



Modifiable lifestyle behaviours impact the health-related quality of life of bladder cancer survivors

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Objective

To examine health behaviours in bladder cancer survivors including physical activity (PA), body mass index, diet quality, smoking and alcohol consumption, and to explore their relationship with health-related quality of life (HRQoL).

Subjects/Patients and Methods

Cross-sectional questionnaire packages were distributed to bladder cancer survivors (muscle-invasive bladder cancer [MIBC] and non-muscle-invasive bladder cancer [NMIBC]) aged >18 years, and proficient in English. Lifestyle behaviours were measured using established measures/questions, and reported using descriptive statistics. HRQoL was assessed using the validated Bladder Utility Symptom Scale, and its association with lifestyle behaviours was evaluated using analysis of covariance (ANCOVA) and multivariate regression analyses.

Results

A total of 586 participants completed the questionnaire (52% response rate). The mean (SD) age was 67.3 (10.2) years, and

68% were male. PA guidelines were met by 20% ($n = 117$) and 22.7% ($n = 133$) met dietary guidelines. In all, 60.9% ($n = 357$) were overweight/obese, and the vast majority met alcohol recommendations ($n = 521$, 92.5%) and were current non-smokers ($n = 535$, 91.0%). Health behaviours did not differ between MIBC and NMIBC, and cancer treatment stages. Sufficient PA, healthy diet, and non-smoking were significantly associated with HRQoL, and the number of health behaviours participants engaged in was positively associated with HRQoL ($P < 0.001$).

Conclusion

Bladder cancer survivors are not meeting guidelines for important lifestyle behaviours that may improve their overall HRQoL. Future research should investigate the impact of behavioural and educational interventions for health behaviours on HRQoL in this population.

Keywords

health behaviours, health-related quality of life, patient education, supportive care, #BladderCancer, #blcsm

Introduction

Bladder cancer is a common genitourinary cancer, and with the ageing population, its prevalence is expected to increase significantly [1,2]. Due to older age, high recurrence rates, and repeated surgeries for noninvasive disease and cystectomy for invasive disease, bladder cancer survivors (defined from the point of diagnosis) [3] carry an extensively high disease-related personal and economic burden [4,5]. Modifiable lifestyle behaviours such as: physical activity (PA), weight management, diet, and smoking cessation, may reduce

morbidity and mortality, and have been shown to improve health-related quality of life (HRQoL) in survivors of multiple other cancers [6–8]. However, to date, there have been few large studies that assess the degree to which bladder cancer survivors are adhering to current lifestyle recommendations across the disease trajectory, and between those with different stage of disease (muscle-invasive bladder cancer [MIBC] vs non-muscle-invasive bladder cancer [NMIBC]). Further, the impact of lifestyle behaviours of bladder cancer survivors on HRQoL remains unclear due to small sample sizes and measurement issues including the use of generic HRQoL

questionnaires or bladder cancer-specific questionnaires that have not been validated [9–11].

To build upon this literature, we have conducted a large, cross-sectional study of bladder cancer survivors using validated measures to: (i) describe health behaviours (PA, body mass index [BMI], diet quality, smoking and alcohol consumption) and compare between survivors with MIBC vs NMIBC and across the different phases of the cancer journey (newly diagnosed and undergoing treatment, in follow-up surveillance, and recurrent/metastatic disease); and (ii) explore the relationship between lifestyle behaviours and HRQoL.

Subjects/Patients and Methods

Study Recruitment and Procedure

This study was approved by the Research Ethics Board at the University Health Network (UHN, 13-7207). Detailed inclusion/exclusion criteria and recruitment procedures are described in a previous report [12]. Briefly, bladder cancer survivors (MIBC and NMIBC) aged >18 years and proficient in English attending regular clinic visits at the Princess Margaret Cancer Centre (PMCC) and The Ottawa Hospital (TOH) were approached in-person, and an online version of the survey (Appendix S1) was e-mailed to the registered patient members of Bladder Cancer Canada (BCC).

