Health-Related Quality of Life of Omani Colorectal Cancer Survivors

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Abstract

Background: Colorectal cancer (CRC) patients often experience physical and psychological symptoms which affect quality of life (QOL).

Purpose: This study aimed to identify factors affecting QOL among adult Omani CRC survivors.

Methods: A prospective cross-sectional study of 124 adult CRC survivors was conducted at the two main oncology referral hospitals in Oman. A validated Arabic version of the European Organisation for Research and Treatment of Cancer-Quality of Life Questionnaire for Colorectal Cancer-29 (EORTC QLQ-CR29) was used to collect data.

Results: Of the 118 participants (response rate: 95.2%), 59 (50.0%) were male. The mean age was 52.7 years. Overall, 102 (86.4%) had been diagnosed with CRC at stages II or III. High mean scores on the QLQ-CR29 functional scale were reported for body image (88.9), weight (79.3), and anxiety (75.4). Mean scores for sexual interest were lower in men (31.4) compared to women (62.2). Severe anxiety was reported in 12 survivors (10.2%). Age, gender, the presence of comorbidities, and tumor location were significant predictors of QOL ($P \leq .05$).

Conclusion: Omani CRC survivors demonstrated satisfactory QOL, although men reported more anxiety and sexual problems. Healthcare providers in Oman should conduct regular assessments of CRC survivors and offer counseling services if necessary.

Keywords

colorectal cancer, quality of life, cancer survivors, support services, Oman

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed type of cancer worldwide after breast and lung cancer, comprising 11% of all cancer diagnoses and affecting a total of 1.9 million individuals in 2018.[1] The disease predominantly affects male and younger populations (aged <50 years), particularly in low- and middle-income countries.[2,3] Survival rates of CRC have increased in the last several decades, mainly as a result of early diagnosis, improved availability of screening programs, advanced treatments modalities, and palliative care.[4] Approximately 80% of CRC patients survive the first year after diagnosis, and 62% survive 5 years or more.[5] In 2018, a total of 935 000 deaths were attributable to CRC.[1]

Although CRC survival has increased over time, many survivors nevertheless experience severe psychological and physical symptoms affecting their quality of life (QOL).[6] The

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term "QOL" refers to a multidimensional concept involving an individual's physical, emotional, and social functioning.[7] In some cases, CRC survivors report anxiety, depression, and embarrassment as a result of their diagnosis or due to the side-effects of treatment—including problems with stoma care, alopecia, increased fatigue, and changes in sexual interest and body image—along with disrupted sleep and fear of CRC recurrence or the development of another cancer.[8] In addition, CRC survivors may experience other physical issues, such as fecal or urinary incontinence and irregular bowel movements.[6,9] Thus, as overall survivorship has increased, QOL has become an important outcome measure to evaluate the full impact of the disease on the patient's physical and psychological functioning.[6] Evidence shows that improvements in overall QOL and physical function increase cancer patients' survival and are a vital indicator of treatment efficacy.[10,11]

In Oman, CRC was ranked as the most commonly diagnosed cancer in men in 2018 and the second most commonly diagnosed cancer in women after breast cancer.[12] Overall, a total of 203 patients were diagnosed with CRC in 2018 with a median age at diagnosis of 58 years, resulting in age-standardized incidence rates of 12 and 9.1 per 100 000 individuals for males and females, respectively.[12,13] A study conducted in 2015 found that the majority of CRC patients in Oman were diagnosed at a younger age (median age of 56 years) and presented at more advanced stages (42.6% and 32.7% at stages III and IV, respectively); moreover, 58.6% of patients were male.[14] According to the same study, the 5-year overall survival rate was 100% for patients with stage I CRC, 60% for those with stage II CRC, and 60% for those with stage III CRC.[14] Nevertheless, many cancer survivors continue to require specific services or support for a broad range of survivorship issues encountered throughout the period following cancer diagnosis and treatment. Although oncological investigations and all types of modalities of treatment (i.e., surgery, chemotherapy, and hormonal therapy) are provided free of charge by the Omani Government, there remains an absence of well-established supportive cancer services for Omani cancer survivors, including tailored follow-up, counseling for sexual well-being, and support for psychological and mental disorders, post-cancer childbearing, and recommendations for diet or physical activity.

Although the topic of QOL in CRC survivors has received some attention in more developed countries, no studies have yet been conducted in Oman to evaluate the QOL of CRC survivors. It is reasonable to assume that the emotional, psychological, physical, and social needs of CRC survivors have increased in Oman over the last few decades as a result of increasing survivorship. Indeed, data concerning the QOL of Omani CRC survivors, along with their experiences, are of critical importance to guide the development of strategies and initiatives to enhance the QOL of future cancer survivors. The aim of this study was therefore to evaluate and identify factors affecting QOL among Omani CRC survivors.

