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Sexual Health and Quality of Life in Cancer Survivors With Pelvic Radiation Injuries

KEY WORDS

Cancer survivors
Cross-sectional design
Late radiation tissue injuries
Pelvic cancers
Quality of life
Sexual health
Symptom burden

Background: Little knowledge exists on how late radiation tissue injuries (LRTIs) affect sexual health and health-related quality of life (HRQOL) in pelvic cancer survivors.

Objective: To explore sexual health and HRQOL in cancer survivors with pelvic LRTI.

Method: A descriptive cross-sectional study was conducted, including 83 pelvic cancer survivors with LRTI. Data on sexual health, LTRIs, and HRQOL were collected by validated questionnaires, whereas medical variables were collected from medical records.

Results: Participants' sexual health was severely impaired. Bowel and urinary LRTIs correlated with most of the symptoms of impaired sexual health (Pearson $r = -0.241$ to -0.376 , $P < .05-.01$). Men and women reported different sexual challenges related to functional and symptomatic variables but not on the gender-neutral aspects of sexual health. Younger survivors, gynecological cancer survivors, or those who received external and internal radiation or additional chemotherapy reported significantly ($P < .05-.001$) higher levels of sexual impairment. Participants' HRQOL was impaired. Several dimensions of sexual health correlated significantly ($P < .05-.001$) with the functional dimensions of reduced HRQOL. **Conclusion:** Cancer survivors with pelvic LRTIs experience severely impaired sexual health across genders, with negative consequences for their HRQOL. **Implications for Practice:** Healthcare professionals should include sexual health as an important part of individual patients' health and HRQOL throughout their treatment trajectory and follow-up, by screening sexual health, implementing measures and interventions to promote sexual health, and supporting survivors' coping and health-promoting strategies.

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Sexual health is a holistic concept that includes physical, emotional, mental, and social well-being in relation to sex and has been shown to be an important and integral part of human health and well-being across genders.^{1,2} Cancer and cancer treatment may impact all areas of survivors' lives, but healthcare professionals often ignore the impact of the illness and treatment on sexual health.^{3,4} Furthermore, there is often a one-dimensional focus on sexual dysfunction,⁵ negative impact on sexual act,⁶ and fertility issues,⁷ ignoring the holistic aspects of sexual health.

Pelvic cancers, including those in the pelvic bones, urinary tract, bowel, and reproductive organs, such as prostate, testicular, and gynecological cancers, account for more than a third of all cancers.^{8,9} More than 50% of pelvic cancer survivors—versus 25% to 30% of survivors of other cancers—report sexual problems after treatment.^{1,10} Previous research has found that survivors of gynecological, prostate, and gastrointestinal cancers experience severely impaired sexual function,¹¹ decreased desire,¹² body image concerns,¹³ sexual dissatisfaction,¹⁴ psychological distress, fatigue and sexual pain,¹⁵ erectile dysfunction, and loss of sex and intimacy.^{16–18}

Radiotherapy, often in combination with surgery and chemotherapy, is an essential part of curative treatment for pelvic cancers.^{19,20} The irradiated area involves vulnerable tissue in the urinary and gastrointestinal tracts and genitals, and approximately 5% to 15% of patients develop late radiation tissue injuries (pelvic LRTIs).^{20,21} Common manifestations are cystitis, proctitis, soft-tissue necrosis, and fistulas, with increased frequency, urgency, and leakage of urine and feces; diarrhea; and pain.^{22–25} Survivors with such tabooed symptoms often suffer in silence, whereby pelvic LRTIs often remain underdiagnosed or misdiagnosed as normal age-related changes.²⁶ In line with the holistic and gender-neutral definition of sexual health, pelvic LRTIs involve anatomical and physiological changes that may impede or preclude both sexual activity and function,²⁷ as well as the individual's identity, body and self-image, and sexual relationship.²⁸ However, no research exists on how established pelvic LRTIs influence survivors' sexual health across gender, sociodemographic, and medical variables.

Previous research has shown that pelvic LRTIs negatively impact survivors' everyday life and health-related quality of life (HRQOL), leading to deterioration in physical, emotional, and social function.^{17,29–36} However, the association between sexual health and HRQOL in these survivors has received limited attention. Nascimento et al³⁷ found impaired sexual function in gynecological cancer survivors with pelvic floor dysfunction without a negative impact on HRQOL. In contrast, Roussin and colleagues³⁸ review concluded that gynecological cancer survivors experience long-term impacts on HRQOL owing to impaired sexual health. This underlines the current limited and discrepant knowledge regarding the association between sexual health and HRQOL in survivors with pelvic LRTIs. Increasing our understanding of sexual health is important for healthcare personnel and especially cancer nurses in follow-up and support of these survivors.

