Sultan Qaboos University Med J, August 2014, Vol. 14, Iss. 3, pp. e330-336, Epub. 24TH Jul 14
Submitted 27TH Oct 13
Revision Req. 5TH Jan 14; Revision Recd. 2ND Feb 14
Accepted 18TH Feb 14

CLINICAL & BASIC RESEARCH

Obesity and Weight Loss Attempts among Subjects with a Personal History of Cancer

Ambria Moten,[1] Kayin Jeffers,[1] Daniel Larbi,[1] Roxanne Smith-White,[1] Teletia Taylor,[2] Lori Wilson,[3] Babafemi Adenuga,[4] Wayne Frederick,[2,3] *Adeyinka Laiyemo[1]

السمنة ومحاولات إنقاص الوزن عند من لديهم تاريخ شخصي للإصابة بالسرطان

أمبريا موتن،كاين جيفيرز، دانيال لاربي، روكسانا اسمث–وايت، تليتا تايلور، لوري ويلسن، بابا فيني بادونقا، وين فيدريك، وادينكا ليويمو

ABSTRACT: ***Objectives:*** Obesity is a risk factor for many cancers and obese cancer patients have a poorer prognosis. This study aimed to evaluate the prevalence of obesity and attempts to lose weight among cancer survivors. The effects of cancer treatment and time since cancer treatment were also evaluated. ***Methods:*** The 2007 Health Information National Trends Survey data were analysed between 2011 and 2013; respondents with (n = 966) and without (n = 6,093) a personal history of cancer were identified. Each respondent's body mass index (BMI) was calculated using self-reported height and weight measurements and categorised as normal (<25 kg/m^2), overweight (25–29.9 kg/m^2) or obese (≥30 kg/m^2). ***Results:*** Cancer survivors were older (mean age = 63.4 *versus* 44.7 years for those with no history of cancer). Overall, there were similar percentages of overweight (37.6% *versus* 34.1%; relative risk ratio [RRR] = 0.99; 95% confidence interval [CI]: 0.75–1.31) and obese (31.4% *versus* 27.5%; RRR = 1.04; 95% CI: 0.79–1.39) respondents among both cancer survivors and those without a history of cancer. Among overweight and obese participants, cancer survivors did not demonstrate increased weight loss attempts compared to those without a history of cancer (61.6% *versus* 66.3%; odds ratio = 0.94; 95% CI: 0.73–1.20). ***Conclusion:*** A high prevalence of overweight and obese cancer survivors were identified without any association with cancer treatment. However, cancer survivors did not demonstrate increased attempts to lose weight in comparison to those without a history of cancer despite awareness of their degree of body fatness. Increased efforts to promote the maintenance of a healthy weight among cancer survivors are needed.

Keywords: Cancer; Body Mass Index; Overweight; Obesity; Weight Loss.