Materials and Methods

Study Design and Target Population

A prospective cross-sectional study was conducted from August 2020 to February 2021 at the National Oncology Centre of the Royal Hospital (NOCRH) and the Sultan Qaboos University Hospital (SQUH), both of which are located in Muscat, the capital city of Oman. These two institutions are the two main referral oncology centers in the country, with the vast majority of cancer patients in Oman from different regions being referred for treatment and diagnosis to one of these two centers.[15] The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[16]

The target population consisted of adult Omani patients (≥18 years old) of both genders (male and female) and different educational backgrounds (i.e., both literate and illiterate patients) with confirmed histological diagnoses of CRC. In addition, patients who had survived at least six months or more following the completion of cancer treatment and had attended follow-up appointments at the oncology outpatient departments of either institution were included. Patients with stages 0, I, II, or III CRC or stage IV CRC with complete resection of the residual tumor for cure or complete remission with evidence of absent microscopic or macroscopic residual tumors (R0) were included. Only those survivors who agreed to participate by providing written consent after the study was explained to them were included. The exclusion criteria comprised patients with stage IV CRC without R0, as well as any patients with known mental illnesses that might interfere with their comprehension or QOL. Moreover, patients in acute pain were excluded as well.

Sample Size Calculation

According to data from the Ministry of Health in Oman, a total of 203 Omani patients were diagnosed with CRC in 2018, including 102 females (51%) and 101 males (50%).[12] Therefore, assuming that the frequency of CRC diagnoses per year is 203, the total number of patients diagnosed with CRC in the last 20 years was estimated to be 3000. Based on these estimations, the necessary sample size was calculated to be between 58 and 133 using an online sample size calculator (Raosoft Inc., Seattle, WA, USA), with an expected response rate of 90–96% at 5% precision (margin of error) and to a 95% confidence interval.[17] The calculation was made as per the below formula:

$$N = (Nx)/[(N-1)E2 + x]$$

Where n is the required sample size, N is the population size (3,000), r is the expected response rate (90–95%) of the population of interest, E is the expected margin of error (5%), x is equal to [=Z(c/100)2 * r(100-r)], and Z(c/100) is the critical value for the confidence interval (95%).

Instrument Used to Measure QOL

Developed by the European Organisation for Research and Treatment of Cancer (EORTC), the Quality of Life Questionnaire for Colorectal Cancer-29 (QLQ-CR29) is a self-assessed outcome tool used to measure different aspects of QOL in CRC patients.[18] The questionnaire consists of two functional subscales (assessing body image, anxiety, weight, and sexual interest) and seven symptom scales (including micturition, gastrointestinal tract symptoms, side-effects of chemotherapy, defecation problems, stoma-related problems, and male and female sexual problems).[18]

The EORTC QLQ-Cr29 has been translated and validated in several languages, including Polish, Spanish, Dutch, and Arabic.[19–22] For example, the EORTC QLQ-Cr29 was used previously to evaluate the QOL of Dutch and Polish patients with or without stomata regarding bowel problems, leakage of stool, embarrassment, body image, urinary incontinence, and abdominal and buttock pain.[20,22] This tool has also been used to measure QOL among Spanish patients with advanced rectal cancer in the treatment follow-up period after receiving surgery and neoadjuvant chemoradiotherapy.[21] In addition, the Arabic version of this tool has been used among CRC survivors in Saudi Arabia and Jordan to measure health-related QOL related to psychological well-being, sexual interest, and stoma care problems.[23,24] Overall, the Arabic version of the EORTC QLQ-CR29 is a valid and reliable tool and has shown good internal consistency in the urinary and stool frequency scales, with alpha Cronbach coefficients of .79 and .83, respectively.[19] For the purposes of the current study, the researchers contacted the EORTC directly and received permission for use of both the original English and official Arabic translations of the questionnaires in this research.

An additional section to assess the sociodemographic characteristics and medical history of the participants was designed and included in the questionnaire. Sociodemographic items assessed age, education, marital status, place of residence, employment status, and income, while medical history items included the presence of any comorbidities, tumor location (i.e., the colon, rectum, or colorectal junction), time since diagnosis, stage of cancer at diagnosis, and any treatment modalities the survivors had received.

Statistical Analysis

Results related to the participants' sociodemographic characteristics, medical history, and EORTC QLQ-Cr29 scores were reported using descriptive statistics, including frequencies, percentages, means, and standard deviations. A univariate analysis was conducted to make comparisons between EORTC QLQ-Cr29 scores and sociodemographic and medical history variables using t-test or analysis of variance. Those variables found to be statistically significant in the univariate analysis ($P < .05$) were included in the multivariate linear (enter) regression analysis after adjustment to identify independent predictors associated with EORTC QLQ-Cr29 scores. All analyses were performed using SPSS software (Version 27.0, IBM Inc., Chicago, IL, USA), set at a 5% level of significance ($P < .05$).

Ethics Approval

This study received ethical approval from the Medical Research and Ethics Committee of the College of Medicine and Health Sciences, Sultan Qaboos University, Oman (#SQU-EC/143/2020), as well as the Research and Ethical Review and Approval Committee of the Ministry of Health, the Royal Hospital, Oman (#MOH/DGPS/PROPOSAL_APPROVED/ 115/2020). All subjects provided written informed consent prior to participating in the study. All patient details have been de-identified to ensure anonymity.

Results

Characteristics of the Participants

Of the 124 CRC survivors invited to take part in the study, a total of 118 agreed to participate (response rate: 95.2%). Table 1 shows the sociodemographic and clinical characteristics of the participants. The majority of the participants (59.3%) were from SQUH, while the remainder (40.7%) were from NOCRH. The mean age was 52.0 ± 11.7 years (range: 26–80 years). There were an equal number of female and male survivors (50.0%). Most were married (78.0%); the remaining survivors were either single (5.1%), widowed (14.4%), or divorced (2.5%). More than half of the survivors had a general diploma (52.5%), while 22 (18.6%) had a university-level or higher educational qualification and 34 (28.8%) had no formal education. Less than half were unemployed (42.4%), 31 (26.3%) were employed, and 37 (31.4%) were retired. Most of the survivors were from the Governorates of Al-Batinah (29.7%) and Muscat (28.0%). Of the 96 survivors who responded to the question regarding their income status, 40 (41.7%) had an income of between 500 and 1000 Omani Rials, whereas only six (6.3%) had an income of >2000 Omani Rials.

