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ORIGINAL ARTICLE

Quality of life in colorectal cancer patients during chemotherapy in the era of monoclonal antibody therapies

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Summary

Purpose: *Colorectal cancer (CRC) survivors are currently living longer due to better therapies but they also need to maintain their quality of life (QoL). QoL is increasingly being used as primary outcome measure in clinical studies. This study was designed to gain knowledge about QoL during chemotherapy across different lines and different regimens.*

Methods: *The study comprised 101 CRC out patients receiving chemotherapy who completed the EORTC QLQ-C30 questionnaire. The Shapiro-Wilk, Kruskal-Wallis, and Mann-Whitney U tests were used for statistical analyses.*

Results: *The demographics of the patients were evaluated for QoL. Prior surgery, prior radiotherapy, working status, stage, comorbidity and sex had no effect on global health status in CRC patients, although some other demographics such as education, monthly income, age and type of chemotherapy regimen did have an effect on global health status. Role functioning was worse in older than in younger ones ($p<0.05$). Adjuvant chemotherapy did not affect the QoL scores negatively but palliative chemotherapy negatively affected the cognitive function, appetite loss and nausea/vomiting scores ($p<0.05$). According to chemotherapy regimen, the best QoL was observed with adjuvant FUFA regimen. In the palliative setting FOLFOX/Bevacizumab was associated with the best QoL scores whereas FOLFIRI/Cetuximab were associated with the worst QoL scores.*

Conclusions: *Palliative chemotherapy maintained QoL irrespective of the chemotherapy line in metastatic CRC (mCRC) patients. Some demographics affect QoL and different chemotherapy regimens showed different QoL scores.*

Key words: *chemotherapy, colorectal cancer, quality of life, EORTC QoL C-30 Questionnaire*

Introduction

Cancer is a significant health problem which affects the QoL. Improving QoL is as important as survival prolongation. In the last 10 years, with the development of new anticancer drugs, it has become generally possible to prolong overall survival and more patients receive multiple treatment lines. Patients require not only chemotherapy administration, but they also need maintaining their QoL. The only effective treatment to improve QoL for mCRC is chemotherapy. Patients receiving different chemotherapy regimens and lines.

In CRC, many drugs are being used for therapy. Drugs are divided into two groups: cytotoxic drugs and biological agents. In CRC these two groups are usually combined in mCRC and most patients are offered second and third line therapies when tumor progression or severe toxicity occurred with previous therapy.

Quality of Life

According to the World Health Organization (WHO), definition of QoL is "An individual's perception of life, values, objectives, standards, and

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Table 1. Scoring the QLQ-C30 version 3.0

Scale		*Number of items*	*Item Range*	*Version 3.0 Item numbers*
	Global health status/QoL			
Global health status / QoL (revised)	QL2	2	6	29,3
	Functional scales			
Physical functioning	PF2	5	3	1 to 5
Role functioning	RF2	2	3	6,7
Emotional functioning	EF	4	3	21 to 24
Cognitive functioning	CF	2	3	20,25
Social functioning				
	Symptom scales/ Items			
Fatigue	FA	3	3	10,12,18
Nausea and vomiting	NV	2	3	14,15
Pain	PA	2	3	9,19
Dyspnoa	DY	1	3	8
Insomnia	SL	1	3	11
Appetite loss	AP	1	3	13
Constipation	CO	1	3	16
Diarrhoea	DI	1	3	17
Financial difficulties	FI	1	3	28

interests in the framework of culture". Cancer patients experience problems such as "dyspnea, cough, hemoptysis, pain, fatigue, insomnia, loss of appetite, nausea, vomiting, diarrhea, constipation, weight loss, changes in urinary habits, anxiety, fear, depression, changes in body image, and impaired family and social relationships", all of which have adverse impact on QoL [1] . Chemotherapy causes side effects and toxicities on patients' emotional, physical, and spiritual well-being, whereas patients undergoing chemotherapy experience positive improvements in their QoL with respect to the chemotherapy regimen [2]. QoL can be assessed using more than 50 different instruments [3], most of which have been evaluated for reliability and validity for different nationalities [4]. The EORTC-QLQ-C30 was developed specifically for cancer patients and is a widely-used reliable instrument to measure QoL. QoL assessments studies may help to notice the effects of disease, different chemotherapy regimens and morbidities [2].