الملخص: الهدف: تعد السمنة واحدة من عوامل الخطورة للإصابة بمختلف أنواع السرطان، ولدى المصاب بالسرطان والسمنة معا تنبؤا أسوأ من المصابين بالسرطان أو السمنة فقط. وتهدف هذه الدراسة لتقييم معدل انتشار السمنة ومحاولات إنقاص الوزن عند من تعافوا من السرطان. وتم كذلك تقييم تأثير العلاج من السرطان ومدة الإصابة به. **الطريقة:** تم تحليل اتجاهات المسح الوطني للمعلومات الصحية لعام 2007 م بين عامي 2011 و2013م عند 966 من من لهم تاريخ مرضي بالسرطان و6,093 من غير المصابين به. وتم حساب مؤشر كتلة الجسم من قياسات الأطوال والأوزان التي قام بها المشاركون في البحث بأنفسهم، والتي صنفت المشاركين على أنهم إما ذوي وزن طبيعي (أقل من 25 كجم لكل متر^2) أو وزن زائد (25 إلى 29.9 كجم لكل متر^2) أو بدناء (30 أو أكثر كجم لكل متر^2). **النتائج:** وجد أن الذين تعافوا من السرطان كانوا أكبر سنا من غيرهم (في المتوسط 63.4 عاما مقارنة بـ 44.7 عاما)، وكانت نسبة ذوي الأوزان الزائدة عند من تعافوا من السرطان ومن ليس لديهم تاريخ مرضي به متقاربة (37.6% و 31.4%؛ ونسبة المخاطرة النسبية 0.99 وفاصل الثقة 99% هو (0.75–1.31). أما عند البدناء فقد كانت هذه النسب هي 31.4% و27.5%؛ ونسبة المخاطرة النسبية 1.40 وفاصل الثقة 99% هو (0.79–1.39). ووجد كذلك أن عدد محاولات خفض الوزن عند ذوي الأوزان الزائدة أو البدناء من المتعافين من السرطان لم تكن مختلفة عنها عند غير المصابين بالسرطان (61.6% مقابل 66.3%؛ مع نسبة أرجحية 0.94، وفاصل الثقة 95% هو (0.73–1.20). **الخلاصة:** تم التعرف على عدد كبير نسبيا من ذوي الأوزان الزائدة والبدناء في أوساط المتعافين من السرطان دون أن يكون لذلك ارتباط بعلاج السرطان. ولم تكن محاولات تقليل الأوزان مختلفة عند هؤلاء عنها عند غير المصابين بالسرطان رغم معرفتهم بالزيادة في أوزانهم. هنالك حاجة لاستمرار الجهود للدعوة للحفاظ على أوزان مثالية عند المتعافين من السرطان.

مفتاح الكلمات: السرطان؛ مؤشر كتلة الجسم؛ وزن زائد؛ سمنة؛ إنقاص الوزن.

Advances in Knowledge

- *It is unknown whether cancer treatment affects the body mass index of cancer survivors. The present study evaluated data on a large sample of American adults and found that the type of cancer treatment and the elapsed time since treatment did not affect the prevalence of obesity among cancer survivors.*
- *Despite their poorer prognosis and awareness of their degree of body fatness, obese and overweight cancer survivors did not demonstrate increased efforts to lose weight in comparison to those without cancer.*

Departments of [1]Medicine and [3]Surgery, Howard University, Washington D.C., USA; [2]Howard University Cancer Center, Washington D.C., USA; [4]Howard University Hospital, Washington D.C., USA

**Corresponding Author e-mail: adeyinka.laiyemo@howard.edu*

Application to Patient Care

- *The findings of this study underscore the need to implement changes in the routine patient care of cancer survivors. Patient-provider discussions regarding maintaining a healthy weight should be emphasised among cancer survivors to improve patient outcomes. These discussions should focus on the importance of a healthy diet and engaging in physical exercise.*
- *In addition, the organisation of support groups with a focus on weight maintenance may provide additional social support for cancer survivors.*

Cancer is the second leading cause of death in the USA. In 2012, there were approximately 1.6 million new cases of cancer and 577,000 deaths from cancer; however, more people are surviving after being diagnosed with cancer.[1] The five-year relative survival rate for cancers diagnosed between 1975 and 1977 was only 49%; this rose to 67% for cancers diagnosed between 2001 and 2007.[1] In 2006, there were 11.4 million cancer survivors in the USA.[1]

The prevalence of obesity has increased in many parts of the world. For example, an estimated 72.5 million American adults are obese, representing approximately 36% of the population.[2] In Oman, it has been estimated that 30% of the population is overweight and 20% is obese.[3] While there have been major advances in the management of cancer, leading to an improvement in the survival rate, obesity has nevertheless been shown to have a negative impact on the prognosis of those with cancer.[4] Therefore, the rising incidence of obesity could undermine the improvement in cancer survival achieved in the last two decades.

