



Original Article

Factors associated with psychosocial adjustment in working-age colorectal cancer survivors: A cross-sectional study

Wenjie Zou^{a,1}, Yiheng Zhang^{a,1}, Lizhen Gong^b, Meng Zhang^a, Xiaoyu Wu^a, Jingyue Xie^a, Meifen Zhang^{a,*}^a School of Nursing, Sun Yat-sen University, Guangzhou, China^b State Key Laboratory of Oncology in South China, Collaborative Innovation Center for Cancer Medicine, Sun Yat-sen University Cancer Center, Guangzhou, China

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ABSTRACT

Objective: This study aimed to describe the level of psychosocial adjustment and identify factors associated with psychosocial adjustment in working-age colorectal cancer survivors.

Methods: This cross-sectional study involved 212 colorectal cancer survivors visiting a cancer clinic at a specialized oncology hospital in China. Socio-demographic characteristics, disease-related characteristics, status of returning to work, Work Ability Index scores, M. D. Anderson Symptom Inventory for Gastrointestinal Cancer scores, and self-reported Psychological Adjustment to Illness Scale scores were collected from all participants. Data analyses included descriptive statistics, independent t-test, one-way analysis of variance, correlation analysis, and multiple linear regression analysis, which were performed using the Statistical Package for the Social Sciences version 25.0 (IBM Corporation, Armonk, NY, USA).

Results: Participants reported a medium level of psychosocial maladjustment (35.73 ± 19.68), with 19.3% of participants experiencing severe maladjustment, 29.7% experiencing moderate maladjustment, and 50.9% experiencing mild maladjustment, respectively. Age, gender, marital status, having a child, education level, having a stoma, comorbidities, return to work, work ability, and symptom distress were entered into a multiple linear regression analysis. The strongest factor influencing the level of psychosocial adjustment was work ability ($\beta = -0.393, P < 0.001$), followed by symptom distress ($\beta = 0.380, P < 0.001$) and an education level of college or above ($\beta = 0.150, P = 0.027$). These variables accounted for 46.1% of the variance in psychosocial adjustment.

Conclusions: Colorectal cancer survivors with low work ability, high symptom distress, and an education level of college or above are at a high risk for psychosocial maladjustment. Nursing interventions for psychosocial adjustment should attach increased importance to the work status and symptom distress of colorectal cancer survivors.

Introduction

According to GLOBOCAN 2020, colorectal cancer (CRC) ranks third in incidence and second in mortality among all cancers worldwide.¹ Early screening and advancements in treatment modalities have contributed to an increased incidence of survival among those < 60 years of age and a higher 5-year survival rate,² resulting in a growing population of CRC survivors of working age. In this study, CRC survivors were defined as those who have completed active treatment for CRC.³

Following CRC treatment, survivors can struggle with psychological impacts, such as anxiety, depression, and a fear of recurrence, and

relational impacts, including disruptions to their intimate relationships and social isolation.⁴ Psychosocial adjustment in this context refers to an individual's adaptation to these impacts as a result of cancer, which is a crucial component of cancer survivorship since survivors must adjust to the psychological and social changes that have occurred while living beyond their cancer. Adjustment is even harder for working-age cancer survivors as they have to deal with work- and family-related issues. Financially, these individuals are at higher risk of financial hardships, such as medical debt and bankruptcy,⁵ as they are hindered in providing for their family. A registry-based study showed that working-age cancer survivors report much higher anxiety levels than the general population.⁶

* Corresponding author.

E-mail address: zhmfen@mail.sysu.edu.cn (M. Zhang).¹ These authors contributed equally to this work as joint first author.

Thus, it is imperative to explore the factors associated with psychosocial adjustment among working-age CRC survivors.

Previous studies have partially explored the factors associated with psychosocial adjustment in patients with cancer, albeit mostly patients with breast cancer. To our knowledge, only a single study has explored CRC survivors' psychosocial adjustment,⁷ and its authors identified several significant associating factors, including health-promoting behaviors, difficulty with activities of daily living, post-traumatic growth, and having a stoma. However, this study included CRC survivors of all ages and did not describe the components of psychosocial adjustment in CRC survivors. To date, no previous studies have focused on working-age CRC survivors and their psychosocial adjustment. For patients at working-age, their employment is interrupted by their cancer diagnosis, and they are often concerned about returning to their career even before the end of treatment and struggle with an altered working experience after returning to work.⁸ Thus, they likely face unique adjustment problems and, accordingly, factors associated with their psychosocial adjustment may differ from those of other cancer survivors. In other words, work-related factors may play a significant role in their psychosocial adjustment.

