

DOI: <https://doi.org/10.56936/18290825-1.v19.2025-10>**NUTRITIONAL AND HEALTH STATUS
OF COLORECTAL CANCER PATIENTS - BASELINE STUDY****ĆORIĆ N.^{1,2}, BANJARI I.^{2,3*}, ROLIĆ T.^{4,5}, MARIJANOVIĆ I.⁶**¹ University Clinical Hospital Mostar, Patient Food and Nutrition Service, Mostar, Bosnia and Herzegovina² Faculty of Agronomy and Food Technology, University of Mostar, Mostar, Bosnia and Herzegovina³ Faculty of Food Technology Osijek, Josip Juraj Strossmayer University Osijek, Osijek, Croatia⁴ Department for Chemistry, Biochemistry and Clinical Chemistry, Faculty of Medicine, Josip Juraj Strossmayer University of Osijek, Osijek, Croatia⁵ Institute of Clinical Laboratory Diagnostics, University Hospital Centre Osijek, Osijek, Croatia⁶ University Clinical Hospital Mostar, Department of Oncology, Mostar, Bosnia and Herzegovina*Received 19.02.2024; Accepted for printing 11.02.2025***ABSTRACT**

Colorectal cancer represents a significant global health burden, impacting millions of lives each year. Beyond the immediate challenges of diagnosis and treatment, colorectal cancer patients often face a cascade of complex issues affecting their quality of life, including impaired nutritional status and compromised health. The aim of this study was to examine initial nutritional and health status of patients with colorectal cancer. Basic anthropometric measurements were collected from 45 colorectal cancer patients at the initial nutritional counselling and prior to the start of treatment. At the same time, health-related quality of life was examined using a 36-Item Short Form Survey (SF-36). Results show weight loss amongst a substantial proportion of patients in the three months prior to the first nutrition counseling, 68.9% of patients lost weight, and 15.6% of patients gained weight. Patients with right-sided colorectal cancer have unfavorable anthropometric indices in comparison to left-sided colorectal cancer patients including lower muscle mass, higher waist to hip ratio, body fat, visceral fat index and higher waist circumference. In regard to health-related quality of life, the results show that right-sided and left-sided colorectal cancer patients significantly differ only in emotional functioning ($p=0.036$). Early nutritional assessment and implementation of nutritional support can contribute to the quality of life and maintenance of normal nutritional status in patients with colorectal cancer.

KEYWORDS: Colorectal Cancer; Nutritional Status; Anthropometrics; Health-Related Quality of Life**INTRODUCTION**

Colorectal cancer is a malignant neoplasm of the large bowel and/or rectum. It is the third most common cancer in the world, and it is one of the most common tumors in western countries [WHO, 2023] with the significant cause of morbidity and mortality worldwide [Jayasinghe M et al., 2023]. colorectal

cancer is the 3rd most common cancer in men and the 2nd most common cancer in women [WCRF, 2023]. It predominantly affects older individuals, with the majority of cases occurring in people of 50 years or older [WHO, 2023].

The statistics show that Bosnia and Herzegovi-

CITE THIS ARTICLE AS:

Ćorić N., Banjari I., Rolić T., Marijanović I. (2025). Nutritional and health status of colorectal Cancer patients - baseline study. The New Armenian Medical Journal, vol.19(1), 10-19; DOI: <https://doi.org/10.56936/18290825-1.v19.2025-10>

ADDRESS FOR CORRESPONDENCE:

Ines Banjari, PhD, Prof.
Department of Food and Nutrition Research, Faculty of
Food Technology, Josip Juraj Strossmayer University of
Osijek, Franje Kuhača 18, 31000 Osijek, Croatia
Tel. (+385 31) 224 339
E-mail: ibanjari@ptfos.hr

na is not far behind. According to the latest available data of International Agency for Research on Cancer, in Bosnia and Herzegovina, colorectal cancer is the second most frequent cancer, after lung cancer [Ferlay J et al., 2024].

Different parts of the world have varied rates of colorectal cancer, mostly because of genetic predisposition, but also due to environmental factors and lifestyle of the people in a given area [Lewandowska A et al., 2022]. The risk of colorectal cancer increases approximately linearly with increasing body mass index, from 23 kg/m² to 30 kg/m². This relation is stronger in men than in women. In addition, dietary patterns such as high fat and calorie intake and red meat consumption exceeding 100 g per day increase the risk of colorectal cancer [Mohammad NMAB et al., 2022].

The basic treatment of colorectal cancer is classical or laparoscopic resection of the tumor with the removal of the surrounding lymph nodes [Lewandowska A et al., 2022]. Chemotherapy or chemoradiation is advised for patients with unresectable tumors or who are medically unfit for surgery. Adjuvant chemotherapy is recommended for post-surgical patients with stage III or high-risk stage II disease. Pre-operative neoadjuvant therapy may be administered to patients with resectable high-stage colonic disease (T4 tumors) in order to downstage the tumor [Szymańska K, 2018].

The location of the primary tumor, in terms of right- or left-sided origin, is significant because the two sides have different characteristics in terms of symptoms, treatment approaches and prognosis [Brule S et al., 2015; Pugh S et al., 2016; Baran B et al., 2018]. The right-sided colorectal cancer include cecum, appendix, ascending colon, hepatic flexure and proximal two thirds of the transverse colon. The left-sided colorectal cancer includes the left-side of the colon, more precisely transverse colon, splenic flexure, descending colon, sigmoid colon and rectum [Baran B et al., 2018]. The incidence of left-sided colorectal cancer has been higher than right-sided colorectal cancer [Lee GH et al., 2015].

Nutrition status of patients is important at all stages of the treatment. Malnutrition, either underweight or with excess body weight [Davis JN et al., 2020], can impair treatment outcomes and tolerance, promote the development of early and late complications of treatment, and worsen quality of life.