Obesity increases the risk of many cancers including cancers of the colon and pancreas.[1] Obese cancer survivors also have an increased risk of cancer recurrence, second primary cancer occurrence and the development of comorbidities such as osteoporosis, diabetes and cardiovascular disease.[1,5–7] Furthermore, being overweight and/or obese are contributory factors in 14–20% of all cancer mortalities.[1] The reported prevalence of obesity among cancer survivors varies, ranging from 15–28%.[8,9]

Although obesity is associated with an increased risk of cancer, it is uncertain whether the experience or diagnosis of cancer encourages cancer survivors to modify their lifestyle choices, thereby leading to a decrease in the prevalence of obesity after the cancer diagnosis. Previous studies have suggested that there is no difference between the body mass indexes (BMI) of cancer survivors and those without a history of cancer; however, these studies were limited in that they focused on either one gender, a particular type of cancer or on participants from one geographical area.[9–13] No previous study has evaluated the effect of cancer treatment on the prevalence of obesity among cancer survivors.

This study examines the prevalence of overweight and obesity among a nationally representative sample of adult cancer survivors in the USA. It also evaluates the time interval since the cancer treatment as well as the cancer survivors' perception of their own body weight and examines weight loss attempts among overweight and obese cancer survivors.

Methods

This cross-sectional study was conducted between 2011 and 2013 at Howard University Hospital, Washington, D.C., USA, using data from the 2007 Health Information National Trends Survey (HINTS).[14] HINTS collects biennial data on cancer-related information in the USA. The HINTS 2007 data were collected between January and May 2008 using two different modalities, telephone and postal questionnaire. One sample was obtained via random digit dial in which participants completed a 30-min telephone survey; there were 4,092 respondents with an overall response rate of 24.2%. The other sample was obtained via a random selection of addresses from a list provided by the USA Postal Service, where participants were mailed a printed survey and given a postage-paid envelope in which to return the survey. This yielded 3,582 respondents with an overall response rate of 31%. These two modalities had a combined sample of 7,674 participants, representative of the national population.[14]

The analytic sample used in this study included 7,059 participants who provided information regarding their height, weight and cancer history. The respondents answered questions which ascertained whether they had ever been diagnosed with cancer, the site of that cancer, the treatment received and the time since completion of the treatment. Overall, there were 966 respondents with and 6,093 respondents without a personal history of cancer. The outcomes of interest were the BMI of overweight or obese respondents and their perceptions of body weight and attempts to lose weight in the previous 12 months. The BMI of the respondents was calculated as the body weight in kg divided by the height in metres squared and categorised

Table 1: Characteristics of respondents by cancer status (N = 7,059)*

Characteristics†	No history of cancer n (weighted %)	Cancer survivors n (weighted %)	*P* value
Mean age in years	44.7 (95% CI: 44.4–45.0)	63.4 (95% CI: 62.4–64.4)	-
Gender			
Male	2,388 (93.5)	403 (6.5)	0.001
Female	3,705 (91.9)	563 (8.1)	
Education			
Less than high school	533 (91.4)	96 (8.6)	
High school	1,491 (92.5)	237 (7.5)	
College/ vocational school	1,856 (94.0)	259 (6.0)	0.013
College graduate	2,194 (91.7)	371 (8.3)	
Smoking status			
Never	3,228 (94.1)	413 (5.9)	
Former	1,730 (88.1)	411 (11.9)	<0.001
Current	1,067 (94.8)	130 (5.2)	
Race			
Non-Hispanic white Caucasian	4,464 (91.2)	821 (8.8)	
Non-Hispanic black	599 (94.6)	54 (5.4)	<0.001
Hispanic	532 (96.9)	39 (3.1)	
Other	375 (97.2)	33 (2.8)	
Income			
<$20,000	921 (92.3)	153 (7.7)	
$20,000–34,999	864 (92.0)	157 (8.0)	
$35,000–49,999	716 (91.0)	134 (9.0)	0.025
$50,000–74,999	1,029 (93.9)	142 (6.1)	
≥$75,000	1,772 (94.0)	234 (6.0)	
Marital status			
Single	2,459 (93.8)	389 (6.2)	0.002
Married	3,612 (91.8)	574 (8.2)	
Health insurance			
No	695 (97.1)	60 (2.9)	<0.001
Yes	5,317 (91.9)	889 (8.1)	

CI = confidence interval.
**Survey weights were used for all analyses. The weighted total population estimate was N = 205,672,703. †Some data were missing for respondents: 22 education levels, 80 smoking statuses, 142 races, 937 income levels, 25 marital statuses and 98 insurance statuses.*

as normal (<25 kg/m^2), overweight (25–29.9 kg/m^2) or obese (≥ 30 kg/m^2). Of note, only seven (0.7%) cancer survivors had a BMI <18, four of whom had BMIs of 17.2–17.9 kg/m^2. In the current study, data from these seven respondents were included in the normal category.

