




BMJ Open Predictive factors associated with health-related quality of life in patients with colorectal cancer in Iran: a cross-sectional study

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ABSTRACT

Objectives This study aims to identify the primary factors influencing health-related quality of life (HRQoL) in patients with colorectal cancer (CRC), hypothesising that specific patient characteristics and clinical factors significantly impact HRQoL.

Design This was a cross-sectional study conducted over 1 month, from 1 April 2022 to 1 May 2022.

Setting The study was conducted in five hospitals in the northwest region of Iran, focusing on outpatient chemotherapy services.

Participants A total of 251 patients diagnosed with colon and rectal cancer participated in the study. Inclusion criteria included a confirmed diagnosis by an oncologist, ability to communicate, willingness to participate and being aware of their diagnosis and treatment. Exclusion criteria were the presence of other chronic diseases, cognitive disorders, known mental disorders and unwillingness to participate.

Interventions No interventions were applied as this was an observational study.

Primary and secondary outcome measures The primary outcome was the HRQoL of patients with CRC, measured using a standardised SF-36 (36-Item Short Form Health Survey) questionnaire. Secondary outcomes included the impact of demographic and clinical factors on HRQoL.

Results The total score of HRQoL in these patients is 47.22 ± 16.78 , which indicates that HRQoL is disturbed in these patients. Also, the results of the stepwise multiple regression revealed that among all the participants' characteristics considered, seven factors: not having another disease besides cancer ($p < 0.001$, β : 12.91, 95% CI 8.40, 17.42), only receiving chemotherapy ($p < 0.001$, β : 9.10, 95% CI 4.12, 14.09), not having colostomy ($p < 0.001$, β : 10.27, 95% CI 5.70, 14.84), female sex ($p = 0.046$, β : -4.52, 95% CI -8.95, -0.08), living in their own house ($p = 0.001$, β : 11.25, 95% CI 4.77, 17.73), living in city ($p = 0.002$, 17.74, 95% CI 6.51, 28.96) and finally not having a job ($p = 0.003$, β : -7.47, 95% CI -12.31, -2.63), including are the factors that have the most predictive power in HRQoL.

Conclusions The findings of this study encourage health service providers and planners to pay special attention to the characteristics of patients with CRC as identified in this study. Notably, several HRQoL scores in patients with CRC

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Used a well-established instrument to assess health-related quality of life (HRQoL).
- ⇒ Considered cultural influences on HRQoL experiences.
- ⇒ Addressed potential biases from self-reported questionnaires.
- ⇒ The cross-sectional design limits the ability to establish causality.
- ⇒ Achieved a 100% response rate, which may introduce selection bias.

are low, and the study found that patient characteristics, such as the presence of colostomy, unemployment, female gender and comorbidities, significantly predict the overall HRQoL score. Future research should focus on interventional studies aimed at minimising the adverse effects of disease symptoms on HRQoL in these vulnerable patients.

INTRODUCTION

Colorectal cancer (CRC) is one of the most common cancers worldwide, with its incidence projected to increase to 3.2 million new cases and 1.6 million deaths by 2040.¹ In Iran, the incidence rate of CRC has notably increased over the past 25 years.^{2 3} A recent report from the Iranian National Population-based Cancer Registry predicts a significant rise in the incidence of CRC in Iran. The number of new CRC cases is expected to surge by 54.1%, increasing from 11 558 cases in 2016 to 17 812 cases by 2025.⁴ Tragically, CRC claims the lives of approximately 30 000 individuals in Iran annually.^{5 6} The rise in CRC can be attributed to factors such as increased life expectancy, lifestyle changes and advancements in diagnostic and therapeutic methods.⁷ As the life expectancy of patients with CRC has improved, there is growing recognition of the importance of addressing their quality of life (QOL) concerns.⁸ Numerous studies have



emphasised the measurement and evaluation of cancer outcomes in terms of patient survival and QOL during and after treatment.^{9–11} Assessing the health-related QOL (HRQoL) in patients with cancer provides valuable insights into unaddressed emotional, social and psychological concerns and assists in assessing the impact of the disease on survivors.¹⁰

HRQoL is a multidimensional concept that encompasses physical, mental, emotional and social functioning.¹² Several factors have been identified as influencing HRQoL in patients with CRC, including sociodemographic characteristics, treatment-related factors and lifestyle-related factors such as smoking, physical activity, diet and alcohol consumption.¹³ HRQoL is significantly associated with non-communicable chronic diseases such as cancer, impacting both physical and mental health outcomes.¹⁴ Therefore, evaluating HRQoL can provide valuable information about the physical and mental well-being of patients with cancer, as well as their social relationships and overall perception of health and well-being.¹⁵