With regards to the location of the cancer, the colon was affected in the majority of the survivors (66.1%), followed by the rectum (23.7%) and colorectal junction (10.2%). In terms of TNM staging, approximately half had been diagnosed with stage III cancer (49.2%), 44 with stage II cancer, 11 with stage I cancer, and four with stage IV cancer at R0. Only one survivor was diagnosed with stage 0 cancer. Half of the survivors had no comorbidities (50.0%), whereas the rest had one (23.7%), two (12.7%), or three or more (13.6%) comorbidities. More than half of the survivors (56.8%) had received a combination of surgery and chemotherapy as cancer treatment modalities, while 25 (21.2%) had received surgery alone and 26 (22.0%) had received a combination of surgery, chemotherapy, and radiotherapy. In terms of time since diagnosis, 37 (31.4%) had been diagnosed with CRC less than three years previously, 47 (39.8%) within the last 3–6 years, and 34 (28.8%) more than six years previously. The

Table 1. Sociodemographic Characteristics and Medical History.

Characteristic		n (%)
Age, years	Mean ± SD	52.0 ± 11.7
Gender	Male	59 (50.0)
	Female	59 (50.0)
Marital status	Single	6 (5.1)
	Married	92 (78.0)
	Divorced	3 (2.5)
	Widowed	17 (14.4)
Education level	No formal education	34 (28.8)
	General diploma	62 (52.5)
	University/postgraduate	22 (18.6)
Employment status	Unemployed	50 (42.4)
	Retired	37 (31.4)
	Employed	31 (26.3)
Region of residence	Muscat	33 (28.0)
	Al-Batinah	35 (29.7)
	Ash Sharqiyah	14 (11.9)
	Ad Dhahirah	6 (5.1)
	Ad Dakhiliyah	16 (13.6)
	Musandam	1 (.8)
	Dhofar	12 (10.2)
	Al Buraimi	1 (.8)
Tumor location	Colon	78 (66.1)
	Rectum	28 (23.7)
	Colorectal junction	12 (10.2)
Stage of cancer	0	1 (.8)
	I	11 (9.3)
	II	44 (37.3)
	III	58 (49.2)
	R0	4 (3.4)
Number of comorbidities	0	59 (50.0)
	1	28 (23.7)
	≥2	31 (26.3)
Treatment modality	Surgery alone	25 (21.2)
	Surgery plus chemotherapy	67 (56.8)
	Surgery, chemotherapy, and radiotherapy	26 (22.0)
Time since diagnosis (years)	<3	37 (31.4)
	3-5.9	47 (39.8)
	≥6	34 (28.8)
	Mean ± SD	4.6 ± 2.7
Colonostomy	No	107 (90.7)
	Yes	11 (9.3)

SD, standard deviation.

mean time since diagnosis was 4.6 ± 2.7 years (range: 1 15 years). A total of 11 survivors (9.3%) had undergone a colonostomy.

EORTC QLQ-Cr29 Scores

Table 2 shows the mean scores for items in the EORTC QLQ-Cr29 tool as well as the frequencies and percentages of respondents who reported scores of <33.3% and ≥66.7% for each item. Overall, the mean QLQ-CR29 score for body image was 88.9, indicating that the participants in general had a good body image. The next highest mean scores in the functional

scale were for weight and anxiety (79.3 and 75.4, respectively) which meant that the survivors were satisfied with their weight and were not particularly anxious. Overall, the poorest mean score in the functional scale was sexual interest in men with a mean score of 31.4. In contrast, sexual interest in women was much higher, with a mean score of 62.2.

With regards to the symptom scales, the highest mean score was noted for impotence (35.9), thus affecting primarily male participants, followed by urinary frequency and bloating (26.4 and 24.9, respectively). In contrast, the least troublesome symptoms were blood and mucus in the stool, urinary incontinence, changes in taste, and fecal incontinence (mean

Table 2. EORTC QLQ-Cr29 Scores.

