

ปัจจัยที่สัมพันธ์กับความเหนื่อยล้าที่เกี่ยวข้องกับมะเร็งในผู้ป่วยมะเร็งกระเพาะอาหารระยะลุกลาม 1 เดือนหลังการผ่าตัดกระเพาะอาหาร เมืองเหวินโจว ประเทศจีน

Factors Related to Cancer-related Fatigue in Advanced Gastric Cancer Patients One-month After Gastrectomy in Wenzhou, China

นิพนธ์ต้นฉบับ

Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อประเมินระดับความเหนื่อยล้าที่เกี่ยวข้องกับมะเร็ง และทดสอบความสัมพันธ์กับภาวะนอนไม่หลับ ภาวะโภชนาการ ความวิตกกังวล และการสนับสนุนทางสังคม ซึ่งอาจส่งผลต่อความเหนื่อยล้าในผู้ป่วยมะเร็งกระเพาะอาหารระยะลุกลาม 1 เดือนหลังการผ่าตัดกระเพาะอาหาร **วิธีการศึกษา:** การศึกษาเชิงความสัมพันธ์มีกลุ่มตัวอย่างเป็นผู้ป่วยมะเร็งกระเพาะอาหารระยะลุกลามที่มารับการรักษารักษาต่อเนื่องที่แผนกผู้ป่วยนอกและผู้ป่วยใน แผนกศัลยกรรมทางเดินอาหาร The First Affiliated Hospital of Wenzhou Medical University in China จำนวน 111 คน ประเมินคนไขโดยใช้แบบสอบถามภาวะนอนไม่หลับ แบบประเมินภาวะโภชนาการ แบบประเมินความวิตกกังวล แบบประเมินการสนับสนุนทางสังคม และแบบประเมินความเหนื่อยล้าฉบับย่อ ในช่วงสิงหาคม พ.ศ. 2564 ถึงกุมภาพันธ์ พ.ศ. 2565 ทดสอบความสัมพันธ์ด้วยสัมประสิทธิ์สหสัมพันธ์ของเพียร์สัน **ผลการศึกษา:** คะแนนเฉลี่ยของความเหนื่อยล้าเท่ากับ 2.71 (SD = 1.50) จาก 10 คะแนน ความแปรปรวนของการนอนหลับ ภาวะเสี่ยงด้านโภชนาการ และความวิตกกังวลมีความสัมพันธ์ทางบวกกับความเหนื่อยล้าที่เกี่ยวข้องกับมะเร็ง ($r = .37, p < .001$; $r = .35, p < .001$; $r = .57, p < .001$ ตามลำดับ) การสนับสนุนทางสังคมมีความสัมพันธ์ทางลบกับความเหนื่อยล้า ($r = -.40, p < .001$) **สรุป:** ผลการศึกษาอาจใช้เป็นความรู้พื้นฐานในการพัฒนาแผนการพยาบาลเพื่อส่งเสริมคุณภาพการนอนหลับ ภาวะโภชนาการ การสนับสนุนทางสังคม และลดความวิตกกังวล เพื่อให้ผู้ป่วยมะเร็งกระเพาะอาหารระยะลุกลามภายหลังการผ่าตัดกระเพาะอาหารลดความเหนื่อยล้าที่เกี่ยวข้องกับมะเร็ง

คำสำคัญ: ความเหนื่อยล้าที่เกี่ยวข้องกับมะเร็ง; ความแปรปรวนของการนอนหลับ; ภาวะเสี่ยงทางโภชนาการ; ความวิตกกังวล; การสนับสนุนทางสังคม; มะเร็งกระเพาะอาหารระยะลุกลาม