■ Aim and Research Questions

This study aimed to explore sexual health and HRQOL in cancer survivors with established and verified pelvic LRTIs. Specifically, we aimed to address the following research questions:

1. How do cancer survivors with pelvic LRTIs report their sexual health in relation to their symptom burden?
2. How is the survivors' sexual health related to sociodemographic and medical variables?
3. What is the relationship between the survivors' sexual health and HRQOL?

■ Methods

Study Design

This study is part of a larger study that aims to increase knowledge about cancer survivors with pelvic LRTIs undergoing hyperbaric oxygen treatment (HBOT) (trial registration: ClinicalTrials.gov ID no. NCT03570229). In the present study, a descriptive cross-sectional design was applied at the baseline of a larger study. The aim of this design was to collect data at a specific time point for a defined population to increase knowledge about a condition or disease, illuminate related factors, and identify areas for further study.³⁹

Ethics

This study was approved by the Regional Committee of Medical and Health Research Ethics North, Norway (ID no. 2018/706). The study was conducted in compliance with the Helsinki Declaration and institutional requirements for data processing and handling. Participants received written information about voluntary study participation, and all participants provided written consent. No harm was expected for study participation; however, as the study's content was sensitive, participants were offered support upon request. No such requests were received.

Recruitment and Eligibility Criteria

Participants were recruited from all cancer survivors with pelvic LRTIs assigned to the Norwegian National Unit for Planned Hyperbaric Oxygen Therapy based on the following inclusion criteria: (a) pelvic radiation injury after intended curative radiation for pelvic cancer (prostate, gynecological, urological, bowel, and bone cancers); (b) LRTI symptoms from the bowel, bladder, or pelvic area verified by endoscopy or radiology; (c) ≥6 months after completion of radiation therapy; and (d) age ≥18 years. Exclusion criteria were as follows: (a) severe physical and/or mental comorbidity, including signs of active cancer; (b) insufficient language skills to answer the study questionnaires; and (c) previous treatment with hyperbaric oxygen.

Data Collection

Data were collected by purposeful sampling, inclusive of all eligible patients from August 2019 to August 2021, using self-reported questionnaires and medical records. The questionnaire that comprised sociodemographic variables, sexual health, and symptom burden was pilot tested by cancer survivors with various pelvic LRTIs who were not included in the study and was found to be assessable, relevant, and had an acceptable workload

(approximately 10–15 minutes). The questionnaire comprised the following:

- Sociodemographic data were measured by self-reported gender, age, civil status, education, and work status.
- Sexual health was measured by the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Sexual Health Questionnaire (QOL-SHQ-C22).¹⁰ This is a recently developed instrument based on World Health Organization's holistic definition of sexual health. It consists of 2 multi-item scales to assess sexual satisfaction and sexual pain with 11 single items assessing sexual activity and covering treatment- and partner-related questions and general questions on sexual health. The recall period is 4 weeks, and the items are scored on a Likert scale (1–4) and normalized to 0 to 100. A high score on the functional scales/items represents a high level of sexual health, whereas a high score on the symptom scales/items represents a high level of symptoms or problems.
- Pelvic LRTI symptoms were measured using the Expanded Prostate Cancer Index Composite (EPIC). This instrument is validated for both prostate cancer and gynecological cancers, including complications from radiotherapy, and measures urinary and bowel symptoms based on the past 4 weeks.⁴⁰ EPIC is proven to be a reliable, valid, and sensitive instrument for assessing urinary and bowel symptoms. Items are scored Likert scales (0, –4, 1, –3, 1, –4, and 1–5) and normalized to 0 to 100. Finally, the total mean scores for urinary and bowel symptoms and subscales for urinary symptoms (function, bother, incontinence, irritation/obstruction) and bowel symptoms (function, bother) are calculated. Lower scores indicate more severe symptoms in both domains.
- Health-related quality of life was assessed using the EORTC Quality of Life Questionnaire (QLQ-C30, version 3.0), consisting of 30 items.⁴¹ Items are scored on Likert scales (1–4, 1–7), normalized to 0 to 100, and combined into 1 overall HRQOL scale (based on 2 questions), 5 functional scales, and 9 symptom scales. For functional scales and overall HRQOL, a high score reflected a high level of functional capacity. The instrument has proven robust psychometric properties and established data for normal populations.^{42,43} As this instrument does not include sexual issues, we added the following question at the end of this questionnaire: “Has your physical condition or medical treatment affected your sexual life?” This item was scored and handled in the same way as in the other symptom scales.
- Medical variables were obtained from the participants' records and included cancer diagnosis, type of radiation, radiation doses, time from radiation, and chemotherapy/not received.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26 (IBM Corp, Armonk, New York). Normality was determined using Q-Q plots, skewness, and kurtosis. Cronbach's α was high for most scales in all instruments, varying from $\alpha = .644$ – $.960$ (details for each scale can be found in the Appendix available at <http://links.lww.com/CN/A125>). Missing values were handled according to the respective questionnaire manuals.