Numerous studies have investigated the factors influencing HRQoL in patients with CRC. One of them has shown that specific patient subgroups may be at a higher risk of diminished HRQoL.¹⁶ Some others have showed that age,^{16–18} gender,¹⁶ comorbid conditions,^{16 17} income¹⁹ and education^{16 18} may effect discernment of health. Additionally, cancer-related factors, such as time since diagnosis, cancer recurrence, multiple primary cancers and recent initiation of cancer treatment, have been associated with HRQoL among patients with cancer.^{16 18} Disparities in HRQoL between genders have yielded variable results, with most studies reporting poorer HRQoL among women, although some studies have found no differences in patients living with ostomies. Variations across sociodemographic groups have also been documented.^{20–24} Furthermore, body mass index (BMI) and physical activity have been recognised as essential factors in HRQoL, with obesity being linked to lower HRQoL.^{18 25}

Healthcare providers involved in the care and management of patients with CRC should consider HRQoL and its influencing factors.^{26 27} Timely identification of patients at risk of impaired HRQoL enables early interventions to enhance their well-being.²⁸ Moreover, the influence of ethnicity, culture and socioeconomic status can introduce fundamental variations in the factors influencing HRQoL.^{16 18 19 22} Despite the high prevalence and increasing trend of CRC in Iran, along with the importance of HRQoL, there is a scarcity of organised studies in this area. Therefore, this cross-sectional study aims to determine the predictive power of patient characteristics on HRQoL in patients with CRC in Iran.

METHODS

Prior to conducting the study, permission was obtained from the research environment where the investigation took place. The research objectives were clearly explained

to the potential participants, and their voluntary participation was sought. To safeguard confidentiality, participants were assured that their personal information would be treated with utmost confidentiality. Instead of using their actual names, a coding system was employed to anonymise the participants' identities in the questionnaire. The study strictly adhered to ethical principles regarding the use of other research and sources. Proper citation and referencing were employed, acknowledging the original authors and respecting intellectual property rights. Furthermore, on request, the research findings were shared with the participants, promoting transparency and accountability. By adhering to these ethical considerations, the study aimed to protect the rights and well-being of the participants, maintain the confidentiality of their information and ensure the integrity and reliability of the research findings.

Study design

A cross-sectional study was conducted from 1 April 2022 to 1 May 2022. The target population consisted of patients diagnosed with colon and rectal cancer. During the sampling process, the distinction between the presence or absence of a colostomy, and whether the colostomy bag was permanent or temporary, was not considered. All participants were patients referred to outpatient chemotherapy centres. Convenience sampling was employed as the sampling method. The researcher approached five hospitals, namely Shahid Madani, Shahid Ghazi, Alinasab, Shahriar and Valiasr in Tabriz. Qualified and interested individuals were invited to participate in the study by completing the research questionnaire. The methodology of this research involved the researcher visiting the research environment, and after obtaining permission from hospital managers, distributing questionnaires to patients in a manner that did not interfere with their treatment process. The inclusion criteria were a definitive diagnosis of colon or rectal cancer by an oncologist; being able to communicate; willingness to participate in the study; referral for outpatient chemotherapy; having knowledge of their illness and the type of treatment received. The exclusion criteria were suffering from other chronic diseases such as diabetes, kidney diseases or any organ defects that could affect HRQoL according to the participants' statements; presence of cognitive disorders (such as Alzheimer's) according to the statements of the participant or their companions; known mental disorders according to the statements of the participant, their companions or records in their file and unwillingness to participate in the study.

Sample size calculation

In our study, we carefully considered the number of independent factors, which amounted to 22. Adhering to 'Green's rule of thumb', which suggests that the sample size should be a minimum of 50 plus 8 times the number of predictors, we calculated that a total sample size of 226 would be appropriate.²⁹ This calculation took into

account a significance level (α) of 0.05 and a desired power of 0.8. To ensure the detection of a medium effect size (0.14 for small effects, 0.39 for medium effects and 0.59 for large effects), we incorporated a conservative 10% allowance for potential participant drop-out, resulting in a minimum sample size of 251 (226×0.9). To determine the sample size, we employed Statistics Kingdom as a reliable tool.³⁰

Data collection

In this study, two questionnaires were used as follows:

Participants' characteristics

In this study, the characteristics of patients were assessed using a researcher-designed questionnaire aimed at capturing various demographic and clinical variables. These variables encompassed age, sex, marital status, educational background, occupation, insurance coverage, place of residence, housing type, type of treatment received, duration of the most recent chemotherapy cycle, family history of cancer among both close and distant relatives, the presence of cancer metastasis, the number of completed chemotherapy sessions, concurrent presence of other diseases, duration of surgery (if applicable), weekly exercise frequency, height, weight and BMI. The questionnaire was administered comprehensively to collect data on participant characteristics, facilitating a thorough analysis of the study population. Additionally, significant attention was directed towards 'income adequacy', a measure that evaluates whether a household's income suffices to meet its expenses from a subjective standpoint. This assessment not only considers the actual income level but also gauges the perceived capability to cover necessary expenditures, thereby offering a nuanced insight into economic stress and financial satisfaction. Through the examination of income adequacy, the study aimed to discern households experiencing financial strain despite low expenses and those feeling financially secure despite lower incomes.

HRQoL questionnaire with 36 questions (SF-36)

The HRQoL questionnaire, initially developed by Ware and Sharebourne in 1992,³¹ serves as a fundamental instrument for assessing the impact of health on individuals' overall QOL. Comprising 36 questions and encompassing 8 distinct components, this questionnaire uses the Likert scale to measure HRQoL. The Likert scale employs a 5-point rating system, where a score of 1 denotes 'completely false', 2 signifies 'somewhat false', 3 represents 'I don't know', 4 indicates 'mostly true' and 5 corresponds to 'completely correct'. The questionnaire generates scores ranging from 0 to 100, without a predetermined cut-off point. Scores in each dimension are interpreted relative to the minimum and maximum values reported for that specific dimension. A higher score indicates a lower level of disability within the corresponding area while a lower score suggests a higher degree of disability. Therefore, the proximity of the score

to 100 signifies reduced disability, whereas a closer proximity to 0 indicates increased disability within the same area. Researchers may also use the reported minimum and maximum values for each dimension to assess the obtained scores. The questionnaire has been subject to various studies, consistently demonstrating good validity.^{32–34} Additionally, it exhibits strong reliability, as evidenced by a reported Cronbach's alpha coefficient of 0.92 in a study.³³ Importantly, the questionnaire has been appropriately translated and standardised for use in Iranian society, ensuring its applicability within this context.^{35 36}

Data analysis

The data analysis was performed by using IBM SPSS Statistics V.24. To examine the characteristics of the samples, frequency and percentage distributions were employed. Additionally, for variables exhibiting normal distributions, descriptive statistics such as mean and SD were used. The normality of variable distributions was evaluated using the Kolmogorov-Smirnov test, accompanied by skewness and kurtosis indices. A significance level of 0.05 was adopted for all tests conducted within this study. To investigate the predictive influence of the variables, a step-by-step linear regression model was employed. All variables, including those with multiple categories (which were transformed into dummy variables), were entered into the regression analysis. The variables demonstrating the most substantial predictive effects were selected for inclusion in the subsequent statistical analysis. It is worth noting that throughout this analysis, the total QOL score served as the dependent variable.

Patients and public involvement

Patients and members of the public did not participate in the formulation of the research design, the execution of the study or the communication of the research outcomes.

RESULTS

Table 1 shows the characteristics of the study participants. A total of 256 patients consented to participate and diligently completed the questionnaires in accordance with the inclusion and exclusion criteria. Among these participants, 129 were male (49.6%), with 49.6% possessing a colostomy bag and 51.2% without. Similarly, 127 female patients were included (50.4%), with 50.4% of females exhibiting a colostomy bag and 48.8% without. Most participants (206 individuals) were married. Regarding age distribution, the highest frequency (67 individuals) was in the 30–40 years age range while the lowest frequency (28 individuals) was in the age range exceeding 60 years. 196 participants acknowledged having children. Concerning educational attainment, the majority (81 individuals) possessed a bachelor's degree, followed by 50 individuals with a diploma. Among the sample, 166 participants were employed. Furthermore, 138

Table 1 Distribution of frequency and percentage of individual characteristics of samples