After a health shock like CRC, being employed can bring a sense of normalcy, accomplishment, and financial independency to survivors,⁹ which is beneficial to their psychological well-being and return to normal life. However, returning to work is challenging for cancer survivors. Most cancer survivors return to their job after completing active treatment, but some are at risk of a change of employment status or even job loss after cancer treatment.⁸ A study from Korea reported that survivors who were unemployed due to cancer treatment adjusted worse than those who successfully returned to work.⁷ Cancer can not only influence the employment status of a person but also disrupt their work ability in terms of completing physical and mental tasks and productivity.¹⁰ However, to our knowledge, the correlation between work ability and psychosocial adjustment has not yet been studied. Thus, this study examined 2 work-related factors—working status and work ability—and their impact on psychosocial adjustment in CRC survivors.

Symptom distress is another troubling problem during survivorship, which can be defined as the subjective perception of a disturbance caused by physical symptoms. Physical symptoms commonly experienced by CRC survivors include fatigue, diarrhea, constipation, sexual dysfunction, and sleep disturbances,^{11–13} and these effects can persist for > 5 years into survivorship.¹⁴ Further, these symptoms not only bother survivors physically but also disrupt their social activities and mental health.¹⁵ However, very few studies have explored the association between symptom distress and psychosocial adjustment, except for a single study that examined patients during post-radiation treatment transition.¹⁶

The purpose of this study was to describe the psychosocial adjustment level in working-age CRC survivors and identify those factors associated with psychosocial adjustment. We hypothesized that work-related factors, symptom distress, and some sociodemographic characteristics are predictive factors of psychosocial adjustment. Besides, survivors who returned to work with a higher work ability and less symptom distress may have better psychosocial adjustment.

Methods

Study design

This study applied a cross-sectional design and investigated CRC survivors who visited a specialized oncology hospital for follow-up in China between November 2018 and November 2019.

Sampling and inclusion criteria

This study used convenience sampling for participant enrollment. CRC survivors who went to the clinic for regular follow-up were

approached and assessed for eligibility according to the following criteria: (1) had a diagnosis of CRC made through histopathology and had completed active treatment, such as surgery and adjuvant treatment; (2) had been employed for > 1 year before diagnosis; (3) was aged 18–55 years if female or 18–60 years if male; (4) was able to communicate in oral and written Chinese; and (5) was willing to participate and had provided informed consent. Participants were excluded if they are diagnosed with metastatic CRC (stage IV) or had a mental illness or cognitive impairment.

The sample size was calculated by the following sample size calculation formula for multiple linear regression embedded in the PASS version 14 software program (NCSS Statistical Software, Kaysville, UT, USA):

$$N = \left(4 \left[\frac{Z_{\alpha/2} + Z_{\beta}}{\ln\left(\frac{1+p}{1-p}\right)} \right]^2 + 3 \right) / (1 - R^2)$$

As the association between work ability and psychosocial adjustment has not been explored to date, we only involved symptom distress in the sample size estimation. In the above formula, “*p*” stands for the correlation coefficient of symptom distress and psychosocial adjustment, which is 0.53,¹⁶ while *R*² stands for the determination coefficient of symptom distress by demographic variables, and the closest *R*² that could be found was 0.51.¹⁷ Based on $\alpha = 0.05$ and $\beta = 0.20$, the sample size needed to detect an association between symptom distress and psychosocial adjustment was 68 participants. Thus, we decided that including 212 participants for analysis in this study was sufficient.

Ethical considerations

Ethical approval was obtained from the ethical committee of the hospital where the study was conducted (Approval No. 5010-2014-0401). Information about the study aim and principle was given to the participants, and completed written consent forms were obtained before data collection. Participants were free to withdraw from the study at any time.

Data collection

This study used a convenient sampling approach for study inclusion. CRC survivors who went to the oncology clinic for follow-up visits between November 2018 to November 2019 were recruited after eligibility assessment. After obtaining informed consent from eligible participants, data were collected through questionnaires on the spot. The study participants completed the questionnaires independently; proper guidance was given by the interviewer only when the participants asked questions. Questionnaires were checked in front of the respondents in case of mistakes or confusion.

