Antrocom Online Journal of Anthropology vol. 16. n. 1 (2020) 131-139 – ISSN 1973 – 2880

Antrocom Journal of Anthropology

journal homepage: http://www.antrocom.net

Nutritional status and body composition of ovarian cancer patients

Priyanka Dutta and Jyoti Ratan Ghosh

Department of Anthropology, Visva-Bharati, Santiniketan-731235, West Bengal, India. Corresponding author: jrghosh@rediffmail.com; jrghosh@visva-bharati.ac.in

KEYWORDS

Ovarian cancer, India, Chronic energy deficiency, Body composition, Nutritional status

ABSTRACT

Ovarian cancer has emerged as one of the most common malignancies affecting women in India. It was also observed that malnutrition is a common and under-recognized problem among cancer patients. The present study was undertaken to evaluate and compare the nutritional status and body composition of ovarian cancer patients. A total of 145 newly diagnosed adult ovarian cancer patients and 290 apparently healthy adult women with a mean age of 43.69 (SD 8.95) years were studied. In conclusion, the results of the present study demonstrated an altered body composition in terms of body fat and higher prevalence of chronic energy deficiency (CED) in cancer patients as compared with healthy women.

Introduction

Ovarian cancer is the seventh most common cancer worldwide with a lower survival rate (Puri et al. 2018). It is estimated that globally 239,000 women are diagnosed with ovarian cancer each year, and a further 152,000 women die from the disease (Ferlay et al. 2012). Ovarian cancer has also emerged as one of the most common malignancies affecting women in India (Murthy et al., 2009), and ranked second for the incidence of ovarian cancer globally (Puri et al. 2018). In India, ovarian cancer has the worst prognosis among all gynaecological malignancies and thus become an enormous disease burden (Basu et al. 2009).

Malnutrition is a common and under-recognized problem among cancer patients and also a major cause of morbidity and mortality (Read et al. 2007; Gupta et al. 2010; Das et al. 2014). Kaduka et al. (2017), in a study in Kenya, demonstrated that 13.4 % cancer patients were malnourished and 33.1% were at risk of malnutrition. Gupta et al. (2010) demonstrated that up to 85% of all patients with cancer develop clinical malnutrition. A high prevalence of malnutrition (71.1%) among cancer patients were also observed by Silva et al. (2015). The association between cancer and malnutrition has many consequences, together with an increased risk of infection, increased length of hospitalization, poor wound healing, reduction in muscle function and also affect the response to the therapy (Obermair et al. 2001; Davies 2005). It was also observed that body composition, specifically fat mass (FM) was strongly associated with the survival of an ovarian cancer patient (Purcell et al. 2016). A meta-analysis of body mass index (BMI) at the time of diagnosis of ovarian cancer demonstrated

Please cite this article as: Priyanka Dutta and Jyoti Ratan Ghosh, Nutritional status and body composition of ovarian cancer patients. *Antrocom J. of Anthropology 16-1 (2020) pp. 131-139.*

that a higher BMI was associated with a shorter survival (Protani et al. 2012). Moreover, variability in body composition plays an important role in differential metabolism of cytotoxic agents (Carla et al. 2013). Body composition is also a strong predictor of tumours prognosis (Martin et al. 2013; Purcell et al. 2016).

There are several ways of measuring nutritional status and body composition (Chatterjee et al. 2006; Ghosh and Sarkar 2013). The ideal would be to use a rapid, low-cost, non-invasive method. Simultaneously, it would have to be of highly sensitive and specific (Zorlini et al. 2008). Anthropometry is especially important as a screening tool to identify individuals at risk of undernutrition followed by biochemical and clinical techniques (Gorstein and Akre 1988). BMI has been accepted and widely used as a valid scientific method throughout the world to assess undernutrition especially in developing countries (Shetty and James 1994; Khongsdier 2001; Ghosh and Bandyopadhyay 2007; Purcell et al. 2016). However, precise techniques used to measure body composition in terms of body fat and its distribution like dual-energy X-ray absorptiometry (DXA) and computed tomography (CT) scan in humans are not appropriate for use in field based studies because of its cost, radiation exposure, limited availability outside the research setting and also time consuming (Taing et al. 2017). Thus, to obtain a reasonable estimation of body composition the bioelectrical impedance analysis (BIA) method is widely used (Sillanpaa et al. 2014; Taing et al. 2017). The BIA is also considered a valid method of total and regional body composition analysis and also less time consuming, non-invasive and inexpensive (Malavolti et al. 2003).