Outcome Measures

Our previous report describes the initial development and piloting of the questionnaire used for data capture [12]. The questionnaire package included the following: (i) Demographic and disease/treatment information; (ii) PA was assessed using the Godin Leisure-Time Exercise Questionnaire, a three-item tool that measures the weekly minutes that a participant spends participating in strenuous, moderate, and mild-intensity exercise [13]. Total weekly PA was measured by the total minutes reported engaging in mild/moderate/strenuous exercise. Based on current guidelines for PA, participants were categorised as ‘sufficiently active’ if they met the guideline of ≥ 150 min of moderate/strenuous exercise, otherwise, they were considered ‘insufficiently active’ [14,15]; (iii) BMI was calculated using the questions, ‘How much do you currently weigh?’ and ‘What is your height?’, and applying the formula: $\frac{\text{Weight in Kilograms}}{\text{Height in meters}^2}$. Each participant was subsequently categorised as: ‘underweight or normal weight’ if their BMI was < 25.0 kg/m², ‘overweight’ if their BMI was 25–29.9 kg/m², and ‘obese’ if their BMI was ≥ 30 kg/m²; (iv) Diet quality: was measured by a modified version of the Rapid Eating Assessment for Participants – Short (REAP-S; 10 items) [16]. The REAP-S contains seven items scored from 1 to 3 that assess intake of fruits, whole grains, and vegetables (FWV), and dairy and

meat in a typical week. The summed score estimates dietary quality, with higher scores indicating healthier eating behaviours (range 7–21). In addition to the total sum, we also summed the scores for sufficient consumption of FWV as a marker of healthy dietary patterns. If participants scored a total of 9 points from the three items, they were categorised as having ‘sufficient’ FWV, and < 9 points was considered ‘insufficient’ FWV. Lastly, participants were asked how willing they were to make changes in their eating habits in order to be healthier (scale, very willing 1–5 not at all willing); (v) Smoking status: was measured by the question, ‘Have you smoked at least part of a cigarette in the past 7 days?’ – ‘Yes’ indicated current smoker, and ‘No’ indicated that they were a non-smoker; (vi) Alcohol consumption: was measured using the question, ‘Over the past 12 months, on average how many alcoholic drinks do you have each week?’, and using current guidelines (male ≤ 15 , female ≤ 10 drinks/week), participants were categorised into ‘Within’ or ‘Exceeding’ alcohol consumption recommendations [17]; (vii) HRQoL: was evaluated using the 10-item, validated Bladder Utility Symptom Scale (BUSS) [18]. The BUSS is a 10-question, global HRQoL questionnaire that evaluates generic and bladder cancer-specific domains of QoL. The total BUSS for each participant was calculated by summing up the scores from each question (maximum = 100), with a higher score indicating higher HRQoL [12].

Statistical Analysis

Demographic and clinical information on the sample were reported using descriptive statistics.

Description of Health Behaviours

Health behaviours were reported using descriptive statistics across the study cohort. Health behaviours between survivors of MIBC vs NMIBC and across the different phases of the cancer journey (newly diagnosed and undergoing treatment, in follow-up surveillance, and recurrent/metastatic disease) were compared using chi-square or Fisher’s exact tests for categorical variables and Student’s *t*-test or ANOVA for continuous variables.

Association Between Lifestyle Behaviours and HRQoL

The association of each health behaviour with HRQoL was examined using analysis of covariance (ANCOVA), while adjusting for significant demographic and clinical confounders such as education status, diagnosis with MIBC or NMIBC, and time since diagnosis. To examine whether the cumulative number of net health behaviours would be significantly associated with better HRQoL, health behaviour

scores of 0–5 were created by assigning 1 point for each of the following health behaviours: being sufficiently active, consuming sufficient FWV, not smoking, alcohol consumption within recommendation, and BMI of <25 kg/m² [19]. Trend analysis was then performed to check the association of health behaviour score with total BUSS score, by controlling for the same confounders used in the aforementioned analysis.

Statistical significance was set as a $P < 0.05$ (two-sided). The Statistical Analysis System (SAS), version 9.3 (SAS Institute Inc., Cary, NC, USA) was used for all analyses.

Results

The response rate for the questionnaire was 52% (586/1126, returned/distributed), with 204 (204/308, 66%) from the PMCC, 129 (129/183, 70%) from TOH, and 253 (253/625, 40%) from the BCC network. Data from the three study sites were pooled, as their HRQoL scores did not differ significantly ($P = 0.428$). Demographic and clinical

Table 1 Demographic and clinical data of study participants.