Descriptive statistics (mean, percentage, and SD) were used for sexual health, demographics, medical variables, and HRQOL. The outcome variables were controlled for dichotomized sociodemographic and treatment variables using an independent-samples t test and a χ^2 test. Pearson r was used to measure the correlation between pelvic LRTI symptoms, sexual health, and functional scales of HRQOL. For all analyses, a 2-tailed $P < .05$ was set as the significance level.

To compare the results from EPIC, we used data from a normative sample without cancer ($n = 112$).⁴⁴ To compare the participants' HRQOL with norms, we used the European QLQ-C30 Norm ($n = 15\ 386$).⁴² To interpret the HRQOL outcome from this study, we used the thresholds (reflecting the clinical importance of a health problem) for the EORTC QLQ-C30 published by Giesinger et al.⁴⁵

Results

Study Participants

Overall, 92 individuals were eligible and invited to participate in this study, of which 83 (90.2%) accepted and filled out the questionnaires. Nonparticipation ($n = 9$) was related to not wishing to participate ($n = 4$), canceling HBOT treatment ($n = 4$), or cognitive decline ($n = 1$). The participants' mean age was 64 years, 53% were male, 41% had higher education, and most were married/cohabiting and retired from work. Most participants had been treated for prostate, cervical, or anal cancer. The majority had received external radiation only, and 48.2% had received chemotherapy in addition to radiation therapy. The mean time since radiotherapy was nearly 6 years. We found no significant differences between the genders regarding the sociodemographic variables, except that female participants were younger than male participants ($P < .001$), and more female participants had children younger than 18 years than did male participants ($P < .036$). Related to the medical variables, male patients received significantly higher radiation doses than female patients ($P < .001$), and female patients were more often treated with chemotherapy in addition to radiation ($P < .001$) (Table 1).

Participants' Sexual Health and Symptom Burden

The sample scored low on all functional scales and items of sexual health and on libido and extremely low on sexual satisfaction. Male participants scored very low on confidence in erection, and female patients scored very low on femininity. On the symptom scales, the participants reported that most problems related to fatigue affected their sex life, whereas female participants' highest scores were for vaginal dryness. We found no significant differences between the genders for any of the gender-neutral items, except that female participants reported more sexual pain ($P < .001$) and fatigue ($P < .020$) than male patients (Table 2).

Participants reported a severe symptom burden compared with norms, especially related to bowel symptoms. We found no significant gender differences related to the symptom burden of LRTIs. Furthermore, we found no correlation between any of the LRTIs symptoms and the functional scales/items of sexual health. In contrast, there were small correlations between bowel symptoms and sexual pain and moderate correlations between bowel and bladder symptoms and worry of incontinence, between bowel symptoms and fatigue affecting sexual activity, and between bladder symptoms and vaginal dryness (Table 3).

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Table 1 • Participants' Sociodemographic and Medical Characteristics (N = 83)

Demographic Characteristics	All Participants (N = 83)	
	n (%)	Mean/SD (Range)
Age, y		64.1/11.9 (33–86)
Gender		
Male	44 (53)	
Female	39 (47)	
Highest education		
Primary school	17 (20.5)	
Senior high school	32 (38.5)	
University/university college	34 (41.0)	
Civil status		
Married/cohabiting	62 (74.7)	
Single/divorced	21 (25.3)	
Work status		
Full- or part-time employment	17 (20.5)	
Sick leave or disability pension	24 (28.9)	
Retired	42 (50.6)	
Medical characteristics		
Cancer site		
Prostate	41 (49.4)	
Rectum	6 (7.2)	
Anus	15 (18.1)	
Cervix	19 (22.9)	
Vulva	1 (1.2)	
Neoplasm sacrum	1 (1.2)	
Cancer treatment		
Radiation only	83 (100)	
Chemotherapy and radiation	40 (48.2)	
Types of radiation		
External only	64 (77.1)	
Internal only ^a	2 (2.4)	
External and internal ^a	17 (20.5)	
Radiation doses, Gy		
External radiation dose		61.9 (13.1)
Internal radiation dose ^a		5.0 (10.6)
Months since radiation		67.0 (82.0)

Abbreviations: N, total sample; n, part of sample.

