Body Mass Index (BMI) and Ovarian Cancer: Impact on Tumor Stage

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ABSTRACT

Objective: To determine the frequency of high body mass index in ovarian cancer and to compare the stage of tumour in patients of ovarian cancers with normal versus high BMI.

Study Design: Descriptive, cross-sectional

Place and Duration of Study: This study was conducted at the Department of Pathology, King Edward Medical University, Lahore from September 2017 to March 2018.

Materials and Methods: One hundred and fourteen patients having ovarian cancer of age 15-55 years were included. Patients having metastatic ovarian carcinoma were excluded. Frequency of high BMI was recorded and two groups (A & B) were formed according to their BMI i.e. body mass index BMI $\geq$30 kg/m2 and body mass index BMI <30 kg/m2. Tumor stage of these cases was assessed by FIGO staging system.

Results: Mean age was 38.89±10.07 years. Most of the females, i.e. 66 (57.89%) were between 46 to 55 years of age. Mean duration of ovarian cancer was 9.12±3.68 months. Out of the 114 patients, 99 (86.84%) were married and 15 (13.16%) were unmarried. Frequency of high body mass index in ovarian cancer was found in 35 (30.70%) patients, whereas there was normal BMI in 79 (69.30%) patients.

Conclusion: Frequency of high body mass index in ovarian cancer is quite high. No statistically significant difference was noticed in stage of tumour in patients with normal versus high BMI.

Key Words: Ovarian tumours, Body mass index, Stage of tumour, Prognosis

INTRODUCTION

Among the cancers of female genital tract, ovarian carcinoma carries the worst prognosis, having five-year survival rate of 37%.[1] Numerous researchers have assessed the effect of obesity on the risk of ovarian carcinoma using BMI as the measure of obesity.[2] Obesity or high BMI has been established as a risk factor for a number of hormone-related malignancies.3 However, its association with ovarian carcinoma has been contradictory in the literature. The relationship between obesity and ovarian carcinoma is quite probable, since obesity has been found to be associated with variation in hormonal levels and ovulation, polycystic ovarian syndrome, infertility and endometriosis, all of which are believed to raise the odds of having ovarian cancer.

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Furthermore, increased BMI has also been associated with other hormonally related malignancies, such as endometrial and breast carcinomas.[4] One of the most significant risk factors for epithelial ovarian carcinomas (EOC) particularly amongst post-menopausal females.[5]

While the evidence suggests that increased BMI is linked with the risk of many malignancies, the increasing epidemic of obesity has lead the researchers to believe that there is a need for implementation of guidelines for the weight management in order to prevent the risk of developing certain malignancies. The data from the literature points out obesity or high BMI is a cause of nearly 14% deaths due to cancer in males and almost 20% deaths in females.[6] A study conducted by Erondu et al[7] compared the BMI with stage of tumour i.e. stage I was recorded in 37.78% in patients with BMI <30 kg/m2 while 62.28% in women with $\geq$30 kg/m2, stage II was recorded in 48.48% versus 51.52% respectively, stage III in 41.07% versus 58.93% and stage IV in 38.10% vs 61.90% respectively.[7]

Although previous international studies are present but no local study was available on this and no researches have explicitly addressed the impact of obesity on ovarian carcinoma survival among Pakistani women, therefore we conducted this study to determine the relationship of BMI with stage of ovarian cancer in local population. The literature indicates that obesity worsens the prognosis of ovarian cancer as in obese patients ovarian cancers tend to be more aggressive and such patients present with a higher stage. Then based on

the results of my study, a protocol can be designed for multidisciplinary management of obesity which will be a prognostic factor in ovarian cancer patients. Also on the basis of this study, public awareness programs on national and regional levels will be arranged to create awareness among public regarding this major public health issue among women as well as treating clinicians for a better future outcome in every aspect to reduce morbidity and mortality of these particular patients.