Measures

Psychosocial adjustment

The Psychosocial Adjustment to Illness Scale (PAIS) developed by Derogatis is composed of 46 items covering 7 dimensions, as follows: health management (8 items), social environment (6 items), home environment (8 items), sexual relationships (6 items), extended family relationships (5 items), job environment (6 items), and psychological distress (7 items).¹⁸ For each item, there are 4 descriptive options available, which are scored on a 4-point Likert scale from 0 to 3 points (“0” for excellent adjustment, “1” for mildly problematic, “2” for moderately problematic, and “3” for very problematic). The total scoring range of the scale is 0–138 points, with higher scores indicating more severe psychosocial maladjustment. In the present study, total scores of 0–34, 35–50, and 51–138 points were considered to indicate mild,

moderate, and severe psychosocial maladjustment, respectively.¹⁹ The Chinese version of PAIS has shown good psychometric properties in Chinese patients with cancer, with Cronbach's α values of 0.61–0.84 for its subscales.²⁰ In this study, reliability testing showed a satisfactory Cronbach's α value of 0.90.

Work ability

The work ability index is a 7-item instrument used to measure a respondent's perceived ability to perform their work in view of their personal circumstances and working conditions. The 7 question areas are as follows: (1) current work ability compared to lifetime best, (2) work ability in relation to job demands, (3) number of diagnosed illnesses, (4) estimated impact of disease on work, (5) sick leave during the last 12 months, (6) prediction of work ability during the upcoming 2 years, and (7) vitality status. The possible total score of this index ranges from 7 to 49 points. The original index was validated in a large Finnish longitudinal study and recently applied in patients with rectal cancer.^{21,22} In this study, the Cronbach's α value of the work ability index was 0.76.

Symptom distress

The M. D. Anderson Symptom Inventory for Gastrointestinal Cancer is a disease-specific inventory composed of 2 parts and a total of 24 items.²³ The first part measures symptom severity (18 items) and the second part measures to what degree the symptoms have interfered with daily functioning (6 items). All items are scored on a scale of 0–10 points. Wang et al. previously validated the Chinese version of the M. D. Anderson Symptom Inventory for Gastrointestinal Cancer in Chinese patients with cancer and reported a Cronbach's α value of 0.80 for the total scale.²⁴ In this study, reliability testing revealed a Cronbach's α value of 0.96.

Demographic and clinical data

Demographic data were obtained using a questionnaire developed for this study and included age, gender, religion, employment, education level, and financial status. Clinical data were retrieved from hospital records and included diagnosis, cancer stage, treatment modality, stoma, comorbidities, and time since treatment.

Data analysis

The Statistical Package for the Social Sciences version 25.0 (IBM Corporation, Armonk, NY, USA) was used. All analyses considered 2-tailed P values of <0.05 to be statistically significant. The normality of continuous variables was judged using the Shapiro–Wilk test and Kolmogorov–Smirnov test, which revealed the normal distribution of continuous variables in this study. Normally distributed continuous variables were described using mean and standard deviation values. Categorical variables were presented as frequencies and percentages. An independent t -test and 1-way analysis of variance were performed to detect differences in psychosocial adjustment among patients with different general characteristics. Pearson's or Spearman's correlation analysis was used to examine the association between continuous variables. During multiple regression analysis, all significant variables in the above analysis were input as independent variables and psychosocial adjustment was dependent variable to identify factors associated with psychosocial adjustment.

Results

Patient characteristics

Among 220 CRC survivors we approached, 212 completed the questionnaires, representing a response rate of 96.4%. Descriptive demographic and clinical data are shown in Table 1. Among the 212 participants, there were more men ($n = 128$, 60.4%) than women, and the average age was 47 (range, 21–60) years. The majority of participants

Table 1

Participants' general characteristics and mean score of psychosocial adjustment ($n = 212$).

