

# Knowledge of Dietary Nutrition in Patients with Radiotherapy for Colorectal Cancer (KAP): A Descriptive Study

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## ABSTRACT

**Objective:** To investigate the status quo of dietary nutrition knowledge, belief and behaviors of patients with colorectal cancer undergoing radiotherapy, and to analyze its influencing factors, so as to provide basis for clinical nutrition management. **Methods:** a convenient sampling method was used to select 200 patients with colorectal cancer who received radiotherapy in the oncology department of three Grade A hospitals in Binzhou City from January to May 2024 for related study. A questionnaire survey was conducted on the knowledge, belief and behavior of total nutrition management of the respondents. In addition, demographic and clinical factors that may affect KABP in hospitalized patients with radiotherapy were investigated and analyzed, so as to provide a basis for formulating nutritional management measures for hospitalized patients with colorectal cancer with radiotherapy in clinical work. **Results:** The results showed that the average score of nutritional knowledge was  $5.03 \pm 4.04$ , and the passing rate was 24.53%. The average score of nutrition attitude was  $27.78 \pm 5.90$ , the pass rate was 80.19%; The average score of nutrition behavior was  $29.05 \pm 8.86$ , and the pass rate was 18.4%. Age, sex, family residence, education level, occupation, family monthly income, type of medical insurance, type of radiotherapy and whether or not concurrent chemotherapy had significant differences in the total score of dietary nutrition knowledge and practice of patients with colorectal cancer inpatient radiotherapy. **Discussion:** This study showed that inpatients with radiotherapy for colorectal cancer had insufficient dietary nutrition knowledge reserve and poor nutritional behavior, but positive attitude towards nutrition. Gender, family per capita monthly income, family location and treatment were the main factors affecting the knowledge and practice of dietary nutrition in patients with colorectal cancer radiotherapy, especially the family residence, which had the greatest influence.

## KEYWORDS

Colorectal cancer; Radiotherapy; Nutrition; KABP

## 1. INTRODUCTION

Colorectal cancer is the general name of colon cancer and rectal cancer, which is one of the common malignant tumors of digestive tract. As an indicator of social and economic development, the incidence of colorectal cancer is steadily increasing. The International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO), has released the latest data on the global cancer burden rate for 2022, and colorectal cancer has the third highest incidence among the top 10 cancers globally, but the second highest mortality rate (Freddie Bray et al., 2024).

As one of the main ways to treat colorectal cancer, radiotherapy has two sides to patient nutrition. On the one hand, radiotherapy can locally inhibit tumor growth, relieve digestive tract obstruction,

correct metabolic disorders, and thus improve nutritional status. On the other hand, while killing tumor cells, radiotherapy will cause damage to normal tissues, especially digestive system tumors, which will directly affect patients' intake, digestion and absorption of nutrients. At the same time, whole body irradiation causes fatigue, loss of appetite, etc., leading to or aggravating patients' weight loss and malnutrition (Kuang & Li, 2023). Various studies have confirmed that nutritional status is closely related to the effect of radiation therapy. Recent studies have shown that up to 50%-70% of patients with digestive system tumors are malnourished. Malnutrition can increase patients' disease-related complications, reduce patients' response and tolerance to anti-tumor therapy, prolong hospital stay and shorten pre-hospital stay, seriously affect patients' quality of life and mobility, and shorten survival time (Weng et al., 2022). Malnutrition can also affect local tumor control and increase the risk of recurrence (Zhu et al., 2021).

Effective nutritional intervention can improve the nutritional status of radiotherapy patients with malignant tumors. However, the effect of nutritional intervention depends not only on health education and dietary regulation of medical staff, but also on the level of nutritional knowledge-belief-behavior (KAP) of patients. Studies have shown that the nutritional knowledge and practice level of inpatients in the department of oncology is generally low, which is significantly related to gender, age, place of residence, education level and family economic status. According to these characteristics, medical staff should carry out targeted health education to improve the level of nutritional knowledge and practice of patients (Cao et al., 2020). The Knowledge, Attitude and Practice Model (KAP) holds that correct knowledge is the basis for the formation of positive beliefs and attitudes; Positive beliefs and attitudes are the driving force for changing individual behavior; Normative behavior is a condition for good health (Wei et al, 2022). Scientific nutrition cognition and positive nutrition attitude can guide radiotherapy patients to make healthy eating behaviors, enhance radiotherapy tolerance, improve patients' clinical prognosis and improve their quality of life.