The aim of this study was to evaluate the QoL in CRC patients undergoing chemotherapy and to explore the relationships between QoL and patient characteristics (age, gender, disease stage, comorbidities etc) and to evaluate the relationship of QoL with different chemotherapy regimens.

Methods

Ethics statement

This research was approved by the Ethics Committee of 19 Mayis University, and informed oral consent was obtained from all participants prior to completion of the questionnaires.

Patients

This study was performed in the chemotherapy units of two tertiary referral hospitals. If the following criteria were met, patients were invited to participate:

1. CRC at any stage
2. ECOG performance status 0-2
3. Age 18 years or older
4. Received chemotherapy for at least 3 months

Patients who completed the questionnaire were

Table 2. Clinical and therapy characteristics (N=101)

Characteristics	*Patients, N*	*%*
Primary		
Colon	65	64.3
Rectum	36	35.6
Stage		
I	0	0
II	9	8.9
III	20	19.8
IV	72	71.2
Prior surgery		
Yes	70	69.3
No	31	30.6
Prior radiotherapy		
Yes	21	20.8
No	80	79.2
Chemotherapy setting		
Adjuvant	28	28
Palliative	73	74
Chemotherapy protocol		
FUFA	12	12
FOLFOX+Cetuximab	15	15
FOLFIRI+Bevacizumab	28	28
FOLFOX	29	29
FOLFIRI+Cetuximab	9	9
FOLFOX+Bevacizumab	8	8
Comorbidity		
Yes	44	44
No	57	57

included in the study since most chemotherapy regimens last about 6 months, it was decided to complete the questionnaires during the second half of the treatment to be able to better observe drug side effects. A total of 101 consecutive patients with CRC who were undergoing chemotherapy were included. Only few patients refused to participate because of their poor clinical condition. Symptom distress and the QoL of the patients were evaluated using the EORTC QLQ C-30 questionnaire. Personal, disease and therapy characteristics were retrieved from patient files. The following patient data were registered: age, gender, educational status, work status, income status, primary tumor site, chemotherapy drug, chemotherapy line, prior surgery/radiotherapy and comorbid diseases. Confidentiality was guaranteed to the patients. Permission to use the questionnaires was obtained from EORTC Quality of Life Group.

Instruments

The standardized EORTC QLQ-C30 questionnaire was used to evaluate QoL in the current study. The QLQ C-30 includes 30 items that are divided into 3 main categories: global health status scale/QoL, functional scales and symptom scales (Table 1). A high score of QoL and a high score of functional scales show a good level, whereas a high score of symptom scale represents bad level. The questionnaire also contains 12 questions about sociodemographic features (gender, age, education, employment status, perceived income status) and the illness of the patient (diagnosis of cancer, stage of cancer, prior surgery, prior radiotherapy, anticancer therapy name and line). After the questionnaires were completed, they were checked to ensure that they had been fully completed.

Statistics

Power analysis was performed before starting the study and the minimum sample size required was found to be 100 to evaluate possible significant differences. Statistical analyses were performed using SPSS software package, version 20. The questionnaire points were calculated according to the EORTC QLQ-C30 Scoring Manual. Compliance with the normal distribution of continuous variables was examined with the Shapiro-Wilk test. For comparison of normal distribution of the variables in 3 or more groups, the Kruskal-Wallis test was used and for comparison of two groups the Mann-Whitney U test was used. A p value less than 0.05 was accepted as significant in all the statistical analyses.