Malnutrition may result from the anticancer therapies, the tumor itself, or the patient's reaction to the tumor. On the other hand, one of the most common risk factors for colorectal cancer and other illnesses is obesity. Obesity is a risk factor both before and after a colorectal cancer diagnosis because obese or underweight colorectal cancer patients may have higher mortality rates than normal or overweight patients [Negrichi S and Taleb S, 2020].

Early detection of those who have a high risk of complications is essential for developing good nutritional and clinical standards, which will improve the quality of care for colorectal cancer patients [Karin M. et al., 2020] but also improve their quality of life. Health-related quality of life is generally recognized as a multidimensional evaluation of how illness and treatment impact a patient's perception of overall function and wellbeing, including physical, psychological, and social aspects of life [Sitlinger A, Syed Yousuf Z, 2018].

The aim of this study was to examine the initial nutritional and health status of patients with colorectal cancer.

MATERIALS AND METHODS

The study was conducted between August 2021 and April 2023 at the University Clinical Hospital Mostar, Bosnia and Herzegovina. This study was approved by the Ethics Committee of the University Clinical Hospital Mostar, Bosnia and Herzegovina. All patients signed informed consent prior enrolling in the study.

A total of 45 individuals with colorectal cancer of all clinical stages were included, with 26 (57.8%) men and 19 (42.2%) women.

Data on sociodemographic characteristics (place of residence, number of children, number of household members, working status, education, average monthly income) were collected via direct interview. Data regarding the diagnosis of colorectal cancer (e.g. date of diagnosis, type of treatment) were collected from personal health charts.

Anthropometric measurements were collected at the initial nutritional counseling, prior to the start of treatment. Digital column scale Seca 769 (Hamburg, Germany) was used to measure body height and weight, and a non-elastic measuring tape to measure waist, hip and mid-upper arm circumference. The waist circumference cut-

off points were 88 cm in females and 102 cm in males according to the World Health Organization (WHO) [WHO, 2008]. Tanita BC-545N was used for bioelectrical impedance analysis (BIA) in order to measure body fat (%), muscle mass (kg), and total body water. Patients were divided into four categories depending on their calculated Body Mass Index (BMI): underweight, normal weight, overweight and obese, based on WHO classification [WHO, 2008].

Health-related quality of life was assessed by using the 36-Item Short Form Survey (SF-36). The 36-Item Short Form Survey (SF-36) is a widely used and well-established health-related quality of life questionnaire. It was developed by the RAND Corporation and is designed to assess an individual's physical and mental health across various dimensions. The SF-36 questionnaire is used in both clinical research and healthcare settings to measure and monitor health outcomes and quality of life. It comprises 36 questions that cover eight different health domains, which are grouped into two main categories: physical health and mental health.

Physical functioning: assessing an individual's ability to perform physical activities and daily tasks.

Role-Physical: Evaluating the extent to which physical health issues interfere with an individual's work or daily activities.

- **Bodily pain:** Measuring the presence and intensity of pain and discomfort.
- **General health:** Assessing overall perceptions of health and well-being.
- **Vitality:** Gauging energy levels and fatigue.
- **Social Functioning:** Evaluating the impact of health on social interactions and relationships.
- **Role-Emotional:** Assessing how emotional health affects work or daily activities.
- **Mental Health:** Measuring psychological distress and well-being [Mchorney CA et al., 1993].
- **Physical functioning scores** ranged from 0 to 100, with higher scores indicating better condition.

Statistical Analysis: The obtained data were analyzed by using IBM SPSS for Windows, version 25 [IBM Corp., Armonk, NY, USA]. For categorical variables, results are expressed as percentages, mean and standard deviation.

The normality of the distribution of the investigated variables was tested using Shapiro-Wilk tests

prior to providing answers to the predetermined research problems. An independent sample t-test was performed to examine differences between genders in health status as also for anthropometric measurements. For all analyses, p-value <0.05 was considered statistically significant.

RESULTS

The average age of all respondents was 62.69 years (SD=7.81). Most of the patients were retired (60%), 24.4% were employed and 15.6% unemployed. 88.8% of participants were living in marriage and the highest percentage of respondents (60%) had a non-university degree.

Out of the total number of respondents, 8 patients were with right-sided and 37 with left-sided colorectal cancer.

Nutritional status: Anthropometric measurements are presented in Table 1. There was a statistically significant difference between gender in weight (kg), body fat (%), muscle mass (kg), total body water (%) and waist-to-hip ratio (p<0.05) (Table 2).

The percentage of underweight, overweight, and obese patients according to gender is shown in Figure 1. In the three months prior to the first nutrition counseling, 68.9% of patients lost weight, and 15.6% of patients gained weight. Although a large percentage of patients lost body weight three months prior to the first nutrition counseling, only one patient was in the underweight category, while 24.4% of patients were overweight, and 15.5% obese. For the majority of patients,

TABLE 1.
Anthropometric measurements of colorectal cancer patients

	Mean ± SD	Min	Max
Weight (kg)	76.23 ± 17.18	48.80	127.70
BMI (kg/m ²)	25.34 ± 5.48	17.00	41.70
Waist circumference (cm)	92.70 ± 13.22	71.00	125.00
Hip circumference (cm)	104.39 ± 10.31	87.00	137.00
Waist-to-hip ratio	0.88 ± 0.07	0.72	1.05
Mid-upper arm circumference (cm)	29.15 ± 4.28	22.00	42.00
Body fat (%)	27.99 ± 10.31	8.90	57.60
Muscle mass (kg)	51.95 ± 11.66	32.00	81.50
Total body water (%)	53.04 ± 9.22	39.10	96.40

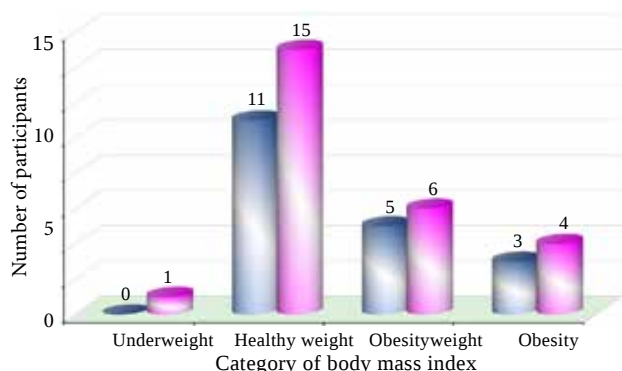


FIGURE 1. Distribution of participants according to BMI category for males (like grey columns) and females (pink columns).