Based on the recommendation of HINTS investigators, the effect of the survey modes (mail and telephone) was evaluated to determine whether a combined analysis was appropriate. There was no difference in modes regarding history of cancer and BMI (*P* >0.1 for all analyses). Therefore, the combined data of the two modes were used for these analyses. The demographic characteristics of subjects without a history of cancer were compared with those of cancer survivors. The mean age by cancer survival status was evaluated. Categorical variables were also compared between cancer survivors and subjects without a history of cancer. Multinomial regression models were used to evaluate the association of BMI categories with a personal history of cancer (yes *versus* no), cancer treatment (yes *versus* no) and time since cancer treatment (currently undergoing cancer treatment *versus* completed treatment less than one year previously *versus* completed treatment more than one year previously). Relative risk ratios (RRR) and 95% confidence intervals (CI) were also calculated. Logistic regression models were used to evaluate the association of cancer survival status with weight loss attempts within the previous 12 months among overweight and obese participants and to determine the odds ratios (OR) and 95% CIs. Due to the concern that the risk of poor outcomes with non-melanoma skin cancers might be lower than other cancers, subjects with non-melanoma skin cancers (n = 234) were excluded and the analysis was repeated. The results were unchanged (data not shown). Missing variables (22 education levels, 80 smoking statuses, 142 races, 937 income levels, 25 marital statuses and 98 insurance statuses) were set to missing without the use of dummy variables.

HINTS data contained sample weights to obtain population-level estimates and a set of 50 replicated sampling weights to obtain the correct standard errors.[14] In this study, survey weights were used in all analyses and variance estimations were performed using the Taylor series (linearisation) method to account for the complex survey design. All reported *P* values corresponded to two-sided tests and only weighted percentages were reported in this analysis. Stata® Statistical Software, Version 11.2 (StataCorp LP, College Station, Texas, USA) was used for all analyses.

Results

The mean age of the respondents was 46.1 years and 50.8% were women. Approximately 70.2% of respondents identified themselves as white/Caucasian, 11.4% as black and 12.1% as Hispanic. A total of 966 (7.3%) respondents had a previous cancer diagnosis while 6,093 (92.7%) had no history of cancer. The most common cancer types were non-melanoma skin cancer (22.7%), breast cancer (16.2%), prostate cancer (10.5%), melanoma skin cancer (9.6%), cervical cancer (10.4%), colon cancer (5.9%) and endometrial cancer (2.9%). Cancer survivors were older and more likely to be female [Table 1]. Furthermore, former smokers, non-Hispanic Caucasians and respondents with a lower socioeconomic status were more likely to have

Table 2: Adjusted* relative risk ratios for cancer status, cancer treatment and time since treatment by respondents' body mass index (N = 7,059)†