Results

Patient characteristics

The median patient age was 57.8 years and was similar between (neo) adjuvant and metastatic patients. Male patients predominated (58%). The majority of patients were married. Education level was low in most of the patients. The clinical characteristics of patients are shown in Table 2. All patients were receiving chemotherapy for CRC. More than half of the patients (64.3%) had colon cancer and the remaining (35.7%) had rectal cancer. As chemotherapy is not required in stage 1, there were no patients in the study at that stage. Stage 2 and 3 patients received only FUFA and FOLFOX chemotherapy. Irinotecan and biological agents were only used in stage 4 patients. The majority of the patients (71.2%) had stage 4 disease and were receiving anti-EGFR and anti-VEGF therapy combined with cytotoxic chemotherapy.

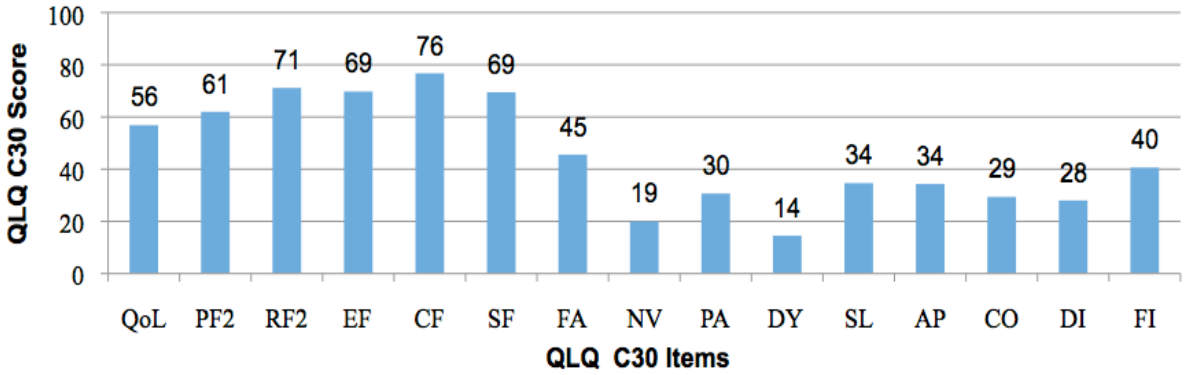

Figure 1. Results of the EORTC QLQC30 questionnaire (Europan Organisation for Research and Treatment of Cancer, Quality of Life Questionnaire, version 3,0). Indicated values are the mean of all pooled patients (N=101). QoL: quality of life, PF2: physical functioning, RF2: role functioning, EF2: emotional functioning, CF2: cognitive functioning, SF2: social functioning, FA: fatigue, NV: nausea and vomiting, PA: pain, DY: dyspnoea, SL: insomnia, AP: appetite loss, CO: constipation, DI: diarrhoea, FI: financial difficulties.

Result of the questionnaires

The mean value of the global health status/QoL was 56 points ±26.6 standard deviation (SD). Within the functional scales, physical function (pf) was rated lowest with a mean score of 61±27.3 points, whereas the cognitive function (cf) was rated highest with a mean of 76±25 points. The most distinctive symptom was fatigue (fa) with a mean value of 45±28.5 points, and the lowest was dyspnea with a mean value of 14±21 points (Figure 1).

The patients were evaluated according to age and were divided into two groups (<65years and >65 years). The age of 65 was used as cut off, with the World Health Organization (WHO) definition of an older person. There was no significant difference in global health status (58 and 50 respectively, p=0.315) and symptom scales, but the role functioning was lower in older than in younger patients (76 and 58 respectively, p<0.05) (Table 3).

In this sample, 70 patients had undergone a palliative or a curative surgical operation and 31 had not. It was searched whether these procedures had affected the global health status/QoL, but no difference was found in scores between the patients who had or had not surgery (56 and 58.6 respectively; p>0.05).