^aWomen only.

Sexual Health in Relation to Sociodemographic and Medical Variables

Married/cohabiting participants scored lower on insecurity of partner, and younger age correlated with more sexual pain ($r = -0.595$, $P < .001$), worry of incontinence ($r = -0.243$, $P < .05$), and fatigue ($r = -0.324$, $P < .001$), and male patients with higher education levels scored lower on masculinity ($P < .05$) (Table 4).

Similarly, a few differences were observed between sexual health and medical variables. In relation to diagnosis, survivors of gynecological and gastrointestinal cancers scored higher on sexual pain than those of prostate cancer ($P = .001$). Survivors of gynecological cancers also scored higher on worry of incontinence and fatigue affecting sexual activity than survivors of gastrointestinal and prostate cancers ($P = .005$). Female participants who received

both internal and external radiation reported higher levels of worry about incontinence than those treated with external radiation only. Time since radiation exposure did not correlate with any of the sexual health scales/items. Participants treated with chemotherapy in addition to radiation scored higher on sexual pain, worry about incontinence, and fatigue affecting sexual life than those who had only received radiation. Internal radiation dose (for women only) was correlated with worry of incontinence ($r = 0.343$, $P < .001$), and external radiation dose was significantly and negatively correlated with sexual pain ($r = -0.243$, $P < .05$) and fear of incontinence ($r = -0.322$, $P < .001$) (Table 4).

Participants' Sexual Health and HRQOL

A comparison between the participants' HRQOL and the European normative population is outlined in the Figure, including our supplementary question related to sexuality. The Figure indicates that the participants scored lower (eg, worse) on all functional dimensions of HRQOL than the European norm, except for emotional function, and higher (eg, more severe) on all symptom variables. However, compared with thresholds, the participants only scored lower than the threshold values on physical (68.6 vs 83.0), cognitive (71.1 vs 75.0), and social (52.8 vs 58.0) functions. On the symptom scales, the participants reported a higher symptom burden than the thresholds on fatigue (49.3 vs 39), pain (41.6 vs 25), dyspnea (25.5 vs 17), and diarrhea (45.5 vs 17). As we added the question about sexuality, no normative data or threshold for this scale were available. However, in relation to the other symptom scales, this scale had the highest mean, indicating severely impaired sexuality in line with the SHQ-22 scores. Furthermore, we found no gender differences on any of the HRQOL dimensions or on the extra added question on how the cancer and treatment had influenced sexual life, except that female patients scored significantly lower on cognitive ($P < .029$) and social function ($P < .012$).

The only significant correlation (weak to moderate) between the functional dimensions of HRQOL and the functional scales and items of sexual health appeared between social function and the impact of treatment, physical role and social function, and masculinity for men, and overall HRQOL and femininity for women. In contrast, sexual pain, fatigue, and worry about incontinence were significantly correlated (moderate to large) with all functional HRQOL dimensions, except for worry about incontinence and cognitive function (Table 5).

Discussion

The overall aim of this study was to explore the sexual health of cancer survivors with established pelvic LRTIs. This is the first study to focus on this topic across gender and diagnoses, acknowledging that sexuality reaches far beyond the sexual organs. Furthermore, by using EORTC's newly developed and validated instrument building on the World Health Organization's holistic definition of sexual health, this study provides a broader knowledge base related to sexual health than sexual function and activity.

Table 2 • Participants' Sexual Health (N = 83)

Sexual Health	Total Sample	Women (n = 39)	Men (n = 44)
	Mean (SD)	Mean (SD)	Mean (SD)
Functional scale/items			
Sexual satisfaction	13.7 (9.2)	13.5 (8.9)	13.8 (9.6)
Importance of sexual activity	58.8 (34.7)	53.5 (31.6)	63.6 (31.6)
Libido	45.1 (38.8)	40.5 (40.2)	49.2 (37.7)
Treatment	58.8 (34.7)	53.5 (37.6)	63.6 (31.6)
Communication with professionals	58.8 (34.7)	53.5 (37.6)	63.6 (31.6)
Insecurity with partner	52.9 (39.2)	60.8 (40.6)	46.3 (37.2)
Confidence erection			24.8 (35.6)
Masculinity			56.7 (38.6)
Femininity		36.1 (45.3)	
Symptom scale/item			
Sexual pain	36.2 (35.0)	60.6 (32.7) ^a	15.1 (20.4)
Worry of incontinence	43.3 (37.9)	50.5 (39.1)	37.3 (36.2)
Fatigue	54.2 (37.1)	64.8 (35.2) ^b	45.0 (36.6)
Vaginal dryness		61.8 (39.5)	