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Abstract

Objective: To determine Cancer-related fatigue (CRF) and determine its relationships with influencing factors (i.e., insomnia, nutritional status, anxiety, and social support) among advanced gastric cancer patients one month after gastrectomy. **Methods:** This correlational study used simple random sampling to recruit 111 participants from the outpatient and inpatient of gastrointestinal surgery department of the First Affiliated Hospital of Wenzhou Medical University in Wenzhou, China. Participants were assessed with Athens Insomnia Scale, Patient-Generated Subjective Global Assessment, Zung Self-Rating Anxiety Scale, Social Support Rating Scale and Brief Fatigue Inventory. Data were collected from August 2021 to February 2022. Pearson's correlation was used to test correlation. **Results:** The mean score of CRF was 2.71 (SD = 1.50) out of 10. The Pearson correlation analysis revealed that sleep disturbance, nutritional risk, and anxiety were positively associated with CRF ($r = .37, p < .001$), ($r = .35, p < .001$), ($r = .57, p < .001$) respectively and social support was negatively associated with CRF ($r = -.40, p < .001$). **Conclusion:** The findings can provide a theoretical basis for developing nursing intervention to improve sleep quality, enhance nutrition, reduce anxiety and provide more social support to enable advanced gastric cancer patients after gastrectomy to reduce cancer-related fatigue.

Keywords: cancer-related fatigue (CRF); sleep disturbances; nutritional risks; anxiety; social support; advanced gastric cancer

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Introduction

Gastric cancer is a common malignant tumor with poor prognosis, which rank fifth in morbidity and third in mortality in the world among all cancers.¹ China is one of the countries with the highest incidence and mortality of gastric cancer in the world, ranking third and second respectively.² Wenzhou has large population of gastric cancer patients, accounting for about 5% of all morbidity and mortality rates in China in

2018.2, 3 In addition, the worse thing is that China has a large population with an increasingly aging population, while gastric cancer is an age-related disease.⁴ Then, the burden of gastric cancer is very serious in China.

Because of the low early detection rate of gastric cancer, many patients are diagnosed gastric cancer in the advanced stage and they have different health problems from pre-

diagnosis stage to recovery stage at home after discharge, gastrointestinal symptoms are the most common, along with fatigue.² After surgery, their basic life would be affected and they have a lot of pressure from treatment and the disease, which may cause or aggravate the symptom of cancer-related fatigue (CRF).⁵

CRF is the most common and painful symptom in cancer patients.⁵ It defined as “a distressing, persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and that interferes with normal functioning”.⁶ The occurrence of CRF may be related to dysregulation of cytokines and hypothalamic-pituitary-adrenal (HPA) axis. In addition, changes in the HPA axis have been identified as an underlying mechanism of CRF, either directly or through an effect on inflammatory processes.⁵ The prevalence of CRF ranges from 14.03% to 100% in cancer patients.⁷ Besides, the patients reported higher levels of fatigue after surgery than before surgery.^{8, 9}

Unlike normal fatigue, CRF cannot be relieved by rest and can last for months or even years after cancer treatment.⁵ The effect of CRF lasts longer than the complications such as pain, nausea, vomiting and depression that occur during the progression of cancer.¹⁰ 71.6% of perioperative colorectal cancer patients have experienced CRF and reported that it was difficulty in participating with their activities which they used to do regularly and must to limit what they could do each day due to the influence of CRF.⁹ Therefore, CRF greatly affects the rest of patients' lives, result to lower quality of life.⁸ At the same time, fatigue also has strongly related with cancer recurrence and low overall survival rate.¹⁰ However, in clinical practice, most of health care providers do not pay attention to the harm that CRF brings to patients, and 45% of the patients reported that they did not receive fatigue intervention in time.¹¹

In the clinical, if advanced gastric cancer patients recover well after operation, all of them need to receive chemotherapy or radiation therapy one month after operation.¹² However, fatigue levels increased significantly during chemo-radiotherapy treatment⁵ and the fatigue levels at baseline predicted post-treatment fatigue.¹³ The patients, who feel more CRF before receiving further chemo-radiotherapy, they may be unsuccessful complete the treatment course and the tumor will likely recur.¹⁴ Effective nursing interventions need

to be provided to reduce patients CRF in order to continue treatment. So, it is great significance to identify the factors associated with CRF before chemotherapy and radiation therapy.