Characteristics	n (%)	Mean score of psychosocial adjustment	SD	t or F (P)
Gender				–2.62 (0.010**)
Male	128 (60.4)	32.91	18.28	
Female	84 (39.6)	40.04	21.04	
Age, years				2.08 (0.104)
21–30	4 (1.9)	50.50	17.52	
31–40	43 (20.3)	40.70	25.21	
41–50	81 (38.2)	34.06	17.42	
51–60	84 (39.6)	34.10	18.19	
Return to work				5.55 (<0.001**)
Yes	145 (68.4)	30.96	17.83	
No	67 (31.6)	46.06	19.66	
Religion				–0.91 (0.367)
Yes	22 (10.4)	32.14	17.99	
No	190 (89.6)	36.15	19.87	
Monthly income (RMB/per capita)				2.18 (0.115)
≤ 2000	35 (16.5)	38.09	18.76	
2001–4999	94 (44.3)	37.95	19.29	
≥ 5000	83 (39.2)	32.23	20.21	
Education level				3.82 (0.023*)
Junior high school or below	67 (31.6)	38.88	20.68	
High school	53 (25.0)	29.49	16.81	
College or above	92 (43.4)	37.03	19.87	
Marital status				–3.90 (<0.001**)
Married	197 (92.9)	34.32	19.03	
Unmarried	15 (7.1)	54.20	19.34	
Child				–2.58 (0.010*)
Yes	201 (94.8)	34.93	19.12	
No	11 (5.2)	50.45	24.70	
Residency				–1.55 (0.124)
Urban	163 (76.9)	34.59	18.74	
Rural	49 (23.1)	39.53	22.32	
Diagnosis				–0.28 (0.777)
Colon cancer	95 (44.8)	35.31	19.27	
Rectal cancer	117 (55.2)	36.08	20.08	
Permanent stoma				–2.23 (0.027*)
Yes	24 (11.3)	42.15	18.35	
No	188 (88.7)	32.74	17.81	
Cancer stage				0.62 (0.541)
Stage I	37 (17.6)	32.57	18.06	
Stage II	89 (42.0)	36.81	20.30	
Stage III	86 (40.4)	35.98	19.78	
Treatment method				2.26 (0.107)
Surgery only	60 (28.5)	29.62	14.59	
Surgery and chemotherapy	112 (52.9)	34.89	18.67	
Surgery and chemoradiation	40 (18.7)	37.08	19.77	
Time since treatment completed				2.11 (0.036*)
1–12 months	73 (34.4)	37.65	17.00	
> 12 months	139 (65.6)	31.93	18.29	
Comorbidities				4.01 (<0.001**)
Yes	72 (34.0)	43.03	21.41	
No	140 (66.0)	31.98	17.67	

* $P < 0.05$, ** $P < .01$.

SD, Standard deviation.

were > 40 years ($n = 165, 77.8\%$), married ($n = 197, 92.9\%$), had a child ($n = 201, 94.8\%$), had no religion ($n = 190, 89.6\%$), resided in an urban area ($n = 163, 76.9\%$), and had returned to work ($n = 145, 68.4\%$). Forty-three percent of participants ($n = 92$) were at least college-educated. Forty percent of participants had monthly income of more than 5000 RMB, which is higher than the average monthly income of Chinese urban residents in 2019 according to China Statistical Yearbook. There were more participants with rectal cancer ($n = 163, 76.9\%$), with stage II or III disease ($n = 174, 82.4\%$), without a stoma ($n = 188, 88.7\%$), with a treatment history of both surgery and chemotherapy ($n = 112, 52.9\%$), and without comorbidities ($n = 144, 66.0\%$). About sixty-five percent of participants had completed treatment for more than 12 months ($n = 139$).

Forty-one (19.3%) participants reported severe maladjustment, 63 (29.7%) participants reported moderate maladjustment, and 108 (50.9%) participants reported mild maladjustment. The score of each domain of psychosocial adjustment is presented in Table 2. In order to compare between domains, the mean score per item was calculated by dividing the total score of subscales by the number of items. Among the 7 domains, participants reported the highest scores in job environment and the lowest scores in extended family relationships, respectively (Table 2).

Differences in psychosocial adjustment by general characteristics

Univariate analyses were performed to find out the factors associated with psychosocial adjustment. As shown in Table 1, CRC survivors' psychosocial adjustment level was significantly associated with gender ($P = 0.010$), education level ($P = 0.023$), return to work ($P < 0.001$), marital status ($P < 0.001$), having a child ($P = 0.010$), having a stoma ($P = 0.027$), time since treatment completion ($P = 0.036$), and comorbidities ($P < 0.001$). Survivors who were female and unemployed were more likely to have psychosocial adjustment problems. Post-hoc analysis revealed that survivors with an education level either higher or lower than high school had higher PAIS scores than high school-educated survivors. Additionally, those who had no children also had higher PAIS scores. In terms of clinical characteristics, survivors with a stoma, comorbidities, or who were within 12 months after treatment had higher PAIS scores.

Factors associated with psychosocial adjustment

The correlations between continuous variables are presented in Table 3, with coefficients ranging from -0.611 to 0.655 . Psychosocial adjustment had a significant positive correlation with symptom distress ($r = 0.655, P < 0.001$) and a negative correlation with work ability ($r = -0.611, P < 0.001$), respectively.