Variable	Value
Number of participants	586
Age, years, mean (SD)	67.3 (10.2)
Sex, <i>n</i> (%)	
Male	401 (68.4)
Female	183 (31.2)
Country of birth, <i>n</i> (%)	
Canada	397 (67.7)
Outside of Canada	183 (31.2)
Education, <i>n</i> (%)	
≤Post-secondary	204 (34.8)
>Post-secondary	378 (64.5)
Residence setting, <i>n</i> (%)	
Urban	319 (54.4)
Suburban	166 (28.3)
Rural	97 (16.6)
Time since diagnosis, <i>n</i> (%)	
0–2 years ago	75 (12.8)
2–5 years ago	288 (49.1)
5+ years ago	190 (32.4)
Disease type, <i>n</i> (%)	
MIBC	137 (23.4)
NMIBC	324 (55.3)
I do not know	113 (19.3)
TNM staging, <i>n</i> (%)	
Ta, CIS, T1	324 (55.3)
T2–T4	129 (22.0)
N+, M+	8 (1.4)
I do not know	113 (19.3)
Treatment, <i>n</i> (%)	
Surgery only	170 (29.7)
Chemotherapy only	16 (2.8)
Immunotherapy (BCG)	33 (5.8)
Radiation only	3 (0.5)
Surgery + chemotherapy	108 (21.2)
Surgery + immunotherapy (BCG)	261 (51.2)
Surgery + radiation	35 (6.9)

BCG, *Bacillus Calmette–Guérin*.

information of the study cohort are presented in Table 1 and overall health behaviours are shown in Table 2.

Description of Health Behaviours

PA: Participants were engaging in a mean (SD) of 140 (97) min of total PA (mild/moderate/strenuous) per week. Based on current guidelines [15], 20% ($n = 117$) of respondents were considered sufficiently active. NMIBC vs MIBC and cancer journey groups did not differ significantly in meeting sufficient exercise guidelines (Tables S1 and S2). The MIBC group had a mean (SD) of 61 (119) min of strenuous and moderate exercise and in the NMIBC group it was 75 (117) min ($P = 0.84$). By cancer journey group, the newly diagnosed group had a mean (SD) of 58 (108) min, in the follow-up group it was 74 (125) min, and in the recurrent/metastatic group it was 45 (82) min ($P = 0.60$).

BMI

A large portion of participants were overweight (37.7%, $n = 221$) or obese (23.2%, $n = 136$). BMI categories did not differ significantly between NMIBC vs MIBC or cancer journey groups (Tables S1 and S2).

Diet Quality

Details of responses to each REAP-S item are included in Table 3. The mean (SD) REAP-S score was 16.5 (2.9). In all, 42% ($n = 258$) of participants were usually/often eating ≥2 servings of fruit, 49.0% ($n = 287$) vegetables, and 46.9% ($n = 275$) of whole grains per day and 22.7% ($n = 133$) did all three. In terms of willingness to make changes in their eating habits, respondents scored a mean (SD, range) of

Table 2 The number and proportion of participants in each health behaviour group.

Health behaviour	<i>N</i> (%) of <i>N</i> = 586
PA	
Sedentary or insufficiently active	453 (77.3)
Sufficiently active	117 (20.0)
BMI [mean (SD) 27.5 (9.1) kg/m ²]	
Underweight or normal weight	211 (36.0)
Overweight	221 (37.7)
Obese	136 (23.2)
Diet [mean(SD) REAP-S score 16.5 (2.9)]	
Sufficient FWV	133 (22.7)
Insufficient FWV	415 (70.8)
Smoking	
History of smoking	403 (71.0)
Ex-smoker	352 (61.9)
Current smoker	51 (9.0)
Alcohol	
Within recommendation	521 (92.5)
Exceeded recommendation	42 (7.5)

Table 3 Total responses to each item in the REAP-S measure.