The impact of radiotherapy on QoL was also investigated. Twenty one patients had received radiotherapy and 80 had not; no difference was observed between the two groups.

Comorbid diseases also did not cause any difference in QoL (p=0.066, narrowly missing statistical significance).

With respect to the relationship between metastatic (N=29) and non-metastatic patients (N=72), there was no significant difference in global health status, but in functional scales the patients who were receiving adjuvant therapy showed better cognitive function (p<0.05). All the symptom scores were better in the adjuvant group but only nausea and vomiting and appetite loss were statistically significant (p<0.05). Although there were differences between the adjuvant and the palliative groups (Table 4) there was no change in metastatic patients during palliative chemotherapy, irrespective of chemotherapy line (Table 5). Patients who were receiving different chemotherapy regimens were compared for QoL (Table 6). Despite a similar global health status and functional scales, the dyspnea score was higher in the cetuximab (N=24) combination regimens than in the bevacizumab (N=36) combination regimens (p<0.05). Appetite loss score was lowest in the FUFA group and highest in the FOLFOX+cetuximab group (p<0.05).

Patients were also divided into groups according to level of education and the results showed that there was a significant correlation between QoL and education level. Better scores were obtained from university degree patients with respect to nausea and vomiting symptoms than from lower education groups (p<0.05).

Income levels were classified in 3 levels as good, moderate and low. There was no difference in global health status but there were some differences in the symptom scales. For instance, the nausea and vomiting and appetite loss scores were worse in the low income group than in the others (p<0.05).

Table 3. Age-related quality of life

Global health status	*Age <65 years*	*Age 65+ years*	*p value*
QoL (mean±SD) Median (range)	58.09 ± 27.64 58.33 (0-100)	54.17 ± 24.50 50.00 (0-100)	0.315
	Functional scales		
Physical functioning (PF2)	65.41 ± 25.62 73.33 (0-100)	54.58 ± 29.88 63.33 (0-100)	0.073
Role functioning (RF2)	76.81 ± 30.14 83.33 (0-100)	58.85 ± 38.10 50.00 (0-100)	0.031*
Emotional functioning (EF)	70.22 ± 29.48 75.00 (0-100)	68.75 ± 30.01 75.00 (0-100)	0.826
Cognitive functioning (CF)	75.85 ± 27.20 83.33 (0-100)	78.65 ± 20.41 83.33 (0-100)	0.961
Social functioning (SF)	69,08 ± 29,19 66,67 (0-100)	70,31 ± 27,99 75,00 (0-100)	0.926
	Symptom scales/items		
Fatigue (FA)	44.12 ± 29.11 33.33 (0-100)	48.61 ± 27.62 44.44 (0-100)	0.387
Nausea and vomiting (NV)	19.81 ± 28.91 0 (0-100)	20.31 ± 24.95 16.67 (0-100)	0.566
Pain (PA)	30.15 ± 30.91 16.67 (0-100)	31.77 ± 30.92 16.67 (0-100)	0.75
Dyspnoea (DY)	15.46 ± 27.16 0 (0-100)	12.50 ± 25.04 0 (0-100)	0.575
Insomnia (SL)	35.75 ± 33.97 33.33 (0-100)	32.29 ± 34.38 33.33 (0-100)	0.602
Appetite loss (AP)	31.40 ± 36.55 33.33 (0-100)	40.63 ± 38.55 33.33 (0-100)	0.22
Constipation (CO)	30.43 ± 34.65 33.33 (0-100)	27.08 ± 36.35 0 (0-100)	0.513
Diarrhoea (DI)	25.49 ± 29.99 33.33 (0-100)	33.33 ± 36.91 33.33 (0-100)	0.395
Financial difficulties (FI)	42.03 ± 34.61 33.33 (0-100)	37.50 ± 33.60 33.33 (0-100)	0.542