			n (%)	
Item		Mean Score ±SD	Scores of <33.3%	Scores of ≥66.7%
Functional scale[a]	Body image	88.9 ± 18.1	2 (1.7)	102 (86.4)
	Anxiety	75.4 ± 33.2	12 (10.2)	66 (55.9)
	Weight	79.3 ± 29.2	5 (4.2)	71 (60.2)
	Sexual interest (men)	31.4 ± 29.4	17 (33.3)[b]	4 (7.8)[b]
	Sexual interest (women)	62.2 ± 28.7	1 (3.3)[c]	8 (26.7)[c]
Symptom scale[d]	Urinary frequency	26.4 ± 28.8	66 (55.9)	7 (5.9)
	Blood and mucus in stool	1.8 ± 5.6	117 (99.2)	0 (.0)
	Stool frequency	12.4 ± 24.1	94 (79.7)	5 (4.2)
	Urinary incontinence	2.5 ± 10.8	111 (94.1)	0 (.0)
	Dysuria	5.1 ± 14.0	103 (87.3)	0 (.0)
	Abdominal pain	19.2 ± 25.9	68 (57.6)	3 (2.5)
	Buttock pain	12.1 ± 24.5	90 (76.3)	3 (2.5)
	Bloating	24.9 ± 32.1	64 (54.2)	9 (7.6)
	Dry mouth	14.9 ± 22.5	76 (64.4)	1 (.8)
	Hair loss	10.7 ± 19.9	88 (74.6)	0 (.0)
	Changes in taste	3.7 ± 11.4	106 (89.8)	0 (.0)
	Flatulence	19.5 ± 30.6	76 (64.4)	8 (6.8)
	Fecal incontinence	4.8 ± 17.4	108 (91.5)	2 (1.7)
	Sore skin	10.7 ± 22.1	90 (76.3)	3 (2.5)
	Sexual embarrassment	12.7 ± 26.5	90 (76.3)	6 (5.1)
	Stoma care problems	16.7 ± 23.6	6 (54.5)[e]	0 (.0)
	Impotence	35.9 ± 38.9	25 (49.0)[b]	8 (15.7)[b]
	Dyspareunia	12.6 ± 25.8	22 (73.3)[c]	1 (3.3)[c]

SD, standard deviation.
[a]For items in the functional scale, scores of <33.3% were considered to indicate functional difficulties, while scores of ≥66.7% signified good functioning.
[b]Percentages for this variable are calculated out of 51.
[c]Percentages for this variable are calculated out of 30.
[d]For items in the symptom scale, scores of <33.3% were deemed to indicate less severe symptoms, while scores of ≥66.7% signified more severe and distressing symptoms which could impact QOL.
[e]Percentages for this variable are calculated out of 11, SD = standard deviation; QOL = quality of life.

scores of 1.8, 2.5, 3.7, and 4.8, respectively). The mean score for stoma care symptoms was 16.7, indicating that affected survivors had few problems taking care of their stomas. Overall, 17 out of 51 males (33.3%) reported low interest in sex, while only four (7.8%) reported normal to high interest. A total of 12 survivors (10.2%) reported severe anxiety, while 66 (56%) reported no anxiety and the remaining 40 (43.8%) had some degree of anxiety. Eight survivors (6.8%) reported severe flatulence. Of the 51 men who answered the question, eight (15.7%) reported severe impotence, approximately half (49.0%) reported no impotence, and the rest (35.3%) some degree of impotence. Six survivors (5.1%) reported severe sexual embarrassment.

Predictive Factors for EORTC QLQ-Cr29 Scores

The sociodemographic and clinical characteristics of the survivors were compared in a univariate analysis in order to determine predictive factors for QOL, including age (<60 vs ≥60 years old; t = 2.47, P = .015), gender (male vs female; t = 2.145, P = .037), treatment modalities received (surgery alone vs combined treatment; t = 2.081, P = .042), presence or absence of comorbidities (t = 2.102, P = .038), and location of the cancer (colon vs rectum vs colorectal junction; F = 3.193, P = .045). Significant factors from the univariate analysis were subsequently included in the linear regression model to determine their predictive potential for EORTC QLQ-Cr29 scores.

Table 3 shows the results of the linear regression model analysis for items in the EORTC QLQ-Cr29 tool. An analysis of associations between the characteristics of the survivors and their QLQ-Cr29 scores showed significant associations between age and various items in the functional scale, including weight (β = 20.0, P = .006), body image (β = 23.3, P <.001), and sexual interest in women (β = 80.7, P <.001), signifying that survivors below 60 years of age were more concerned about their weight and body image compared to those 60 years of age or older, while women below 60 years of age had more interest in sex compared to their older counterparts. In addition, gender was significantly associated with anxiety (β = 16.5, P = .013), weight (β = 16.7, P = .016), and body image (β = 10.7, P = .038), with men demonstrating significantly higher scores in these domains compared to women.

Table 3. Linear Regression Model for Associations between EORTC QLQ-Cr29 Scores and Sociodemographic and Medical Characteristics.

