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Health-related quality of life and its correlates among rectal cancer survivors, Northwest of Iran

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ABSTRACT

Aim: The objective of this study was to examine the health-related quality of life (HRQOL), and its correlates among rectal cancer survivors. **Methods:** This cross-sectional study was conducted in the northwest of Iran. Rectal cancer survivors were selected from teaching hospitals. HRQOL was estimated using the European Organization for Research and Treatment of Cancer Quality-of-Life Questionnaire C30. Information about socio-demographic, lifestyle and clinical features of disease was obtained by trained interviewers. **Results:** A total of 96 patients were included in this study with mean age of 57.31 ± 14.15 years, 54% were male and 59% over 55 years of age. Women performed poorer than men in many dimensions of HRQOL ($P < 0.05$). Total score of symptoms was higher in those who had a higher stage of the disease. Participants with insufficient physical activity had a lower score in physical and role dimensions and a higher score of pain and fatigue ($P < 0.05$). In multiple regression models, treatment, stage of disease, and physical activity were important predictive factors of HRQOL. **Conclusion:** Some clinico-epidemiological factors were associated with a reduced score of HRQOL and its dimensions in this study. Overall, better performance in the presence of a modifiable factor; physical activity, is an opportunity for interventional strategies to improve the HRQOL.

INTRODUCTION

Colorectal cancer (CRC) is the second common cancer in female and the third in men, with an estimation of about 1.5 million incident cases and almost 700,000 deaths in 2012[1]. There is a geographical variation in the incidence of CRC around the globe with over 10-fold difference between the highest and lowest estimated incidence in 2012. The highest incidence has been reported from Australia, New Zealand, Europe and

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North America and the lowest incidence rates belonged to Africa and south-central Asia[1]. Variation might be explained by differences in genetic susceptibility, dietary habits and environmental exposures[2]. Recent advances in treatment and management of CRC have improved control and disease-free survival[3].

Nowadays, the standard strategy in the management of CRC is a multidisciplinary approach to treatment especially for management of rectal cancer which is one of the great challenges and responsibility of the colorectal surgeons. The main goal is to improve survival, to minimise morbidity and to maximise the quality of life of the rectal cancer patients[4,5].

Health-related quality of life (HRQOL) is a multidimensional concept that covers a range of the subjective perceptions from physical, emotional, social, and cognitive functions to disease symptoms and treatment side effects among cancer patients[6]. In CRC, the assessment of HRQOL is critical, and a range of various factors including socio-demographic characteristics, lifestyle, surgical procedures, and health-related factors are associated with HRQOL of patients with CRC[7]. Although, HRQOL assessment is important in evaluating the treatment options for rectal cancer (RC) patients, data on assessment of the quality of life among RC patients in the presence of a range of socio-demographic, lifestyle behaviours and clinical factors are scarce.

There are few cross-sectional studies which have assessed the quality of life among this group of patients in which some included few cases, or focused on treatment options only or did not include lifestyle factors[7-9]. There is a relatively large prospective study that showed the anterior resection and non-stoma patients, despite suffering micturition and defecation problems, had a better quality of life scores than abdominoperineal extirpation and stoma patients[10]. A longitudinal study with 19 months follow-up, evaluated HRQOL in patients with RC using the functional assessment of cancer therapy-colorectal instrument and reported no differences in HRQOL by either tumour location or type of surgery, at either 9 or 19 months after diagnosis. These prospective studies were also focused on clinical aspects of QOL.

In Iran, CRC is one of the common cancers and is ranked the third and fifth most common cancer in women and men respectively. The age-standardized incidence rates in men and women were 11.31 and 10.89 respectively[11]. Previous studies showed an increase in trend of this cancer in north of Iran and poor quality of life among CRC survivors[12,13]. However, the data was not specific to RC survivors because of the small sample size.

The studies on assessing HRQOL among CRC patients are limited, and we could not find any publication related to the quality of life of RC patients. The aim of this study was to assess the HRQOL and its determinants in patients diagnosed with RC referring to the specialty teaching hospitals in East Azerbaijan, northwest of Iran.

METHODS

This cross-sectional study was conducted in the city of Tabriz, East Azarbaijan province located in the northwest of Iran between 2014 and 2015. All newly diagnosed patients aged 18 and over who had been diagnosed less than one year presenting at the teaching hospitals regardless of stage at diagnosis and plans for treatment, were included in this study.

