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Body mass index, physical activity and quality of life of ovarian cancer survivors: Time to get moving?

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HIGHLIGHTS

- BMI and physical activity independently influence quality of life outcomes.
- Physical activity affects the majority of quality of life outcomes.
- Promoting physical activity and weight loss may improve quality of life.

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ABSTRACT

Objective. To evaluate the association between body mass index (BMI), physical activity (PA) and the quality of life (QoL) of ovarian cancer survivors.

Methods. We performed a two-centre cross-sectional study of women who had been treated for ovarian cancer between January 2007 and December 2014 at the Royal Cornwall Hospital Trust and the Plymouth Hospitals NHS Trust. QoL was assessed using the EORTC QLQ-C30 and QLQ-OV28 questionnaires, and PA using the Godin Leisure Time Exercise questionnaire.

Results. In total, 293 ovarian cancer survivors were invited to participate, of which 209 women (71.3%) responded. Thirty-five percent of women were overweight and 18% were obese, whilst only 21% met recommendations for PA. Obesity was associated with significantly poorer global QoL, physical, cognitive and social functioning, a poorer body image and more symptomatology. Sedentary behaviour was associated with poorer QoL scores including global QoL, physical, role, social and sexual functioning. After adjustment, BMI and PA both remained independently associated with QoL scores.

Conclusion. Obesity and inactivity are associated with poorer QoL among ovarian cancer survivors. Future interventions promoting PA and weight loss should be evaluated as possible means to improve the QoL of this population.

1. Background

Ovarian cancer is the fifth most common cancer in the UK, with a five-year survival of 43% [1]. Over the past 30 years, the survival rate has almost doubled due to the improving treatment options [2,3]. Research has shown that cancer survivors experience poorer health related quality of life (QoL) compared to women in the general population, with treatment related-sequelae and the psychological aftermath of facing cancer diagnosis [4–6]. In several cancer sites including breast and endometrial cancer, these poorer QoL outcomes have been linked to increased body mass index (BMI) and inactivity, laying the foundation for survivorship interventions [7–9].

In ovarian cancer, more than half of the patients are overweight or obese, and studies have shown that two thirds of ovarian cancer survivors are insufficiently active [10,11]. It has been hypothesised that obesity and inactivity negatively affect QoL through decreased physical endurance, limited mobility, associated comorbidities and possibly social discrimination [8]. Interestingly, the associations between these factors and the QoL of ovarian cancer survivors have somehow been neglected in the current literature. We have recently published on the association between BMI and QoL, showing that increasing BMI is associated with poorer QoL outcomes in ovarian cancer [12]. However, the

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association between physical activity (PA), BMI and QoL still remains unclear.

In order to accurately design and implement interventions to improve QoL, it is important to establish the role of BMI and PA in the QoL of ovarian cancer survivors. We have therefore evaluated the relationship between BMI, PA and the QoL of ovarian cancer survivors in a two-centre study.

2. Methods

2.1. Study population

This study was a two-centre cross-sectional study performed at the Royal Cornwall Hospital Trust (RCHT) and the Plymouth Hospitals NHS Trust (PHNT). Women who had undergone treatment for ovarian cancer (including fallopian tube cancer and primary peritoneal cancer) between January 2007 and December 2014 were invited to participate by an invitation letter through the post. We excluded women who were under 18 years at time of study and who were diagnosed with borderline histology. Ethical approval was obtained through the Northampton Ethical committee and the study had full Trust approval at both sites.

2.2. Data collection

Women were identified through the cancer registry of the South West Intelligence Service which included their current status (alive versus deceased). Women were approached for participation through an invitation letter accompanied by an information leaflet, two questionnaires assessing QoL and PA, and an additional questions sheet covering current height and weight. Women were asked to return the completed questionnaires through a provided pre-paid envelope. After three weeks, a reminder was sent to women who did not reply to the initial survey.

Patient characteristics including age at diagnosis, Eastern Cooperative Oncology Group (ECOG) performance status [13], disease stage, BMI at time of diagnosis, medical co-morbidities, current smoking status, treatment, the American Society of Anaesthesiologists (ASA) score, and recurrent disease were collected from medical records. BMI was calculated and categorised according to national guidelines; underweight (≤18.5 kg/m^2), normal range (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), obese (≥30 kg/m^2) and morbidly obese (≥40 kg/m^2) [14]. Incomplete data from respondents on their current weight and height were supplemented through review of medical files.