	β (P value)[a]				Location of Cancer	
Item	Age[b]	Gender[c]	Comorbidities[d]	Treatment modality[e]	Colon[f]	Rectum[g]
Functional scale						
Anxiety	10.12 (.138)	16.53 (.013)	21.93 (.001)	11.15 (.179)	46.78 (<.001)	51.89 (<.001)
Weight	20.00 (.006)	16.70 (.016)	19.76 (.003)	−1.15 (.894)	46.99 (<.001)	44.61 (<.001)
Body image	23.32 (<.001)	10.67 (.038)	19.91 (<.001)	3.92 (.545)	58.66 (<.001)	52.41 (<.001)
Sexual interest (men)	5.90 (.539)	-	12.21 (.175)	2.31 (.827)	16.09 (.153)	31.97 (.004)
Sexual interest (women)	80.76 (<.001)	-	−12.23 (.256)	−19.03 (.159)	−3.30 (.834)	−21.15 (.242)
Symptom scale						
Urinary frequency	−1.52 (.794)	−1.14 (.839)	4.41 (.406)	−1.82 (.797)	26.03 (<.001)	26.78 (.001)
Urinary incontinence	1.02 (.622)	2.53 (.205)	.97 (.606)	3.96 (.118)	−1.01 (.688)	−1.73 (.553)
Dysuria	.75 (.783)	.70 (.790)	1.64 (.511)	1.55 (.642)	1.71 (.610)	6.55 (.092)
Abdominal pain	5.14 (.319)	−2.52 (.611)	3.71 (.430)	4.50 (.474)	13.34 (.035)	14.66 (.045)
Buttock pain	13.04 (.004)	.67 (.878)	5.89 (.154)	9.39 (.089)	−5.78 (.295)	5.84 (.358)
Bloating	5.01 (.419)	−3.19 (.593)	1.45 (.798)	9.65 (.203)	20.35 (.008)	22.66 (.011)
Blood and mucus in the stool	1.19 (.235)	1.89 (.052)	−.94 (.304)	.001 (.997)	−.71 (.560)	3.90 (.007)
Dry mouth	−6.08 (.159)	.08 (.985)	6.87 (.082)	9.59 (.069)	14.12 (.008)	12.23 (.045)
Hair loss	8.49 (.022)	−9.80 (.006)	−.13 (.968)	−7.70 (.086)	10.90 (.016)	13.16 (.012)
Changes in taste	1.82 (.403)	.88 (.675)	1.25 (.531)	−3.04 (.252)	2.28 (.391)	1.59 (.604)
Flatulence	13.76 (.019)	2.01 (.718)	4.46 (.398)	−8.64 (.221)	1.58 (.822)	21.45 (.009)
Fecal incontinence	3.67 (.245)	3.78 (.213)	3.51 (.223)	2.40 (.531)	−6.55 (.090)	9.07 (.043)
Sore skin	2.93 (.483)	−2.51 (.533)	4.83 (.206)	2.47 (.628)	4.22 (.409)	15.96 (.008)
Stool frequency	12.37 (.007)	5.04 (.251)	2.93 (.480)	−6.35 (.253)	−2.03 (.714)	5.75 (.370)
Sexual embarrassment	10.53 (.040)	−3.58 (.466)	−.14 (.977)	−3.48 (.575)	5.11 (.412)	12.68 (.079)
Stoma care problems	<.01 (.999)	25.00 (.434)	−8.33 (.765)	16.67 (.690)	<.01 (.998)	<.01 (.998)
Impotence	19.20 (.097)	-	16.32 (.126)	4.75 (.704)	−.07 (.996)	44.63 (.001)
Dyspareunia	32.71 (.023)	-	7.47 (.444)	7.09 (.557)	−27.73 (.059)	−27.13 (.097)

[a]The level of statistical significance was set at P <.05 (Bold).
[b]Age:0 ≥60 years, 1 <60 years.
[c]Gender: 0 = female, 1 = male.
[d]Comorbidities: 0 ≥1, 1 = 0.
[e]Treatment modality: 0 = combined treatment, 1 = surgery.
[f]Colon: 0 = no, 1 = yes.
[g]Rectum: 0 = no, 1 = yes.

Significant associations were observed between number of comorbidities and items in the functional scale, including anxiety (β = 21.9, P = .001), body image (β = 19.9, P <.001), and weight (β = 19.8, P = .003), with survivors with no comorbidities being more concerned over their weight and body image and complaining more frequently of anxiety compared to those with at least one comorbidity. With regards to treatment modality, no significant associations were noted with any of the items in the functional scale of the QLQ-Cr29 tool (P >.05), thus indicating that treatment group was not a good predictor of these aspects of QOL.

In contrast, significant associations were noted between cancer location and several items in the functional scale, including anxiety (β = 46.8, P <.001), body image (β = 58.7, P <.001), and weight (β = 47.0, P <.001), indicating that survivors of colon cancer were significantly more concerned about these aspects of QOL compared to those with colorectal junction-related cancer. Similarly, there were significant associations between anxiety (β = 51.9, P <.001), body image (β = 52.4, P <.001), and weight (β = 44.6, P <.001) among survivors of rectal cancer, as survivors of rectal cancer were more concerned regarding these aspects of QOL compared to those with colorectal junction-related cancer. In addition, there was a strong significant association between rectal cancer and sexual interest in men (β = 32.0, P = .004), with such men showing more interest in sex compared to their counterparts with colorectal junction-related cancer.

In terms of specific items on the symptom scale, significant associations were observed between age and buttock pain (β = 13.0, P = .004), hair loss (β = 8.5, P = .022), flatulence (β = 13.8, P = .019), sexual embarrassment (β = 10.5, P = .040), stool frequency (β = 12.4, P = .007), and dyspareunia (β = 32.7, P = .023), with survivors below 60 years of age complaining more frequently of such symptoms. In particular, it is

interesting to note that women under 60 years of age were more interested in sex, as detailed previously, yet complained more frequently of painful intercourse compared to women over 60 years of age. Hair loss ($\beta = -9.8$, $P = .006$) was the only symptom found to be significantly associated with gender, with this symptom disproportionately affecting women compared to men. No associations were noted between any of the items in the symptom scale and the presence or absence of comorbidities.