REAP-S item (asked in reference to an average week)	N (%) of N = 586
Skip breakfast	
Usually/often	72 (12.8)
Sometimes	84 (14.9)
Rarely/never	407 (72.3)
Eat 4 or more meals out	
Usually/often	48 (8.8)
Sometimes	128 (23.4)
Rarely/never	372 (67.9)
Eat <2 servings of whole grains a day	
Usually/often	111 (19.9)
Sometimes	173 (30.9)
Rarely/never	275 (49.2)
Eat less than 2 servings of fruits a day	
Usually/often	78 (14.0)
Sometimes	193 (34.6)
Rarely/never	287 (51.4)
Eat/drink <2 servings of dairy products a day	
Usually/often	122 (21.7)
Sometimes	204 (36.3)
Rarely/never	236 (42.0)
Eat <2 servings of vegetables a day	
Usually/often	78 (14.0)
Sometimes	193 (34.6)
Rarely/never	287 (51.4)
Eat >227 g (8 oz) of meat a day	
Usually/often	135 (24.3)
Sometimes	192 (34.6)
Rarely/never	228 (41.1)

4.2 (1.0, 1–5). The mean (SD) REAP-S score between NMIBC [16.8 (2.7)] and MIBC [16.8 (3.0)] did not differ ($P = 0.94$) and there was no difference in score between newly diagnosed [16.6 (3.0)], follow-up surveillance [16.5 (3.0)], and recurrent/metastatic disease [17.0 (2.4)] groups ($P = 0.65$). Furthermore, NMIBC vs MIBC and cancer journey groups did not differ significantly in their FWV consumption ($P = 0.18$ and $P = 0.88$, respectively), or their willingness to change their diets ($P = 0.31$ and $P = 0.44$, respectively).

Smoking

A large majority of the study participants met smoking guidelines, with only 9.0% ($n = 51$) being current smokers at the time of the survey. A majority of participants ($n = 403$, 71.0%) reported a history of smoking. Current smoking status did not differ between MIBC vs NMIBC or between cancer journey groups ($P = 0.28$ and $P = 0.37$, respectively).

Alcohol Consumption

Most participants were meeting recommended consumption guidelines for alcohol ($n = 521$, 92.5%). There were no differences between MIBC vs NMIBC and cancer journey groups based on alcohol consumption ($P = 0.82$ and $P = 0.80$, respectively).

Table 4 The mean HRQoL for groups of each health behaviour.

Health behaviour	HRQoL*	
	Unadjusted	Adjusted*
PA, mean (SD)		
Insufficiently active	76.2 (18.2)	75.9 (18.0)
Sufficiently active	83.7 (13.6)	84.1 (13.4)
d^{\ddagger}	0.47	0.51
BMI, mean (SD)		
Underweight or normal weight	78.4 (18.2)	78.3 (18.5)
Overweight or obese	77.2 (17.2)	77.2 (17.2)
d	0.07	0.07
Diet quality, mean (SD)		
Insufficient FWV	75.2 (18.5)	76.5 (17.5)
Sufficient FWV	80.0 (16.5)	81.6 (16.6)
d	0.25	0.29
Smoking, mean (SD)		
Current smoker	69.2 (24.2)	67.8 (23.5)
Non-smoker	78.6 (16.6)	78.5 (16.5)
d	0.45	0.53
Alcohol, mean (SD)		
Above recommendation	81.4 (16.2)	81.1 (17.1)
Within recommendation	77.5 (17.5)	77.4 (17.3)
d	0.23	0.21

*Higher scores on the HRQoL measure indicate higher self-reported HRQoL on the BUSS. *Mean adjusted for education status, MIBC or NMIBC diagnosis and time since diagnosis. $^{\ddagger}d$ (Cohen's d) = $\text{Mean}_1 - \text{Mean}_2 / \text{SD}_{\text{pooled}}$; $d = 0.2$ (small effect); $d = 0.5$ (moderately large effect); $d = 0.8$ (large effect).*

Association Between Health Behaviours and HRQoL

For each health behaviour, the unadjusted and adjusted mean \pm SD BUSS scores are reported in Table 4. Results from ANCOVA controlling for education status, MIBC or NMIBC diagnosis and time since diagnosis showed that meeting PA recommendations, healthy diet, and non-smoking were significantly associated with HRQoL. Meeting alcohol recommendations and BMI were not associated with HRQoL (Table 4).