57.8% BMI was within the range of reference values. The mean value for mid-upper arm circumference was 29.08 cm. According to waist circumference, abdominal obesity was present in 63.4% of patients, with mean value of waist-to-hip ratio (WHR) of 0.85 for women and 1.03 for men (Table 2). Statistically significant difference was observed between percent of body fat, muscle mass, and total body water between gender. Males had higher percent of muscle mass and total body water.

In Table 3, comparison of anthropometric measurements between right-sided and left-sided colorectal cancer patients are shown, and results clearly confirm that patients with right-sided colorectal cancer have unfavorable anthropometric indices. Particularly, right-sided patients have statistically significantly higher waist-to-hip ratio ($p < 0.001$) and total body water ($p = 0.003$). Additionally, right-sided colorectal cancer patients also have

lower BMI, muscle mass and lower left-hand circumference, more body fat, higher visceral fat index, higher waist and lower hip circumference.

Health status: For 36-Item Short Form Survey (SF-36) mean scores were as follows: physical functioning 71.11, role functioning/physical 46.11, role functioning-emotional 73.48, energy/fatigue 49.67, emotional well-being 56.44, social functioning 62.61, pain 63.11, general health 45.40, health change 22.95. There was no statistically significant difference in health status with regard to gender ($p > 0.05$) (Table 4). Of all participants, 12 females and 15 males were diagnosed with ad-

TABLE 2.

Anthropometric measurements between gender

	Mean $\pm$ SD		t	df	p
	F (n=19)	M (n=26)			
Weight (kg)	70.14 $\pm$ 16.59	80.68 $\pm$ 16.51	-2.111	43	0.041
BMI (kg/m ²)	26.01 $\pm$ 5.68	24.84 $\pm$ 5.39	0.702	43	0.487
Waist circumference (cm)	89.44 $\pm$ 14.88	96.24 $\pm$ 11.73	-1.633	39	0.110
Hip circumference (cm)	104.97 $\pm$ 12.21	100.25 $\pm$ 17.41	0.990	39	0.328
Waist-to-hip ratio	0.85 $\pm$ 0.07	1.03 $\pm$ 0.55	-1.471	39	0.165
Mid-upper arm circumference (cm)	29.16 $\pm$ 14.88	29.01 $\pm$ 11.73	0.109	37	0.914
Body fat (%)	34.83 $\pm$ 5.99	22.80 $\pm$ 9.93	4.667	42	0.000
Muscle mass (kg)	41.93 $\pm$ 6.46	56.94 $\pm$ 13.84	-4.369	42	0.000
Total body water (%)	47.12 $\pm$ 4.74	57.54 $\pm$ 9.31	-4.446	42	0.000
Visceral fat index	8.03 $\pm$ 2.89	1.88 $\pm$ 17.595	-1.676	42	0.099

Notes: M-males; F-females; SD-standard deviation, t-t-test value; df-degrees of freedom; p-statistical significance

TABLE 3.

Comparison of anthropometric measurements between right-sided and left-sided colorectal cancer patients

	Mean $\pm$ SD		t	df	p
	R (n=8)	L (n=37)			
Weight (kg)	78.20 $\pm$ 20.21	75.81 $\pm$ 16.74	0.353	43	0.155
BMI (kg/m ²)	24.81 $\pm$ 6.44	25.45 $\pm$ 5.35	-0.297	43	0.488
Waist circumference (cm)	97.64 $\pm$ 16.31	92.15 $\pm$ 13.00	0.975	39	0.257
Hip circumference (cm)	92.71 $\pm$ 29.48	104.44 $\pm$ 9.94	-1.916	39	0.014
Mid-upper arm circumference (cm)	27.75 $\pm$ 4.44	29.32 $\pm$ 4.31	-0.820	37	0.871
Waist-to-hip ratio	1.29 $\pm$ 0.97	0.88 $\pm$ 0.07	2.537	39	0.000
Body fat (%)	30.02 $\pm$ 5.11	27.54 $\pm$ 9.16	0.611	42	0.065
Muscle mass (kg)	43.98 $\pm$ 18.45	51.89 $\pm$ 11.94	-1.527	42	0.577
Total body water (%)	57.16 $\pm$ 17.78	52.12 $\pm$ 6.04	1.413	42	0.003
Visceral Fat index	22.06 $\pm$ 30.20	9.67 $\pm$ 4.46	2.442	42	0.000

NOTES: R-right sided colorectal cancer; L-left sided colorectal cancer; SD-standard deviation, t-t-test value; df-degrees of freedom; p-statistical significance

ditional health conditions, mostly hypertension, hyperlipidemia and benign prostatic hyperplasia in men. No statistically significant difference was found in any subscale in the health status of SF-36 with regard to the presence of other health conditions ($p < 0.05$).

Right-sided and left-sided colorectal cancer patients significantly differ only in emotional functioning ($p = 0.036$) (Table 5). However, every aspect, except social functioning was worse in right-sided in comparison to left-sided colorectal cancer patients.

DISCUSSION

Nutritional status: Research results on the number of patients with right-sided colorectal cancer ($n=8$) and left-sided colorectal cancer ($n=37$), are consistent with the literature, where two thirds of colorectal cancer occur in the left colon and one-third in the right colon [Szymańska K, 2018].