Demographic information including age, the level of education, employment status and place of residency was collected via self-report. Age was categorised into two categories; < 55 and ≥ 55 years, the level of education was classified as illiterate, literate, occupation classed into (paid work or out of work) and finally place of residency specified as either urban or rural. Patients were also asked whether they experienced various comorbid conditions (including heart disease, hypertension, chronic back pain, arthritis, stroke, osteoporosis, asthma, chronic obstructive pulmonary disease, stomach and/or intestinal condition). Three different treatment regimens were used in this cohort of stage I-III rectal cancer patients: (1) surgery only, surgery plus chemotherapy (surgery + CT), surgery plus radiotherapy (surgery + RT); (2) surgery plus adjuvant chemo-radiotherapy (surgery + CRT); and (3) CT only/RT only/CRT only.

European organization for research and treatment of cancer quality-of-life questionnaire (QLQ) C30 was completed from all participants by two trained interviewers. This scale is the core questionnaire for evaluating the QOL of cancer patients. It is a 30-itemed instrument with a four-point scale, from "not at all" to "very much", for items 1 to 28; and a seven-point scale for items 29 and 30. The QLQ-C30 dimensions include the physical functioning (PF), role functioning (RF), cognitive functioning (CF), emotional functioning (EF), social functioning (SF), the general level of QOL and the symptoms scale (i.e. fatigue, pain). Each patient's scores were transformed into a 0-to-100 scale, where 0 denotes the worst and 100 the best on functioning scales. In contrast, the reverse scoring system was applied for symptoms where zero point denotes the

best and 100 the worst on symptom scales.

Statistical analysis

Descriptive analysis was used to present data, mean and standard deviation (SD) was used for quantitative variables, and numbers and percentages were provided for categorical data. Data checked for normality and linearity where it was required. Total score of HRQOL and its dimensions score were as dependent variables in this study. Univariate and multivariate analysis performed to assess the association between a range of factors and HRQOL. Variables with a *P* value less than 0.1 were included in the multiple linear regression models to identify predictors of HRQOL. A *P*-value of less than 0.05 was predetermined to be mean statistical significance, and SPSS version 21 was used for all data analyses.

Table 1: Clinico-epidemiological characteristics of patients with rectal cancer referring to specialty teaching hospitals in Tabriz, Northwest of Iran 2014-2015

	Number	%
Age group		
< 55 years	39	40.6
≥ 55 years	57	59.4
Gender		
Male	52	54.2
Female	44	45.8
Marital status		
Single/widowed	19	19.8
Married	77	80.2
Place of residence		
Urban	81	54.4
Rural	15	15.6
Education		
Illiterate	42	44.7
Literate	52	55.3
Occupation		
No working	38	39.6
Working	58	60.4
Comorbidities		
Yes	55	57.9
No	40	42.7
Smoking		
Yes	28	29.5
No	67	70.5
Physical activity		
Adequate	15	15.6
Inadequate	81	84.4
Income		
< 7,000,000 R	27	36.0
> 7,000,000 R	48	64.0
Stage of disease		
I & II	66	68.8
III & IV	17	17.7
Treatment		
CT only/RT only/CRT	15	15.6
Surgery only/surgery + CT/ surgery + RT	36	37.5
Surgery + CRT	44	45.8
Stoma		
Yes	36	62.1
No	22	37.9

Total number might be different due to missing values. CT: chemotherapy; RT: radiotherapy; CRT: chemo-radiotherapy

This study received ethics approval from Tabriz University of Medical Sciences; Ethics Committee and all patients completed an informed consent form before the interview session.

RESULTS

A total of 96 newly diagnosed patients with rectal cancer were included in this study with a mean age 57.31 ± 14.15 years (min: 27, max: 83). The majority of them were male (54%), 59% were over 55 years of age and more than two-third resided in urban areas (84%). About 45% of them had no education, and about 40% were out of work. Many of them (84%) reported inadequate physical activity, 30% smoked either a cigarette or waste pipe, 58% had at least one comorbidity, and the stage of the disease was I/II in most of the cases (69%), 46% had received surgery plus CRT as the treatment of choice [Table 1].

Table 2 shows the mean (SD) score for different dimensions of QOL according to socio-demographic factors. As it can be seen, the score of total QOL and its dimensions were not different between younger and older age groups. Women performed significantly poorer than men in EF, PF, and RF dimensions (*P* < 0.05). Those who were not engaged in any work had a lower score in EF and RF dimensions (*P* < 0.05). Participants with insufficient physical activity had a lower score in PF and RF dimensions (*P* < 0.05). Women, those who were not working, and those with insufficient physical activity had higher scores in symptom total, pain and fatigue. Scores of total QOL and its dimensions were not different according to the place of residency and smoking. Although the study participants with no education had poorer scores in total QOL and all dimensions, and showed the higher scores of symptoms total, pain and fatigue, the difference was not statistically significant compaired to literate participants. Patients with lower income had significantly higher scores of total QOL, and EF dimension (*P* < 0.05). They performed better in all other dimensions and had a lower score in symptom-total, pain and fatigue, but it was not statistically significant.