Abbreviations: n, part of sample; N, total sample; QLQ-SHQ-22, Quality of Life Sexual Health Questionnaire 22. Sexual health was measured with QLQ-SHQ-22 scale 0 to 100: a high score for the functional scale/functional single items represents a high level of sexual satisfaction/sexual health, whereas a high score for symptom scale/item represents a high level of symptoms.
^aSignificant at $P < .001$.
^bSignificant at $P = .020$.

The study's most important and concerning finding is the participants' highly impaired sexual health nearly 6 years after radiation across genders. Overall, participants reported a low degree of satisfaction with sexual life and libido, whereas they scored higher on interest in sexual activity and the negative impact of treatment on sexual health. In line with previous research, the results showed that cancer treatment may impair sexual health and libido¹; however, our results highlight that this does not mean that survivors lose interest in sex.

As expected, we found some clear gender differences in sexual health. Female survivors seem to be especially at risk as they reported severely impaired femininity, vaginal dryness, and more pain and fatigue related to sexual activity than men. These results are in line with previous research showing that sexual pain and vaginal dryness are especially pronounced in gynecological cancer survivors because of their anatomical closeness^{22,32} and that women normally report higher levels of fatigue than men.^{33,46}

Table 3 • Participants' LRTI Symptom Burden and Correlations With Sexual Health

	LRTI Symptoms (EPIC)		Sexual Health (EORTC QLQ-SHQ-22)												
			Functional Scale/Items						Symptom Scales/Items						
	Study Sample Mean (SD), N = 83	Norm Sample ^a Mean (SD), n = 112	SEXSAT	ISXA	LI	TX	CHCP	IP	CE	MA	FE	SEXP	WI	FA	VD
			Pearson Correlation (r)												
Urinary total	62.1 (22.9)	89.5 (11.2)											-0.386 ^b		
Urinary function	67.9 (26.2)	95.5 (9.5)											-0.349 ^b		0.471 ^b
Urinary bother	58.0 (23.9)	85.2 (14.1)											-0.366 ^b		
Bowel total	57.0 (21.3)	92.4 (8.7)											-0.292 ^c	-0.337 ^b	-0.300 ^b
Bowel function	64.1 (19.0)	92.1 (8.5)											-0.294 ^c	-0.376 ^b	-0.353 ^b
Bowel bother	49.9 (25.8)	92.8 (11.1)											-0.270 ^b	-0.283 ^b	-0.241 ^c

^aNorm sample, Expanded Prostate Index Composite (2015).⁴⁴
^bSignificant level $P < .01$.
^cSignificant level $P < .05$.

Abbreviations: CE, confidence in erection (male patients); CHCP, communicated with healthcare professionals about sexual issues; EORTC QLQ-SHQ-22, European Organization for Research and Treatment of Cancer Quality of Life Sexual Health Questionnaire 22 (a higher level of the functional scale/items means higher sexual health, whereas higher level on the symptom scales/items means higher symptom burden); EPIC, Expanded Prostate Cancer Index Composite where a lower score indicates more symptoms; FA, fatigue affecting sexual life; FE, femininity (female patients); IP, insecurity with partner; ISXA, interested in sexual activity; LI, libido; MA, masculinity (male patients); N, number of participants; SEXP, sexual pain; SEXSAT, sexual satisfaction; TX, treatments' impact on sexuality; VD, vaginal dryness; WI, worry of incontinence.

Table 4 • Participants' Sexual Health in Relation to Sociodemographic and Treatment Variables