Characteristics	n	BMI <25 n = 2,607 (37.8%)	BMI 25–29 n = 2,476 (34.4%)		BMI ≥30 n = 1,976 (27.8%)	
		n (weighted %)	n (weighted %)	RRR (95% CI)	n (weighted %)	RRR (95% CI)
Cancer status						
No history of cancer	6,093	2,285 (38.3)	2,110 (34.1)	Reference	1,698 (27.5)	Reference
Cancer survivors	966	322 (31.1)	366 (37.6)	0.99 (0.75–1.31)	278 (31.4)	1.04 (0.79–1.39)
Cancer treatment						
No history of cancer	6,093	2,285 (38.3)	2,110 (34.1)	Reference	1,698 (27.5)	Reference
No treatment	114	32 (23.8)	42 (38.9)	1.42 (0.66–3.06)	40 (37.3)	1.46 (0.64–3.35)
Treatment	839	286 (32.1)	322 (37.6)	0.95 (0.70–1.27)	231 (30.3)	1.00 (0.74–1.35)
Time since cancer treatment						
No history of cancer	6,093	2,285 (38.3)	2,110 (34.1)	Reference	1,698 (27.5)	Reference
Still undergoing treatment	90	29 (32.3)	41 (43.8)	0.94 (0.41–2.14)	20 (23.9)	0.71 (0.32–1.55)
Completed treatment <1 year ago	144	47 (32.3)	67 (43.8)	0.87 (0.46–1.64)	30 (23.9)	0.66 (0.26–1.66)
Completed treatment ≥1 year ago	534	185 (32.2)	187 (34.3)	0.88 (0.63–1.23)	162 (33.5)	1.11 (0.75–1.64)

BMI = body mass index in kg/m²; RRR = relative risk ratio; CI = confidence interval.

**Adjusted for age, sex, education, smoking, race, income, marital status and health insurance status. †Survey weights were used for all analyses. The weighted total population estimate was N = 205,672,703.*

a history of cancer [Table 1].

A total of 2,607 (37.8%) respondents were in the normal BMI category, while 2,476 (34.4%) respondents were classified as overweight and 1,976 (27.8%) respondents were obese. Approximately 38% of cancer survivors were overweight and 31.4% were obese in comparison to 34.1% overweight and 27.5% obese respondents without a history of cancer [Table 2]. After adjusting for age, sex, education, smoking, race, income, marital status and health insurance status, cancer survivors were as likely to be overweight (RRR = 0.99; 95% CI: 0.75–1.31) or obese (RRR = 1.04; 95% CI: 0.79–1.39) as those without cancer [Table 2]. A total of 114 of the 953 cancer survivors (12.7%) reported that they did not undergo any cancer treatment even though 95.7% of these respondents had health insurance. Cancer survivors who did not receive treatment had a non-statistically significant increased risk of being overweight (RRR = 1.42: 95% CI: 0.66–3.06) or obese (RRR = 1.46; 95% CI: 0.64–3.35) as compared to those without a history of cancer. However, cancer survivors who had received treatment had a similar risk of being overweight (RRR = 0.95; 95% CI: 0.70–1.27) or obese (RRR = 1.00; 95% CI: 0.74–1.35). The amount of time that had passed since undergoing cancer treatment had no significant effect on the risk of being overweight or obese [Table 2].

Participants' opinions regarding their body weight are shown in Table 3. The self-assessed perceptions of cancer survivors regarding their body weight were similar to those without a history of cancer. Among respondents categorised as obese, 71.3% of cancer survivors and 65.4% of those without a history of cancer acknowledged that they were overweight. The majority of respondents believed that obesity was largely due to overeating and lack of exercise, regardless of cancer status. Although there were no statistically significant differences between cancer survivors and those without a history of cancer, a general pattern was observed that cancer survivors displayed less frequent attempts to lose weight in the previous 12 months [Table 3] and among all those with a BMI ≥25 kg/m² [Table 4].

Discussion

The prevalence of overweight (25–29 kg/m²) and obese (≥30 kg/m²) BMI categories among cancer survivors was evaluated. In addition, the effect of cancer treatment on BMI and weight loss attempts was assessed using nationally representative data. This study showed a high prevalence of excessive body size among cancer survivors; this prevalence was comparable to those without a history of cancer.

Table 3: Respondents' responses regarding their body weights and weight loss attempts by cancer status and body mass index*