Table 3 shows the mean (SD) score for different dimensions of QOL according to clinical factors. Only treatment option had a significant association with total QOL score. Total score of symptoms was higher in those who had a higher stage of disease, and those who had undergone CT/RT/or CRT only. Those who had undergone surgery plus CRT performed better in all subscales except CF, and they had lower scores in symptom total, pain and fatigue (*P* < 0.05). Comorbidities were associated with higher scores in

Table 2: Total score of HRQOL and its dimensions according to various factors, rectal patients referring to the specialty teaching hospitals, Tabriz, Northwest of Iran, 2014-2015 (mean ± SD)

	QOL total	EF	PF	CF	SF	RF	Symptom total	Pain	Fatigue
Age group									
< 55 years	50 ± 26.35	46.15 ± 27.42	56.23 ± 32.5	71.36 ± 29.6	46.15 ± 32.54	49.57 ± 33.65	38.53 ± 22.99	48.71 ± 35.12	50.42 ± 34.18
≥ 55 years	50 ± 24.39	57.16 ± 29.52	49 ± 30.35	70.76 ± 25.64	47.36 ± 29.67	42.98 ± 36.45	37.51 ± 21.18	48.53 ± 33.81	51.46 ± 33.3
P value	0.99	0.068	0.26	0.91	0.85	0.37	0.82	0.98	0.88
Sex									
Female	44.88 ± 26.7	44.7 ± 28.87	42.87 ± 32.41	67.45 ± 31.22	43.93 ± 30.72	35.60 ± 35	43.77 ± 23.27	61.36 ± 35.54	58.08 ± 34.54
Male	52.32 ± 22.9	59.45 ± 27.71	59.61 ± 28.39	74.35 ± 22.97	49.35 ± 30.72	54.16 ± 33	33 ± 19.4	37.82 ± 29.17	45.08 ± 31.68
P value	0.066	0.01	0.008	0.2	0.39	0.01	0.01	0.001	0.058
Residency									
Urban	49.4 ± 24.9	51.44 ± 27.6	50.86 ± 30.33	71.39 ± 26.77	46.29 ± 30.61	44.23 ± 35.27	38.3 ± 21.02	49.3 ± 33.89	51.3 ± 32.5
Rural	52.77 ± 26.6	59.44 ± 36.3	57.77 ± 36.57	68.88 ± 3.12	50.00 ± 32.12	53.33 ± 35.71	35.9 ± 26.50	44.45 ± 36.55	49.62 ± 39.36
P value	0.64	0.33	0.43	0.74	0.67	0.36	0.70	0.61	0.86
Education									
Illiterate	50.39 ± 22.58	55.95 ± 28.76	52.38 ± 31.64	76.98 ± 18.61	45.23 ± 32.12	38.89 ± 34.69	41.77 ± 24.71	54.76 ± 37.32	50.79 ± 36.27
Literate	46.66 ± 22.44	42.77 ± 26.51	47.11 ± 23.43	74.44 ± 25.09	48.89 ± 31.15	50.00 ± 37.26	44.10 ± 23.04	48.88 ± 31.16	60.00 ± 35.58
P value	0.63	0.16	0.59	0.73	0.73	0.36	0.77	0.62	0.45
Occupation									
No-working	47.15 ± 27.49	44.52 ± 30.34	42.46 ± 33.26	66.67 ± 31.72	44.30 ± 30.58	33.33 ± 36.92	45.22 ± 24.27	61.84 ± 36.12	59.36 ± 36.56
Working	51.87 ± 23.42	58.05 ± 27.13	58.16 ± 28.53	73.85 ± 23.59	48.56 ± 30.95	53.74 ± 32.0	33.16 ± 18.79	39.94 ± 30.1	45.59 ± 30.42
P value	0.37	0.025	0.15	0.23	0.5	0.005	0.007	0.002	0.048
Income									
Low (< 800,000 T)	55.92 ± 24.03	59.86 ± 28.33	56.66 ± 30.75	77.63 ± 25.78	49.56 ± 31.35	46.49 ± 31.27	34.68 ± 19.56	46.92 ± 35.69	45.61 ± 31.19
Acceptable (> 800,000 T)	45.06 ± 25.31	47.68 ± 28.19	48.02 ± 32.17	66.97 ± 27.18	44.13 ± 30.22	43.51 ± 38.36	41.36 ± 22.91	51.54 ± 33.53	56.58 ± 34.48
P value	0.041	0.045	0.2	0.06	0.40	0.68	0.14	0.52	0.12
Smoking									
Yes	47.91 ± 25.82	50.29 ± 29.26	54.52 ± 29.87	72.02 ± 24.45	42.85 ± 32.21	52.38 ± 31.0	36.26 ± 20.24	43.45 ± 30.87	52.77 ± 30.63
No	50.37 ± 24.76	52.98 ± 28.78	50.15 ± 28.78	70.15 ± 28.35	47.76 ± 29.71	42.53 ± 36.95	39.11 ± 22.34	51.24 ± 35.45	50.91 ± 34.71
P value	0.66	0.68	0.53	0.76	0.47	0.21	0.56	0.31	0.80
Physical activity									
Inadequate	48.76 ± 25.14	51.85 ± 29.58	47.32 ± 30.67	69.75 ± 26.88	45.6 ± 30.09	39.91 ± 34.22	40.23 ± 22.35	53.29 ± 34.3	53.9 ± 33.66
Adequate	56.66 ± 24.43	57.22 ± 26.51	76.88 ± 21.8	77.77 ± 28.63	56.66 ± 33.21	76.66 ± 23.40	25.47 ± 13.37	23.33 ± 19.72	35.55 ± 28.85
P value	0.26	0.51	0.001	0.29	0.18	0.00	0.002	0.00	0.051

