The Perfect Microcosm: A Study of Cancer and Obesity

Jalal Almaskati, MD* Mazen Almaskati**

Objective: To study the prevalence of overweight and obesity amongst a sample of cancer patients in Bahrain during their initial phase of assessment.

Design: A retrospective randomized study of cancer patients' medical records.

Setting: Private outpatient cancer clinic, Bahrain.

Method: From March 2012 to August 2012, two hundred patients' records were randomly selected. The subjects' age, gender, nationality, type of cancer, history of smoking and family history of cancer were documented. Height and weight were obtained to calculate Body Mass Index (BMI) and patients were allocated to one of four BMI categories.

Result: The total mean BMI was 28.26 kg/m^2 ± 5.72. In males, the mean BMI was 27.35 kg/m^2 ± 7.15 and in females it was 28.60 kg/m^2 ± 5.07. Obesity was high in the range of 31 to 60 years; below 30 and above 61 years obesity was relatively low. Seven (3.5%) were underweight, 52 (26%) were normal and 141 (70.5%) were overweight or obese. Hundred (50%) patients had breast cancer, 24 (12%) had colon cancer, 16 (8%) had lymphoma and 14 (7%) had lung cancer. Two (28.6%) underweight patients had lung cancer and one (14.3%) patient in the same category had colon cancer. Thirty-one (43.1%) patients in the overweight category and 43 (62.3%) of obese patients had breast cancer.

Conclusion: The distribution of overweight and obesity in this study is consistent with the general population in both Bahrain and the GCC. High body mass index values in this study were mostly noted among breast and colon cancer.

Bahrain is considered to be a high-income country. Because of an increase in Bahrain's socioeconomic, political and cultural profile, there has become an increase in local and global concern towards the presence of non-communicable diseases within the population. Non-communicable diseases were found to contribute to as much as 79% of deaths in Bahrain, of which 32% were attributed to cardiovascular disease and 12% to cancer[1].

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* Consultant Medical Oncologist
** Medical Student, Imperial College London, UK
   Ibn Al Nafees Hospital
   Kingdom of Bahrain
   Email: drjalal@ibnalnafees.com

Obesity has become a major health issue and has been observed to be on the rise in Bahrain and worldwide[1]. Furthermore, studies have shown that the percentage of overweight and obese adults and children has markedly increased during the last several decades[2]. Obesity has been linked with coronary artery disease, stroke, diabetes and cancer[2]. Cancer of the esophagus, breast (post-menopausal), endometrium, colon, kidney and gall bladder are amongst the most common types of cancer found to be associated with obesity[2].

The total number of cancer cases in Bahrain from 1998 to 2005 were 3,338; 1,602 (48%) were males and 1,736 (52%) were females, an annual average of 417 cases[3]. The most common types of cancer in males were lung cancer, followed by colon cancer and prostate cancer. The most common type of cancer in females was breast cancer followed by colon cancer and lung cancer[3,4].

Obesity is a condition in which a person has an abnormally high and unhealthy proportion of body fat. Obesity is commonly measured using BMI, which is calculated by dividing a person's weight (in kilograms) by their height (in meters) squared. BMI provides a more accurate measure of obesity or being overweight than weight alone[3]. BMI below 18.5 indicates underweight, 18-24.9 is normal, 25-29.9 is overweight and 30+ is obese.

Obesity could be further subdivided into three classes (I, II, III), which have been found to be associated with different risk levels of comorbidities[5].

Obesity is classified according to BMI. BMI of 30-34.99 is class I and associated with moderate comorbidities; BMI 35-39.99 is class II and associated with severe comorbidities. BMI $\geq$ 40 is class III and associated with very severe comorbidities.

The aim of this study is to determine the prevalence of overweight and obesity amongst a sample of cancer patients in Bahrain during their initial phase of assessment.

METHOD

This study was performed between March 2012 and August 2012. Two hundred patients' records were randomly selected. The first case was randomly selected using random number generator and then retrieving every following fifth case record from patients' initial consultation. The data documented were age, gender, nationality, type of cancer, history of smoking and family history of cancer. Height and weight were obtained to calculate BMI.

BMI of subjects was calculated by the original formula: weight (kg)/height (m^2). Categorization of subjects based on their BMI was done according to the WHO Expert Committee Guidelines on BMI ranges[5].

Basic statistical analyses were conducted using Microsoft excel, and various tables and graphical forms of data were generated. The data were analyzed to determine the proportion of patients in each BMI category, cancer group, gender and history.