Studies have shown that patients lack knowledge of dietary nutrition, the proportion of correct nutrition is low, especially the understanding of protein foods is low, and blind fasting is widespread. A study of hospitalized patients showed that insufficient intake of essential nutrients and chronic weight loss are one of the important reasons for the high incidence of malnutrition in cancer patients (Huang et al., 2022). Standardized nutritional support can effectively improve the nutritional status of colorectal cancer patients undergoing radiotherapy. Muscaritoli et al showed that the first form of nutritional support should be nutritional counseling to help control symptoms and encourage the intake of well-tolerated protein - and energy-rich foods and fluids; An energy - and protein-rich diet is the preferred method for maintaining or improving nutritional status (Muscaritoli et al., 2021). More and more studies have confirmed that nutritional therapy can stabilize and restore the weight of radiotherapy patients, improve nutritional status, reduce adverse effects of radiotherapy, improve therapeutic efficacy, shorten hospital stay and save medical costs. Standardized nutritional therapy for tumor radiotherapy patients can benefit the majority of malignant tumor patients (Kuang &Li, 2023). In this study, the nutritional KAP status of patients with inpatient radiotherapy for colorectal cancer was investigated with self-made questionnaire, aiming to better understand the knowledge-belief-behavior level of nutritional management for patients with colorectal cancer, and provide basis for clinical nutritional intervention.

## **2. METHOD**

This study will use a descriptive correlational research design, convenient purpose sampling method, and self-made questionnaires to investigate respondents' knowledge, beliefs, and practices of nutrition management. The questionnaire consists of three dimensions: knowledge dimension, attitude dimension and behavior dimension. A certain number of small items are listed under each dimension, totaling 32 items, including 14 items in knowledge dimension, 7 items in attitude dimension and 11 items in behavior dimension. The scoring criteria of the questionnaire: The knowledge dimension is

a single choice. One point is given for choosing the correct person, and zero points is given for choosing the wrong or uncertain person. The rating ranges from 0 to 14 points. According to the five-point Likert scale, both the attitude and behavior dimensions are positive scores. The attitude dimension, from "strongly disagree" to "strongly agree," is scored on a scale of "1, 2, 3, 4, 5" on a scale of 7-35. On the behavioral dimension, from "never" to "always," the scores are "1, 2, 3, 4, 5" on a scale of 11-55. The questionnaire had a minimum score of 18 and a maximum score of 104. The higher the total score, the higher the level of nutrition management knowledge, attitude and practice.

## **2.1. Subjects**

A total of 215 patients with colorectal cancer who received radiotherapy from January to May 2024 in the oncology department of three Grade A hospitals in Binzhou City were selected for this study.

### **2.1.1. Inclusion criteria (Bai et al., 2023; Klement et al., 2021; Young, 2021)**

This study included patients with the following pathologic diagnosis of colorectal cancer, clinical or pathological stage T3-4 and/or N + after radical surgery, tumors within 12cm of the anal axis, aged 18-75 years, of any gender, and  $\geq 70$  on the ⑥ Karnofsky Performance scale.

### **2.1.2. Exclusion criteria (Bai et al., 2023; Klement et al., 2021; Young, 2021)**

This study excluded respondents who: did not provide written informed consent; And patients would be considered to have withdrawn if they spontaneously withdrew during the study.

## **2.2. Research Process**

Mainly divided into three stages: questionnaire survey, data collection and processing, and data analysis.

### **2.2.1. Questionnaire survey**

The questionnaire will be divided into two parts. The first part will be the general information of the respondents, and the second part will be the KABP survey for Total Nutrition Management of colorectal cancer radiotherapy patients. The questionnaire will be issued and returned by trained researchers. A total of 215 questionnaires were distributed and 212 valid questionnaires were recovered.