This study guide by the Theory of Unpleasant Symptoms (TOUS), a holistic middle-range theory that considers symptoms as multidimensional.¹⁵ CRF is a symptom that makes patients feel unpleasant. TOUS explain that three domains which were physiological, psychological and situational can influence unpleasant symptoms. Physiological factors are mainly related to the symptoms that cause changes in normal human function, such as sleep, physical status, nutritional status and so on.¹⁵ From literature review, sleep is an indispensable and important physiological phenomenon for human beings. Good sleep quality can promote the recovery of people's physiological state, the improvement of their own immunity and reaction speed. Once sleep quality is poor, there will be a variety of psychosomatic symptoms.¹⁶ Sleep disturbance, such as difficulty in falling asleep, difficulty in maintaining sleep, low sleep efficiency, excessive daytime sleepiness, and early awakening, can lead to aggravation of CRF.¹⁷ In lung cancer patients, who faced with sleep disturbance symptoms, CRF would increase accordingly.¹⁸

For advanced gastric cancer patients, the malignancy tumor of the stomach affects the stomach function, which result in a decrease in energy intake and a sharp increase in energy consumption. This can also lead to malnutrition and weight loss, as a result the patients feel fatigue.¹⁹ The incidence of gastric cancer-related malnutrition is very high.¹⁹ In perioperative period, this group of patients may cause insufficient calorie uptake and are risk for malnutrition. Moreover, cancer and its treatment lead to nutritional complications and nutritional deficiencies, which causes or aggravates CRF.²⁰ Good nutritional status can improve CRF in cancer patients.²¹ There was a significant positive correlation between CRF and nutritional risk status in patients with colorectal cancer.²¹ So, based on TOUS, nutritional risk was regarded as another physiological factor associate CRF in this study.

Most of patients were afraid and resistance to cancer and treatment, worry and uncertainty about the choice, effect, risk and complications of treatment, which are characterized by tension, fear and unease. At this time, patients are prone to

varying degrees of anxiety.⁸ Meanwhile, impaired daily activities, decreased ability to maintain social and family roles, and economic difficulties related to following treatment might lead to a serious anxiety after surgery for cancer patients.²² A study showed that there was a positive correlation between anxiety and CRF, the more anxiety cancer patients were, the more fatigue they were.¹⁸ So, based on TOUS, anxiety was regarded as psychological factor related with CRF in this study.

Social support refers to the exchange, guidance, and social companionship of useful information from family, friends, or colleagues. Literatures shown that higher levels of social support were associated with lower levels of CRF.^{8, 23} With the support of family members or spouse, the patient's CRF level would be reduced.⁸ So, based on TOUS, social support was regarded as situational factor related with CRF in this study.

According to the literature review, there were not many studies on CRF in patients with advanced gastric cancer, especially those who were one month after gastrectomy.^{8, 9, 11} As noted above, it is particularly important to identify the factors related to CRF before receiving chemo-radiotherapy. Therefore, this study would be described level of CRF and its related factors in postoperative patients with advanced gastric cancer before receiving chemo-radiotherapy. This study result will fill this gap and provide scientific evidence for develop nursing intervention to help patients reduce CRF in order to continue further treatment, and to improve the quality of life of postoperative patients with advanced gastric cancer.

Research objective

To describe the level of cancer-related fatigue and determine the relationships between sleep disturbance, nutritional risk, anxiety and social support with cancer-related fatigue among advanced gastric cancer patients one month after gastrectomy.

Research hypotheses

There is positive correlation between sleep disturbance, anxiety, nutritional risk with cancer-related fatigue among advanced gastric cancer patients one month after gastrectomy in Wenzhou, China. On the contrary, social support is negative correlation with CRF in this population.

Conceptual framework

This study was based on the Theory of Unpleasant Symptoms (TOUS) by Lenz et al.¹⁵ This theory includes three

core concepts: symptoms, influencing factors and performance.¹⁵ Each symptom can exist alone or in clusters with other symptoms, which have a much greater impact on individuals than a single symptom. The influencing factors include physiological, psychological and environmental/situational factors. The performance was changes in cognitive and functional activities. TOUS emphasizes that there is a bidirectional correlation and influence among the three core concepts of symptoms, influencing factors and performance. That is, when the influencing factors play a role in the symptoms experienced by the individual, the symptoms can also act on the variables in turn. When the symptoms directly affect the performance, the performance can also have a feedback effect on the symptoms and influencing factors.