	Sexual Health		Sociodemographic Variables						Treatment Variables			
	QLQ-SHQ-22 ^a		Civil Status		Education		Type of Radiation		Single or Multiple Treatments			
	Mean (SD)	Mean (SD)	Married/ Cohabiting (n = 62)	Single (n = 21)	Higher (n = 34)	Lower (n = 49)	External Only (n = 62)	Internal and External (n = 17)	Radiation Only (n = 43)	Radiation and Chemo (n = 40)	Mean (SD)	Mean (SD)
Functional Scale/Items												
Sexual satisfaction	13.7 (9.2)	13.9 (8.9)	12.6 (10.7)	14.5 (10.0)	13.1 (8.7)	13.5 (8.8)	14.3 (10.7)	13.5 (9.5)	13.9 (9.1)			
Importance of sexual activity	58.8 (34.7)	62.2 (32.2)	49.2 (40.3)	56.6 (32.6)	59.7 (36.4)	59.7 (34.2)	56.1 (36.9)	59.3 (34.6)	58.3 (35.2)			
Libido	45.1 (38.8)	44.3 (39.7)	47.6 (37.4)	40.4 (37.0)	48.6 (40.2)	47.8 (37.5)	36.8 (42.5)	49.2 (38.5)	41.0 (39.3)			
Treatments' impact on sexuality	58.8 (34.7)	62.2 (32.2)	49.2 (40.3)	57.6 (32.6)	59.7 (36.4)	59.7 (34.2)	56.1 (36.9)	59.3 (34.6)	58.3 (35.2)			
Communication with professionals	58.8 (34.7)	62.2 (32.2)	49.2 (40.3)	57.6 (32.6)	59.7 (36.6)	59.7 (34.2)	56.1 (36.9)	59.3 (34.6)	58.3 (35.2)			
Insecurity with partner	52.9 (39.2)	47.4 (38.3)	70.4 (37.2) ^b	59.2 (42.9)	48.9 (36.7)	50.3 (39.3)	61.1 (36.6)	51.3 (37.3)	54.6 (41.5)			
Confidence erection ^c	24.8 (35.6)	23.7 (37.7)	29.2 (27.8)	26.7 (38.2)	23.6 (34.7)	50.3 (39.3)	61.1 (36.6)	29.2 (37.6)	4.8 (12.6)			
Masculinity ^c	56.7 (38.6)	52.5 (39.1)	76.2 (31.8)	40.0 (42.2)	66.7 (33.3) ^b	57.8 (39.3)	—	60.6 (37.7)	38.1 (40.5)			
Femininity ^d	36.1 (45.3)	37.5 (44.3)	33.3 (49.2)	33.3 (45.3)	37.9 (46.3)	33.3 (44.4)	39.2 (47.8)	58.3 (31.9)	33.3 (46.4)			
Symptom scale/item												
Sexual pain	36.2 (35.0)	40.0 (35.0)	24.8 (33.7)	34.5 (34.5)	37.3 (35.8)	32.2 (34.6)	47.7 (34.6)	13.5 (18.9)	56.8 (33.7) ^e			
Worry incontinence	43.3 (37.9)	43.5 (38.6)	42.9 (36.7)	42.4 (37.5)	43.9 (38.6)	37.3 (35.6)	70.0 (39.4) ^f	32.5 (34.2)	53.8 (38.7) ^b			
Fatigue influencing sexual activity	54.2 (37.1)	56.0 (36.6)	49.1 (39.1)	50.0 (37.9)	57.0 (36.7)	49.7 (37.9)	68.5 (31.2)	42.3 (36.6)	65.8 (34.2) ^f			
Vaginal dryness	61.8 (39.5)	62.5 (35.5)	54.5 (47.8)	76.2 (33.2)	51.7 (41.1)	68.6 (39.9)	54.9 (38.9)	33.3 (27.2)	65.6 (39.6)			

Abbreviations: N, total sample; n, part of total sample; QLQ-SHQ, Quality of Life Sexual Health Questionnaire.

^aFrom 0 to 100, where a high score for the functional scale/item represents a high level of sexual satisfaction/sexual health, whereas a high score for symptom scale/item represents a high level of symptoms.

^bSignificant $P < .05$.

^cOnly men.

^dOnly women.

^eSignificant $P < .001$ all measured with independent t test.

^fSignificant $P < .01$.

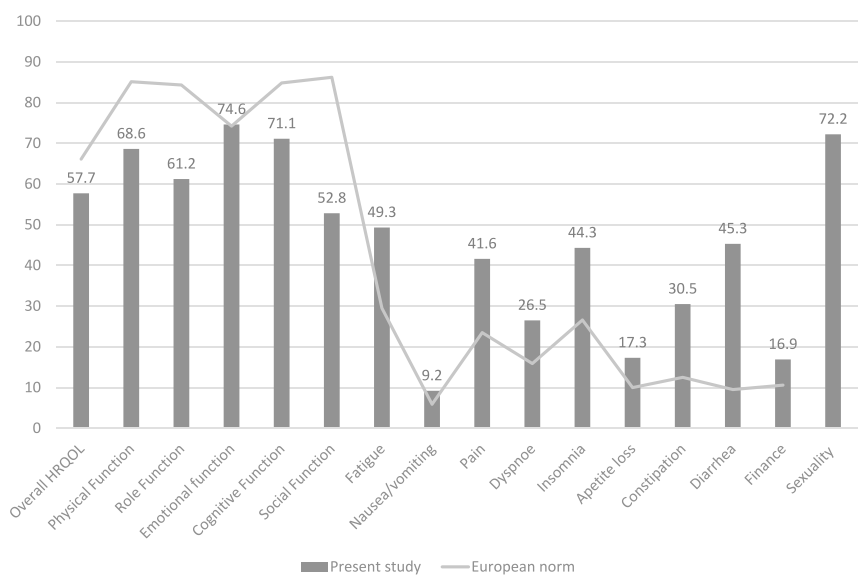


Figure ■ Participants' health-related quality of life (N = 83) compared with the European norm (N = 15 386).