Despite the clinical significance of the nutritional status and body composition, few attempts have been made to understand the nutritional status and body composition of ovarian cancer patients, especially in India. Therefore, the present study was undertaken to evaluate and compare the nutritional status and body composition of ovarian cancer patients of West Bengal, India.

Material and Methods

The present cross-sectional study was conducted in histologically confirmed ovarian cancer patients from the oncology outpatient department of Government cancer hospitals in Kolkata. Each patient's diagnosis was confirmed by pathologists. A total of 145 adult newly diagnosed ovarian cancer patients were incorporated in the present study. Patients with a previous history of cancer, after neoadjuvant treatment, pregnant, lactating women, or with liver disease were excluded. On the other hand, 290 apparently healthy adult women were also chosen randomly from Kolkata. Cancer free participants were matched to patients by ethnicity and age. Pregnant, lactating women and women with low bone density and chronic disease were also excluded from the study.

Information on bio-social data including age and ethnicity were collected using questionnaires. Anthropometric measurements namely height and weight were measured using standard techniques (Lohman et al. 1988). Height was measured using an anthropometer to the nearest 0.1 cm. Weight was measured using a weighing machine to the nearest 0.1 kg. Nutritional status was assessed by BMI and was calculated as weight in kilograms divided by the square of the height in meters (kg/m^2). BMI was categorized into four groups according to the conventional WHO classification (WHO 1995); chronic energy deficiency (CED) (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese (≥30 kg/m^2). Body composition was measured using Omron body composition monitor (Karada Scan). Body composition variables include percent body fat (PBF), subcutaneous fat at whole body (SFWB), trunk (SFT), arm (SFA) and leg (SFL) and skeletal muscle at whole body

(SMWB), trunk (SMT), arm (SMA) and leg (SML). Prior to the study informed consent was taken from each participant. Ethical clearance was obtained from the institutional ethical clearance board. Descriptive statistics includes mean and standard deviation (SD). Inferential statistics include t-test and chi-square test. A p value of 0.05 was considered as significant. All analyses were performed using the statistical program (SPSS).

Results

A total of 435 adult women including 145 ovarian cancer patients and 290 apparently healthy women were included in the present study. The mean age of the studied population was 43.69 (SD 8.95) years. There was no significant ($p>0.05$) age differences between cancer patient (43.28±9.79 years) and healthy women (43.89±8.50 years). Characteristics of the studied population are presented in table 1. It revealed that ovarian cancer parents are significantly ($p<0.05$) lighter in body weight compared to the healthy women. Ovarian cancer patients also revealed significantly ($p<0.05$) lower PBF as well as lower SFWB, SFT and SFL. A significantly ($p<0.05$) lower BMI was also observed among the ovarian cancer patient compared to the healthy women. However, comparatively higher SMWB, SMT and SMA was observed among the ovarian cancer patients compared to the healthy women. Contrary to that, the healthy women demonstrated a higher HT, SFA and SML compared to the ovarian cancer patients.

Participant's status-wise distribution of nutritional status (Table 2) revealed significant ($p<0.05$) association between nutritional status and ovarian cancer. The result revealed that the overall prevalence of CED was higher (19.3%) among the ovarian cancer patients compared to the healthy women (10%). However, the prevalence of overweight and obesity was higher among the healthy women (29.7% and 16.9%, respectively) than women with ovarian cancer (25.5% and 13.1%, respectively).