MATERIALS AND METHODS

This descriptive, cross-sectional study was conducted at Department of Pathology, King Edward Medical University, Lahore from 6th September 2107 to 5th March 2018. Samples were received from the surgical units affiliated with King Edward Medical University, i.e. Lady Willingdon Hospital and Lady Aitchison Hospital, Lahore. Females with ovarian cancer diagnosed on the basis of histopathology and age 15-55 years were included. Patients having metastatic ovarian carcinoma and autolysed specimen (on gross examination) were excluded. A total of 114 females having ovarian cancers, diagnosed on the basis of histopathology, who fulfill selection criteria were enrolled. A thorough history of the patients was noted. Frequency of high BMI was recorded and two groups (A & B) were formed according to their BMI i.e. BMI ≥30 kg/m2 and <30 kg/m2. Tumor stage of these cases was assessed by FIGO staging system as described in operational definitions. All the data was recorded. The collected data was entered in SPSS-20.0 and analyzed. Chi square test was applied to determine the significance in both groups and p value ≤0.05 was taken as significant.

RESULTS

Mean age of the patients in this study was 38.89 ± 10.07 years with age ranging from 15 to 55 years. Majority of the females, i.e. 66 (57.89%) were between 46 to 55 years of age. Mean duration of ovarian cancer was 9.12 ± 3.68 months. Out of the 114 patients, 99 (86.84%) were married and 15 (13.16%) were unmarried. Frequency of high body mass index in ovarian cancer was found in 35 (30.70%) patients, whereas there was normal BMI in 79 (69.30%) patients as shown in Figure I.
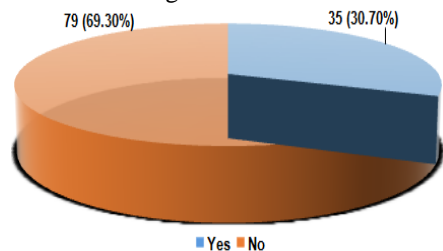

Figure No. 1: Frequency of high body mass index in ovarian cancer (n=114)

When stratification of high body mass index in ovarian cancer was done on stage of tumour, it was established that there was no significant difference among various stages as shown in Table I while the stratification of high body mass index in ovarian cancer with regard to age groups is mentioned in Table II which also revealed no significant difference amid various age groups.

Table No.1: Stratification of high body mass index with respect to stage of tumour

Stage of tumour	High body mass index		P value
	Yes	No	
I	9 (27.27%)	24 (72.73%)	0.162
II	10 (34.48%)	19 (65.52%)	
III	11 (45.83%)	13 (54.17%)	
IV	5 (17.86%)	23 (82.14%)	

Table No. 2: Stratification of high body mass index with respect to age groups

Age (years)	High body mass index		P value
	Yes	No	
15-35	15 (31.25%)	33 (68.75%)	0.914
36-55	20 (30.30%)	46 (69.70%)	

DISCUSSION

Pooled and meta analyses carried out among chiefly white populations revealed that obese females are at a higher risk for developing ovarian cancer[8,9] and have worse survival rate after the diagnosis.[10] According to some studies, for African American women,[11-13] a risk factor for ovarian carcinoma is obesity. The age range in the current study was from 15 to 55 years with mean age of 38.89±10.07 years. Majority of females, i.e. 66 (57.89%) were between 46 to 55 years of age. Frequency of high body mass index in ovarian cancer was found in 35 (30.70%) patients, whereas there was normal BMI in 79 (69.30%) patients. In a meta-analysis, there were 25% cases of ovarian cancer with high BMI ≥30 kg/m^2. Multivariate risk of ovarian carcinoma for overweight patients with BMI ≥30 kg/m^2, in comparison with females having normal weight (BMI 18.5–24.9 kg/m^2 in the cohort on the whole was 1.25 (95%-CI=0.93–1.68). The multivariate risk for overweight as opposed to females with normal weight was 1.80 (95%-CI=1.16–2.80) amongst females who never used Hormone Replacement Therapy. On the contrary, no relationship between body mass index and ovarian carcinoma was evident in females who took Hormone Replacement Therapy (MVRR=0.96; 95%-CI=0.64–1.43; P-interaction = 0.02). An association between body mass index and carcinoma of the ovary was noticed amid females with no family history of ovarian carcinoma (MVRR comparing obese versus females with normal weight =1.36; 95%-CI=0.99–1.85) has also been suggested, however no association with Body Mass Index was found in females who had a