Significant variables in previous univariate analyses and correlation analyses (gender, education level, return to work, having a child, having a stoma, marital status, time since treatment completion, comorbidities, work ability, and symptom distress) were entered as independent variables. The general characteristics found to be significantly associated with psychosocial adjustment in another study⁷ (eg. having a stoma, return to work, and time since treatment) were also considered and were

Table 2
Participants' psychosocial adjustment level in different domains ($n = 212$).

Variables	Total score (M ± SD)	Score per item (M ± SD)
Psychosocial adjustment	35.73 ± 19.68	0.78 ± 0.43
Health management	6.84 ± 3.20	0.86 ± 0.40
Social environment	4.59 ± 4.30	0.77 ± 0.72
Home environment	4.64 ± 4.71	0.58 ± 0.59
Sexual relationships	5.64 ± 3.99	0.94 ± 0.66
Extended family relationships	2.30 ± 2.69	0.46 ± 0.54
Job environment	6.16 ± 4.09	1.03 ± 0.68
Psychological distress	5.56 ± 4.81	0.79 ± 0.69

M ± SD: mean ± standard deviation.

Table 3
Correlation analysis between continuous variables ($n = 212$).

Variables	Psychosocial adjustment		Work ability	
	r	P	r	P
Work ability	-0.611	< 0.001**		
Symptom distress	0.655	< 0.001**	-0.485	< 0.001**

** $P < 0.01$.

already included. Psychosocial adjustment was input as a dependent variable. Then, a multiple linear regression analysis was performed.

Autocorrelation and multicollinearity were checked when performing the multiple linear regression analysis. A Durbin-Watson statistic of 2.07 indicated that there was no autocorrelation in the residuals. The tolerance limits were all > 0.10, and the variance inflation factors were all 1.207–1.299, which indicated no multicollinearity.

The results of the multiple linear regression analysis are presented in Table 4 and showed that the regression model of psychosocial adjustment was significant ($F = 41.335, P < 0.001$). The strongest factor influencing the level of psychosocial adjustment was work ability ($\beta = -0.393, P < 0.001$), followed by symptom distress ($\beta = 0.380, P < 0.001$) and an education level of college or above ($\beta = 0.150, P = 0.027$). Meanwhile, the influence of an education level of junior high school or below was almost statistically significant ($\beta = 0.131, P = 0.058$). These variables accounted for 46.1% of the variance of psychosocial adjustment in CRC survivors.

Discussion

This study aimed to describe the level of psychosocial adjustment in CRC survivors and to explore whether demographic, clinical factors, symptom distress, and work ability are associated with psychosocial adjustment.

The results indicated that the psychosocial adjustment of CRC survivors in this study was generally of a moderate level. Our study participants' scores were slightly higher than those of a population of patients with cancer surveyed in Iran.²⁵ Meanwhile, the psychosocial adjustment problems of our Chinese CRC survivors were milder than those of Korean CRC survivors, who were surveyed in a study that included patients with longer survivorship and of all ages.⁷ Nineteen percent of their participants had severe maladjustment, indicating that psychosocial adjustment among CRC survivors requires attention and intervention. However, considering the scores in the present study, psychosocial maladjustment was more severe among patients with CRC undergoing chemotherapy or patients with an ostomy.^{26,27}

The items from the same domain were linked and overlapped to some extent, thus the score per item was chosen to represent the severity of maladjustment in each domain. According to the result, the top two maladjusted aspects were job environment and sexual relationships. This

Table 4
Linear regression of factors associated with psychosocial adjustment ($n = 212$).

Factors	Unstandardized coefficients		Standardized coefficient	P	95% CI of B
	B	SE			
(Constant)	54.731	6.060		< 0.001**	(42.777, 66.684)
Junior high education or below	5.057	2.653	0.131	0.058	(-0.178, 10.291)
College education or above	5.446	2.446	0.150	0.027*	(0.621, 10.270)
Work ability	-0.910	0.140	-0.393	< 0.001**	(-1.185, -0.634)
Symptom distress	0.211	0.033	0.380	< 0.001**	(0.147, 0.276)

$F = 41.335, P < 0.001, Adjusted R^2 = 0.461$.

* $P < 0.05, **P < 0.01$.