Discussion

Nutritional intervention is an important aspect of quality of treatment, which have a potentially positive impact on patient outcomes (du Bois et al. 2008). Because, well-nourished patients are best able to withstand medical treatment, specifically in cancer (Gupta et al. 2010). As a result, malnutrition decreases the survival rate (Yim et al. 2016). Malnutrition also plays an adverse effect on the immune response, including decreased lymphocyte response to mitogen, impaired cell-mediated immunity, phagocytic dysfunction, impaired inflammatory response, and impaired cytotoxic T cell activity (Langer et al. 2001).

However, the results of the present study to evaluate and compare the nutritional status and body composition between ovarian cancer patients and apparently healthy women revealed that the women with ovarian cancer were lighter than the healthy women in terms of body weight. In accordance with the result of the present study Warnold et al. (1978) also demonstrated significantly lower body weight in cancer patients compared to healthy women. Extreme weight loss was also common in patients with incurable solid cancer, which is hard to control (Andreoli et al. 2011). The lighter body weight of the ovarian cancer patients compared to the healthy women might be due to the lower overall and subcutaneous fat among them, as they have significantly lower PBF, SFWB, SFT and SFL along with comparatively lower SFA. Lower fat reserves by skin-fold thickness among ovarian cancer patients were also observed by Fuchs-Tarlovsky et al. (2013). Warnold et al. (1978) observed a similar lower body fat among cancer patients compared to healthy women. It was also observed that

patients with low subcutaneous and intramuscular FM had a longer length of hospital stay compared to patients with high subcutaneous and intramuscular FM (Torres et al. 2013). Interestingly, there were no significant differences in subcutaneous muscle between ovarian cancer and healthy women. Nakayama et al. (2019) in a recent study demonstrated that ovarian cancer patients are less susceptible to sarcopenia i.e. the progressive loss of skeletal muscle mass and quality than those with other cancers.

However, when compared the BMI between ovarian cancer patients and healthy women, a significantly lower mean BMI was observed in ovarian cancer patient. Moreover, the prevalence of CED was also significantly higher among ovarian cancer patients compared to healthy women, which may be associated with the lower overall and subcutaneous fat among them. Laky et al. (2007) also demonstrated a higher proportion of undernutrition among patients with gynaecological malignancies and found that patients with ovarian cancer were 19 times more likely to be malnourished. It was also observed that up to 85% of all patients with cancer develop clinical malnutrition (Gupta et al. 2010). Study demonstrated that the relative risk of death was about six times higher in moderately or severely malnourished patients compared to others (Yim et al. 2016). Similarly, in a study among gynaecologic patients in Germany, Hertlein et al. (2014) found 35.8% patients were at severe risk of malnutrition. A similar higher prevalence of severe malnutrition among cancer patients were also observed by Nho et al. (2014) and Yanaranop and Nutcharas (2019), though, Bandera et al. (2017) found no association between BMI and ovarian cancer survival. However, a higher prevalence of malnutrition in cancer patients may be due to the alterations in the central nervous system and systemic tumor, which results in altering food intake through anorexia, cachexia, nausea and vomiting, changes in taste and smell as well as bowel obstruction (Gadducci et al. 2001; Nho et al. 2014). Ovarian cancer patients also demonstrated high resting energy expenditure due to increase in Cori cycle activity, glucose and triglyceride-fatty acid cycling and gluconeogenesis (Gadducci et al. 2001).

Conclusion

In conclusion, the results of the present study demonstrated an altered body composition in terms of body fat and higher prevalence of CED in cancer patients as compared with healthy women. Thus, early identification of patients who are undernourished or at risk of undernutrition followed by nutritional intervention can promote recovery and improve prognosis and quality of life, as ovarian cancer mortality rate is very high among all malignancies.

Acknowledgements

The authors are grateful to all the participants of the study. The authors are also grateful to all the Doctors for their support and cooperation for the present study.

References

Andreoli, A., De Lorenzo, A., Cadeddu, F., Iacopino, L., Grande, M., (2011). "New trends in nutritional status assessment of cancer patients". *European Review for Medical and Pharmacological Sciences* 15:469-480.

Bandera, E.V., Lee, V.S., Qin, B., Rodriguez-Rodriguez, L., Powell, C.B., Kushi, L.H., (2017). "Impact of body mass index on ovarian cancer survival varies by stage". *British Journal of Cancer* 117(2): 282–289.