However, fatigue was reported as the worst symptom also by the male participants, aligning with previous research showing that fatigue is experienced as one of the most common and worst-ranked late effects among survivors, independent of age and diagnosis, affecting all areas of life.⁴⁶ Our results indicate that this is also true for sexuality. In line with previous research,^{1,12} the men reported severely impaired confidence in erection and impaired masculinity, with those with higher education scoring lower than those with lower education. One explanation may be that men with higher education also tend to connect masculinity

to factors other than erection. Together, these results highlight the importance of sex-specific and preventive follow-up across gender, including measures and interventions to promote femininity and masculinity.

Although our findings align with previous research on sexual health in survivors of gynecological and colorectal cancers treated with radiation,^{1,5,11,16} our results indicate that both male and female survivors with pelvic LRTIs may experience even more negative impact on their sexual health. This interpretation is supported by 2 studies that used the new SHQ-C22. In comparison,

Table 5 • Pearson Correlations Between Sexual Health and HRQOL (N = 83)

	Overall HRQOL	Physical Function	Role Function	Emotional Function	Cognitive Function	Social Function
Functional scales/items						
Sexual satisfaction						
Importance of sexual activity						
Libido						
Impact of treatment						0.268 ^a
Communications with healthcare professionals						
Insecurity with partner						
Confidence in erection ^b						
Masculinity ^b		0.328 ^a	0.358 ^a			0.344 ^a
Femininity ^c	0.432 ^d					
Symptom scales/items						
Sexual pain	-0.375 ^d	-0.386 ^d	-0.322 ^d	-0.275 ^a	-0.378 ^d	-0.526 ^d
Worry of incontinence	-0.341 ^d	-0.288 ^a	-0.256 ^a	-0.333 ^a		-0.285 ^a
Fatigue	-0.469 ^d	-0.483 ^d	-0.381 ^d	-0.361 ^d	-0.253 ^a	-0.523 ^d
Vaginal dryness ^c						

Abbreviations: HRQOL, health-related quality of life (measured with European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, version 3.0 [0–100], where a high score for the functional scales represents a high level of function); N, total number of the sample.

Sexual health was measured with European Organization for Research and Treatment of Cancer Quality of Life Sexual Health Questionnaire C22 (0–100), where a high score for the functional scale/functional single items represents a high level of sexual satisfaction/sexual health, whereas a high score for symptom scale/item represents a high level of symptoms.

^aSignificant *P* < .05.
^bOnly men.
^cOnly women.
^dSignificant *P* < .001.

our sample scored lower on most of the functional scales and items of sexual health (especially on sexual satisfaction) and higher on all the symptom scales/items compared with both Aptekar and colleagues⁴⁷ study (N = 109) and Bobrie and colleagues⁴⁸ study of 45 French patients with breast cancer. However, a very interesting finding is that our sample scored extensively better on communication with healthcare professionals about sexual issues than these 2 cited studies (our sample: 58.8, Aptekar et al: 4.49, and Bobrie et al: 11.1). These results may indicate that healthcare professionals are beginning to focus more on survivors' sexual health or that survivors are more confident in bringing these issues up by themselves. Notwithstanding, the results indicate that healthcare providers' communication with survivors requires improvement.^{1,16,38}

The participants in this study had established LRTIs. Consequently, relatively high scores of symptom burden are expected and align with previous research.⁴⁹ Interesting findings are that we found no gender differences related to the LRTI symptom burden, nor did the LRTI symptoms correlate with any of the functional scales/items of participants' sexual health. This may indicate that these symptoms are experienced at the same level for both genders and that the symptoms do not influence functional aspects of sexual health. In contrast, the results indicate that both urinary and bowel symptoms particularly impacted participants' worry of incontinence in relation to sexuality (which could be expected as urge and incontinence are frequent in LRTI). The correlation between bowel symptoms, sexual pain, and fatigue is interesting, although we cannot provide a definite explanation. However, previous research has shown that urinary and fecal leakage, sexual pain, and fatigue may impair all areas of sexual health, including body image, feelings of attractiveness, and sexuality and consequently represent important causes of withdrawal from sexual intimacy.^{1,13}