Discussion

Although gastrointestinal tumors represent a major health care problem worldwide, data for the QoL for patients suffering from this kinds of cancer are rare, especially data deriving from routine clinical practice [5]. QoL has become more important in health care practice and clinical researches [6]. Despite the importance of QoL evaluations, standardized methods are not applied in most oncology centers. In this study, a single, well-established and reliable assessment tool was used instead of several different specific questionnaires for patients. Despite the milder type and intensity of chemotherapy, elderly patients derive equivalent benefit compared with their younger counterparts [7]. Elderly patients showed similar QoL with the youngers in global health status, and only worse outcomes in role function were determined. Transportation to receive chemotherapy sessions may be more difficult in older patients and this may keep the elderly away from daily activities and hobbies. A history of surgical operation did not lead to any differences. Conditions affecting the QoL could be related to stoma but the stoma status was not evaluated because at the time of the current study the Turkish version of

Table 4. Quality of life in metastatic and non-metastatic patients

Global health status	*Metastatic*	*Non-metastatic*	*p value*
QoL, mean±SD	58.33 ± 20.54	56.28 ± 28.73	0.782
Median (range)	58.33 (8.33-100)	58.33 (0-100)	
	Functional scales		
Physical functioning (PF2)	67.14 ± 22.58	60.00 ± 28.89	0.419
	73.33 (6.67-100)	66.67 (0-100)	
Role functioning (RF2)	71.43 ± 33.60	71.00 ± 34.02	0.962
	83.33 (0-100)	83.33 (0-100)	
Emotional functioning (EF)	72.32 ± 24.43	68.75 ± 31.36	0.947
	75 (0-100)	75 (0-100)	
Cognitive functioning (CF)	87.50 ± 14.79	72.60 ± 27.13	0.011
	83.33 (50-100)	83.33 (0-100)	
Social functioning (SF)	70.83 ± 25.51	68.95 ± 29.96	0.991
	75 (0-100)	66.67 (0-100)	
	Symptom scales/items		
Fatigue (FA)	39.29 ± 25.57	47.99 ± 29.48	0.171
	33.33 (0-100)	44.44 (0-100)	
Nausea and vomiting (NV)	7.74 ± 13.21	24.66 ± 30.19	0.005
	0 (0-50)	16.67 (0-100)	
Pain (PA)	22.62 ± 28.04	33.80 ± 31.40	0.079
	16.67 (0-100)	33.33 (0-100)	
Dyspnoea (DY)	11.90 ± 22.62	15.53 ± 27.82	0.61
	0 (0-66.67)	0 (0-100)	
Insomnia (SL)	32.14 ± 34.52	35.61 ± 33.94	0.61
	33.33 (0-100)	33.33 (0-100)	
Appetite loss (AP)	17.86 ± 27.94	40.64 ± 38.59	0.005
	0 (0-100)	33.33 (0-100)	
Constipation (CO)	23.81 ± 32.53	31.51 ± 35.96	0.37
	0 (0-100)	33.33 (0-100)	
Diarrhoea (DI)	22.62 ± 31.47	30.09 ± 32.70	0.241
	0 (0-100)	33.33 (0-100)	
Financial difficulties (FI)	32.14 ± 32.05	43.84 ± 34.64	0.117
	33.33 (0-100)	33.33 (0-100)	

EORTC QLQ-CR29 (a specific module of CRC patients especially useful for stoma patients about sphincter control and sexual life) was not available. Patients were compared according to the stages of disease and differences were found in the cognitive function. Studies in literature have shown that depression is very common in metastatic cancer survivors [8]. This depressive mood may influence the cognitive functions negatively. In the adjuvant group, cognitive function, appetite loss and nausea/vomiting scores were better. These differences may primarily be related to impairments because of a longer time since diagnosis, disease progression and cumulative toxicity of drugs [9,10].