Basu, P., De, P., Mandal, S., Ray, K., Biswas, J., (2009). "Study of 'patterns of care' of ovarian cancer patients in a specialized cancer institute in Kolkata, eastern India". *Indian Journal* of *Cancer* 46(1): 28-33.

Carla, M.M.P., Yara, L.L.M., Michael, O., Michael B. S., Vickie, E. B., (2013). "Assessment of nutritional status in cancer–the relationship between body composition and pharmacokinetics". *Anti-Cancer Agents* in *Medicinal Chemistry* 13(8):1197-1203.

Chatterjee, D., Ghosh, J.R., Chanda, S., Bandyopadhyay, A.R., (2006). "Relationship between anthropometric measurements and body composition among Santal girls aged between 6-18 years of Galudih, Jharkhand, India". *The Anthropologist* 8 (4): 241-243.

Das, U., Patel, S., Dave, K., Bhansali, R., (2014). "Assessment of nutritional status of gynecological cancer cases in India and comparison of subjective and objective nutrition assessment parameters". *South Asian Journal* of *Cancer* 3(1): 38–42.

Davies, M., (2005). "Nutritional screening and assessment in cancer-Associated malnutrition". *European Journal of Oncology Nursing* 9(2):S64-S73.

du Bois, A., Rochon, J., Pfisterer, J., Hoskins, W.J. (2008). "Variations in institutional infrastructure, physician specialization and experience, and outcome in ovarian cancer: a systematic review". *Gynecologic Oncology* 112(2):422–436.

Ferlay, J., Soerjomataram, I., Ervik, M., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., Parkin, D.M., Forman, D., Bray, F., (2012). Cancer Incidence and Mortality Worldwide: IARC. Cancer Base no. 11. Lyon: World Health Organization.

Fuchs-Tarlovsky, V., Alvarez-Altamirano, K., Turquie-Sacal, D., Alvarez-Flores, C., Hernandez-Steller, H., (2013) "Nutritional status and body composition are already affected before oncology treatment in ovarian cancer". *Asia Pacific Journal of Clinical Nutrition* 22 (3):426-430.

Gadducci, A., Cosio, S., Fanucchi, A., Genazzani , A. R., (2001). "Malnutrition and cachexia in ovarian cancer patients: pathophysiology and management". *Anticancer Research* 21(4B):2941-2947.

Ghosh, J. R., Bandyopadhyay, A. R., (2007) "Receiver operating characteristic curve analysis of BMI in assessing obesity among adult Bengalee males in India. Collegium Antropologicum 31(3) 705–708.

Ghosh, J. R., Sarkar A., (2013). "Prevalence of undernutrition among Santal children of Birbhum District, West Bengal, India". Sri Lanka Journal of Child Health 42(3): 147-150.

Gorstein, J., Akre, J., (1988). "The use of anthropometry to assess nutritional status". *World Health Statistics Quarterly* 41(2): 48-58.

Gupta, D., Lis C. G., Vashi, P. G., Lammersfeld, C. A., (2010). "Impact of improved nutritional status on survival in ovarian cancer". *Supportive Care* in *Cancer* 18(3)373–381.

Gupta, D., Lis, C. G., Vashi, P. G., Lammersfeld, C. A., (2010). "Impact of improved nutritional status on survival in ovarian cancer". *Supportive Care* in *Cancer* 18(3) 373–381.

Hertlein, L., Kirschenhofer, A., Fürst, S., Beer, D., Gob, C., Lenhard, M., Friese, K., Burges, A., Rittler, P., (2014). "Malnutrition and clinical outcome in gynecologic patients". *European Journal* of *Obstetrics* & *Gynecology* and *Reproductive Biology 174:* 137–140.

Kaduka, L.U., Bukania, Z.N., Opanga Y., Mutisya R., Korir, A., Thuita, V., Nyongesa, C., Mwangi, M., Mbakaya, C. F. L., Muniu, E. (2017). "Malnutrition and cachexia among cancer out-patients in Nairobi, Kenya". *Journal of Nutritional Science* (6) e63.