Responses	No history of cancer			Cancer survivors		
	BMI <25	BMI 25–29	BMI ≥30	BMI <25	BMI 25–29	BMI ≥30
Your opinion regarding your body weight						
Overweight	2.2	21.1	65.4	6.0	24.8	71.3
Slightly overweight	25.1	54.2	29.5	25.8	54.3	24.4
Underweight	3.9	0.3	0	4.9	0	0
Slightly underweight	10.9	0.9	0.4	9.3	0.2	0
Just about right	57.9	23.5	4.6	54.0	20.8	4.3
Extent you believe that obesity is caused by overeating and lack of exercise						
A lot	73.5	75.7	72.9	73.0	81.7	65.5
Some	22.2	20.0	21.0	23.5	13.9	29.1
A little	3.2	3.2	5.5	3.5	2.6	3.5
Not at all	0.7	0.8	0.6	0	1.8	1.6
Attempts to lose weight in the past 12 months						
Yes	33.3	60.1	74.1	27.5	53.0	71.9
No	66.7	39.9	25.9	72.5	47.0	28.1

*BMI = body mass index in kg/m². *Data shown in weighted percentages.*

Cancer survivors did not demonstrate greater efforts to lose weight despite their increased risk of poor health outcomes. This underscores the need for care providers to place more emphasis on the maintenance of healthy body weight in routine care for cancer survivors.

Analysis of the characteristics of the study population revealed that cancer survivors were significantly more likely to be female, white/Caucasian, married and have health insurance. This is consistent with the published literature. For example, Courneya *et al*. reported that a greater proportion of Canadian cancer survivors were female (59.6% *versus* 49.4%) and white/Caucasian (91.6% *versus* 81.5%) when compared to those without cancer.[15] Similarly, Fairley *et al*. reported that cancer survivors from Massachusetts were more likely to be female (62.1% *versus* 52.4%) and white/Caucasian (94.3% *versus* 84.0%) compared to those without a history of cancer; however, there was no difference in marital status between the two groups.[12]

Table 4: Odds ratios of weight loss attempts among overweight and obese* respondents by cancer status

Cancer status	Tried to lose weight in the past 12 months n (weighted %)		Attempted *versus* not attempted to lose weight OR (95% CI)	
	No	Yes	Unadjusted	Adjusted†
No history of cancer	1,237 (33.7)	2,563 (66.3)	Reference	Reference
Cancer survivors	247 (38.4)	397 (61.6)	0.81 (0.64–1.03)	0.94 (0.73–1.20)

*OR = odds ratio; CI = confidence interval. *Body mass index of ≥25 kg/m². †Adjusted for age, sex, education, smoking, race, income, marital status and insurance status.*

The similarity in the prevalence of overweight and obese BMI categories among respondents with and without a personal history of cancer in this study was comparable to prior studies. For instance, Rogers *et al*. compared lifestyle behaviours, obesity and perceived health among 2,524 men with prostate cancer and 61,138 men without it.[11] The investigators found no significant difference in the prevalence of obesity between the two groups. Similarly, Fairley *et al*. analysed data from the 2006 Massachusetts Behavioral Risk Factor Surveillance System survey and found no significant difference between 716 cancer survivors and 7,375 participants without cancer with respect to smoking, obesity and physical activity.[12] Eakin *et al*. investigated the health behaviours of cancer survivors in Australia and reported that cancer survivors were slightly more likely to be obese than those without a history of cancer.[16] In an analysis of physical activity and obesity among Canadian cancer survivors, Courneya *et al*. reported in a subgroup analysis that prostate cancer survivors were less likely to be obese

(OR = 0.71; 95% CI: 0.56–0.90) compared to men without the disease.[15] Moreover, it was noted that prostate cancer survivors were 27% more likely to be physically active (OR = 1.27; 95% CI: 1.01–1.59). This increase in physical activity may account for the lower incidence of obesity in men with prostate cancer. There were no other significant differences in the prevalence of obesity between those with and without other types of cancer.[15]

It is conceivable that the dietary patterns of cancer survivors could be affected by cancer treatment—partly due to the side-effects of the treatment and the amount of time that has elapsed since treatment—and that this may affect the relationship between body weight and cancer survival status. However, the authors are not aware of any previous study that has evaluated the association of cancer treatment on the prevalence of overweight and obesity among cancer survivors. In the current study, no correlation was noted between the effect of receiving cancer treatment and the time since completing cancer treatment on the body weight of cancer survivors.