CI, confidence interval; SE, standard error.

finding reflects two main concerns during CRC cancer survivorship. As seen in a systematic review, a diagnosis of CRC may negatively influence cancer survivors' work ability, alter their employment status, or make the need for sick leave inevitable.²⁸ Both patients and employers with CRC may report challenges in the return to work at both an individual and institutional level.²⁹ It is also hard for CRC survivors to adapt to sexual relationships as cancer treatment may damage their sexual ability and diminish their sexual desire.³⁰ Thus, it is supported in both the present and previous studies that CRC survivors face difficulties in their job environment and sexual relationships.

Conforming to our hypothesis, work ability was found to be the strongest factor associated with psychosocial adjustment in this study. Although the association between these two variables has not yet been tested elsewhere, several findings from previous studies can support this association. One study found that cancer survivors who returned to work after treatment reported better psychosocial adjustment than those who did not return to work.⁷ For working-age patients, their vocational goals and milestones may be disrupted by cancer diagnosis and treatment,³¹ and returning to work as cancer survivors can bring them a sense of normalcy, serve as a distraction, or provide necessary social interactions.³² Patients with a higher perceived work ability were more confident in their work and felt more comfortable returning to work, which was one of the ultimate goals of cancer adjustment. Whether patients returned to work and their work ability were both included in the multivariate linear regression analysis, but only work ability entered the final equation. Therefore, survivors' perceived work ability might be a better predictive variable of their psychosocial adjustment.

This study also suggested that greater symptom distress can predict psychosocial maladjustment. Although the association between symptom distress and psychosocial adjustment has not been directly tested in CRC survivors previously, relevant findings can support this finding. A recent systematic review summarized that one-third to one-half of CRC survivors experience fatigue, constipation, diarrhea, or incontinence.¹⁵ These symptoms were reported to interfere with survivors' daily activities and adversely impact their quality of life.^{33,34} More specifically, gastrointestinal symptoms and embarrassment associated with bowel movements were associated with poor sexual functioning and relationships.³⁵ Especially, the social functioning and work ability of working-age survivors were also limited by their symptom burden.³⁶ Besides, not only symptoms but also the feeling of interference with normal life can cause emotional distress.³⁷ The abovementioned aspects are crucial components of psychosocial adjustment; thus, it can be concluded that symptom distress hinders CRC survivors' psychosocial adjustment.

An education level of college or above was another risk factor for psychosocial maladjustment. This result is inconsistent with findings of previous studies, where higher education levels more consistently led to better adjustment. For example, a lower education level has been linked with a greater risk of poor adjustment in cancer survivors and patients undergoing chemotherapy.^{26,38} Also, in a study of patients with human immunodeficiency virus, a higher level of education contributed to better psychosocial adjustment through illness perception.³⁹ Tousoulis inferred that well-educated patients were more informed about their disease, noting that lower education is a surrogate of low socioeconomic status.⁴⁰ Although CRC survivors with < 9-year compulsory education also reported more psychosocial problems in this study, lower education did not show significance in the regression model. This suggested that lower education was not an independent predictor of psychosocial adjustment in our patient population, and its perceived effect might instead originate from the existence of other variables, such as work ability. This study further pointed out that patients with higher education levels might actually adjust worse than expected. A similar result was also found in a large-sample study investigating adjustment disorders in patients with cancer using international diagnostic interviews.⁴¹ The mechanism underneath this connection has not only been explored yet but also this finding should remind health care professionals to pay greater attention to well-educated patients' psychosocial adjustment.

Limitations and recommendation

There are several limitations in this study. First, this study was conducted at a single cancer center in China. Second, selection bias may exist because we only included survivors who came to the hospital for follow-up, and those who missed their follow-up appointments were not investigated. These 2 limitations might jeopardize the generalizability of our results. Third, a cross-sectional study design cannot draw a conclusion of a unidirectional causal relationship between the dependent variable and independent variables. However, the factors identified in this study may shed some light on how to improve working-age CRC survivors' psychosocial adjustment.

Nursing interventions for psychosocial adjustment should consider different aspects of focus for working-age patients and non-working-age patients. In cancer survivorship, patients' work ability and symptom distress, which are important predictors of their psychosocial adjustment, should be tracked. Regarding psychosocial adjustment, health care providers should attach greater importance to monitoring well-educated CRC survivors and managing their work-related problems and symptom distress.

Conclusions

Working-age CRC survivors reported more adjustment problems in the aspects of job environment and sexual relationships. Survivors with a low work ability, greater symptom distress, and an education level of college or above are at high risk of psychosocial maladjustment.