TOUS is sufficient to understand cancer-related fatigue as the unpleasant symptom, sleep disturbance and nutritional risk were in the physiological factors. Evidence showed that the patients with good sleep quality and good nutritional status, would have less CRF.^{18,21} Anxiety was in the domain of psychological factors, the patients with more anxiety had more CRF.¹⁸ Social support was situational factors, the patients who had support from others would have less CRF.⁸ The relationship between factors in these three domains and cancer-related fatigue is shown in the Figure 1.

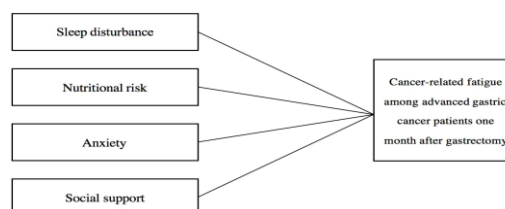


Figure 1 Conceptual framework

Methods

A descriptive correlational research design was applied to examine the research objectives.

Population and sample

The population of this study were the advanced gastric cancer patients one month after gastrectomy and before receiving chemo-radiotherapy, who came to receive further treatment in the department of gastrointestinal surgery, the First Affiliated Hospital of Wenzhou Medical University. Eligible samples for the study were recruited followed the inclusion criteria then using simple random sampling

technique to random 50% of the target population by drew the odd or even No. of patients' ID in each day. The inclusion criteria include: 1. Age \geq 18 years old; 2. Having some degree of CRF; 3. No history of other cancer; 4. Able to communicate in Mandarin or Wenzhou dialect; 5. No mental health problems (from medical record); 6. No cognitive disorders by screening with The Mini-Mental State Examination (MMSE); 7. No postoperative complications (such as: postoperative gastric bleeding, duodenal stump rupture, and anastomotic rupture, disturbance of gastric emptying, postoperative obstruction and dumping syndrome). Moreover, in this study, termination criteria were determined as: during collecting data, if the samples had any symptoms of physical discomfort such as tiredness, fatigue, pain, etc., the researcher would stop the collecting data process and provide basic standard nursing care, moreover notify the nurses to continue providing care according to the standards of the hospital.

The sample size was calculated by G*Power software. The correlation normal model was choosing as type of statistical test in G*Power program with a significance level of .05, statistical power of .80, and an estimated moderate effect size .26.^{24, 25} According to the formula, this study needed at least 111 participants.

Procedures

The proposal was approved by the Ethics Committee of Burapha University (BUU) (NO. G-HS045/2564) and the First Affiliated Hospital of Wenzhou Medical University, China (NO. 2021-096). This study used a simple random sampling technique to recruit participants. In the inpatient unit, potential participants were approached and invited to participate in the study within the first two hours of their admission. In the outpatient unit, the patients were approached after outpatient visit. After recruited, the researcher explained to the patients the purpose, procedure, content, privacy and information about the rights of the study, and then signed the consent form after obtaining the consent, and then conducted to complete the questionnaire of this study.

Instrument

Data were collected using self-administered research questionnaires, which were included:

1. The demographic questionnaire which was designed by the researcher for this study. The contents of the questionnaire included: age, gender, education, marital status, occupation, income, method of payment for medical

expenses, history of smoking and alcohol drinking status, height, weight, comorbidity, operation method, postoperative days, caregivers, diet, ADL scores, exercise and physical symptoms. The Barthes index (BI) in Chinese version²⁶ was used to measure performance in activities of daily living (ADL).

2. The Athens Insomnia Scale (AIS) was first designed by Soldatos in 1995.²⁷ This study used the Chinese version of AIS which was back translated by Sun et al.²⁸ to evaluate sleep disturbance of advanced gastric cancer patients. This scale consists of 8 items, and each item is graded as 0 to 3, the number in front of the options represents the corresponding, score from none (0 = no problem at all) to serious (3 = a very serious problem). Add the scores of each question to get the total score, which ranges from 0 to 24. A score of 0 means there is no sleep problem, while a score of 24 represents the most severe degree of insomnia. The total score \geq 6 points mean that the patient has sleep disturbance.²⁸

AIS has high reliability and validity, with the Cronbach's alpha is around .90.²⁹ The Chinese version of AIS has been widely verified in cancer patients, and the Cronbach's alpha is .97.³⁰ In this study, the Cronbach's alpha was .90.