Physical activity was assessed by the validated Godin Leisure Time Questionnaire. This is a four-item questionnaire assessing the amount of mild, moderate and strenuous activity per 15 min in the past week. Frequency scores of moderate and strenuous activity were multiplied with corresponding Metabolic Equivalent (MET) values, assigning each patient a leisure score index (LSI) [15,16]. Women reporting moderate-to-strenuous LSI ≥ 24 were classified as active, whereas individuals reporting moderate-to-strenuous LSI ≤ 23 were classified as insufficiently active in accordance with public health guidelines [16–19]. Women who did not report any moderate-to-strenuous exercise (LSI = 0) were classified as sedentary.

2.3. Outcome measures

Quality of life was assessed through the validated European Organisation of Research and Treatment of Cancer (EORTC) QLQ-C30 and QLQ-OV28 questionnaires [20,21]. The QLQ-C30 is a 30-item cancer-specific questionnaire, covering several areas of QoL; physical, role, emotional, cognitive and social functioning, as well as symptom distress and global QoL [20]. A higher score on the functioning scales and global health represents a higher level of functioning and a higher QoL, whilst in symptom scales a higher score indicates a higher level of symptomatology [22]. The QLQ-OV28 is a specific ovarian cancer module, covering specifically relevant issues such as body image, sexuality and abdominal symptoms [21].

2.4. Statistical analysis

Data were analysed using IBM SPSS software [23]. For analysis purposes, BMI was categorised into; <25 kg/m^2 (normal), 25–29.9 kg/m^2 (overweight) or ≥30 kg/m^2 (obese). PA was categorised into 'sufficient', 'insufficient' or 'sedentary' following LSI scores. Reported outcomes of the QLQ-C30 and OV28 were linearly transformed to 0–100 scores [21,22]. Data were compared using the Pearson Chi square or Fisher's exact test for categorical data, and the Mann–Whitney *U* test, Kruskal–Wallis test or Median test for continuous data. The associations between current BMI, PA, and QoL outcomes were analysed using univariate analyses, and where appropriate multiple regression analyses were performed whilst adjusting for other factors including age, ECOG status, comorbidities, ASA score, stage, recurrent disease and time since diagnosis. P-values were regarded significant if <0.05 and the tests were two-sided.

3. Results

In total, 293 women who received treatment for ovarian cancer between January 2007 and December 2014 at the RCHT and PHNT were alive at time of study. Of the women invited to participate, 209 women (71.3%) completed the questionnaires. Five women did not fill in their current BMI and PA level. Consequently, outcomes of 204 women were available for analysis.

The median age of the study population was 63 years at diagnosis (17–87), and 48.8% had been diagnosed with stage I/II disease. The average time since primary diagnosis was 35 months (range 1–189). Almost all women had undergone surgery (97.1%) and received chemotherapy (83.7%) as part of their treatment. Non-respondents did not show different baseline and clinical characteristics compared to respondents including ECOG status ($P = 0.802$), stage of disease ($P = 0.341$) and operation ($P = 0.095$). However, there was a significant difference in BMI at time of diagnosis ($P = 0.003$), with non-respondents having higher average BMI (29.3 kg/m^2) compared to respondents (26.7 kg/m^2).

At the time of our survey, 91 women (46.7%) had a BMI below 25 kg/m^2, 69 women (35.4%) were overweight (BMI 25–29.9 kg/m^2) and 35 women (17.9%) were obese (BMI ≥ 30 kg/m^2), of which three were morbidly obese (BMI ≥ 40 kg/m^2). Fourteen women did not fill in their current weight. PA data were available for 202 women, of which only 42 women (20.8%) met the national guidelines for PA. The remaining 160 women (79.2%) were insufficiently active of which 51 women (25.2%) reported some PA, and 109 women (54.0%) reported a sedentary lifestyle.

Baseline and clinical characteristics did not differ significantly according to BMI groups (Table 1). Obese women had more comorbidities and poorer ECOG performance status compared to the normal weight and overweight, but this did not reach statistical significance. At time of study, 72.7% of women had no evidence of recurrent disease. When comparing BMI at time of survey to BMI at diagnosis, 72.6% of women remained in the same BMI category whilst 27.4% changed, with 10.2% of women having a higher BMI category at time of survey and 17.2% a lower BMI category. PA levels varied significantly among BMI groups ($P = 0.012$). In the BMI < 25 kg/m^2 group, 25% of women were sufficiently active, whilst this was 19% in the overweight group and 17% in the obese group. Seventy-four percent of women in the obese group were sedentary as they reported no moderate or strenuous activity, whilst the normal and overweight groups reported sedentary rates of 46% and 51% respectively.