### **2.2.2. Data Collection and processing**

The collected data will be calculated and checked jointly by two researchers, and will be entered into the computer system after verification. Excel was used for data entry, and SPSS statistical software was used for statistical analysis.

### **2.2.3. Data analysis**

Pearson's correlation analysis was used to test the correlation between nutrition knowledge, attitude and the overall score of behavior, and multiple linear regression analysis was conducted with the scores of each part divided into dependent variables and basic information items with statistical significance as independent variables.

## **3. RESULTS**

### **3.1. General Information of Current Survey Respondents**

A total of 215 questionnaires were distributed in the three target hospitals, of which 3 were invalid and 212 were valid, with an effective recovery rate of 98.60%. The results showed that the age groups were mainly 56-65 years old (33.49%) and 46-55 years old (24.06%), with 118 males (55.66%) and

94 females (44.34). Marital status of the respondents, 207 (97.64%) were married, and 115 (54.25%) were living in rural areas; At the education level, the group with lower education level accounted for the majority, among which 79 cases (37.26%) were in primary school or below; Occupation, farmers (89) accounted for the largest proportion (41.98%); Among the medical payment methods, 107 cases (50.47%) of workers' medical care and 78 cases (36.79%) of new rural cooperative medical care were the main ones. Only 52 cases (24.53 percent) had a per capita monthly household income of more than 4,000 yuan. The age characteristics and gender distribution of the sample population in this study were basically the same as the epidemiological characteristics of colorectal cancer patients in China (Huang,2024). Detailed data are shown in Table 3.1.

**Table 3.1.** General patient Data (n=212)

Name	Options	Frequency	Percentage (%)	Name	Frequency	Percentage (%)
Gender	female	94	44.34	Method of hospitalization payment	78	36.79
	male	118	55.66		27	12.74
Age group	Age 45 and younger	44	20.76		107	50.47
	46-55 years old	51	24.06	Understand malnutrition (n=206)	196	95.15
	Ages 56-65	71	33.49		10	4.85
	Age 65 +	46	21.70	Whether or not you are malnourished	208	98.11
Marital status	Widowed spouse	5	2.36		4	1.89
	Married	207	97.64	Family history	114	53.77
Place of Residence	Rural area	115	54.25		98	46.23
	city	57	26.89	Disease staging	15	7.08
	Suburbs	40	18.87		168	79.25
Education	Junior high school	56	26.42		29	13.68
	Junior college and above	37	17.45	Whether it has undergone surgery	89	41.98
	Elementary school and below	79	37.26		123	58.02
	High school	40	18.87	Radiation type	4	1.89
Occupation	Business unit	29	13.68		85	40.09
	Enterprises and public institutions	40	18.87		123	58.02
	Farmers	89	41.98	Whether chemotherapy is concurrent	124	58.49
Worker	40	18.87	88		41.51	
Income	Freelance work	14	6.60			
	<1000	34	16.04			
	1001-2000	30	14.15			
	2001-3000	32	15.09			
	3001-4000	64	30.19			
	4001-5000	41	19.34			
	>5000	11	5.19			

### 3.2. Correlation between Each Dimension and the Total Questionnaire

Pearson correlation analysis showed that the three dimensions of the questionnaire were positively correlated with the total questionnaire ( $P < 0.01$ ), as shown in Table 3.2.

**Table 3.2.** Correlation between each dimension and the total questionnaire

	Nutrition knowledge	Nutrition attitude	Nutritional behaviors	Overall
Nutrition knowledge	1.00			
Nutrition attitude	0.449 * * *	1.00		
Nutritional behavior	0.613 * * *	0.585 * * *	1.00	
Overall	0.758 * * *	0.805 * * *	0.924 * * *	1.00

Note: \*\*\* stands for  $P < 0.01$ .