Prior studies have reported inconsistent or conflicting results with respect to physical activity levels between cancer survivors and those without a history of cancer. For instance, cancer survivors were more likely to be active,[17] less likely to participate in strenuous physical activity,[9,12] and there was no difference in the level of physical activity among cancer survivors and those without a history of cancer.[16] Although physical activity levels have been assessed in other studies, a search of the literature did not reveal any studies evaluating overall perceived weight loss attempts among those with and without a history of cancer. The findings of this study revealed that cancer survivors were not more likely to attempt to lose weight than those without a history of cancer. This is an area of research worthy of further investigation in order to discover the factors that motivate important behavioural changes among cancer survivors.

Given the poorer health outcomes that are associated with being overweight or obese, particularly among cancer survivors, the high prevalence of overweight and obesity among cancer survivors observed in this study should be viewed as a call for action. This may be applicable to other countries as well. These findings underscore the importance of addressing this issue with comprehensive interdisciplinary efforts in order to motivate cancer survivors to maintain a healthy weight and to equip healthcare providers with the resources to facilitate cost-effective targeted interventions for their patients. There is a need to improve communication between oncologists, primary care providers and patients as well as enhance public awareness through a process of education and information dissemination on cancer, an emphasis on discussing the prevention and effective treatment of cancer upon diagnosis.[18]

Apart from encouraging the adoption of a healthy diet and increasing physical activity, obese cancer survivors should be evaluated for bariatric surgical intervention. Recent research has suggested that the procedure can be safely performed among cancer survivors.[19] In addition, reports that obese patients had a reduced risk of cancer after undergoing bariatric surgeries also raises the possibility that maintaining a healthy weight through this modality may reduce the recurrence of cancer or second primary cancer incidence among cancer survivors.[20–22]

It is recommended that healthcare providers remain aware of the importance of maintaining a healthy weight and emphasise this to their patients, especially those who have a prior history of cancer. There is a need to increase public awareness of the health problems associated with obesity, particularly for cancer survivors. A multidisciplinary approach should be used to manage obesity among cancer survivors by involving nutritionists, social workers and personal trainers as local resources allow. Physicians should also discuss and advocate weight loss surgery for qualified cancer survivors.

There are some notable strengths of the current study, particularly that the study utilised a large, nationally representative sample of adults. In addition, the effects of cancer treatment and time since cancer treatment on obesity were also evaluated. However, there are some limitations to the study. The data used were based on self-reports by the patients. Furthermore, it was impossible to analyse the exact types of cancer treatment received, such as radiation therapy and locoregional *versus* systemic therapy, as the information was not available.

Conclusion

In conclusion, a high prevalence of overweight and obesity among cancer survivors was found, without any association with cancer treatment or elapsed time since treatment. The current study also revealed that cancer survivors, even though they had insight into their degree of body fatness, did not display greater efforts to lose weight in comparison to those without cancer. It is imperative that healthcare providers increase their efforts to encourage cancer survivors to maintain a healthy weight.