In previous studies, it was observed that patients with gastrointestinal neoplasms who had poor nutritional status as well as delayed and insufficient nutritional support after surgery had worse surgical treatment outcomes [Zietarska

TABLE 4.

Comparison between the measures of health, based on the SF-36 questionnaire between gender

Variable	Mean $\pm$ SD		t	df	p
	F (n=19)	M (n=26)			
Physical functioning	65.00 $\pm$ 20.06	75.58 $\pm$ 20.31	-1.73	43	0.090
Role functioning/physical	38.16 $\pm$ 45.92	51.92 $\pm$ 46.32	-0.98	43	0.329
Role functioning/emotional	64.91 $\pm$ 46.44	80.00 $\pm$ 40.82	-1.14	42	0.259
Energy/fatigue	45.79 $\pm$ 16.68	52.50 $\pm$ 19.98	-1.31	43	0.194
Emotional well-being	57.89 $\pm$ 17.90	55.38 $\pm$ 15.25	0.50	43	0.615
Social functioning	52.89 $\pm$ 32.76	69.71 $\pm$ 31.69	-1.73	43	0.090
Pain	52.63 $\pm$ 41.91	69.71 $\pm$ 37.67	0.143	43	0.136
General health	47.84 $\pm$ 24.36	43.62 $\pm$ 20.93	0.428	43	0.536
Health change	18.42 $\pm$ 33.37	25.38 $\pm$ 31.90	0.614	43	0.482

NOTES: M-males; F-females; SD-standard deviation, t-t-test value; df-degrees of freedom; p statistical significance

TABLE 5.

Comparison between the measures of health, based on the SF-36 questionnaire between right-sided and left-sided colorectal cancer patients

Variable	Mean $\pm$ SD		t	df	p
	R (n=8)	L (n=37)			
Physical functioning	68.75 $\pm$ 25.60	71.62 $\pm$ 19.82	-0.353	43	0.379
Role functioning/physical	50.00 $\pm$ 53.45	45.27 $\pm$ 45.19	0.260	43	0.159
Role functioning/emotional	50.00 $\pm$ 53.45	78.70 $\pm$ 39.96	-1.728	42	0.036
Energy/fatigue	51.25 $\pm$ 24.89	49.32 $\pm$ 15.23	0.287	43	0.076
Emotional well-being	53.50 $\pm$ 22.31	57.08 $\pm$ 14.98	-0.560	43	0.154
Social functioning	64.06 $\pm$ 33.03	62.30 $\pm$ 33.28	0.136	43	0.972
Pain	66.25 $\pm$ 41.29	62.43 $\pm$ 40.37	0.242	43	0.722
General health	52.63 $\pm$ 22.30	43.84 $\pm$ 22.26	1.012	43	0.770
Health change	32.50 $\pm$ 40.97	20.27 $\pm$ 30.41	-0.709	43	0.086

NOTES: R-right sided colorectal cancer; L-left sided colorectal cancer; SD-standard deviation, t-t-test value; df-degrees of freedom; p-statistical significance

M et al., 2018]. Although only one patient was in the underweight category and the majority of patients had BMI within the reference range, 68.9% of patients reported weight loss prior to the examination and nutrition counseling. The findings support the preexisting issue of nutritional status disruption in colorectal cancer patients. The research results are consistent with the results of [*Zietarska M et al. 2018*] who conclude how severe malnutrition or actual cancer cachexia do not often occur in colorectal cancer patients. Prevalence of malnutrition is generally lower in patients with colorectal and breast cancers with some exceptions [*Bossi P et al., 2021*]. Also, if pre-cachexia is observed in patients, it is reversible by appropriate nutritional support [*Zietarska M et al., 2018*].

In this study, the mean BMI was 25.34 ± 5.48 kg/m². According to a review [*Moghaddam AA et al., 2007*] for every 2 kg/m² increase in BMI, the risk for developing colorectal cancer increases by 7%. BMI at the time of diagnosis is an independent prognostic factor among patients with early-stage disease whose primary tumors were resected and who received adjuvant chemotherapy with curative intent [*Renfro LA et al., 2016*]. In analysis by [*Sinicrope FA et al. 2013*] based on 25,291 patients from the Adjuvant Colon Cancer End Points (ACCENT) database, during a median follow-up of 7.8 years, obese and underweight patients with stage II or III disease had significantly poorer survival compared with overweight and normal-weight patients. For metastatic colorectal cancer, BMI was prognostic factor for the overall survival and progression-free survival, with an L-shaped pattern [*Renfro LA et al., 2016*]. Risk of progression and/or death was greatest for low BMI, risk decreased as BMI increased to approximately 28 kg/m², and then it plateaued [*Renfro LA et al., 2016*].

The minimum value for mid-upper arm circumference was 22 cm and the highest 42cm, which also indicates a reduced risk of malnutrition in this study population.

Bioelectrical impedance analysis (BIA) was also conducted to support basic anthropometric measurements. It is an accessible and cheap method to measure fat-free mass [*Ræder H et al., 2018*]. The results for BMI (kg/m²), muscle mass (kg), and percent of fat mass were comparable with findings

of [*Zietarska M et al., 2018*]. Excess abdominal fat is an important, independent risk factor for disease, especially for cardiovascular disease and diabetes. In the study [*Popovici D et al. 2023*] obesity was found to be a significant predictor of rectal cancer in the context of BMI, meaning that patients who were obese were more likely to develop rectal cancer than those who were normal weight or overweight.