However, involvement of the colon as opposed to the colorectal junction was significantly associated with various symptoms, including urinary frequency ($\beta = 26.0$, $P < .001$), abdominal pain ($\beta = 13.3$, $P = .035$), bloating ($\beta = 20.4$, $P = .008$), dry mouth ($\beta = 14.1$, $P = .008$), and hair loss ($\beta = 10.9$, $P = .016$), indicating that these symptoms more frequently affected colon cancer survivors. Similarly, significant associations were observed between involvement of the rectum as opposed to the colorectal junction and various symptoms, including urinary frequency ($\beta = 26.8$, $P = .001$), abdominal pain ($\beta = 14.7$, $P = .045$), bloating ($\beta = 22.7$, $P = .011$), blood and mucus in the stool ($\beta = 3.9$, $P = .007$), dry mouth ($\beta = 12.2$, $P = .045$), hair loss ($\beta = 13.2$, $P = .012$), flatulence ($\beta = 21.5$, $P = .009$), fecal incontinence ($\beta = 9.1$, $P = .043$), sore skin ($\beta = 16.0$, $P = .008$), and impotence in men ($\beta = 44.6$, $P = .001$). Involvement of the rectum was therefore found to be predictive of more frequent complaints of such symptoms compared to involvement of the colorectal junction.

Discussion

To the authors' knowledge, this is the first study conducted in Oman to identify and evaluate factors affecting QOL among Omani CRC survivors. The mean age of the CRC survivors in our study was 52 years and the majority (86.4%) were diagnosed at stages II or III. These findings support those reported by previous studies conducted in Oman and neighboring countries which indicate that CRC in this region of the world is diagnosed at a younger age and more advanced stage compared to Western populations, particularly if patients are obese, overweight, or have existing comorbidities such as diabetes.[24–26]

With regards to the functional scale of the EORTC QLQ-CR29, the mean score for body image in this study was high (88.9), while those for weight (79.3) and anxiety (75.4) were satisfactory. Previous studies conducted in nearby countries such as Saudi Arabia, Jordan, and Egypt have shown that Arab CRC patients demonstrate similarly high scores in terms of functioning.[23,24,27] Nonetheless, it is important to note that the mean time since CRC diagnosis was 4.6 years and that most CRC survivors in the present study had completed their first six months of treatment—thus, it could be argued that most of these patients would have had sufficient time to come to terms with the diagnosis and disease, which could minimize acute effects of cancer diagnosis and treatment on QOL. Functional QOL among CRC patients has been found to worsen in the first few months following the initiation of cancer treatment, due to the influence

of acute cancer treatment and related side-effects.[24,28] Moreover, the prevalence of anxiety is usually high following cancer treatment, particularly if the patient is female, has a history of past psychiatric illness, or is diagnosed at stages III or IV.[29]

Other possible reasons for the high rate of functional QOL in our study could be related to the fact that access to cancer services and treatment is free in Oman; as such, Omani CRC patients may therefore be subject to fewer financial burdens and resulting stress. Cancer patients in other countries often have to pay subsidized costs of cancer treatment, resulted in a greater financial burden which contributes to psychological stress, thereby affecting aspects of functional QOL.[30] Nonetheless, although CRC survivors who have survived more than five years since diagnosis have been found to have better overall QOL compared to patients who have survived less than 5 years, they still experience greater psychological distress compared to the general population.[31]

Age was a predominant factor found to influence QOL in the current study. Older patients (>60 years old) were more likely to report low scores on the functional scales, especially in the domains of physical and cognitive functioning. This finding is to be expected considering normal age-related changes in cognition and physical capacity.[32] Thus, it is important that physicians encourage older individuals, including cancer patients, to participate in community activities such as sports, hobbies, and social groups; such activities have been shown to improve both daily activity performance as well as overall QOL.[33] Greater attention is needed to ensure the capability of healthcare systems to deliver appropriate accommodations to meet the needs of elderly patients, especially those recovering from cancer.

Alopecia was found to affect women significantly more frequently than men. This finding is to be expected, given that alopecia is a common side-effect of cancer treatment. Moreover, hair is an important aspect of physical appearance, particularly for women, and is often seen as a symbol of femininity. Thus, alopecia as a result of chemotherapy treatment can be traumatic, contributing to poor mental health, body image, and increased stress and anxiety, all of which affect QOL.[34] Indeed, a previous study found that many Omani women diagnosed with cancer experience severe psychological distress as a result of chemotherapy-induced side-effects such as alopecia, decreased libido, loss of femininity, and changes in body image.[35]

The mean score for the sexual interest in men item of the functional scale was very poor in our study, particularly compared to the score for sexual interest in women; moreover, the symptom found to be most distressing on the symptom scale was male impotence. Sexual impairment often occurs in CRC survivors over time as a consequence of radiotherapy and surgical treatment, leading to psychological distress and worsening QOL.[36] Indeed, patients in our study, particularly men who had rectal cancer, were significantly more concerned about impotency, urinary frequency, bloating, and fecal incontinence compared to patients with colon cancer, which

could indicate that the causes of such complaints may be organic rather than psychological. While involvement of the rectum was associated with a greater frequency of certain symptoms compared to involvement of the colon, despite both types of patients receiving similar treatment modalities in terms of radiation, chemotherapy, and surgery, the relationship between such symptoms and the site of the cancer is not clear and merits further investigation.