3. The Patient-Generated Subjective Global Assessment (PG-SGA) was first designed by Ottery in 1996.³¹ The Chinese version of PG-SGA which was translated by Fu et al.³² was used to evaluate nutritional risk of advanced gastric cancer patients. This scale is divided into two parts, part one is filled in by patients, including recent changes of weight, dietary intake, symptoms and signs, activity and function, and the scores of the four aspects are added up to A which scores range from 0 to 36 points. For this part, patients should choose the appropriate options according to their own situation. Then the researcher calculated the scores for each aspect.

Part two is filled in by health care providers, including disease and its relation to nutritional requirements, metabolic demand, and physical exam, and the scores are recorded as B, C and D respectively. For this part, the researcher evaluated the patients immediately after they had completed the first part. For the aspects of disease and its relation to psychological requirements and metabolic demand, the answer could be obtained by asking the patients. Scores of parts B range from 0 to 7 points, and scores of parts C range from 0 to 9 points. Finally, for the aspect of physical

examination, including fat, muscle and fluid status, the order of examination is from top to bottom, from head to toe. Because this aspect is a subjective assessment, the researcher should investigate fat, muscle and fluid in more healthy adults and compare them with the researcher's own situation, and then assessed the patients. The scores of fat, muscle and fluid of the patients were determined according to the conditions of most parts, which was calculated as D with scores range from 0 to 3 points. The total score of PG.SGA is the sum of A, B, C and D. It ranges from 0 to 55 points, and higher score indicates high nutritional risk. Total score 0-1 points = well-nourished, 2-8 points = suspected mild or moderate malnutrition, ≥ 9 points = severe malnutrition.³²

PG-SGA is a reliable tool and some studies have shown that internal consistency is acceptable in a variety of patient populations, with the Cronbach's alpha range from .72 to .73.³³ In this study, the Cronbach's alpha was .82.

4. The Zung Self-Rating Anxiety Scale (SAS) was designed by Zung in 1971.³⁴ This study used the Chinese version of SAS which was translated by Wang³⁵ to investigate anxiety of advanced gastric cancer patients. This scale contains 20 items based on a 1-4 score and it mainly assesses the frequency of symptoms, "1" means a little of the time, "2" means some of the time, "3" means good part of the time, "4" means most of the time. This scale 15 items are stated in negative words and are graded in the order of 1 to 4. The remaining 5 items (5, 9, 13, 17 and 19) are stated in positive words and are scored in reverse order from 4 to 1. Total score ranges from 20 to 80 points, with a higher score manifesting a higher level of anxiety. For description the level of anxiety, total score 20-44 points = Normal, 45-59 points=Mild to Moderate Anxiety Levels, score 60-74 points = Marked to Severe Anxiety Levels, and score 75-80 points = Extreme Anxiety Levels.³⁵

The scale of SAS has an internal consistency of .83 and a test-retest reliability of .88.³⁴ The Chinese version of the SAS has been used by experts and it has good reliability, Cronbach's α coefficient was over .80.³⁶ The Cronbach's alpha in this study was .84.

5. The Social Support Rating Scale (SSRS) developed by Xiao Shuiyuan in 1994,³⁷ was used to evaluate social support in this study, with a total of 10 items. Items 1-4 and 8-10, the score was 1-4 points. Items 5, 6 and 7 are scored differently. Item 5 includes 5 minor subjects of A, B, C, D and

E, and the scores are also from 1 to 4 in each subheading which are represented none to full support. Items 6 and 7 are scored as 0 points if the answer is "no sources", and if the answer is "the following sources", the number of sources is the number of points. In items 6 and 7, the highest point is 9 in each item. The total score of the scale is the sum of the ten items, with a maximum score of 66 and a minimum score of 12. For description, the level of social support total score ≤ 22 points = low level perceived social support, score 23-44 points = moderate level perceived social support, score ≥ 45 points = high level perceived social support.³⁷

This scale has been widely used in Chinese population. The Cronbach's alpha coefficient of the total scale and sub-scale is .83-.90.³⁸ In this study, the Cronbach's alpha was .82.