HRQOL: health-related quality of life; PF: physical functioning; RF: role functioning; CF: cognitive functioning; EF: emotional functioning; SF: social functioning

Table 3: Total score of HRQOL and its dimensions according to clinico-pathological factors, rectal patients referring to the specialty teaching hospitals, Tabriz, Northwest of Iran, 2014-2015 (mean ± SD)

	QOL total	EF	PF	CF	SF	RF	Symptom total	Pain	Fatigue
Comorbidities									
Yes	46.96 ± 25.82	50.15 ± 32.01	48.6 ± 31.88	68.18 ± 29.79	47.87 ± 31.92	43.93 ± 34.59	39.58 ± 21.49	50.9 ± 33.39	57.37 ± 32.9
No	53.33 ± 23.55	55 ± 23.78	55.33 ± 29.82	74.16 ± 22.94	44.16 ± 28.38	47.5 ± 36.89	36.48 ± 22.07	46.25 ± 35.5	43.33 ± 32.78
P value	0.22	0.4	0.3	0.29	0.55	0.63	0.49	0.51	0.043
Stage of disease									
I & II	52.02 ± 25.1	57.95 ± 26.89	55.95 ± 31.07	72.47 ± 26.71	52.77 ± 30.74	47.97 ± 35.5	34.11 ± 21.22	43.18 ± 33.33	45.62 ± 32.5
III & IV	48.04 ± 25.09	42.64 ± 30.74	44.31 ± 30.36	70.58 ± 26.04	31.37 ± 24.21	50.00 ± 38.18	48.29 ± 21.4	61.76 ± 36.68	64.05 ± 34.14
P value	0.56	0.045	0.17	0.79	0.009	0.83	0.016	0.048	0.042
Treatment									
CT only/RT only/CRT	39.44 ± 19.78	45.00 ± 26.31	48.44 ± 25.63	66.67 ± 33.92	47.78 ± 26.63	42.22 ± 35.56	42.22 ± 14.92	54.44 ± 32.41	56.03 ± 26.38
Surgery only/surgery + CT/surgery + RT	45.83 ± 28.97	43.29 ± 26.71	40.37 ± 31.99	67.06 ± 26.24	33.33 ± 26.73	34.72 ± 32.7	48.37 ± 20.03	60.19 ± 34.43	66.36 ± 30.8
Surgery + CRT	56.81 ± 21.81	62.69 ± 29.28	62.88 ± 29.55	75.76 ± 25.02	57.95 ± 31.44	55.3 ± 35.54	27.33 ± 20.62	36.74 ± 31.66	35.86 ± 31.69
P value	0.009	0.006	0.016	0.17	0.03	0.054	0.001	0.012	0.002
Stoma									
Yes	51.28 ± 27.2	54.27 ± 30.64	53.67 ± 32.55	64.95 ± 30.77	41.02 ± 31.02	41.88 ± 38.01	36.88 ± 21.84	47 ± 34.38	49 ± 32.5
No	47.02 ± 23.84	47.61 ± 27.0	47.46 ± 29.78	74.6 ± 24.48	45.63 ± 27.8	46.42 ± 35.41	43.47 ± 20.82	54.76 ± 34.58	60.05 ± 33.74
P value	0.45	0.3	0.37	0.12	0.48	0.58	0.16	0.31	0.13