References

1. American Cancer Society. Cancer Facts & Figures 2012. From: www.cancer.org/Research/CancerFactsFigures/ACSPC-031941 Accessed: Aug 2013.
2. Centers for Disease Control and Prevention (CDC). Vital signs: State-specific obesity prevalence among adults: United States, 2009. MMWR Morb Mortal Wkly Rep 2010; 59:951–5.
3. Lakhtakia R. Conspicuous consumption and sedentary living: Is this our legacy to our children? Sultan Qaboos Univ Med J 2013; 13:336–40.
4. Burney IA, Al-Moundhri MS. Major advances in the treatment of cancer: What does a non-oncologist need to know? Sultan Qaboos Univ Med J 2008; 8:137–48.
5. Majed B, Moreau T, Senouci K, Salmon RJ, Fourquet A, Asselain B. Is obesity an independent prognosis factor in woman breast cancer? Breast Cancer Res Treat 2008; 111:329–42. doi: 10.1186/bcr3572.
6. Chlebowski RT, Aiello E, McTiernan A. Weight loss in breast cancer patient management. J Clin Oncol 2002; 20:1128–43. doi: 10.1200/JCO.20.4.1128.
7. Demark-Wahnefried W, Aziz NM, Rowland JH, Pinto BM. Riding the crest of the teachable moment: Promoting long-term health after the diagnosis of cancer. J Clin Oncol 2005; 23:5814–30. doi: 10.1200/JCO.2005.01.230.
8. Rabin C, Politi M. Need for health behavior interventions for young adult cancer survivors. Am J Health Behav 2010; 34:70–6. doi: 10.5993/AJHB.34.1.9.
9. Rausch SM, Millay S, Scott C, Pruthi S, Clark MM, Patten C, et al. Health behaviors among cancer survivors receiving screening mammography. Am J Clin Oncol 2012; 35:22–31. doi: 10.1097/COC.0b013e318200598e.
10. Mayer DK, Terrin NC, Menon U, Kreps GL, McCance K, Parsons SK, et al. Health behaviors in cancer survivors. Oncol Nurs Forum 2007; 34:643–51. doi: 10.1188/07.ONF.643-651.
11. Rogers LQ, Courneya KS, Paragi-Gururaja R, Markwell SJ, Imeokparia R. Lifestyle behaviors, obesity, and perceived health among men with and without a diagnosis of prostate cancer: A population-based, cross-sectional study. BMC Public Health 2008; 8:23. doi: 10.1186/1471-2458-8-23.
12. Fairley TL, Hawk H, Pierre S. Health behaviors and quality of life of cancer survivors in Massachusetts, 2006: Data use for comprehensive cancer control. Prev Chronic Dis 2010; 7:A09.
13. Coups EJ, Ostroff JS. A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. Prev Med 2005; 40:702–11. doi: 10.1016/j.ypmed.2004.09.011.
14. Cantor D, Coa K, Crystal-Mansour S, Davis T, Dipko S, Sigman R. Health Information National Trends Survey (HINTS) 2007: Final Report. From: www.hints.cancer.gov/docs/HINTS2007FinalReport.pdf Accessed: May 2012.
15. Courneya KS, Katzmarzyk PT, Bacon E. Physical activity and obesity in Canadian cancer survivors: Population-based estimates from the 2005 Canadian Community Health Survey. Cancer 2008; 112:2475–82. doi: 10.1002/cncr.23455.
16. Eakin EG, Youlden DR, Baade PD, Lawler SP, Reeves MM, Heyworth JS, et al. Health behaviors of cancer survivors: Data from an Australian population-based survey. Cancer Causes Control 2007; 18:881–94. doi: 10.1007/s10552-007-9033-5.
17. Bellizzi KM, Rowland JH, Jeffery DD, McNeel T. Health behaviors of cancer survivors: Examining opportunities for cancer control intervention. J Clin Oncol 2005; 23:8884–93. doi: 10.1200/JCO.2005.02.2343.
18. Burney IA. The trend to seek a second opinion abroad amongst cancer patients in Oman: Challenges and opportunities. Sultan Qaboos Univ Med J 2009; 9:260–3.
19. Gagné DJ, Papasavas PK, Maalouf M, Urbandt JE, Caushaj PF. Obesity surgery and malignancy: Our experience after 1500 cases. Surg Obes Relat Dis 2009; 5:160–4. doi: 10.1016/j.soard.2008.07.013.
20. Tee MC, Cao Y, Warnock GL, Hu FB, Chavarro JE. Effect of bariatric surgery on oncologic outcomes: A systematic review and meta-analysis. Surg Endosc 2013; 27:4449–56. doi: 10.1007/s00464-013-3127-9.
21. Christou NV, Lieberman M, Sampalis F, Sampalis JS. Bariatric surgery reduces cancer risk in morbidly obese patients. Surg Obes Relat Dis 2008; 4:691–5. doi: 10.1016/j.soard.2008.08.025.
22. Ashrafian H, Ahmed K, Rowland SP, Patel VM, Gooderham NJ, Holmes E, et al. Metabolic surgery and cancer: Protective effects of bariatric procedures. Cancer 2011; 117:1788–99. doi: 10.1002/cncr.25738.