6. The Brief Fatigue Inventory (BFI) was first developed by Mendoza et al. in 1999.³⁹ The Chinese version of BFI which was translated by Wang et al.⁴⁰ was used to investigate cancer-related fatigue among advanced gastric cancer patients in this study. It contains 9 items and uses 11-point numerical rating scale, which is easy and fast for participants to accomplish. Each item in the BFI is scored numerically on a scale of 0-10, from 0 (no fatigue or influence) to 10 (the most severe fatigue or the most severe disturbance you can imagine). The final result is an average score of 9 items. For description level of cancer-related fatigue were 0 point = no fatigue, 1-3 points = mild fatigue, 4-6 points = moderate fatigue, 7-10 points = severe fatigue.⁴⁰

BFI has established reliability and validity in oncology inpatients, outpatients and healthy person.³⁹ Its internal consistency was .96.³⁹ The Chinese version of the BFI has been confirmed by experts to have good reliability that the Cronbach's coefficient alpha was .92 for fatigue severity items and .90 for fatigue interference items.⁴⁰ In this study the Cronbach's alpha was .95.

Data analysis

Data was analyzed by Statistical Package for the Social Sciences SPSS version 25.0. The significance level was set at .05, data analysis included: descriptive statistics was used to describe frequencies, percentages, means, and standard deviations of demographic data and each variable, and Pearson's product moment correlation was used to examine relationship between sleep disturbance, nutritional risk, anxiety and social support with CRF among advanced gastric cancer patients one month after gastrectomy. The data were

tested for normality and homoscedasticity outliers of the variables to verify the assumptions of Pearson's product moment correlation test.

Results

The demographic characteristics of the participants are showed in table 1. The result showed that age of the samples was range from 39 to 83 years old with the average of 66.2 years old (SD = 8.1). The majority of this group was a younger elderly which age between 60-74 years old, approximately 66.7%. The most of participants were male (71.2%) and married (83.8%). 40.5% of the participants were unemployed, while just one-third of the participants were employed (35.1%). 49.6 % of the participants had attended primary school and 36.9 % of them had never been to school. Majority of participants (45.1%) earned monthly household of more than ¥5,000 (\$789), and 35.1% of them earned ¥3,000~5,000 (\$473-\$789). Nearly all of participants (94.6%) had used insurance to pay for the medical expenses.

Table 1 Frequency, percentage, mean, and standard deviation of demographic characteristics of the participants (n = 111)

Characteristics	N	(%)
Age		
30-44 years (Young adult)	1	0.9
45-59 years (Middle-aged)	21	18.9
60-74 years (Younger elder)	74	66.7
75-89 years (Elderly)	15	13.5
(M=66.2, SD=8.1, min=39, max=83)		
Gender		
Male	79	71.2
Female	32	28.8
Marital status		
Married	93	83.8
Widowed	18	16.2
Occupation		
Employed	39	35.1
Officer	14	12.6
Farmer	14	12.6
Self-business	11	9.9
Unemployed	45	40.5
Retirement	27	24.4
Education		
Illiteracy	41	36.9
Primary school	55	49.6
Middle school	10	9.0
High school	4	3.6

College	1	0.9
Income (monthly household)		
¥ 1000-3000 (\$158-\$473)	22	19.8
¥ 3000-5000 (\$473-\$789)	39	35.1
¥ >5000 (\$789)	50	45.1
Payment for medical expenses		
Self-payment	6	5.4
Insurance	105	94.6