Although certain symptoms of CRC and CRC-related treatments such as gastrointestinal tract symptoms have been found to improve over time, concerns with sexual satisfaction and female sexual problems continue or worsen even up to 10 years later; hence, additional interventions and resources are recommended to address concerns regarding sexual function after cancer treatment in order to enhance survivors' QOL.[37] Nevertheless, while sexual problems did not appear to be a significant issue for female patients in the current study, this might not be accurate; as traditional Omani society is extremely conservative, women are not expected to discuss sexual issues. Thus, many female patients in the current study may have felt uncomfortable admitting that they had sexual problems, although younger women more frequently complained of painful intercourse. Similarly, physicians in Oman might avoid discussing such concerns with female patients out of fear of causing offense, or because they do not have sufficient knowledge regarding evaluation of sexual health in cancer patients.[38]

This study has several limitations. First, the cross-sectional nature of the study could have exposed the results to errors related to recall, response, and/or personal bias. Second, although we used the official Arabic version of the EORTC QLQ-CR29 which has high validity and reliability, the self-assessed nature of the tool entails a degree of subjectivity that cannot be eliminated, particularly for patients who were diagnosed with CRC a long time previously. Third, although most of our data were collected using self-administered questionnaires, illiterate patients (28.8%) were interviewed face-to-face and therefore we cannot rule out the possibility of subjective bias on the part of the interviewers. Finally, data were collected during the ongoing coronavirus disease 2019 (COVID-19) pandemic; hence, the impact of such an unprecedented and stressful large-scale event on the patients cannot be ruled out. In response to the COVID-19 pandemic, routine and non-urgent appointments for cancer patients were canceled in many countries, including Oman, resulting in considerable delays in cancer treatment and follow-up.[39] As such, it is possible that this might have caused additional stress and frustration to the cancer patients in our study, thereby opening the findings to potential bias.

Conclusion

Although the overall QOL of Omani CRC survivors was high, several survivors suffered from some degree of psychological, emotional, and physical disturbance. Oncology services in Oman are only available at two tertiary hospitals, both of which are located in Muscat, the capital city. Therefore, there is limited capacity within the national healthcare system to provide ongoing care and follow-up for cancer survivors. It is crucial that primary healthcare clinics in other regions of Oman become more involved in the routine psychological assessment and follow-up of cancer survivors, potentially allowing for easier access to health services and better control of symptoms affecting QOL. Moreover, it may be beneficial for other healthcare professionals, such as nurses specialized in geriatric care, to be incorporated in the follow-up and assessment of CRC survivors.

Age, gender, number of comorbidities, and tumor location were found to be significant predictors of QOL. In particular, sexual dysfunction was found to affect the functional QOL of CRC survivors, especially for men. It is imperative that healthcare providers dealing with CRC patients identify QOL concerns and implement appropriate interventions, particular in conservative societies such as Oman. Improving current methods of evaluating CRC survivors, encouraging them to express their feelings and concerns, and building a patient-physician relationship based on trust and open communication should enable CRC patients to feel more comfortable disclosing potentially sensitive or embarrassing concerns, including sexual problems. Healthcare providers should listen carefully to the complaints and concerns of CRC survivors, referring such patients to specialized counseling as needed.

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References

1. World Health Organization. Cancer. 2021. Accessed July 25. https://www.who.int/news-room/fact-sheets/detail/cancer.

2. Wong MCS, Huang J, Lok V, et al. Differences in incidence and mortality trends of colorectal cancer worldwide based on sex, age, and anatomic location. *Clin Gastroenterol Hepatol*. 2021; 19(5):955-966. e61.

3. Arnold M, Sierra MS, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global patterns and trends in colorectal cancer incidence and mortality. *Gut*. 2017;66(4):683-691.

4. Brenner H, Chen C. The colorectal cancer epidemic: Challenges and opportunities for primary, secondary and tertiary prevention. *Br J Cancer*. 2018;119(7):785-792.

5. Rawla P, Sunkara T, Barsouk A. Epidemiology of colorectal cancer: incidence, mortality, survival, and risk factors. *Gastroenterol Rev*. 2019;14(2):89-103.

6. Marventano S, Forjaz MJ, Grosso G, et al. Health related quality of life in colorectal cancer patients: State of the art. *BMC Surg*. 2013;13(S2):S15.

7. Cella DF, Tulsky DS. Quality of life in cancer: Definition, purpose, and method of measurement. *Cancer Invest*. 1993; 11(3):327-336.

8. Mosher CE, Winger JG, Given BA, Helft PR, O'Neil BH. Mental health outcomes during colorectal cancer survivorship: A review of the literature. *Psycho Oncol*. 2016;25(11): 1261-1270.

9. Rutherford C, Müller F, Faiz N, King MT, White K. Patient-reported outcomes and experiences from the perspective of colorectal cancer survivors: Meta-synthesis of qualitative studies. *J Patient Rep Outcomes*. 2020;4(1):27.

10. Shrestha A, Martin C, Burton M, Walters S, Collins K, Wyld L. Quality of life versus length of life considerations in cancer patients: A systematic literature review. *Psycho Oncol*. 2019; 28(7):1367-1380.

11. Bonnetain F, Borg C, Adams RR, et al. How health-related quality of life assessment should be used in advanced colorectal cancer clinical trials. *Ann Oncol*. 2017;28(9):2077-2085.

12. Sultanate of Oman Ministry of Health.Cancer Incidence in Oman. 2018.

13. Al-Lawati NA, Al-Bahrani BJ, Al-Raisi SS, Al-Lawati JA. Twenty-year trends of cancer incidence in Omanis, 1996-2015. *Oman Medical Journal*. 2019;34(4):361-387.

14. Kumar S, Burney IA, Zahid KF, et al. Colorectal cancer patient characteristics, treatment and survival in oman - a single center study. *Asian Pac J Cancer Prev*. 2015;16(12): 4853-4858.