### 3.3. Score for All Dimensions of Knowledge and Communication

The results of this investigation showed that the average total score of the patients with colorectal cancer radiotherapy was  $61.86 \pm 15.97$ , and the passing rate was 28.3%. The average score of nutrition knowledge was  $5.03 \pm 4.04$ , and the passing rate was 24.53%; The average score of nutrition attitude was  $27.78 \pm 5.90$ , and the pass rate was 80.19%; The average score of nutrition behavior was  $29.05 \pm 8.86$ , and the pass rate was 18.4%. See Table 3.3.

**Table 3.3.** Each dimension and overall score of dietary nutrition knowledge and practice of tumor radiotherapy patients

Name	Rating range	Scoring range	Average score	Passing grade	Pass rate
Nutrition knowledge	0-14	0-14	$5.03 \pm 4.04$	8.4	24.53%
Nutrition attitude	7-35	12-35	$27.78 \pm 5.9$	23.8	80.19%
Nutritional behaviors	11-55	11-51	$29.05 \pm 8.86$	37.4	18.40%
totality	18-104	25-95	$61.86 \pm 15.97$	69.6	28.30%

### 3.4. Scores of Each Item of Nutritional Knowledge of Patients with Inpatient Radiotherapy for Colorectal Cancer

In order to further understand the dietary nutrition knowledge reserve of patients with colorectal cancer radiotherapy, this study calculated the accuracy of 14 items in the knowledge dimension. Among them, the first and sixth items had the lowest accuracy of 12.26%, and the 11th item had the highest accuracy of 62.26%; Another 10 entries were correct less than 50 percent of the time. See Table 3.4.

**Table 3.4.** Correct rate of entries of each degree of nutrition knowledge dimension

Entries	Number of correct answers	Correct answer rate (%)
1. Do you know the Chinese Balanced Diet Pagoda (2022)?	26	12.26
2. What nutrients do you think are contained in food?	50	23.59
3. What do you think are the main food sources of calories in the diet?	50	23.59
4. Which soup (such as chicken stock) do you think is more nutritious than meat (such as chicken)?	98	46.23
5. Which of the following foods do you think is rich in high-quality protein (protein that can be easily absorbed, digested and used)?	36	16.98
6. Which of the following foods do you think is the best for iron supplementation?	26	12.26
7. Which of the following foods do you think contains the most vitamin C?	102	48.11
8. Which of the following foods do you think has the highest dietary fiber content?	90	42.45
9. Which food do you think is harmful to your health if you eat it regularly?	100	47.17
10. Which of the following foods do you think is not a high-fat food?	72	33.96
11. Which of the following foods do you think can aggravate the symptoms of diarrhea after radiotherapy?	132	62.26
12. Which of the following foods do you think is best for improving constipation during radiotherapy?	49	23.11
13. Which of the following foods do you think is not helpful for radiation patients who need to boost white blood cells?	110	51.89
14. Which of the following foods do you think is best for improving appetite during radiation therapy?	126	59.43

### 3.5. Analysis of Differences in Nutritional Knowledge and Practice Among Inpatient Patients with Colorectal Cancer Receiving Radiotherapy

This study used ANOVA and independent sample T-test to verify the differences in the total scores of the nutritional knowledge and practice questionnaire among different demographic data. The results showed that age, gender, family residence, educational level, occupation, family monthly income, type of medical insurance, type of radiotherapy and whether or not concurrent chemotherapy had significant differences in the total score of dietary nutrition knowledge and practice of patients with colorectal cancer inpatient radiotherapy ( $P < 0.05$ ), as shown in Table 3.5.

**Table 3.5.** Difference analysis of general demographic data on total score of knowledge, belief and action in patients with radiotherapy