In the current study, there was no difference between different chemotherapy lines of metastatic patients (p>0.05). This means that palliative chemotherapy did not negatively affect QoL [10]. On the contrary, chemotherapy maintained the QoL. When deciding on further chemotherapy, we usually use ECOG performance status and ask a few brief questions to understand the tolerability potential of the patient. Actually, applying the questionnaire to every new patient provides more detailed information about the patient. Differences in QoL with different regimens may primarily be related to the type of chemotherapeutic drugs

Table 5. Quality of life between chemotherapy lines

Global Health Status	*Palliative chemotherapy*	*Palliative chemotherapy*	*Palliative chemotherapy*	*p value*
	1st line	*2nd line*	*3rd line*	
QoL, mean±SD	52.89 ± 27.98	60.19 ± 31.38	72.22 ± 23.37	0.197
Median (range)	50 (0-100)	66.67 (0-100)	79.17 (33.33-100)	
		Functional scales		
Physical functioning (PF2)	54.15 ± 29.52	73.33 ± 20.96	67.78 ± 33.31	0.054
	66.67 (0-93.33)	73.33 (33.33-100)	80 (0-86.67)	
Role functioning (RF2)	65.65 ± 35.26	84.26 ± 24.57	75.00 ± 41.83	0.187
	66.67 (0-100)	91.67 (0-100)	100 (0-100)	
Emotional functioning (EF)	64.93 ± 32.66	76.85 ± 26.13	75.00 ± 34.56	0.357
	75 (0-100)	83.33 (0-100)	91.67 (8.33-100)	
Cognitive functioning (CF)	69.73 ± 27.78	78.70 ± 27.30	77.78 ± 20.18	0.367
	83.33 (0-100)	83.33 (0-100)	75 (50-100)	
Social functioning (SF)	67.35 ± 30.80	69.44 ± 29.29	80.56 ± 26.70	0.552
	66.67 (0-100)	66.67 (0-100)	91.67 (33.33-100)	
		Symptom scales/items		
Fatigue (FA)	53.71 ± 29.74	37.65 ± 28.30	33.33 ± 18.59	0.103
	50 (0-100)	44.44 (0-100)	33.33 (11.11-55.56)	
Nausea and vomiting (NV)	24.15 ± 28.48	32.40 ± 36.81	5.55 ± 8.61	0.182
	16.67 (0-100)	16.67 (0-100)	5.56 (0-16.67)	
Pain (PA)	37.50 ± 33.24	27.78 ± 21.39	22.22 ± 40.37	0.294
	33.33 (0-100)	33.33 (0-66.67)	22.22 (0-100)	
Dyspnoea (DY)	14.97 ± 28.92	14.81 ± 20.52	22.22 ± 40.37	0.763
	0 (0-100)	0 (0-66.67)	22.22 (0-100)	
Insomnia (SL)	39.46 ± 34.48	31.48 ± 33.28	16.67 ± 27.89	0.237
	33.33 (0-100)	33.33 (0-100)	16.67 (0-66.67)	
Appetite loss (AP)	44.22 ± 41.04	35.19 ± 35.19	27.78 ± 25.09	0.648
	33.33 (0-100)	33.33 (0-100)	27.78 (0-66.67)	
Constipation (CO)	34.69 ± 39.65	25.93 ± 29.27	22.22 ± 17.21	0.855
	0 (0-100)	33.33 (0-100)	22.22 (0-33.33)	
Diarrhoea (DI)	33.33 ± 36.39	24.07 ± 25.06	22.22 ± 17.21	0.775
	33.33 (0-100)	33.33 (0-66.67)	22.22 (0-33.33)	
Financial difficulties (FI)	45.58 ± 35.81	44.44 ± 30.25	27.78 ± 38.97	0.439
	33.33 (0-100)	50 (0-100)	27.78 (0-100)	

or additional monoclonal antibodies. As far as we know, this is the first study about the effects of different chemotherapy regimens on QoL in patients with CRC. For example, even the treatment sequence of FOLFOX and FOLFIRI changes toxicity [11]. Bevacizumab-based therapy has been reported to have a more favorable toxicity profile with less severe diarrhea and neutropenia [5]. In the current study, treatment regimens with bevacizumab were also shown to yield better QoL and in contrast to the data reported by Unger et al., the QoL scores were worse with combinations of cetuximab [12].