HRQOL: health-related quality of life; PF: physical functioning; RF: role functioning; CF: cognitive functioning; EF: emotional functioning; SF: social functioning; CT: chemotherapy; RT: radiotherapy; CRT: chemo-radiotherapy

fatigue. Those with stage III and IV had significantly lower scores in EF and SF dimensions and had significantly higher scores of symptoms total, pain and fatigue compared to patients with lower scores. Patients with stoma had better scores of QOL and reported less pain, and fatigue and had a lower score of symptom total.

Table 4 shows the results of a multivariate linear regression model that was performed to identify predictors of HRQOL. As it can be seen in this table income and treatment option were predictors of QOL (R^2 = 9%). Income was negatively predictive of QOL score. Stage of disease and treatment option were associated with EF scores (R^2 = 18%). Stage of disease was negatively predictive of poorer EF score, however surgery plus CRT was a predictor of better EF functioning. Gender, treatment option and physical activity remained significant predictors of better PF functioning (R^2 = 23%). Stage of disease and treatment option were predictors of SF dimension score (R^2 = 11%). Physical activity was the only predictors of RF functioning score (R^2 = 17%). Treatment option and physical activity were negatively predictive of total symptom score (R^2 = 22%).

Predictors of pain were a treatment option, physical activity and stage of disease (R^2 = 25%). Treatment other than surgery + CRT, insufficient physical activity and higher stage of disease were associated with higher scores of pain. Treatment option, comorbidities, disease stage, and physical activity were predictors of fatigue score (R^2 = 27%).

DISCUSSION

The aim of the current study was to assess the predictors of HRQOL among patients with rectal cancer. To our knowledge, limited studies examined the HRQOL among CRC patients including a range of different clinico-epidemiological factors, and especially among patients with rectal cancer separately.

We found that the overall score of QOL was low in our patients (48.2). Which was lower the total score reported from studies regarding CRC patients in other countries[14,15] and in Iran which reported the total scores of higher than 70[16,17]. The global QOL in a study by Engel *et al.*[10] among rectal cancer patients was reported 65.3 in the first year of diagnosis. It was reported 54.5 in a study by Zając *et al.*[18] among patients with stoma due to rectal cancer. Studies showed that the score of QOL is getting better over time[19]. It has been shown that the QOL among disease-free survivors of rectal cancer after two years

Table 4: Association between HRQOL and its dimensions and sociodemographic and clinical factors

Dependent variable	Covariates	Regression coefficient, *R*			95% CI	
		B (SE)	Beta	*P*	Lower bound	Upper bound
QOL total	Income	-11.44 (5.14)	-0.22	0.029	-21.66	-1.23
R^2 = 9%	Treatment	8.73 (3.47)	0.25	0.014	1.83	15.63
EF	Stage of disease	-14.99 (7.1)	-0.21	0.03	-29.14	-0.83
R^2 = 18%	Treatment	8-81 (4.09)	0.23	0.035	0.65	16.96
PF	Sex (male\female)	14.55 (5.84)	0.23	0.015	2.94	26.16
R^2 = 23%	Treatment	9.07 (3.91)	0.21	0.023	1.29	16.85
	Physicalactivity	26.07 (7.67)	0.31	0.001	10.82	41.32
SF	Stage of disease	-22.42 (7.90)	-0.29	0.006	-38.15	-6.68
R^2 = 11%	Treatment	9.42 (4.32)	0.22	0.032	0.80	18.03
RF	Physicalactivity	32.66 (9.32)	0.33	0.001	14.15	51.18
R^2 = 17%						
Symptom total	Treatment	-9.14 (2.94)	-0.32	0.003	-15.00	-3.27
R^2 = 22%	Physicalactivity	-15.51 (5.98)	-0.26	0.011	-27.44	-3.59
Pain	Treatment	-8.83 (4.63)	-0.18	0.06	-18.05	0.39
R^2 = 25%	Physicalactivity	-31.18 (9.41)	-0.31	0.001	-49.93	-12.43
	Stage of disease	21.146 (8.33)	0.24	0.013	4.55	37.74
Fatigue	Treatment	-14.94 (4.56)	-0.33	0.002	-24.03	-5.85
R^2 = 27%	Physicalactivity	-22.68 (9.29)	-0.25	0.017	-41.19	-4.17
	Stage of disease	23.66 (8.23)	0.29	0.005	7.26	40.06
	Comorbidities	-14.49 (6.73)	-0.21	0.035	-27.90	-1.07