The evaluation of waist circumference to assess the risks associated with obesity or overweight is supported by research [*WHO, 2011*]. A 2-cm increase in waist circumference, a measure of central obesity, was associated with a 4% greater risk of colorectal cancer [*Moghaddam AA et al., 2007*]. Waist circumference and waist-to-hip ratio could also be predictors of mortality and morbidity after colorectal surgery, and according to [*Kartheuser AH et al., 2013*] even better than BMI or body surface area. Thirty-nine percent of men and 24.39% of women in our study, were classified as abdominally obese (≥ 88 cm for women and ≥ 102 cm for men). Obesity is an important factor in predicting the recurrence of colorectal cancer [*Choi Y et al., 2016*] and according to study [*Choi MH et al., 2018*] visceral obesity tended to shorten disease-free survival (time from surgery to the time of recurrence) in rectal cancer patients.

Visceral obesity, the accumulation of visceral adipose tissue, as a more reliable indicator of obesity than BMI, had a negative impact on the outcomes of patients with cancer. That includes longer operative time, greater intraoperative blood loss, longer hospital stays, higher postoperative complications after elective colorectal surgery and even higher mortality rate [*Zhou CJ et al., 2023*]. Viscerally obese rectal cancer patients after neoadjuvant chemotherapy and resection showed shorter disease-free survival than non-obese patients [*Cederholm et al., 2019*]. WHO has highlighted “a double burden of malnutrition” - characterized by the coexistence of undernutrition and being overweight or obese or having diet-related non-communicable diseases, as a real and growing global health challenge [*Zhou CJ et al., 2023*].

Study of [*Zhou CJ et al., 2023*] showed that the combination of visceral obesity and malnutrition resulted in higher postoperative complications and mortality rates and was a good indicator of poor

prognosis in patients with rectal cancer. Also, some studies have proposed that the progress of cachexia may be directly linked to an imbalance between the catabolic and anabolic processes occurring in peripheral tissues, particularly adipose tissue [Batista Jr ML et al., 2012].

Higher waist-to-hip ratio, body fat, visceral fat index and waist circumference in right-sided colorectal cancer patients (Table 3) indicate increased abdominal obesity. The results clearly confirm that patients with right-sided colorectal cancer have unfavorable anthropometric indices, which can affect both their treatment and survival success. Beside higher waist circumference, right-sided colorectal cancer had also lower muscle mass than left-sided colorectal cancer, and according to the previous studies, reduced muscle mass and increased visceral fat mass are considered negative prognostic factors for colon cancer patients [Choi MH et al., 2018]. The findings of the previously mentioned study indicate the importance of patients' muscle mass at initial diagnosis as an important factor in oncologic outcome.

Most of the studies have shown that the prognosis of right-sided colorectal cancer is worse than that of left-sided colorectal cancer [Lee G et al., 2015; Baran B et al., 2018]. Patients with right-sided colorectal cancer present with more advanced tumor stages compared with patients with left-sided colorectal cancer. One of the possible reasons could be that symptoms in right-sided colorectal cancer are often manifesting with subtle signs including microcytic anemia and weight loss, rather than the more obvious symptoms in left-sided colorectal cancer like rectal bleeding and altered bowel habits [Lee GH et al., 2015]. In the systematic review and meta-analysis by [Petrelli F et al. 2016], which included 66 studies with more than 1.4 million patients, a significant prognostic impact of tumor site in the overall survival was found with a 20% reduced risk of death for cancers arising on the left side.

Health status: The SF-36 is widely used as a generic short-form measure of functional health and wellbeing of different population groups [Jureša V et al., 2000].

Although, there was no statistically significant difference in health status with regard to gender

($p>0.05$) (Table 4), mean value for role functioning/physical were lower in females than in men, as well for role functioning/emotional. The lower scores of role functioning/physical means problems with work or other daily activities as a result of physical health, and lower scores of functioning/emotional means certain problems with work or other daily activities as a result of emotional problems. In the study by [Domati F et al., 2014] about quality of life in colon cancer patients during chemotherapy, physical role (perception of physical capacities) was reduced in both sexes (though not significantly) when compared to the reference Italian population.

Results from our study show that right-sided and left-sided colorectal cancer patients significantly differ only in emotional functioning ($p=0.036$). However, every aspect, except social functioning, was worse in right-sided in comparison to left-sided colorectal cancer patients. These results were expected given the more severe manifestation of the right-sided colorectal cancer and their unfavorable anthropometric indices, which have an impact on health status. Also, the biochemical effects of adjuvant therapy for colorectal cancer and the unavoidable morphological modification of intestinal anatomy resulting from surgical resections may cause changes in the physical and functional aspects of health-related quality of life [Theodoropoulos GE et al., 2012]. The study of [Bosma E et al., 2015] revealed that patients with severe complication after colorectal surgery have a larger postoperative decrease in health status compared to patients with none or minor complications. The most notable decrease was 6 weeks postoperatively and most notably in the domains of limitations in physical activities and social activities, the general mental health domain, vitality and general health perception [Bosma E et al., 2015].

The increasing importance given to the quality of life makes a significant impact on how cancer patients are treated. It is becoming increasingly recognized that fatigue, a non-specific, multifaceted syndrome with psychological, social, and physiological components, is the most prevalent and frequent side effect that colon cancer patients experience during their treatment (surgery, radiation and/or chemotherapy) [Domati F et al., 2014].

CONCLUSION

Considering that the anthropometric measurement was done at the very beginning, before the therapy, it is possible that the loss of body mass is one of the disease's signs and symptoms or is connected to the surgery that some of the patients have already undergone.

Obese patients can be malnourished, and as we show, there are significant difference in nutritional status between right-sided and left-sided colorectal cancer patients. Increased visceral fat (associ-

ated with inflammation and sarcopenia risk) within right-sided colorectal cancer patients, could be the reason for a more severe clinical presentation as compared to left-sided colorectal cancer. This warrants further evaluation and monitoring of nutritional status, physical activity and quality of life in right and left-sided colorectal cancer throughout the course of treatment. Recognition of deterioration in the nutritional status early in the course of the treatment can be successfully treated with appropriate nutritional support.