Although no relationship has been demonstrated between education and QoL scores in several studies, a variation was observed in the current study at different levels of education in nausea/vomiting. The nausea/vomiting scores were lower in univpersity graduate patients than in others. Patients with higher levels of education are usually more aware of the effects of treatment and they might use antiemetics more regularly.

Table 6. Six different chemotherapy regimens and correlation with QoL

Global health status	*FUFA*	*FOLFOX+ Cetuximab*	*FOLFIRI+ Bevacizumab*	*FOLFOX*	*FOLFIRI+ Cetuximab*	*FOLFOX + Bevacizumab*	*p value*
QoL, mean±SD	68.06 ± 18.06	55.56 ± 35.59	58.33 ± 27.69	51.15 ± 24.37	52.78 ± 20.83	62.5 ± 28.87	0.465
Median (range)	66.67 (33.3-100)	50 (0-100)	54.17 (0-100)	50 (0-100)	50 (0-83.33)	62.5 (16.67-100)	
				Functional scales			
PF2	72.22 ± 24.53	49.33 ± 34.07	63.81 ± 25.56	58.85 ± 26.25	63.70 ± 24.97	65.83 ± 25.06	0.106
	83.3 (6.7-100)	53.3(0-100)	70 (13,3-100)	66.7 (0-100)	73.3 (6.7-86.7)	73.3 (33.3-100)	
RF2	88.88 ± 24.96	61.11 ± 41.15	71.43 ± 32.67	66.67 ± 33.63	75.93 ± 34.47	72.92 ± 32.04	0.322
	100 (16.7-100)	66.7(0-100)	83.3 (0-100)	66.7 (0-100)	100 (0-100)	83.3 (16.7-100)	
EF	79.17 ± 22.33	58.93 ± 35.12	75.00 ± 28.60	68.10 ± 26.64	53.70 ± 34.64	80.21 ± 30.19	0.16
	87.5 (33.3-100)	62.5(0-100)	83.3 (0-100)	75 (0-100)	50 (8.3-100)	91.7 (8.3-100)	
CF	87.50 ± 14.43	67.78 ± 31.79	73.21 ± 29.17	80.46 ± 23.18	77.78 ± 23.57	75.00 ± 12.60	0.429
	83.3 (50-100)	83.3(0-100)	83.3 (0-100)	83.3 (16.7-100)	83.3 (33.3-100)	66.7 (66.7-100)	
SF	81.94 ± 18.06	55.56 ± 34.31	71.43 ± 30.04	67.24 ± 27.63	70.37 ± 35.14	77.08 ± 12.40	0.303
	83,3 (33,3-100)	50(0-100)	75 (0-100)	66,7 (0-100)	66,7 (0-100)	75 (66,7-100)	
				Symptom scales/items			
FA	26.85 ± 24.83	51.85 ± 32.98	46.09 ± 31.98	47.13 ± 24.96	48.15 ± 26.06	51.39 ± 24.44	0.143
	22.2 (0-88.9)	55.5 (0-100)	33.3 (0-100)	44.4 (11.1-100)	44.4 (11.1-100)	55.6 (0-88.9)	
NV	2.78 ± 6.49	17.78 ± 25.56	23.21 ± 28.45	21.26 ± 27.05	25.93 ± 35.46	27.08 ± 36.67	0.192
	0 (0-16.7)	16.7 (0-100)	16.7 (0-100)	16.7 (0-100)	16.7 (0-100)	8.3 (0-100)	
PA	11.11 ± 24.96	41.11 ± 40.76	30.86 ± 31.25	33.33 ± 26.35	37.04 ± 32.03	22.92 ± 21.71	0.093
	0 (0-83.3)	33.3 (0-100)	16.7 (0-100)	33.3 (0-100)	33.3 (0-83.3)	16.7 (0-66.7)	
DY	5.56 ± 19.25	31.11 ± 40.76	5.95 ± 15.85	18.39 ± 26.10	22.22 ± 28.86	4.17 ± 11.79	0.030*
	0 (0-66.7)	0 (0-100)	0 (0-66.7)	0 (0-100)	0 (0-66.7)	0 (0-33.3)	
SL	16.67 ± 22.47	51.11 ± 41.53	35.71 ± 35.05	34.48 ± 35.05	37.04 ± 26.06	25.00 ± 23.57	0.264
	0 (0-66.7)	33.3 (0-100)	33.3 (0-100)	33.3 (0-100)	33.3 (0-66.7)	33.3 (0-66.7)	
AP	2.78 ± 9.62	46.67 ± 39.44	38.10 ± 43.24	35.63 ± 33.25	44.44 ± 40.83	29.17 ± 27.82	0.024
	0 (0-33.3)	33.3 (0-100)	33.3 (0-100)	33.3 (0-100)	33.3 (0-100)	33.3 (0-66.7)	
CO	30.56 ± 36.12	35.56 ± 36.66	30.95 ± 32.62	27.59 ± 35.71	18.52 ± 33.79	29.17 ± 45.21	0.841
	33.3 (0-100)	33.3 (0-100)	33.3 (0-100)	0 (0-100)	0 (0-100)	0 (0-100)	
DI	25.00 ± 32.18	28.89 ± 33.01	27.16 ± 32.08	24.14 ± 29.41	25.93 ± 27.78	50 ± 47.14	0.806
	16.7 (0-100)	33.3 (0-100)	33.3 (0-100)	0 (0-100)	33.3 (0-66.7)	50 (0-100)	
FI	30.56 ± 33,21	60.00 ± 40.24	39.29 ± 35.20	36.78 ± 30.01	33.33 ± 28.87	45.83 ± 35.36	0.329
	33.3 (0-100)	66.7 (0-100)	33.3 (0-100)	33.3 (0-100)	33.3 (0-66.7)	50 (0-100)	