15. Al Lamki ZMN. Cancer care in regions/societies in transition in the Gulf States: Sultanate of Oman. In: Silbermann M, ed.- *Cancer Care in Countries and Societies in Transition*. New York: Springer; 2016:337-347.

16. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Ann Intern Med*. 2007;147(8):573-577.

17. Inc R. Sample size calculator. Published online 2004. 2021. Accessed December 21. http://www.raosoft.com/samplesize.html http://www.raosoft.com/samplesize.html.

18. Gujral S, Conroy T, Fleissner C, et al. Assessing quality of life in patients with colorectal cancer: An update of the EORTC quality of life questionnaire. *Eur J Cancer*. 2007;43(10):1564-1573.

19. El Alami Y, Bachri H, Essangri H, et al. Validation of the Arabic version of the EORTC colorectal (CR29) module in Moroccan colorectal cancer patients. *Research Square*. 2020. [in press].

20. Stiggelbout AM, Kunneman M, Baas-Thijssen MCM, et al. The EORTC QLQ-CR29 quality of life questionnaire for colorectal cancer: Validation of the Dutch version. *Qual Life Res*. 2016; 25(7):1853-1858.

21. Arraras JI, Suárez J, Arias de la Vega F, et al. The EORTC quality of life questionnaire for patients with colorectal cancer: EORTC QLQ-CR29 validation study for Spanish patients. *Clin Transl Oncol*. 2011;13(1):50-56.

22. Nowak W, Tobiasz-Adamczyk B, Brzyski P, Sałówka J, Kuliś D, Richter P. Adaptation of quality of life module EORTC QLQ-CR29 for Polish patients with rectal cancer: Initial assessment of validity and reliability. *Pol Przegl Chir*. 2011;83(9):502-510.

23. Abu-Helalah MA, Alshraideh HA, Al-Hanaqta MM, Arqoub KH. Quality of life and psychological well-being of colorectal cancer survivors in Jordan. *Asian Pac J Cancer Prev*. 2014; 15(18):7653-7664.

24. Almutairi KM, Alhelih E, Al-Ajlan AS, Vinluan JM. A cross-sectional assessment of quality of life of colorectal cancer patients in Saudi Arabia. *Clin Transl Oncol*. 2016;18(2):144-152.

25. Al Bahrani BJ, Mehdi I, Monem EA, Al Farsi AM, Al Lawati N, Nada AM. Laterality of colorectal cancer (CRC) in Oman. *Cancer Sci Res*. 2021;4(1):1-7.

26. Mhaidat NM, Al-Wedyan TJ, Alzoubi KH, Al-Efan QM, Al-Azzam SI, Balas QA, et al. Measuring quality of life among colorectal cancer patients in Jordan. *J Palliat Care*. 2014;30(3): 133-140.

27. Hokkam E, Farrag S, El Kammash S, Faisal M. Assessment of quality of life of colorectal carcinoma patients after surgery. *World J Colorectal Surg*. 2013;3(1):4.

28. Arndt V, Merx H, Stegmaier C, Ziegler H, Brenner H. Quality of life in patients with colorectal cancer 1 year after diagnosis compared with the general population: A population-based study. *J Clin Oncol*. 2004;22(23):4829-4836.

29. Cardoso G, Graca J, Klut C, Trancas B, Papoila A. Depression and anxiety symptoms following cancer diagnosis: A cross-sectional study. *Psychol Health Med*. 2015;21(5):562-570.

30. Mehlis K, Witte J, Surmann B, et al. The patient-level effect of the cost of cancer care - financial burden in German cancer patients. *BMC Cancer*. 2020;20(1):529.

31. Adam S, Feller A, Rohrmann S, Arndt V. Health-related quality of life among long-term (≥5 years) prostate cancer survivors by primary intervention: A systematic review. *Health Qual Life Outcome*. 2018;16(1):22.

32. Milanovic Z, Jorgić B, Trajković N, Sporiš G, Pantelić S, James N. Age-related decrease in physical activity and functional fitness among elderly men and women. *Clin Interv Aging*. 2013; 8:549-556.

33. Zaitsu M, Kawachi I, Ashida T, Kondo K, Kondo N. Participation in community group activities among older adults: Is

diversity of group membership associated with better self-rated health? *J Epidemiol*. 2018;28(11):452-457.

34. Trusson D, Pilnick A. The role of hair loss in cancer identity. *Cancer Nurs*. 2017;40(2):E9-E16.

35. Al-Azri M, Al-Awisi H, Al-Rasbi S, et al. Psychosocial impact of breast cancer diagnosis among Omani women. *Oman Med J*. 2014;29(6):437-444.

36. Ho VP, Lee Y, Stein SL, Temple LK. Sexual function after treatment for rectal cancer: A review. *Dis Colon Rectum*. 2011; 54(54):113-125.

37. Reese JB, Handorf E, Haythornthwaite JA. Sexual quality of life, body image distress, and psychosocial outcomes in colorectal cancer: A longitudinal study. *Support Care Cancer*. 2018; 26(10):3431-3440.

38. Wazqar DY. Sexual health care in cancer patients: A survey of healthcare providers' knowledge, attitudes and barriers. *J Clin Nurs*. 2020;29(21-22):4239-4247.

39. Al-Azri MH. Delays in cancer diagnosis during the era of the coronavirus disease 2019 pandemic. *Sultan Qaboos University Medical Journal [SQUMJ]*. 2021;21(3):341-343.