Variable	Classes	N (valid per cent)
Age	30–40	67 (26.2)
	40–50	46 (18.0)
	50–60	95 (37.1)
	More than 60	48 (18.8)
Sex	Male	129 (50.4)
	Female	127 (49.6)
Marital status	Single	22 (8.6)
	Married	206 (80.5)
	Divorced and widowed	28 (10.9)
Education	Under diploma	50 (19.5)
	Diploma	73 (28.5)
	Bachelor	81 (31.6)
	Postgraduate	52 (20.3)
Job	Employed	166 (64.8)
	Unemployed	90 (35.2)
Income adequacy	Income equals expenditure	138 (53.9)
	Income more than expenditure	42 (16.4)
	Income less than expenditure	76 (29.7)
Having insurance	Yes	228 (89.1)
	No	28 (10.9)
Location	City	240 (93.8)
	Village	16 (6.3)
Housing type	Personal	228 (89.1)
	Rent	28 (10.9)
Type of treatment	Only chemotherapy	81 (31.6)
	Chemotherapy radiotherapy surgery	98 (38.3)
	Chemotherapy surgery	77 (30.1)
Time of last chemotherapy (week)	<5	232 (90.6)
	≥5–10	24 (9.4)
	Mean (SD)	3.10 (4.04)
Family history	Positive	121 (47.3)
	Negative	135 (52.7)
Metastasis	Yes	149 (58.2)
	No	107 (41.8)
Number of chemotherapy courses (number)	<10	137 (53.5)
	≥10–20	84 (32.8)
	≥20–30	35 (13.7)
	Mean (SD)	9.34 (6.98)
Another disease besides cancer	Yes	106 (41.4)
	No	150 (58.6)

Continued

Table 1 Continued

Variable	Classes	N (valid per cent)
Time of last surgery (month)	1–10	223 (87.1)
	≥11–20 and more	33 (12.9)
	Mean (SD)	6.11 (5.52)
Exercise (hour/week)	≤10	229 (89.5)
	10–20 and more	27 (10.5)
	Mean (SD)	3.42 (3.84)
Sexually active before the disease	Active	251 (98)
	Not active	5 (2)
Weight (kg)	45–65	63 (24.6)
	≥65–85	126 (49.2)
	≥85–105	67 (26.2)
	Mean (SD)	74.71 (14.42)
Height (cm)	70–130	3 (1.2)
	≥130–192	253 (98.8)
	Mean (SD)	169.34 (13.48)
Body mass index (kg/m ²)	<18.5	12 (4.7)
	≥18.5–25	123 (48)
	≥25–30	67 (26.2)
	≥30	54 (21.1)
	Mean (SD)	25.88 (4.74)
Having colostomy	With	127 (49.6)
	Without	129 (50.4)

individuals indicated that their income matched their expenses, and insurance coverage was reported by 228 participants. In terms of the duration since their disease diagnosis, the highest proportion (17.6%) reported a duration of 10 months. 240 participants resided in urban areas, and within this group, 228 lived in their own residences. With respect to the type of treatment received, 81 patients underwent chemotherapy exclusively, 98 patients received a combination of chemotherapy, radiotherapy and surgery and 77 patients underwent chemotherapy in conjunction with surgery. Of the 232 participants who completed the questionnaire, 2 weeks had transpired since their most recent chemotherapy session. 121 patients affirmed a positive family history of cancer, while in 149 cases, the tumour had metastasised to different regions of the body. Concerning the number of chemotherapy courses, 137 patients received 1–10 courses. Additionally, 106 patients exhibited at least one comorbid condition alongside cancer. The majority of participants (223 individuals) disclosed that 1–10 months had elapsed since their most recent surgery. Among the sample, 229 individuals engaged in sports activities for less than 10 hours per week. 251 participants asserted that they were sexually active prior to their disease diagnosis and commencement of treatment. In terms of weight distribution, 63 patients weighed between 45–65 kg, 126

Table 2 Mean and SD of health-related quality of life by gender

Items	Total		
	Mean	SD	95% CI Min-Max
Physical functioning	44.96	30.97	0 to 100
Role limitations due to physical health	62.40	40.64	0 to 100
Role limitations due to emotional problems	62.06	41.04	0 to 100
Energy/fatigue	52.28	15.97	5 to 100
Emotional well-being	57.57	15.58	20 to 100
Social functioning	48.05	23.99	0 to 100
Pain	43.50	25.99	0 to 100
General health	33.46	8.42	6 to 56
Health-related quality of life	47.42	16.78	6 to 75

patients fell within the 65–85 kg range and 67 patients registered a weight of 85–105 kg. The majority of participants (253 individuals) exhibited heights ranging from 130 to 192 cm. Regarding BMI, the majority (123 individuals) fell within the 18.5–25 range. Notably, the participant characteristic questionnaire did not include any information regarding the cancer stage.