RESULT

Two hundred patients' records were reviewed. One hundred forty-five (72.5%) patients were females and 55 (27.5%) were males. One hundred fifty-six (78%) were Bahrainis and 44 (22%) were non-Bahrainis. The mean age was 50.2 years with a standard deviation of 12.3; the mean age of males was 54.5 ± 14.9 and the mean age of females was 48.5 ± 10.7. The mean weight was 73.6 kg ± 18.0. The mean weight of males was 80.5 kg ± 24.9 and the mean weight of females was 71.0 kg ± 13.8. The mean height was 1.61 m ± 0.93; the males the mean height was 1.71 m ± 0.78 and females was 1.57 m ± 0.70.

The weight and height of each patient was utilized to calculate their respective BMI. The total mean BMI was 28.26 kg/m^2 ± 5.72; the males mean BMI was 27.35 kg/m^2 ± 7.15 and females mean BMI was 28.60 kg/m^2 ± 5.07, see table 1.

**Table 1: The Mean BMI of the Sample, the Mean BMI of Females and Males and Standard Deviations**

BMI Group	Mean BMI (kg/m^2)	SD
Total	28.26	± 5.72
Female	28.60	± 5.07
Male	27.35	± 7.15

The age range was 20-61. Overweight was seen mainly in 20-30 years age group. Obesity was seen in 31-60 years. Obesity remained relatively low in ages below 30 and above 61. The rate of obesity below 50 years was 39% compared to 31% above 50 years, see table 2.

Table 2: The Proportion of Normal, Obese, Overweight and Underweight Patients in Each Age Group

Age Group	Normal(52)	Obesity(69)	Overweight(72)	Underweight(7)
20-30	37%	13%	50%	0%
31-40	29%	45%	26%	0%
41-50	26%	38%	32%	4%
51-60	21%	39%	39%	2%
61+	29%	18%	42%	11%

Out of the 200 patients, 7 (3.5%) patients were underweight and 52 (26%) had normal BMI. Seventy-two (36%) were overweight and 69 (34.5%) were obese; the total of overweight and obese patients were 141 (70.5%). Forty-six (23%) patients were obese class I, 18 (9%) obese class II and 6 (3%) were obese class III. Twenty-six (47.3%) males were overweight compared to 46 (31.7%) females. The percentages of cancer patients according to BMI are shown in figure 1.
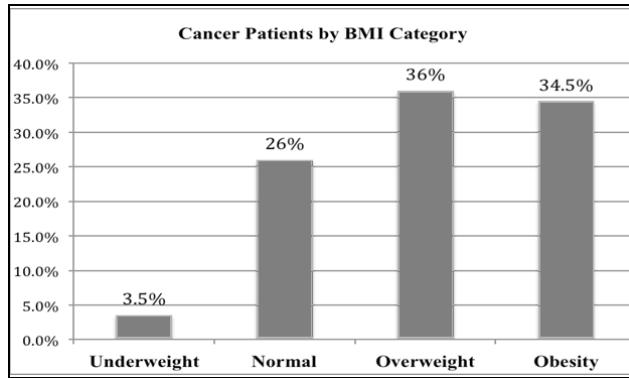
Figure 1: The Proportion of Patients in Each BMI Category

One hundred (50%) patients had breast cancer, 24 (12%) had colon cancer, 14 (7%) had lung cancer, 16 (8%) had lymphoma and 6 (3%) had ovarian cancer, while patients who had other types of cancer collectively totaled 40 (20%), see figure 2.
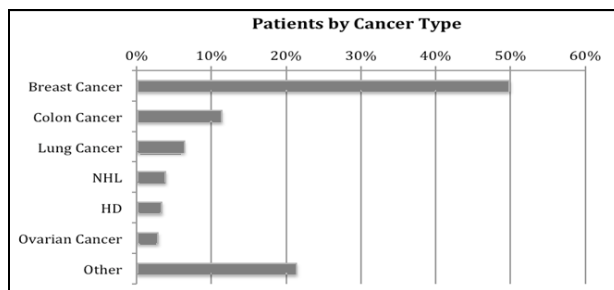
Figure 2: The Percentage of Different Cancer Types

Two (29%) underweight patients had lung cancer and one (14.3%) patient had colon cancer. Thirty-one (43.1%) overweight patients and 43 (62.3%) obese patients had breast cancer, see table 3.

Table 3: The Proportion of Patients with Different Cancer Types in Each BMI Category (N=200)

Category	Breast Cancer	Colon Cancer	Lung Cancer	Lymphoma	Ovarian Cancer	Others
Underweight (7)	0 (0%)	1 (14.3%)	2 (28.6%)	0 (0%)	1 (14.3%)	3 (42.8%)
Normal (52)	27 (51.9%)	5 (9.6%)	7 (13.5%)	3 (5.8%)	0 (0%)	10 (19.2%)
Overweight (72)	30 (41.2%)	11 (15.3%)	4 (5.6%)	4 (5.6%)	2 (2.8%)	21 (29%)
Obese (69)	43 (62.7%)	7 (10.4%)	1 (1.5%)	9 (12.0%)	3 (4.4%)	6 (9%)
Total	**100**	**24**	**14**	**16**	**6**	**40**

Twenty-five (36.2%) obese patients were non-smokers and 18 (26.1%) were smokers. Twenty-five (36.2%) obese patients had positive family history and 23 (33.3%) had negative family history.