For abbreviations see previous Tables

The results of this study showed a strong correlation between income level and nausea-vomiting, appetite loss and financial difficulties. Constant nausea causes difficulty in selecting food because some kinds of food exacerbate nausea. If an individual's income level is low it will be difficult to always find every kind of food he/she likes to eat and this may be the reason for appetite loss.

In our clinic, questionnaires about the pa-

tient's QoL are not used regularly. However, at the end of this study it was noticed that, according to the survey, a lot of patients with high pain and nausea/vomiting scores had received incomplete treatment for pain and emesis and therefore additional treatment was provided. A disadvantage of the study is the small number of patients for different types of chemotherapy regimens. Larger studies are surely needed, but the present study described the results of a particular region, ensuring the advantage of homogeneity.

In a study including gastric, CRC and pancreaticobiliary cancers, overall survival was compared in optimal and suboptimal chemotherapy groups, showing that patients with gastrointestinal cancers (especially CRC and gastric cancer) had better survival in the optimally-treated group [13]. In the current study we didn't evaluate survival but chemotherapy was mainly associated with a stable QoL over time, irrespective of treatment line and stage in CRC patients. Results of the GERGOR OPTIMOX 1 study showed that QoL has prognostic value in mCRC patients and QoL scores could give information to the clinician about the prognosis of a patient [14].

The decision of a chemotherapy regimen has been influenced by a number of factors, such as the patient's performance, comorbidities, k-ras status, resectability potential or desires [15]. Further treatments were seen to improve QoL and indirectly the survival in CRC patients and this may be encouraging for patients as there is still a social stigma attached to chemotherapy by a part of the society in Turkey.

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