Table 2 presents the comprehensive assessment of HRQoL scores and their respective dimensions. The average score obtained (mean=47.42, SD=16.76, min=6, max=75) highlights the range of values observed within the entire group, as indicated in table 2. Notably, according to the analysis guidelines for the questionnaire, a score of 50 can be considered as a crucial threshold for evaluating HRQoL. Comparatively, when considering scores obtained from a similar study conducted in Iran (The average QoL score was 77.28±8.86 for colon cancer and 76.5±8.47 for rectal cancer),³⁷ it becomes apparent that our patients exhibit significant disturbances in their HRQoL. This finding adds an intriguing aspect to the investigation, emphasising the need for further exploration and potential interventions to address the compromised well-being of these individuals.

Table 3 summarises the results of a stepwise regression analysis conducted on 22 factors to determine their impact on the total HRQoL score. Among these variables, seven were found to have a significant effect on the outcome measure. Notably, the 'location' variable exhibited the most substantial influence, with a standardised beta value and a 95% CI ranging from 6.51 to 28.96 (p=0.002). These findings highlight the importance of considering the 'location' variable in understanding and improving overall HRQoL. The significance of these results brings excitement and underscores their potential implications for future research and interventions targeting the enhancement of HRQoL in the studied population.

Table 3 Results from stepwise multiple regression for total score of HRQoL

Factors	β (95% CI)	Beta*	P value
Another disease besides cancer (yes)	12.91 (8.40 to 17.42)	0.38	>0.001
Type of treatment (chemotherapy surgery)	9.10 (4.12 to 14.09)	0.25	>0.001
Having colostomy (with)	10.27 (5.70 to 14.84)	0.30	>0.001
Sex (male)	-4.52 (-8.95 to -0.08)	-0.13	0.046
Housing type (personal)	11.25 (4.77 to 17.73)	0.22	0.001
Location (village)	17.74 (6.51 to 28.96)	0.20	0.002
Job (employed)	-7.47 (-12.31 to -2.63)	-0.21	0.003

R²: 0.458 (adjusted R²: 0.428).
 *Standardised beta coefficient.
 HRQoL, health-related quality of life.

DISCUSSION

HRQoL has emerged as a crucial outcome measure for patients afflicted with CRC.³⁸ HRQoL goes beyond the well-being of patients with cancer, as it also influences treatment response and survival rates. Several studies have extensively examined factors that impact HRQoL assessment in CRC, highlighting the substantial influence of symptoms, surgical procedures and comorbidity burden on overall well-being.⁸ The aim of this study was to assess the influential factors associated with HRQoL in individuals with CRC and provide a comprehensive analysis of its dimensions. The study findings revealed consistently low scores in various domains of HRQoL among individuals with CRC. This suggests that the challenges posed by cancer and its treatment have a detrimental impact on the HRQoL experienced by individuals with CRC. These findings are consistent with previous studies reporting unfavourable HRQoL outcomes among patients with CRC.^{39–41} Furthermore, systematic reviews conducted across diverse literature sources have consistently demonstrated a significant decline in QoL among these patients.^{42 43}

In this study, a thorough evaluation and comparison of eight dimensions of HRQoL was undertaken. The findings revealed that the dimension scoring the lowest was general health, followed by physical functioning and pain. Conversely, emotional well-being achieved the highest score, followed by role limitations due to physical health and role limitations due to emotional issues. These outcomes are consistent with those of Domati *et al*, who examined HRQoL in individuals with CRC compared with healthy controls.⁴⁴ However, discrepancies between our study and prior research could stem from variations in participant demographics, sample size and cultural, economic and social contexts. Moreover, our study

identified a significant association between reduced physical functioning and disability, which impacts independence.⁴⁵ Previous research has also underscored the importance of understanding how ostomies affect HRQoL to better prepare patients presurgery.⁴⁶ Therefore, comprehensive knowledge and improved physical function are pivotal for enhancing physical aspects of HRQoL and overall well-being. These findings underscore the imperative for oncologists, psychiatrists, oncology nurses and health policy-makers to prioritise HRQoL in patients with CRC. Addressing these identified dimensions and fostering patient adaptation can markedly enhance the overall QOL, particularly across the dimensions highlighted.