Authors' contributors

Conceived and designed the analysis: Wenjie Zou, Yiheng Zhang, Meifen Zhang. **Collected the data:** Yiheng Zhang, Lizhen Gong, Jingyue Xie, Xiaoyu Wu, Meng Zhang. **Contributed data or analysis tools:** Wenjie Zou, Yiheng Zhang. **Performed the analysis:** Wenjie Zou, Yiheng Zhang. **Wrote the paper:** Wenjie Zou.

Declaration of competing interest

None declared.

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Ethics statement

This research was approved by the Medical Ethical Committee of Sun Yat-sen University Cancer Center where the study was conducted (Approval No. 5010-2014-0401).

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References

1. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2021;71(3):209-249.
2. Siegel RL, Miller KD, Sauer AG, et al. Colorectal cancer statistics, 2020. *CA Cancer J Clin.* 2020;70(3):145-164.
3. Hebdon M, Foli K, McComb S. Survivor in the cancer context: a concept analysis. *J Adv Nurs.* 2015;71(8):1774-1786.
4. Lim CYS, Laidsaar-Powell RC, Young JM, Kao SCH, Zhang YH, Butow P. Colorectal cancer survivorship: a systematic review and thematic synthesis of qualitative research. *Eur J Cancer Care.* 2021;30(4), e13421.