REFERENCES

1. Baran B, Ozupek NM, Tetik NY, Acar E, Bekcioglu O, Baskin Y. (2018). Difference between left-sided and right-sided colorectal cancer: a focused review of literature. *Gastroenterology research*, 11(4), 264. doi: 10.14740/gr1062w.
2. Batista Jr ML, Peres SB, McDonald ME, Alcântara PSMD, Olivan M, Otoch JP et al. (2012). Adipose tissue inflammation and cancer cachexia: possible role of nuclear transcription factors. *Cytokine*, 57(1), 9-16. doi: 10.1016/j.cyto.2011.10.008.
3. Bosma E, Pullens MJ, de Vries J, Roukema JA. (2016). Health status, anxiety, and depressive symptoms following complicated and uncomplicated colorectal surgeries. *International journal of colorectal disease*, 31, 273-282. doi: 10.1007/s00384-015-2373-9.
4. Bossi P, Delrio P, Mascheroni A, Zanetti M (2021). The spectrum of malnutrition/cachexia/sarcopenia in oncology according to different cancer types and settings: a narrative review. *Nutrients*, 13(6), 1980. doi: 10.3390/nu13061980.
5. Brule SY, Jonker DJ, Karapetis CS, O'Callaghan CJ, Moore MJ, Wong R. et al. (2015). Location of colon cancer (right-sided versus left-sided) as a prognostic factor and a predictor of benefit from cetuximab in NCIC CO. 17. *European Journal of Cancer*, 51(11), 1405-1414. doi: 10.1016/j.ejca.2015.03.015.
6. Choi MH, Oh SN, Lee IK, Oh ST, Won DD. (2018). Sarcopenia is negatively associated with long-term outcomes in locally advanced rectal cancer. *Journal of Cachexia, Sarcopenia and Muscle*, 9(1), 53-59. doi: 10.1002/jcsm.12234.
7. Choi Y, Lee YH, Park SK, Cho H, Ahn KJ. (2016). Association between obesity and local control of advanced rectal cancer after combined surgery and radiotherapy. *Radiation Oncology Journal*, 34(2), 113. doi: 10.3857/roj.2016.01725.
8. Davis JN, Oaks BM, Engle-Stone R (2020). The double burden of malnutrition: A systematic review of operational definitions. *Current Developments in Nutrition*, 4(9), nzaa127. doi: 10.1007/s11739-014-1174-4.
9. Domati F, Luppi G, Reggiani-Bonetti L, Zironi S, Depenni R, Fontana A, Gelsomino F, de Leon MP. (2015). The perception of health-related quality of life in colon cancer patients during chemotherapy: differences between men and women. *Internal and emergency medicine*, 10, 423-429. doi: 10.1007/s11739-014-1174-4.
10. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, et al. (2021). *Global Cancer Observatory: Cancer Today*. Lyon, France: International Agency for Research on Cancer. Available from: <https://gco.iarc.who.int/today>, accessed 18 February 2024.
11. Jayasinghe M, Prathiraja O, Caldera D, et al. (2023) *Colon Cancer Screening Methods: 2023 Update*. *Cureus* 15(4): e37509. doi: 10.7759/cureus.37509.
12. Jureša V, Ivanković D, Vuletić G, Babić-Banaszak A, Srček I, Mastilica M, Budak A. (2000). The Croatian health survey-SF-36: I. General quality of life assessment. *Collegium*

- antropologicum, 24(1), 69-78.
13. Karin M, Bogut A, Hojsak I, Babić E, Volarić M, Bevanda M (2020) Nutritional status and its effect on complications in patients with colorectal cancer. *Wiener klinische Wochenschrift*, 132, 431-437. doi: 10.1007/s00508-020-01671-4.
14. Kartheuser AH, Leonard DF, Penninckx F, Patterson HM, Brandtv D, Remue C, et al. (2013). Waist circumference and waist/hip ratio are better predictive risk factors for mortality and morbidity after colorectal surgery than body mass index and body surface area. *Annals of surgery*, 258(5), 722-730. doi: 10.1097/SLA.0b013e3182a6605a.
15. Lee GH, Malietzis G, Askari A, Bernardo D, Al-Hassi HO, Clark, SK (2015). Is right-sided colon cancer different to left-sided colorectal cancer?—a systematic review. *European Journal of Surgical Oncology (EJSO)*, 41(3), 300-308. doi: 10.1016/j.ejso.2014.11.001.
16. Lewandowska A, Religioni U, Czerw A, Deptala A, Karakiewicz B, Partyka O, et al. (2022). Nutritional treatment of patients with colorectal cancer. *International Journal of Environmental Research and Public Health*, 19(11), 6881. doi: 10.3390/ijerph19116881.
17. McHorney CA, Ware Johnne JR, Anastasiae R. (1993). The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Medical Care*, 31(3), 247-263. doi: 10.1097/00005650-199303000-00006.
18. Moghaddam AA, Woodward M, Huxley R (2007) Obesity and risk of colorectal cancer: a meta-analysis of 31 studies with 70,000 events. *Cancer Epidemiology Biomarkers & Prevention*, 16(12), 2533-2547. doi: 10.1158/1055-9965.EPI-07-0708.
19. Mohammad NMAB, Shahril MR, Shahar S, Fenech M, Sharif R (2022). Association between Diet-related Behaviour and Risk of Colorectal Cancer: A Scoping Review. *Journal of Cancer Prevention*, 27(4), 208. doi: 10.15430/JCP.2022.27.4.208.
20. Negrichi S, Taleb S (2020) Evaluation of nutritional status of colorectal cancer patients from algerian east using anthropometric measurements and laboratory assessment. *Iranian Journal of Public Health*. 49(7):1242. doi: 10.18502/ijph.v49i7.3577.
21. Petrelli F, Tomasello G, Borgonovo K, Ghidini M, Turati L, Dallera P et al. (2017). Prognostic survival associated with left-sided vs right-sided colon cancer: a systematic review and meta-analysis. *JAMA Oncology*, 3 (2), 211-219. doi:10.1001/jamaoncol.2016.4227.
22. Popovici D, Stanisav C, Saftescu S, Negru S, Dragomir R, Ciurescu D, Diaconescu R. (2023). Exploring the Influence of Age, Gender and Body Mass Index on Colorectal Cancer Location. *Medicina*, 59(8), 1399. doi: 10.3390/medicina59081399.
23. Pugh SA, Shinkins B, Fuller A, Mellor J, Mant D, Primrose JN (2016). Site and stage of colorectal cancer influence the likelihood and distribution of disease recurrence and postrecurrence survival: data from the FACS randomized controlled trial. *Annals of Surgery*, 263(6), 1143-1147. doi: 10.1097/SLA.0000000000001351.
24. Ræder H, Kværner AS, Henriksen C, Florholmen G, Henriksen HB, Bøhn SK et al. (2018). Validity of bioelectrical impedance analysis in estimation of fat-free mass in colorectal cancer patients. *Clinical Nutrition*, 37(1), 292-300. doi: 10.1016/j.clnu.2016.12.028.
25. Renfro LA, Loupakakis F, Adams RA, Seymour MT, Heinemann V, Schmoll HJ et al. (2016). Body mass index is prognostic in metastatic colorectal cancer: pooled analysis of patients from first-line clinical trials in the ARCAD database. *Journal of Clinical Oncology*, 34(2), 144. doi: 10.1200/JCO.2015.61.6441.
26. Sinicrope FA, Foster NR, Yothers G, Benson A, Seitz JF, Labianca R, et al.; Adjuvant Colon Cancer Endpoints (ACCENT) Group. (2013). Body mass index at diagnosis and survival among colon cancer patients enrolled in clinical trials of adjuvant chemotherapy. *Cancer*, 119(8), 1528-1536. doi: 10.1002/cncr.27938.
27. Sitlinger A, Syed Yousuf Z. (2018). Health-related quality of life: the impact on morbidity and mortality. *Surgical Oncology Clin-*