Health behaviour scores (0–5) were calculated for each participant as described in the statistical analysis section. There were only four participants with a score of 0, and they were combined with individuals with a score of 1 for the purpose of analysis. Similarly, 17 participants with a score of 5 were combined with individuals with a score of 4 to create the score category of 4–5. In total, 42 (7.6%) participants were engaging in 0–1 health behaviours, 224 (40.4%) in 2, 187 (33.6%) in 3, and 102 (18.4%) in 4–5. There was a positive association between the number of health behaviours participants were engaged in and HRQoL, and the linear trend was significant ($P < 0.001$) (Table 5 and Fig. 1).

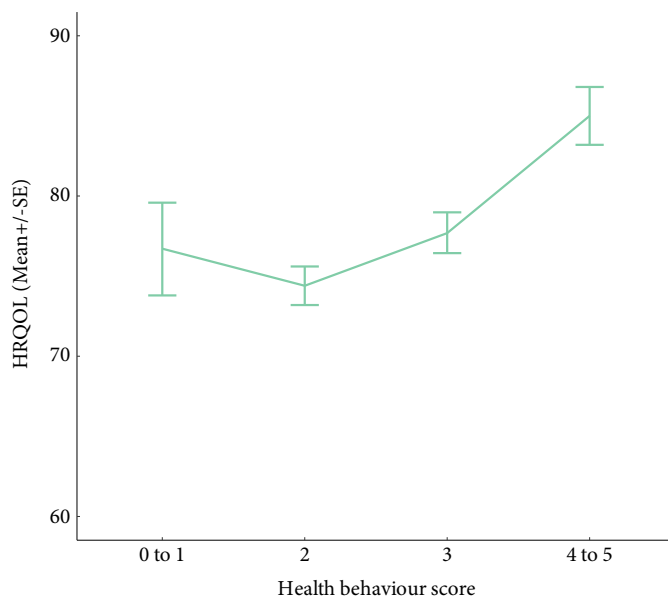
Discussion

The present study found that a minority of bladder cancer survivors are meeting PA and dietary recommendations, and the majority are overweight or obese. HRQoL was

Table 5 Unadjusted and adjusted means of HRQoL by health behaviour scores.

Score	N (% of population)	Unadjusted, mean (sd)	Adjusted*, mean (sd)
0–1	42 (7.6)	76.8 (20.4)	76.7 (18.9)
2	224 (40.4)	74.9 (18.02)	74.4 (18.0)
3	187 (33.6)	77.7 (17.1)	77.7 (16.9)
4–5	102 (18.4)	84.2 (13.8)	85.01 (13.7)

*Mean adjusted for education status, MIBC or NMIBC diagnosis, and time since diagnosis.

Fig. 1 *HRQoL (mean ± se) for total health behaviour. *Mean adjusted for education status, MIBC or NMIBC diagnosis, and time since diagnosis.

significantly associated with non-smoking, meeting PA and dietary recommendations; and they were additive, as revealed by the increasing trend of reported HRQoL with increasing number of met health behaviours. To our knowledge, this is the first study to comprehensively investigate a wide span of health behaviours in a diverse sample of bladder cancer survivors.

More than two-thirds (77.3%) of study participants were sedentary or insufficiently active according to the American Cancer Society (ACS) guidelines [15]. The present study cohort reported lower total PA levels than the general Canadian population, and also compared to other bladder cancer survivor studies [11,20,21]. This may be due to our exclusion of mild exercise, which is not included in the ACS recommendations. Mild exercise can include domestic work, which was the PA domain that Gopalakrishna *et al.* [11] found most reported by bladder cancer survivors. PA was positively and strongly associated with HRQoL, a finding that

is supported by previous studies of bladder cancer populations [11]. Given this, as well as previous work that has demonstrated that regular PA can result in a 50% reduction in risk of functional limitations and disability [19], supervised aerobic and resistance exercise programmes should be recommended to bladder cancer survivors who are not meeting PA recommendations.