In accordance with the findings of this study, several participant characteristics have been identified as significant predictors of HRQoL. Specifically, the presence of other diseases besides cancer was associated with higher HRQoL scores compared with those without additional conditions. Regarding treatment type, individuals who underwent combined chemotherapy and radiotherapy demonstrated superior HRQoL scores compared with those who only received chemotherapy followed by surgery. Participants without a colostomy reported higher HRQoL scores than those with a colostomy bag. Furthermore, male participants and tenants exhibited higher HRQoL scores than their female counterparts and homeowners, respectively. Urban residents also showed higher HRQoL scores compared with rural residents and employed individuals reported better HRQoL than the unemployed. These findings align with studies by Ito *et al*,⁴⁷ Kristensen *et al*⁴⁸ and Dahouri *et al*,⁴⁹ which similarly highlighted various factors influencing HRQoL such as age, marital status, employment and presence of a colostomy. The disparities observed across studies can be attributed to cultural contexts and socioeconomic differences among populations. In our study conducted in Iran, factors like housing type, geographic location and treatment type, which are linked to income levels, emerged as significant determinants affecting HRQoL. Therefore, based on these findings and existing literature, it is evident that factors such as colostomy presence, unemployment, female gender and comorbidities play crucial roles in influencing HRQoL. Health policy-makers should consider these factors at a microlevel to optimise healthcare interventions for individuals affected by CRC, thereby potentially improving their HRQoL through targeted strategies and timely support.

Furthermore, it is imperative to acknowledge the implications of the present study's findings for future intervention studies aimed at mitigating the negative impact of disease symptoms on the HRQoL of patients with CRC. Prospective longitudinal research endeavours should comprehensively evaluate the influence of various factors, including lifestyle choices, health behaviours, psychological determinants and other relevant variables, on HRQoL outcomes. As the population of cancer survivors continues to grow, addressing the multidimensional

aspects of HRQoL through long-term nursing care provisions becomes increasingly crucial. This study highlights the robust correlation between sociodemographic factors and the overall HRQoL score among patients with CRC. The identification of these sociodemographic factors underscores their significance in the treatment and care of patients with CRC, necessitating healthcare professionals to consider them in their clinical practice to enhance HRQoL outcomes.

It is crucial to acknowledge both the strengths and limitations of this study. The utilisation of a well-established instrument to assess HRQoL is a notable strength. Nevertheless, it is essential to consider the influence of cultural factors on the results, as cultural context can shape HRQoL experiences. Future studies should explore this aspect in various cultural contexts to enhance the generalisability of the findings. Additionally, addressing the study's time limitations and sample size in future research would further improve its applicability. Although efforts were made to ensure data anonymity and confidentiality, the reliance on self-reported questionnaires may introduce intentional and unintentional biases. Furthermore, the cross-sectional nature of the study and the 100% response rate among participants may introduce selection bias. These limitations should be carefully considered when interpreting the results.

CONCLUSION

In conclusion, this study contributes significantly to our understanding of the factors influencing HRQoL in patients with CRC, highlighting that several HRQoL scores in this population are notably low. It emphasises the need to integrate these factors into treatment and care practices to improve patients' well-being and HRQoL outcomes. Specifically, the study identified several patient characteristics, such as the presence of colostomy, unemployment, female gender and comorbidities, that exert predictive power over the overall HRQoL score. Healthcare professionals should prioritise the QOL of patients with CRC and tailor interventions accordingly. By addressing the influencing factors identified in this study, healthcare providers can significantly enhance HRQoL outcomes in patients with CRC. Future research should focus on developing targeted interventions and conducting longitudinal studies to further explore the multidimensional aspects of HRQoL in this patient population.

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Contributors AD: the lead investigator and guarantor of the study, designed the empirical analysis, oversaw data creation and management, and significantly contributed to writing the manuscript. MHS: a senior researcher and coauthor, performed the literature search and made substantial contributions to the writing of the manuscript. NG: a research fellow and coauthor, was involved in data creation and management, conducted empirical analyses and contributed to the manuscript writing. AD: a lecturer and coauthor, assisted in data creation and management, participated in the empirical analyses and contributed to the manuscript writing.

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Competing interests None declared.

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Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study adhered to ethical principles, with all necessary approvals and permissions obtained. The research plan received approval from the Research Council and the Research Vice-Chancellor of the Faculty of Nursing and Midwifery at Tabriz University. Additionally, permission to conduct the research was obtained from the esteemed Research Vice-Chancellor of Tabriz University of Medical Sciences. The regional ethics committee approved the study with reference number IR.TBZMED.REC.1401.046.

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Data availability statement Data are available on reasonable request. Data are accessible on reasonable request. Interested parties can obtain the data by submitting a written request to the first or corresponding authors (MHS and AD).

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