5. Banegas MP, Guy GP, de Moor JS, et al. For working-age cancer survivors, medical debt and bankruptcy create financial hardships. *Health Aff.* 2016;35(1):54–61.
6. Inhestern L, Beierlein V, Bultmann JC, et al. Anxiety and depression in working-age cancer survivors: a register-based study. *BMC Cancer.* 2017;17(1):347.
7. Sun H, Lee J. Psychosocial adjustment in Korean colorectal cancer survivors. *J Korean Acad Nurs.* 2018;48(5):545–553.
8. Vanderpool RC, Nichols H, Hoffer EF, Swanberg JE. Cancer and employment issues: perspectives from cancer patient navigators. *J Cancer Educ.* 2017;32(3):460–466.
9. Isaksson J, Wilms T, Laurell G, Fransson P, Ehrsson YT. Meaning of work and the process of returning after head and neck cancer. *Support Care Cancer.* 2016;24(1):205–213.
10. Jaffe SA, Guest DD, Sussman AL, Wiggins CL, Anderson J, McDougall JA. A sequential explanatory study of the employment experiences of population-based breast, colorectal, and prostate cancer survivors. *Cancer Causes Control.* 2021;32(11):1213–1225.
11. Gosselin TK, Beck S, Abbott DH, et al. The symptom experience in rectal cancer survivors. *J Pain Symptom Manag.* 2016;52(5):709–718.
12. Emmertsen KJ, Laurberg S, Rectal Cancer Function Study G. Impact of bowel dysfunction on quality of life after sphincter-preserving resection for rectal cancer. *Br J Surg.* 2013;100(10):1377–1387.
13. Thong MSY, Mols F, Wang XS, Lemmens VEPP, Smilde TJ, van de Poll-Franse LV. Quantifying fatigue in (long-term) colorectal cancer survivors: a study from the population-based patient reported outcomes following initial treatment and long term evaluation of survivorship registry. *Eur J Cancer.* 2013;49(8):1957–1966.
14. Cercek A, Holt PR. The care of the colorectal cancer survivor. *Curr Opin Gastroenterol.* 2017;33(1):26–33.
15. Han CJ, Yang GS, Syrjala K. Symptom experiences in colorectal cancer survivors after cancer treatments: a systematic review and meta-analysis. *Cancer Nurs.* 2020;43(3):E132–E158.
16. Mazanec SR, Daly BJ, Douglas S, Musil C. Predictors of psychosocial adjustment during the postirradiation treatment transition. *West J Nurs Res.* 2011;33(4):540–559.
17. Wu XD, Qin HY, Zhang JE, et al. The prevalence and correlates of symptom distress and quality of life in Chinese oesophageal cancer patients undergoing chemotherapy after radical oesophagectomy. *Eur J Oncol Nurs.* 2015;19(5):502–508.
18. Derogatis LR. The psychosocial adjustment to illness scale (PAIS). *J Psychosom Res.* 1986;30(1):77–91.
19. Togluk S, Cuhadar D. The effect of death anxiety on psychosocial adjustment in individual with chronic obstructive pulmonary disease. *Indian J Palliat Care.* 2021;27(3):358–366.
20. Yao J. *Predictors of Adjustment Among Cancer Patients.* Naval Medical University; 2013 [Master Dissertation in Chinese].
21. de Zwart BC, Frings-Dresen MH, van Duivenbooden JC. Test-retest reliability of the work ability index questionnaire. *Occup Med (Lond).* 2002;52(4):177–181.
22. Couwenberg AM, Intven MPW, Gregorowitsch ML, Haaring C, van Grevenstein W, Verkooijen HM. Patient-reported work ability during the first two years after rectal cancer diagnosis. *Dis Colon Rectum.* 2020;63(5):578–587.
23. Cleeland CS, Mendoza TR, Wang XS, et al. Assessing symptom distress in cancer patients: the M. D. Anderson Symptom Inventory. *Cancer.* 2000;89(7):1634–1646.
24. Wang XS, Wang Y, Guo H, Mendoza TR, Hao XS, Cleeland CS. Chinese version of the M. D. Anderson Symptom Inventory: validation and application of symptom measurement in cancer patients. *Cancer.* 2004;101(8):1890–1901.
25. Senmar M, Hasannia E, Moeinoddin A, et al. Psychosocial adjustment to illness and its relationship with spiritual wellbeing in Iranian cancer patients. *Int J Chronic Dis.* 2020;2020:5742569.
26. Taghadosi M, Tajamoli Z, Aghajani M. Psychosocial adjustment to cancer and its associated factors in patients undergoing chemotherapy: a cross-sectional study. *Biomed Res Ther.* 2017;4(12):1853–1866.
27. Li CC, Rew L, Hwang SL. The relationship between spiritual well-being and psychosocial adjustment in Taiwanese patients with colorectal cancer and a colostomy. *J Wound Ostomy Cont Nurs.* 2012;39(2):161–169.
28. Mols F, Tomalin B, Pearce A, Kaambwa B, Koczwara B. Financial toxicity and employment status in cancer survivors: a systematic literature review. *Support Care Cancer.* 2020;28(12):5693–5708.
29. Gruss I, Hanson GC, McMullen C, et al. A qualitative assessment of challenges to return to work for colorectal cancer survivors: multistakeholder perspectives. *Cancer Epidemiol Biomarkers Prev.* 2020;29(6 suppl 1):B009.
30. Traa MJ, Braeken J, De Vries J, et al. Sexual, marital, and general life functioning in couples coping with colorectal cancer: a dyadic study across time. *Psycho Oncol.* 2015;24(9):1181–1188.
31. Vetsch J, Wakefield CE, McGill BC, et al. Educational and vocational goal disruption in adolescent and young adult cancer survivors. *Psycho Oncol.* 2018;27(2):532–538.
32. Wennman-Larsen A, Svard V, Alexanderson K, Friberg E. Factors of decisive importance for being in work or not during two years after breast cancer surgery: content analysis of 462 women's open answers. *BMC Womens Health.* 2021;21(1):332.
33. Drury A, Payne S, Brady AM. The cost of survival: an exploration of colorectal cancer survivors' experiences of pain. *Acta Oncol.* 2017;56(2):205–211.
34. Vardy J, Dhillon HM, Pond GR, et al. Cognitive function and fatigue after diagnosis of colorectal cancer. *Ann Oncol.* 2014;25(12):2404–2412.
35. Bailey CE, Cao HST, Hu CY, et al. Functional deficits and symptoms of long-term survivors of colorectal cancer treated by multimodality therapy differ by age at diagnosis. *J Gastrointest Surg.* 2015;19(1):180–188.
36. Mols F, Schoormans D, de Hingh I, Oerlemans S, Husson O. Symptoms of anxiety and depression among colorectal cancer survivors from the population-based, longitudinal PROFILES registry: prevalence, predictors, and impact on quality of life. *Cancer.* 15 2018;124(12):2621–2628.
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. Schnoll RA, Knowles JC, Harlow L. Correlates of adjustment among cancer survivors. *J Psychosoc Oncol.* 2002;20(1):37–59.
39. Harifi S, SeyedAlinaghi S, Qorbani M, Mahmoodi Z. The relationship between social roles and psychosocial adjustment in women with HIV: a structural equation model. *Brain Behav.* 2021;11(1), e01943.
40. Tousoulis D. Cardiovascular disease and socioeconomic status it is mainly education that counts and not wealth. *Eur Heart J.* 2020;41(34):3213–3214.
41. Hund B, Reuter K, Harter M, et al. Stressors, symptom profile, and predictors of adjustment disorder in cancer patients: results from an epidemiological study with the Composite International Diagnostic Interview, Adaptation for Oncology (Cidi-O). *Depress Anxiety.* 2016;33(2):153–161.