- ics of North America, 27(4), 675-684. doi: 10.1016/j.soc.2018.05.008.
28. *Szymańska K.* (2018). Cancers of the Colorectum. Diagnosis and Treatment. Reference Module in Biomedical Sciences. doi: 10.1016/b978-0-12-801238-3.65304-7.
29. *Theodoropoulos GE, Karantanos T, Stamopoulos P, Zografos G.* (2013). Prospective evaluation of health-related quality of life after laparoscopic colectomy for cancer. *Techniques in Coloproctology*, 17, 27-38. doi: 10.1007/s10151-012-0869-7.
30. *World Cancer Research Fund (WCRF).* Colorectal cancer statistics. Available from: <https://www.wcrf.org/cancer-trends/colorectal-cancer-statistics/> Accessed October 15, 2023.
31. *World Health Organization (WHO)* (2011). Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. Available from: <https://iris.who.int/bitstream/handle/10665/44583/?sequence=1>
32. *World Health Organization (WHO)* (2023). "Colorectal cancer". <https://www.who.int/news-room/fact-sheets/detail/colorectal-cancer#:~:text=Colorectal%20cancer%20is%20the%20third,people%20aged%2050%20and%20above> Accessed August 23, 2023.
33. *Zhou CJ, Lin Y, Liu JY, Wang ZL, Chen XY, Zheng CG.* (2023). Malnutrition and visceral obesity predicted adverse short-term and long-term outcomes in patients undergoing proctectomy for rectal cancer. *BMC cancer*, 23(1), 1-10. doi: 10.1186/s12885-023-11083-y.
34. *Ziętarska M, Krawczyk-Lipiec J, Kraj L, Zaucha R, Małgorzewicz S.* (2017). Nutritional status assessment in colorectal cancer patients qualified to systemic treatment. *Contemporary Oncology/Współczesna Onkologia*, 21(2), 157-161. doi: 10.5114/wo.2017.68625.



