological cancers other than ovarian cancer are not likely to be classified as malnourished. The data strongly suggest a high prevalence of moderate malnutrition in ovarian cancer patients at diagnosis with two-thirds of these patients being classified as malnourished (PG-SGA B). After adjusting for patient's age, BMI and albumin level ovarian cancer, patients were 19 times more likely to be classified as malnourished (PG-SGA B) compared

to patients with benign conditions. The PG-SGA provides the clinician with both a score and a recommendation for appropriate nutritional intervention and is a useful instrument to detect malnourished patients in a gynaecologic oncology setting.

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