Variables	Categories	Overall	F/t	p
Age group	45 and under (n=44)	71.750±17.950	9.465	0.000 * * *
	46-55 years old (n=51)	61.804±14.421		
	56-65 years old (n=71)	59.944±11.379		
	Age 65 + (n=46)	55.435±17.658		
Gender	Female (n=94)	65.032±16.128	2.614	0.010 * *
	Male (n=118)	59.339±15.449		
Marital status	Unmarried/divorced/widowed (n=5)	52.600±20.391	1.729	0.19
	Married (n=207)	62.087±15.843		
Place of residence	Rural (n=115)	57.800±15.280	11.972	0.000 * * *
	City (n=57)	69.842±16.804		
	Suburban (n=40)	62.175±12.247		
Education level	Elementary school and below (n=79)	56.101±15.701	9.413	0.000 * * *
	Junior high (n=56)	61.107±12.093		
	High school (n=40)	65.725±16.286		
	Junior college and above (n=37)	71.135±16.467		
Occupation	Business unit (n=29)	68.000±17.044	6.357	0.000 * * *
	Enterprises and public institutions (n=40)	67.550±17.372		
	Farmers (n=89)	55.888±12.801		
	Worker (n=40)	64.625±13.183		
	Freelance work (n=14)	63.000±22.908		
Income	1.0 (n = 34)	53.471±15.539	5.796	0.000 * * *
	2.0 (n = 30)	57.600±14.455		
	3.0 (n = 32)	60.500±15.719		
	4.0 (n = 64)	62.547±15.142		
	5.0 (n = 41)	68.512±13.704		
	6.0 (n = 11)	74.636±18.790		
Method of payment for hospitalization expenses	New Rural Cooperative Medical System (n=78)	56.103±14.724	10.56	0.000 * * *
	New Rural Cooperative Medical System + Commercial Insurance (n=27)	60.222±16.360		
	Employee medical care (n=107)	66.477±15.425		
Disease staging	Stage 2 (n=15)	63.933±20.401	0.218	0.804
	3 phases (n=168)	61.512±15.829		
	4 phases (n=29)	62.828±14.675		
Type of radiotherapy	Palliative radiation therapy (n=4)	49.250±25.500	4.107	0.018 *
	Pre-op aid (n=85)	59.000±17.477		
	Post-operative assistance (n=123)	64.252±14.075		
Whether chemotherapy is also used	No (n=124)	58.629±14.941	-3.598	0.000 * * *
	Yes (n=88)	66.420±16.340		

### 3.6. Effects of Patient General Information on Dietary Nutrition Knowledge and Practice in Patients with Inpatient Radiotherapy for Colorectal Cancer

Through the results of the above analysis, it can be known that there is a certain degree of correlation between the study variables. However, it does not prove causation. In order to further study the causal relationship between them, regression analysis is introduced to study the relationship between independent variables and dependent variables. It aims to build a mathematical model to predict or explain the change of the dependent variable by using known values of the independent variable. Residence (urban and suburban compared to rural) has a significant negative effect on the total score of knowledge and behavior, with the largest effect for urban residents (Beta = -0.43). Postoperative adjuvant therapy (Beta = 0.38), concurrent chemotherapy (Beta = 0.371) and income (Beta = 0.295) had a significant positive effect on the total score, and gender (female positive) also had a certain effect (Beta = 0.239). The model had good explanatory power (adjusted R<sup>2</sup> = 0.391), significant F-value (p < 0.001), and no multicollinearity problems. This indicates that increasing income, strengthening postoperative adjuvant treatment and health education, especially in urban and suburban areas, can effectively improve the level of knowledge and behavior. See Table 3.6 for more details.

**Table 3.6.** Stepwise regression analysis of each variable to the total score of knowledge, belief and action

Variables	B	Standard error	Beta	t	p	VIF	Tolerance
Constant	42.02	3.925	-	10.705	0.000 **	-	-
Female (male =0)	9.615	3.514	0.239	2.737	0.007 **	1.859	0.538
Suburban (rural =0)	-11.218	3.406	-0.229	-3.294	0.001 **	1.179	0.848
City (rural =0)	-14.429	2.989	-0.43	-4.827	0.000 **	1.928	0.519
Revenue	3.504	0.798	0.295	4.389	0.000 **	1.095	0.913
Postoperative assistance (Preoperative assistance =0)	12.422	2.497	0.38	4.976	0.000 **	1.419	0.705
Yes concurrent chemotherapy (no =0)	12.128	2.418	0.371	5.017	0.000 **	1.33	0.752
R 2	0.415						
Adjust R 2	0.391						
F	16.814 (***)						

## 4. DISCUSSION

### 4.1. Knowledge and Practice Level of Dietary Nutrition in Colorectal Cancer Radiotherapy Patients

The results of this study showed that patients with inpatient radiotherapy for colorectal cancer had poor knowledge reserve of dietary nutrition and lacked scientific nutritional behavior, but had a positive attitude towards nutrition, which was consistent with the survey results of Yao et al., 2022.