In terms of diet quality, we found that 22.7% of the participants were meeting recommendations for FWV intake. This proportion is similar to other reports of patients with cancer (14.8–18.2%), but lower than a recent study of bladder cancer survivors that found 66.8% met fruit and vegetable recommendations [7,22]. These findings warrant concern, given the very low number of bladder cancer survivors who are meeting recommendations in our present cohort, and the emerging evidence that links diet quality to improved health outcomes including mortality, disability and chronic disease in the general population [23]. There is a lack of research on the impact of diet quality on the HRQoL of bladder cancer survivors, which has led to mixed evidence of its effects [7,24,25]. From studies involving other cancer groups, there is evidence suggesting that a poor diet leads to functional decline, worsened overall health outcomes, and recurrence [6,15,26]. In our present analyses, better diet quality, as measured by consuming sufficient FWV, as well as by the REAP-S score, was shown to be associated with higher HRQoL. Thus, nutritional screening is recommended to raise awareness regarding diet quality and to identify bladder cancer survivors who may need additional nutrition-related resources and support services.

The mean (sd) BMI of this study population was 27.5 (9.1) kg/m², which was comparable to the bladder cancer survivors [27.9 (5.5) kg/m²] in the Gopalakrishna *et al.* [11] study, and similar to the BMI distribution of the general population of Canadians aged 18–79 years [25,27]. Despite PA and diet quality both being positively correlated with HRQoL, BMI was not associated with HRQoL. This is in contrast to reports from other cancer sites, which have reported that being overweight or obese may result in functional decline and reduced HRQoL [28,29]. Despite this finding, there is emerging evidence to suggest an association between BMI and cancer recurrence, and counselling regarding weight loss is recommended [30].

Encouragingly, while a large proportion of respondents had a history of smoking, which increases their risk of developing bladder cancer [31], very few respondents were current smokers. It is possible that a diagnosis of cancer may have presented an incentive for smoking cessation. Screening for smoking status and the provision of cessation services are important, given that continued smoking can affect disease outcomes [31], and we found that smoking behaviour was also correlated with lower HRQoL. Alcohol consumption

among our present participants was quite low, and not associated with HRQoL.

The effect of health behaviours was additive; that is, the more health behaviours bladder cancer survivors engaged in, the higher their HRQoL. Interestingly, we found that none of the health behaviours differed significantly across disease groups (MIBC vs NMIBC) or cancer journey groups (newly diagnosed, follow-up surveillance, or metastasis/recurrence), which suggests that lifestyle behaviour interventions may not need to target a specific group of bladder cancer survivors and should be offered across the cancer trajectory, although ideally at diagnosis.

A limitation to the present study is its cross-sectional design, not allowing for definitive conclusions to be made on the benefits of exercise, non-smoking, and diet quality on HRQoL, and it is uncertain whether HRQoL can conversely influence health behaviours. Also, due to the self-reported nature of the questionnaire, participants may have overestimated their exercise levels and dietary patterns. Similarly, treatment information was not included in the analysis, as it could have been misreported by patients. Nonetheless, there is scarce research in the field of health behaviours and HRQoL of bladder cancer survivors and our present study provides data to support the importance of conducting more interventional, randomised controlled trials for different health behaviours and their potentially additive effects on HRQoL, and how they can differentially affect different subgroups of bladder cancer survivors [7].

Conclusions

Our present results showed that many MIBC and NMIBC survivors are not engaging in important health behaviours throughout the cancer journey and this is associated with worse HRQoL. Future research should study the impact of lifestyle interventions on behaviour changes and HRQoL in this group of survivors.

Conflict of Interest

There were no conflicts of interest from any of the authors.

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Abbreviations: ACS, American Cancer Society; BCC, Bladder Cancer Canada; BMI, body mass index; BUSS, Bladder Utility Symptom Scale; FWV, fruits, whole grains, and vegetables; HRQoL, health-related quality of life; MIBC, muscle invasive bladder cancer; NMIBC, non-muscle invasive bladder cancer; PA, physical activity; PMCC, Princess Margaret Cancer Centre; REAP-S, Rapid Eating Assessment for Participants – Short; TOH, The Ottawa Hospital.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Health behaviours by disease type.

Table S2. Health behaviours by cancer journey.

Appendix S1. Health behaviours questionnaire package.