The results also highlight important risk factors for impaired sexual health in pelvic LRTI survivors in relation to sociodemographic and medical variables. White's¹ review found a strong association between low sexual function and age older than 55 years. We found no age differences related to sexual function, only an association of younger age with more sexual pain and worry of incontinence and fatigue. These results may indicate that younger survivors are more prone to be in sexual relationships, have sex more frequently, and often receive more intensive and multimodal treatment. Nevertheless, these results highlight the holistic concept of sexual health and that it is an important part of overall health during the entire life course.²

Furthermore, receiving both internal and external radiation, higher doses of internal radiation, and additional chemotherapy seem to be important risk factors for impaired sexual health, of which healthcare professionals should be especially aware. Both Viswanathan and colleagues²² and Jensen and Froeding's¹⁸ reviews from 2014 and 2015 state that dose intensity may increase the risk of sexual dysfunction but that newer radiation modalities may decrease this risk. However, decreased adverse effects with newer devices may also mean that higher radiation doses may be applied to destroy cancer, which, in turn, may lead to similar late effects. Consequently, healthcare professionals should pay particular attention to these survivors.

Participants' HRQOL was highly impaired across genders. This aligns with Sipaviciute and colleagues²⁴ review of survivors of rectal cancer and Sekse and colleagues³² review of survivors of gynecological cancer, but contrasts with Yavas et al,³⁶ who found that radiotherapy did not impair the participants' HRQOL over time. Our results were further elaborated by the correlation between participants' HRQOL and sexual health. The results indicate that men's experience of masculinity was positively correlated with overall HRQOL and most of the functional dimensions of HRQOL, underlining the importance of healthcare professionals in addressing this theme. In contrast, sexual pain, fatigue, and worry about incontinence seem to impair all functional areas of the HRQOL. This adds to the knowledge from Sekse et al,³³ who found that fatigue impaired HRQOL in gynecological cancer survivors, but without being connected to sexuality.³² However, Nascimento et al³⁷ found no association between gynecological impairment and HRQOL. This underlines the importance of measuring both sexual health and HRQOL using a psychosocial approach.

Strengths and Limitations

The moderate size sample, including approximately the same number of men and women with established and objectively verified LRTIs and survivors of various pelvic cancer diagnoses, and the use of validated measures, patient-reported outcomes (PROs), and comparison of LRTI and HRQOL scores with norms were all judged as study strengths. Study limitations may include the selective sampling of those referred to HBOT, the large proportion of survivors of prostatic cancer, including few young adult cancer survivors (<39 years), and no information about surgical treatment.

Implications for Clinical Practice

The results of the present study have several clinical implications. First, they indicate a need for screening of pelvic cancer patients' sexual health before radiation; education of patients and partners about preventive measures, such as the use of dilators, lubrication, and erectile medications and aids; and discussing important coping mechanisms and interventions related to a holistic perspective on sexual health. Second, healthcare professionals need education on pelvic LRTIs and their negative consequences on patients' sexual health. Specific attention should be paid to urinary and bowel LRTIs that impair sexual health. Third, healthcare professionals should be aware of sex-specific issues related to sexual health and provide screening, interventions, and follow-up related to individuals' specific needs and challenges. Fourth, healthcare professionals should be aware of survivors' higher risk of impaired sexual health due to youth, gynecological cancer, and earlier multimodal treatment, as well as gender-specific risk factors. Finally, healthcare professionals should mandatorily screen survivors' sexual health and HRQOL throughout the treatment trajectory and survivorship follow-up, initiate open dialogues related to sexual issues, and implement interventions or refer patients to specialists when needed.

■ Conclusions

The results of this study indicate that the sexual health of both male and female cancer survivors with pelvic LRTIs is impaired several years after radiation therapy. Participants reported high levels of LRTI symptoms that were particularly associated with sexual pain, worry about incontinence, and fatigue influencing sexual activity. Men and women reported few different challenges, except for the gender-specific issues of functional and symptomatic aspects of sexual health, underlining the importance of individual follow-up. Compared with norms, the participants' HRQOL was particularly impaired in relation to physical, cognitive, and social functions, whereas sexual pain, fatigue, and fear of incontinence correlated with most of the functional HRQOL dimensions. The results highlight the need for preventive and sexual health-promoting interventions, follow-up, and further research on this group of cancer survivors.

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