In this study, the average dimension of nutritional knowledge of patients with colorectal cancer radiotherapy was 5.03±4.04, with a pass rate of 24.53%, which was basically consistent with the results of Xu Xuena's (2021) study on nutritional knowledge of patients with malignant tumor chemotherapy. Therefore, the nutritional cognition level of patients with inpatient radiotherapy for colorectal cancer needs to be further improved. Knowledge is the basis of behavior change, and attitude and belief are the driving forces of behavior change. Therefore, the higher the nutritional cognition level of patients, the more likely they are to establish positive beliefs and attitudes, and the

easier it is to produce scientific health behaviors. In the study of Chen et al. (2023), it was proposed that nutrition and health education for cancer patients by clinical medical staff is one of the important channels for them to acquire nutrition knowledge. In clinical work, medical staff should strengthen nutrition communication with patients and carry out nutrition education according to individual needs of patients. Medical staff is the carrier of patients' right to acquire nutrition knowledge. Therefore, hospitals should regularly hold relevant nutrition knowledge training and update it regularly to ensure the accuracy, quality and real-time of nutrition information provided to patients. Hospitals can also hold lectures by nutrition experts or disseminate nutrition knowledge in China (Ye Huifang, 2022), which should be vivid and easy to understand as much as possible. Patients and their families are encouraged to actively participate in the lectures. Paper materials such as nutritional recipe brochures and food lists for patients can also be distributed in the wards to facilitate patients and their families obtaining nutritional knowledge.

The average score of nutrition attitude was  $27.78 \pm 5.90$ , and the pass rate was 80.19%, indicating that most patients with radiotherapy for colorectal cancer had a positive attitude towards nutrition, which was roughly the same as the results of Chang Hu et al. [Chang Hu et al. 2024]. During radiotherapy, due to the disease itself and the side effects of treatment, as well as the fact that the tumor is located in the digestive system, which directly affects the digestion and absorption of nutrients, patients with colorectal cancer pay more attention to their own nutrition status than patients with other tumors. Most patients believe that scientific diet plays a vital role in the rehabilitation of the disease, and are eager to understand the relevant nutritional knowledge. Patients have a positive attitude towards acquiring nutritional knowledge and need to be guided by medical staff or nutritionists. Medical staff should pay attention to the changes in patients' nutrition attitude, stabilize patients' good learning attitude, timely carry out health education for patients, and correct patients' dietary nutrition misunderstandings in time.

The average score of nutrition behavior was  $29.05 \pm 8.86$ , and the pass rate was 18.4%, which was consistent with the survey conducted by Du Yajuan et al. [Du Yajuan et al., 2021]. In the statistics of daily eating behavior, it was found that more than half (54%) of the patients ate less food rich in dietary fiber, such as fresh vegetables and fruits, especially the elderly. 67.2% did little aerobic physical activity after the treatment period. This indicates that most of the patients lack scientific dietary behavior, which may be related to the lack of nutritional knowledge. Good nutrition behavior is the basis of keeping healthy. Therefore, while carrying out nutrition and health education, medical staff should dynamically pay attention to patients' behavior changes in order to correct the bad eating habits in time. Let patients truly realize that nutrition knowledge and beliefs affect nutrition behavior, so as to achieve the unity of knowledge, belief and practice. In addition, cancer patients should be screened regularly and their nutritional status should be monitored dynamically. Patients with nutritional risks should be further evaluated and nutritional intervention should be carried out in time when malnutrition exists. Dynamically monitor the results of nutrition intervention, and continue to revise the nutrition intervention plan if the nutritional status has not improved. Correct nutritional intervention can reduce the morbidity and mortality of malnutrition patients, reduce the cost of treatment and improve the quality of life.