Khongsdier, R. (2001). "Body mass index of adult males in 12 populations of Northeast India". *Annals of Human Biology* 28(4): 374–383.

Laky, B., Janda, M., Bauer, J., Vavra, C., Cleghorn G., Obermair, A. (2007). "Malnutrition among gynaecological cancer patients". *European Journal of Clinical Nutrition* 61(5): 642–646.

Laky, B., Janda, M., Bauer, J., Vavra, C., Cleghorn, G., Obermair, A., (2007). "Malnutrition among gynaecological cancer patients". *European Journal of Clinical Nutrition* 61(5): 642–646.

Langer, C. J., Hoffman, J. P., Ottery, F. D., (2001). "Clinical significance of weight loss in cancer patients: rationale for the use of anabolic agents in the treatment of cancer-related cachexia". *Nutrition* 17(1) S1–S20.

Martin, L., Birdsell, L., Macdonald, N., Reiman, T., Clandinin, M. T., McCargar, L. J, Murphy, R., Ghosh, S., Sawyer, M.B., Baracos, V. E., (2013). "Cancer cachexia in the age of obesity: skeletal muscle depletion is a powerful prognostic factor, independent of body mass index". *Journal of Clinical Oncology* 31(12):1539–1547.

Murthy, N.S., Shalini, S., Suman, G., Pruthvish, S., Mathew, A., (2009). "Changing trends in incidence of ovarian cancer - the Indian scenario". *Asian Pacific Journal of Cancer Prevention* 10 (6):1025-1030.

Nakayama, N., Nakayama, K., Nakamura, K., Razia, S., Kyo, S., (2019). "Sarcopenic factors may have no impact on outcomes in ovarian cancer patients. *Diagnostics* (Basel) 9(4): 206.

Nho, J., Kim, S.R., Kwon, Y.S. (2014). "Depression and appetite: predictors of malnutrition in gynecologic cancer". *Supportive Care* in *Cancer* 22: 3081–3088.

Obermair, A., Hagenauer , S., Tamandl, D., Clayton, R.D., Nicklin, J.L., Perrin, L.C., Ward, B.G., Crandon, A.J., (2001). "Safety and efficacy of low anterior en bloc resection as part of cytoreductive surgery for patients with ovarian cancer". *Gynecologic Oncology* 83(1): 115–120.

Pacholczak, R., Klimek-Piotrowska, W., Kuszmiersz, P., (2016). "Associations of anthropometric measures on breast cancer risk in pre- and postmenopausal women-a case-control study". *Journal of Physiological Anthropology* (35):7.

Protani, M. M., Nagle, C. M., Webb, P. M., (2012). "Obesity and ovarian cancer survival: a systematic review and meta-analysis". *Cancer Prevention Research* 5(7):901–910.

Purcell, S. A., Elliott, S. A., Kroenke, C. H., Sawyer, M. B., Prado, C. M., (2016). "Impact of body weight and body composition on ovarian cancer prognosis". *Current Oncology Reports* (18):8.

Purcell, S. A., Elliott, S. A., Kroenke, C. H., Sawyer, M. B., Prado, C. M., (2016). "Impact of body weight and body composition on ovarian cancer prognosis". *Current Oncology Reports* 18(2):8.

Puri, S., Chadha, V., Pandey, A. K., (2018). "Epidemiology of ovarian tumours in Northern India - a tertiary hospital based study". *Indian Journal* of *Community* and *Family Medicine* 4(2): 37-41.

Read, J.A., Beale, P.J., Volker, D.H., Smith, N., Childs, A., Clarke, S.J., (2007). "Nutrition intervention using an eicosapentaenoic acid (EPA)-containing supplement in patients with advanced colorectal cancer. Effects on nutritional and inflammatory status: a phase II trial". *Supportive Care* in *Cancer* 15(3):301–307.

Shetty, P.S., James, W.P. (1994). "Body mass index: a measure of chronic energy deficiency in adults". *FAO Food and Nutrition Paper* (56):1–57.