HRQOL: health-related quality of life; CI: confidence interval; PF: physical functioning; RF: role functioning; EF: emotional functioning; SF: social functioning

was higher than that in the general population[20]. The difference between our results and other studies might be explained by the time of recruitment of the study population. In our study, all patients were diagnosed less than one year and some were receiving active treatment, and some patients with advanced stages were also included. Our results showed that younger and older patients had almost the same score of the overall QOL and its dimensions except emotional dimension which was lower in younger patients. It in line with the results of other studies which showed the poorer emotional performance of younger patients[9,21]. We found that females generally had poorer QOL than men, the same reported by Li *et al*.[9] but some studies reported the lower social wellbeing score among men, that might be because they used different instrument for assessment of the QOL[21].

In the current study income and treatment options were predictors of the total score of QOL. Income was negatively predictive of QOL score, surgery plus CRT was positively related to the higher score of the QOL total score. The QOL of the long-term survival group was associated with lifestyle factors, symptoms and usual activity, and the presence of a stoma was not the matter. However, QOL one year after surgery was associated with adjuvant therapy[22].

In this study, stage of disease was negatively predictive of EF and SF, but positively predictive of pain and fatigue. Treatment option was predictive of all QOL dimensions (except CF) and pain and fatigue. Those who received surgery plus CRT had better performance and lower pain and fatigue. There is evidence that type of surgery affects the QOL after surgery among patients with cancer of the rectum. Evidence showed that cancer-free patients with rectal cancer who had no terminal abdominal stoma showed a better score in all categories of the QOL 30 after five years[23]. In addition, it has been shown that sphincter sparing operations are higher among patients who undergone neoadjuvant chemo-radiotherapy and they show better scores in QOL[24]. However, in this study we combined neoadjuvant and adjuvant therapies, therefore the reason for such results cannot be clearly concluded. In this study, patients with comorbidities had poorer scores on total QOL and its dimensions and showed higher pain and fatigue, however, in the final model it was predictive of only fatigue. Studies also showed a poorer performance of QOL among those with comorbidities[25].

Another finding of this study was the association between physical activity and the score of PF and RF dimensions, those with sufficient physical activity had better scores in these dimensions, and it was also negatively predictive of symptom total, pain and fatigue. Those with sufficient physical activity had lower scores in symptom total, had lower pain and fatigue. Studies demonstrated the positive effect of physical activity on quality of life among patients with CRC[26].

This study has some limitations, we included patients from teaching hospitals, those who were admitted to private hospitals might be from higher socioeconomic

status, therefore association between income and score of QOL might be affected. At the time of this study we could not access to surgery profile of the patients, then the information about preserving sphincter was not available, however evidence showed that sphincter-ablating procedures do not necessarily reduce QOL in patients with rectal cancer[21].

This study reported a relatively low score of QOL among patients with rectal cancer compared to studies from other countries. In general treatment option and stage of disease, and physical activity were important predictive factors of QOL. The presence of a modifiable factor is an opportunity for interventional strategies to improve the QOL via physical activity modification. Organised screening is recommended to improve the stage at presentation and concordance with treatment guidelines is also recommended.

DECLARATIONS

Authors' contributions
Involved in design of the protocol of the study and all drafts of the manuscript, and reviewed and agreed the final draft of the manuscript: N. Aminisani, M. Fatemi, P. Sarbakhsh, A. Nikanfar, A. Eftekharsadat, E. Jafari
Did data collection and analysis: M. Fatemi, E. Jafari
Supervised and supported data collection: N. Aminisani, A. Nikanfar, A. Eftekharsadat
Supervised the data analysis: N. Aminisani, P. Sarbakhsh

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Conflicts of interest
There are no conflicts of interest.

Patient consent
At the beginning of the study, informed consent was obtained in written from all of the participants.

Ethics approval
The study was conducted in accordance with the declaration of Helsinki and had ethics approval from the Tabriz University of Medical Science Ethical Review Committee (Ethical ID numbers: TBZMED. REC.5/4/11460).

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