#### **4.2. The Nutritional Knowledge Level of Inpatients with Radiotherapy for Colorectal Cancer Needs to be Improved**

The survey results showed that the item with the highest accuracy in the knowledge dimension was "Which of the following foods do you think can aggravate the symptoms of diarrhea after radiotherapy?" This may be related to the change of bowel habits of colorectal cancer disease itself. Most patients have diarrhea symptoms, so they are more familiar with what foods can cause diarrhea symptoms. The second is "which of the following foods do you think is most conducive to improving appetite during radiation therapy?" "Was also highly correct, and the possible reason for this is related to life experience, as most people know that hawthorn fruit can increase appetite. Seven of the entries

were correct less than 40 per cent of the time, with the first and sixth knowledge entries having the lowest accuracy of 12.26 per cent. The accuracy of the other items was the 5th, 12th, 2nd, 3rd and 10th in order from lowest to highest. Item 1 "Do you know the balanced diet pagoda of Chinese residents" has the lowest correct answer rate, which may be because the setting of this article is more professional, indicating that the public is very unfamiliar with the Chinese residents' diet pagoda, and it is necessary to strengthen the publicity of dietary nutrition at the social level. Item 6 "Which of the following food do you think has the best effect on iron supplementation?" The reason for the low percentage of correct answers may be because of some misunderstandings in life, leading to the lack of nutritional knowledge of patients. Except item 12, the other items with less than 40% correct rate were all related to basic nutrition knowledge, which was related to the lack of nutrition knowledge of Chinese resident patients. Item 12 "Which of the following foods do you think is most conducive to improving constipation during radiotherapy?" The correct rate is less than 40%, which may be due to the fact that some patients do not understand the food rich in dietary fiber and do not know that dietary fiber can help relieve constipation. Or because of the lack of nutritional knowledge. The high accuracy of other items may be related to treatment problems, and patients are more concerned about treatment-related problems. To sum up, the overall level of nutritional knowledge of colorectal cancer radiotherapy patients was low. Therefore, medical staff should strengthen the training of patients' dietary guidance and nutrition. At the same time, personalized diet management should be provided according to the differences in the level of nutritional knowledge and practice of patients.

### **4.3. Correlation of Dietary Nutrition Knowledge and Practice In Patients with Inpatient Radiotherapy for Colorectal Cancer**

The results of this study showed a positive correlation between dietary nutrition knowledge, attitude and behavior in patients with inpatient radiotherapy for colorectal cancer. In particular, there was a strong positive correlation between nutritional behavior and knowledge and attitude. It shows that medical staff should pay attention to the interaction of knowledge, attitude and behavior in the process of nutrition intervention. The theoretical model of knowledge, belief and action considers that knowledge, belief and action are three continuous processes, and "knowledge" is the cognition and understanding of relevant knowledge; "Belief" is correct belief and positive attitude; "Doing" is action. Only when people acquire relevant knowledge, think positively about it, and have a strong sense of responsibility can they gradually form beliefs. Only when knowledge is elevated to belief can people adopt a positive attitude to change their behavior (Wang Qin, 2019). In the process of clinical nutrition and health education, medical staff should continuously and dynamically evaluate patients' knowledge, attitude and behavior. Constantly enrich the nutritional knowledge of patients, correct their wrong cognition in time, change the concept of nutrition, and correct bad eating habits.

### **4.4. Important Influencing Factors of Dietary Nutrition Knowledge and Practice in Patients with Colorectal Cancer Radiotherapy**

#### **4.4.1. Family location**

Single factor and multiple stepwise regression analysis showed that family residence had an important effect on nutritional knowledge and practice of patients with colorectal cancer. Further comparison showed that the differences between rural and urban areas, township and urban areas were statistically significant. This may be related to the remote location of most rural and township areas and the inadequate dissemination of nutritional information (Xu, 2021). It is also related to the low educational level of patients, the deviation of family economic conditions, and the relatively simple way to obtain nutritional information. Therefore, medical personnel should make full use of the Internet, increase the intensity of nutrition information publicity in non-urban areas, systematically strengthen the healthy diet guidance for patients in the area, and promote their correct attitude and develop scientific eating behavior.