Silva, F. R., de Oliveira, M. G., Souza, A. S., Figueroa, J. N., Santos, C. S., (2015). "Factors associated with malnutrition in hospitalized cancer patients: a croos-sectional study." *Nutrition Journal* (14) 123.

Torres, M. L., Hartmann, L. C., Cliby, W. A., Kalli, K. R., Young, P. M., Weaver, A. L., Langstraat, C.L., Jatoi, A., Kumar, S., Mariani, A., (2013). "Nutritional status, CT body composition measures and survival in ovarian cancer". *Gynecologic Oncology* 129(3):548–553.

Warnold, I., Lundholm, K., Schersten, T., (1978). "Energy balance and body composition in cancer patients". *Cancer Research* (38) 1801-1807.

World Health Organization. (1995). "Physical Status: The Use and Interpretation of Anthropometry". Geneva: WHO; 1995. *WHO Technical Report Series* no 854.

Yanaranop, M., Nutcharas, T., (2019). "Prevalence of malnourished status and its relationship to surgical outcomes in women undergoing surgery for gynecologic cancers". *Journal of the Medical Association of Thailand* 102(5):61.

Yim, G. W., Eoh, K. J., Kim, S. W., Nam, E. J., Kim, Y. T., (2016). "Malnutrition identified by the nutritional risk index and poor prognosis in advanced epithelial ovarian carcinoma". *Nutrition and Cancer* 68(5):772-779.

Zorlini, R., Akemi Abe Cairo, A., Salete Costa Gurgel, M., (2008). "Nutritional status of patients with gynecologic and breast cancer". *Nutricion Hospitalaria* 23(6):577-583.

Tables

Table 1. Characteristics of the studied population

Variables	Status	Mean	SEM	t	p
HT (cm)	Healthy women	151.84	0.31	1.79	0.08
	Ovarian cancer patients	150.88	0.44		
WT (kg)	Healthy women	58.49	0.86	2.36	0.02
	Ovarian cancer patients	54.90	1.29		
PBF (%)	Healthy women	35.05	0.46	2.67	0.01
	Ovarian cancer patients	32.83	0.74		
SFWB (%)	Healthy women	29.92	0.39	2.17	0.03
	Ovarian cancer patients	28.40	0.60		
SFT (%)	Healthy women	26.48	0.39	2.02	0.04
	Ovarian cancer patients	25.08	0.60		
SFA (%)	Healthy women	46.73	0.48	1.84	0.07
	Ovarian cancer patients	45.18	0.72		
SFL (%)	Healthy women	41.33	0.57	2.43	0.02
	Ovarian cancer patients	38.83	0.89		
SMWB (%)	Healthy women	22.89	0.12	-0.66	0.51
	Ovarian cancer patients	23.03	0.18		
SMT (%)	Healthy women	18.47	0.71	0.55	0.59
	Ovarian cancer patients	17.91	0.24		
SMA (%)	Healthy women	24.46	0.28	-1.87	0.06
	Ovarian cancer patients	25.39	0.41		
SML (%)	Healthy women	35.44	0.12	0.84	0.40
	Ovarian cancer patients	35.26	0.20		
BMI (kg/m^2)	Healthy women	25.36	0.36	2.03	0.04
	Ovarian cancer patients	24.08	0.54		

HT= Height, WT= Weight, PBF= percent body fat, SFWB= whole body subcutaneous fat, SFT= subcutaneous fat at trunk, SFA = subcutaneous fat at arm, SFL = subcutaneous fat at leg, SMWB = whole body skeletal muscle, SMT = skeletal muscle at trunk, SMA = skeletal muscle at arm, SML = skeletal muscle at leg, BMI = body mass index, SEM= standard error of mean.

Table 2. Association of nutritional status with ovarian cancer

Variables	Nutritional status*			
	CED	Normal	Overweight	Obese
Healthy women	10% (29)	43.4% (126)	29.7% (86)	16.9% (49)
Ovarian cancer patients	19.3% (28)	42.1% (61)	25.5% (37)	13.1% (19)

*CED= chronic energy deficiency; Chi-Square value =7.913; *p<0.05*