The distribution of BMI values were skewed towards the high-end indicating high incidence of overweight and obesity in this sample.

The mean BMI of patients with breast cancer is significantly higher than that of patients with lung cancer, whilst history of smoking is considerably higher among lung cancer patients, compared to the high positive family history of cancer among breast cancer patients, see table 4.

Table 4: A Comparison of the Mean BMI, Smoking and Family History of Cancer in Lung Cancer and Breast Cancer Patients

	Lung Cancer	Breast Cancer
Mean BMI (kg/m^2)	24.9	28.9
BMI SD	± 7	± 4.9
Smoking History	9 (64.3%)	7 (7%)
Family History	2 (14.3%)	37 (37%)

DISCUSSION

In a study by Musaiger et al, obesity was found to be high in females below 50 years of age and with a negative history of smoking[6]. In our study, the prevalence of obesity was found to be high in the same groups of patients.

The contrasting levels of obesity in each gender are not directly reflected in the mean BMI in the groups. This finding was also observed in a study conducted by Hubail et al, where males had a mean BMI of 28.2 kg/m^2 and females had a mean BMI of 28.6 kg/m^2. In this study, the mean calculated female and male BMI values were consistent with the findings of the study conducted by Hubail et al[7].

WHO report of 2011 showed that the prevalence of obesity in Bahrain is 29.5% in males and 38% in females[1]. Zaghloul et al found that 36.7% males and 28.3% females were overweight; obesity was found to be 23.3% in males and 34.1% in females[8]. Our study findings were consistent with WHO and Zaghloul et al.

In this study, the prevalence of obesity was found to be low in 21-30 and 61+ age groups; the prevalence of underweight was high in the same age group. These findings are consistent with the findings published in the National Nutritional Survey for adult Bahrainis[9]. Underweight in elderly patients is commonly due to muscle wastage, early satiety, loss of taste and smell and dysphagia[10,11]. Underweight in young adults could be due to higher level of activity and an increased metabolism which results in an ability to counter the daily caloric intake of a young adult.

The link between obesity and cancer has already been established and is explained by several different mechanisms. Fat tissue is known to produce estrogen, high levels have been associated with cancer of the breast and endometrium. Likewise, fat cells can produce hormones called adipokines (e.g. leptin) which could stimulate or inhibit cell growth. In addition, the high level of insulin and insulin like growth factor commonly seen in obese patients may promote the development of certain tumors. Furthermore, fat cells may also have a direct and indirect effect on other tumor growth regulators such as mammalian target of rapamycin (mTOR) and AMP-

activated protein kinase. Other possible mechanisms include altered immune responses and oxidative stress[3].

Our study and the study of cancer incidence of GCC nationals, including Bahrain, conducted from 1998 to 2005 showed a significant degree of similarity; however, they are not entirely reflective of the distribution of cancer in the wider general population[2].

The most prevalent types of cancers in this sample of patients were breast, lung and colon cancer, which are consistent with the results of the eight year review of cancer incidence in Bahrain, which showed that the most prevalent types of cancer were lung and colorectal cancer in males compared to breast and lung cancer in females[4]. A study showed that cancer of the colon, rectum, and breast are associated with obesity[2]. Our study revealed that breast and colon cancer is highly prevalent among overweight and obese patients.

In this study, patients with lung cancer had 62% positive history of smoking; lung cancer affected 1.5% of obese and 28.6% of underweight patients. Furthermore, 26.5% of patients with a negative smoking history compared to 36.1% of patients with a positive smoking history were categorized as obese; this indicates that the prevalence of lung cancer is more closely related to smoking history rather than obesity.

The mean BMI in Bahraini males and females over the last four decades published by the WHO indicates a rising trend of the mean BMI from 24 to 28 in males and 25 to 29 in females[1,5]. The National Cancer Institute suggests that if the existing trends of obesity continue, this will result in an additional 500,000 cases of cancer in the United States by 2030. It suggests that if every adult reduced their BMI by 1% (equivalent to approximately 1kg) this could potentially result in the avoidance of 100,000 new cases of cancer[5].

CONCLUSION

The distribution of overweight and obesity in this study is consistent with that of the general population in Bahrain and GCC countries.

High BMI values were mostly noted among cancer types with a pre-established link to obesity. This includes breast and colon cancer, both of which were highly represented in this sample.

These findings may act as a pointer for further research in this field, which could highlight the relationship between obesity and cancer.

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