#### 4.4.2. Treatment situation

The results of univariate analysis and multivariate analysis showed that the total scores of nutritional knowledge and practice of colorectal cancer patients treated with radiotherapy were different. The scores of nutritional knowledge and practice of colorectal cancer patients treated with postoperative adjuvant radiotherapy and concurrent chemoradiotherapy were significantly higher than those treated with radiotherapy alone, which was consistent with the results of Song et al. (Song et al, 2020). It suggests that we should pay more attention to the positive role of health education in improving the nutritional health knowledge of cancer patients. This is mainly because patients who have undergone surgery or chemotherapy, due to the needs of treatment, can actively seek and learn nutrition-related knowledge, which is conducive to the establishment of scientific eating habits. Therefore, we should increase nutrition education for patients receiving anti-tumor therapy for the first time according to the difference of patients' treatment conditions. Improve the nutritional cognition level of patients, improve their nutritional attitude, and help them develop good eating habits, so as to improve the nutritional status and improve the quality of life.

#### 4.4.3. Per capita monthly household income

The results of univariate analysis and multivariate analysis showed that family economic income was the main factor affecting the total score of nutrition knowledge, information and practice of patients with inpatient radiotherapy for colorectal cancer. There was significant difference in the total score of knowledge, information and practice of patients with per capita monthly income < 1000 yuan, 1000-3000 yuan, 3000-5000 yuan and more than 5000 yuan. And the average total score of the patients with income above 5000 yuan was significantly higher than that below 5000 yuan. The better the family economic conditions, the better the nutritional knowledge and behavior status. It may be related to better family economic conditions, patients' health education opportunities and better access to nutritional resources. This is roughly the same as the research results of Popkin, B. M., et al. (Popkin, B. M., et al., 2020).

#### 4.4.4. Gender

The results show that sex is one of the main factors that affect the nutritional knowledge level and behavior of patients with colorectal cancer undergoing radiotherapy. In this study, the total score of knowledge and behavior of patients of different sexes were statistically significant, and the nutritional knowledge and behavior level of female patients was significantly higher than that of male patients. This is consistent with the findings of Cao Lei et al. (Cao et al., 2020). This may be related to the responsibilities women have at home and the fact that women pay more attention to the quality of life. Middle-aged and elderly people, influenced by traditional concepts, believe that men and women play different roles in the family while women take charge of the home. In most middle-aged and elderly families, women are responsible for the preparation of three meals a day and the purchase of food ingredients, so female patients may know more about nutrition knowledge. Male patients mainly play the role of work in the family, pay less attention to diet related knowledge, and have a low level of nutrition knowledge and practice.

## 5. CONCLUSION

This study showed that the hospitalized patients who received radiotherapy for colorectal cancer had insufficient knowledge of dietary nutrition and poor nutritional behavior, but have a positive attitude towards nutrition. Gender, family per capita monthly income, family location and treatment are the main factors that affect the dietary nutrition knowledge and behavior of patients with colorectal cancer undergoing radiotherapy, especially family location. It is suggested that the medical staff should pay attention to the population of radiotherapy for colorectal cancer, especially male patients with low income in rural areas who receive anti-tumor treatment for the first time. Routine nutritional screening for cancer patients, further nutritional assessment for those at risk of nutrition, and

individualized nutritional intervention programs based on the evaluation results, and the intervention results were monitored. At the same time, dynamic assessment of patients' dietary nutrition knowledge and practice after starting radiotherapy, combined with relevant influencing factors, to adopt personalized nutrition intervention measures, so as to promote the improvement of the level of dietary nutrition knowledge and practice of patients with colorectal cancer radiotherapy.

Shortcomings of this study: This study is a cross-sectional investigation, only studied the nutritional knowledge and practice, nutritional status and quality of life of patients at a certain point in time, and did not carry out multiple longitudinal follow-up surveys of patients.

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