positive family history of ovarian carcinoma (MVRR=0.73;95%-CI=0.34–1.60;P-interaction=0.02).[1] In 3 prospective cohorts in USA, Italy and Sweden, a case-control study[14] was carried out in which case subjects included the diagnosed cases of epithelial ovarian carcinoma (n = 122) whose diagnosis was made twelve months or later after being recruited in the respective cohort. An inverse association was observed between BMI and the risk of ovarian carcinoma. Odds ratio for increasing quartiles of body mass index higher than the lowest, were 0.62 (0.32-1.21), 0.59 (0.30-1.17) and 0.46 (0.23-0.92), p = 0.03. When overweight females (BMI > 30) were contrasted to thin females (BMI < or = 23), the inverse relationship turned out to be strong, having an odds ratio of 0.38 (0.17-0.85), p<0.02. Some proof of association of carcinoma of the ovary with height was also observed, which was restricted to tumors diagnosed earlier than age 55.[14]

No evidence of relationship between body mass index and ovarian carcinoma-related survival in a cohort study was found.[15] Nevertheless, significant effect modification was observed by stage (P interaction <0.01). In contrast with normal pre-diagnosis body mass index $(18.5–24.9 \, kg \, m^2)$, females who were overweight before the diagnosis $(BMI \geq 35 \, kg \, m^2)$, ovarian cancer-related survival rate was worse in the patients at stages I and II (hazard ratio (HR): 3.40; 95% (CI): 1.16–9.99), however raised in the patients with stage IV tumor (HR: 0.58; 95% CI: 0.35–0.96).[15]

A study by Kuper and colleagues[16] described 57% amplification in possibility of developing ovarian carcinoma that was restricted to overweight, premenopausal females, though the outcomes were not significant statistically. Intriguingly, postmenopausal females exhibited no tendency for increased risk, even though the females who were postmenopausal for less than ten years revealed higher risk compared with females who had been postmenopausal for ten years or more, once more highlighting the modifying impact of menopausal status.[16] A survey carried out by Erondu et al[11] compared the body mass index with tumor stage i.e. stage I was documented in 37.78% in patients with body mass index <30 kg/m2 whereas 62.28% in females with ≥30 kg/m2, stage II was registered in 48.48% versus 51.52% respectively, stage III in 41.07% versus 58.93% and stage IV in 38.10% versus 61.90% respectively.[11]

Farrow et al[17] study of ovarian carcinoma linked to body mass index established a noteworthy increase in risk amongst the most overweight, premenopausal females with serous and endometrioid histological subtypes of ovarian cancer. Nevertheless other investigators established maximum risk amid borderline tumors and invasive serous, mucinous, and undifferentiated subtypes.[16] An analysis of ten case-control studies brought forward the fact that relationship among parity and OCP use and the risk of developing carcinoma is comparatively consistent among various histological types of tumor.[18] On the contrary, body mass index demonstrated increased heterogeneity in anticipating the risk of carcinoma among serous, mucinous, and endometrioid subtypes.[18]

A prospective cohort study showed an inverse relationship among survival time and body mass index in females with ovarian carcinoma.[19] Pavelka et al demonstrated that for females having advanced ovarian carcinoma, obesity was independently associated with both lesser time in recurrence and on the whole survival.[20] These researchers endorsed under dosage of chemotherapy as a likely contributing cause. In a sub-cohort of 149 females having tumor stage III or IV, a considerable fashion was acknowledged supporting increased body mass index as an independent negative factor for overall (P = 0.02) and disease free (P = 0.02) survival.[20] In the SCOTROC I trial, in which chemotherapeutic doses were not restricted based on body weight, the researchers came across no difference among BMI subgroups and general rate of survival.[21]

There were 2 studies including a meta-analysis that described the link between survival rate of increased body weight and survival of ovarian carcinoma. Protani et al., reported that obese patients of ovarian carcinoma showed worse survival than lean patients with ovarian cancer.[22] Nevertheless, this association was applicable only to females with body mass index ≥30. Yang et al., established that obesity early in adulthood happens to be linked to increased mortality in patients having ovarian carcinoma.[23]

CONCLUSION

The frequency of high body mass index in ovarian cancer is quite high with statistically no significant difference among stage of tumour in patients of ovarian cancers with normal versus high BMI. So we recommend that public awareness programs on national and regional levels should be arranged to create awareness among public regarding this major public health issue of obesity among women as well as treating clinicians for a better future outcome in every aspect to reduce morbidity and mortality of these particular patients.

Author's Contribution:

Concept & Design of Study:	Anum Jafri
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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