CONTENTS

4. **STILIDI E.I., KLIARITSKAIA I.L., MAKSIMOVA E.V., MOSHKO YU.A.**
CHRONIC HEPATITIS C WITH CRYOGLOBULINEMIA: FEATURES AND MANIFESTATIONS
10. **ĆORIĆ N., BANJARI I., ROLIĆ T., MARIJANOVIĆ I.**
NUTRITIONAL AND HEALTH STATUS OF COLORECTAL CANCER PATIENTS - BASELINE STUDY
20. **AZATYAN V.YU., YESSAYAN L.K., POGHOSYAN M.A., SHMAVONYAN M.V., SAHAKYAN K.T., MURADYAN A.A.**
CHARACTERISTICS OF MORPHOLOGICAL ELEMENTS OF LESIONS OF THE ORAL MUCOSA IN PATIENTS WITH HIV INFECTION
31. **GHAZARYAN H.V.**
THE EFFECT OF THE MEDICINAL COMPOSITION “EFLORNITHINE-ARMENICUM” ON THE PROGRESSION OF THE INFLAMMATORY PROCESS IN AN EXPERIMENTALLY INDUCED AEROBIC WOUND
38. **SHAHBAZYAN S.S., TER-AVETIKYAN Z.A., BADALOVA ZH.E.**
EVALUATION OF KNOWLEDGE AND ATTITUDE REGARDING MORBID OBESITY AND BARIATRIC SURGERY PRACTICE: AN OBSERVATIONAL ANALYTICAL STUDY IN A NATIONALLY REPRESENTATIVE SAMPLE OF ARMENIAN POPULATION
50. **ZILFAN A.V., AVAGYAN A.S., MURADYAN A.A.**
THE ROLE OF RESIDENT BACTERIAL-FUNGAL INTERACTIONS IN BIOFILM FORMATION DURING WOUND INFECTIONS: DOES BIOFILM FORMATION IN ECOLOGICAL NICHES CONTRIBUTE TO NORMAL FUNCTIONING IN VERTEBRATE MAMMALS?
61. **MOHAMMED N.D., RAGHAVENDRA R., ARJUN B., AISHWARYA C., SUJATHA B.S.**
EFFECTIVENESS OF THERAPEUTIC PLASMA EXCHANGE IN COMPARISON WITH STANDARD OF CARE IN THE TREATMENT OF YELLOW PHOSPHORUS POISONING: AN OBSERVATIONAL STUDY IN SOUTH INDIAN POPULATION
68. **NAZARYAN L.G., BARSEGHYAN A.B., SIMONYAN M.H.**
CONSUMER BEHAVIOR IN ACUTE DIARRHEA TREATMENT: ANALYZING TRUST IN PHARMACY EMPLOYEES
75. **AGHAHOSSEINI F., OMIDSALAR P., AKHBARI P.**
THE FIRST REPORT OF GRAPHITE TATTOO IN THE SOFT PALATE: A NOVEL CASE WITH A REVIEW OF ARTICLES
81. **BARSEGHYAN A.B., DZOAGBE H.Y., GINOVYAN G.G., NAZARYAN L.G., SIMONYAN M.H.**
ASSESSMENT OF VITAMIN USE AND SELF-MEDICATION PRACTICES AMONG CONSUMERS
87. **KRISTANTO R., JUNITHA K., SUYANTO H., PHARMAWATI M., YUDIANTO A.**
SEX DETERMINATION USING CONFOCAL RAMAN MICROSCOPE WITH CHEMOMETRIC METHOD FROM DENTAL SAMPLE AND CONFIRMATION BY AMELOGENIN GENE
95. **RAPYAN A.A., CHOPIKYAN A.S., SARGSYAN T.M., SISAKIAN H.S.**
COMPARATIVE OUTCOMES FOLLOWING PERCUTANEOUS CORONARY INTERVENTION AND CONSERVATIVE TREATMENT IN ELDERLY PATIENTS WITH ACUTE MYOCARDIAL INFARCTION: SINGLE CENTER RETROSPECTIVE COHORT ANALYSIS
104. **RESTREPO GIL E., AGUIRRE CORREA L.A., CARDONA MAYA W.D.**
KNOWLEDGE AND PERCEPTIONS ABOUT THE DIGITAL RECTAL EXAMINATION: EXPERIENCES IN COLOMBIA
112. **GEKHAEV A.U., ISAKOVA F.S., GADAEV I.SH.**
ROLE OF CORTISOL IN THE CARCINOGENESIS OF LARYNGEAL CANCER



The Journal is founded by
Yerevan State Medical
University after M. Heratsi.



Rector of YSMU

Armen A. Muradyan

Address for correspondence:

Yerevan State Medical University
2 Koryun Street, Yerevan 0025,
Republic of Armenia

Phones:

(+37410) 582532 YSMU

(+37493 588697 Editor-in-Chief

Fax: (+37410) 582532

E-mail: namj.ysmu@gmail.com, ysmiu@mail.ru

URL: <http://www.ysmu.am>

Our journal is registered in the databases of Scopus,
EBSCO and Thomson Reuters (in the registration process)



SCOPUS



EBSCO

REUTERS

Copy editor: Tatevik R. Movsisyan

LLC Print in "Monoprint" LLC

Director: Armen Armenaakyan
Andraniks St., 96/8 Bulding
Yerevan, 0064, Armenia
Phone: (+37491) 40 25 86
E-mail: monoprint1@mail.ru

Editor-in-Chief

Arto V. Zilfyan (Yerevan, Armenia)

Deputy Editors

Hovhannes M. Manvelyan (Yerevan, Armenia)

Hamayak S. Sisakyan (Yerevan, Armenia)

Executive Secretary

Stepan A. Avagyan (Yerevan, Armenia)

Editorial Board

Armen A. Muradyan (Yerevan, Armenia)

Drastamat N. Khudaverdyan (Yerevan, Armenia)

Levon M. Mkrtchyan (Yerevan, Armenia)

Foregin Members of the Editorial Board

Carsten N. GUTT (Memmingen, Gernmay)

Muhammad MIFTAHUSSURUR (Indonesia)

Alexander WOODMAN (Dharhan, Saudi Arabia)

Coordinating Editor (for this number)

Hesam Adin Atashi (Tehran, Iran)

Editorial Advisory Council

Mahdi Esmaeilzadeh (Mashhad, Iran)

Ara S. Babloyan (Yerevan, Armenia)

Aram Chobanian (Boston, USA)

Luciana Dini (Lecce, Italy)

Azat A. Engibaryan (Yerevan, Armenia)

Ruben V. Fanarjyan (Yerevan, Armenia)

Gerasimos Filippatos (Athens, Greece)

Gabriele Fragasso (Milan, Italy)

Samvel G. Galstyan (Yerevan, Armenia)

Arthur A. Grigorian (Macon, Georgia, USA)

Armen Dz. Hambardzumyan (Yerevan, Armenia)

Seyran P. Kocharyan (Yerevan, Armenia)

Aleksandr S. Malayan (Yerevan, Armenia)

Mikhail Z. Narimanyan (Yerevan, Armenia)

Levon N. Nazarian (Philadelphia, USA)

Yumei Niu (Harbin, China)

Linda F. Noble-Haeusslein (San Francisco, USA)

Arthur K. Shukuryan (Yerevan, Armenia)

Suren A. Stepanyan (Yerevan, Armenia)

Gevorg N. Tamamyan (Yerevan, Armenia)

Hakob V. Topchyan (Yerevan, Armenia)

Alexander Tsiskaridze (Tbilisi, Georgia)

Konstantin B. Yenkovyan (Yerevan, Armenia)

Peijun Wang (Harbin, Chine)