Health information of the participants are presented in table 2. 57.7% of participants were past smoker, while 54.1% of them drank alcohol in the past. Half of the participants (54.1%) did not have any other medical conditions, and in the other half of the participants who had co-morbidity, hypertension was the most common diagnosis (29.5%). More than half of the participants (69.4%) were in normal BMI level (BMI=18.5-24.9), and 62.2% of participants underwent subtotal gastrectomy. All of participants were cared, by children (65.8%) or spouses (34.2%). For the diet, most of them (86.5%) had 5-7 meals per day, while other (94.6%) ate 0.5 or more than 0.5 bowl per meal. Half of them (53.2%) consumed a soft diet with porridge. Most of the participants (82.0%) were able to taking care of themselves (ADL=100). 36.1% of these patients exercised for about half an hour once a day and 37.8% of them exercised for more than half an hour once a day, basically by walking. More than half of the participants (66.7%) were experiencing some physical discomfort in the last week, some of the participants had more than one physical symptom, and the high numbers were sleep disorder and dyspepsia, at 25.1% and 23.2%, respectively.

Table 2 Frequency, percentage, mean, and standard deviation of health information of the participants (n = 111)

Health information	N	(%)
History of Smoking		
Yes	64	57.7
No	47	42.3
History of Alcohol Drinking		
Yes	61	54.1
No	50	45.9
Co-morbidity		
No	60	54.1
Yes*	51	45.9
Hypertension	43	29.5

	Diabetes	16	10.9	Yes*	74	66.7
	Other (heart disease, COPD, cerebral embolism, anemia)	8	5.5	Dyspepsia	39	23.2
				Bowel habit change	13	7.7
Body mass index (BMI)				Abdominal distension	11	6.5
	<18.5 (Underweight)	26	23.4	Pain	1	0.6
	18.5-24.9 (Normal weight)	77	69.4	Xerostomia	6	3.6
	25-29.9 (Overweight)	6	5.4	Sleep disorder	42	25.1
	≥30 (Obesity)	2	1.8	* The participant can answer more than one answer		
	M= 21.2, SD = 3.1, Range 15.7 to 35.5			Description of cancer-related fatigue		

Cancer-related fatigue (CRF) of the participants are presented in table 3. The mean score of CRF was 2.71 (SD = 1.50) and the actual score rang was 0.11~6.67. Most of samples were at mild level of CRF approximately 80.2% while 19.8% of samples experienced moderate level of fatigue.

Table 3 Frequency, percentage, mean and standard deviation of CRF level (n = 111)

Level of CRF	Range		Number(n)	Percentage (%)
	Possible score	Actual score		
Mild	1-3	0.11-3.89	89	80.2
Moderate	4-6	4.00-6.67	22	19.8
Severe	7-10	--	0	0

M=2.71, SD=1.50, min=0.11, max=6.67

Operation method			
	Total gastrectomy	42	37.8
	Subtotal gastrectomy	69	62.2
Caregivers			
	Children	73	65.8
	Spouse	38	34.2
Meal/day			
	3-4	8	7.2
	5-7	96	86.5
	≥8	7	6.3
Type of diet			
	Porridge	59	53.2
	Noodles	38	34.2
	Rice	14	12.6
Amount of diet			
	<0.5 bowl/meal/	6	5.4
	≥0.5 bowl/meal/	105	94.6
Activities of Daily Living (ADL)			
	41-60 (Moderate dependence)	1	0.9
	61-99 (Slight dependence)	19	17.1
	100 (Independence)	91	82.0
Exercise			
	No	29	26.1
	Half an hour once a day	40	36.1
	More than half an hour once a day	42	37.8

The descriptions of sleep disturbance, nutritional risk, anxiety, and social support

The descriptions of related factors of CRF which were sleep disturbance, nutritional risk, anxiety, and social support were described in table 4 and table 5. Table 4 showed that sleep disturbance, half of the participants (51.4%) had no problem of sleep disturbance, but another half part (48.6%) had. For nutritional risk, majority of the participants (72.1%) had severe malnutrition. For anxiety, all of the participants (100%) reported normal level of anxiety. For social support, most of the participants (85.6%) perceived moderate level social support.

Table 4 Frequency and percentage of related factors (n = 111)

Related factors	N	%
Sleep disturbance		
No sleep disturbance	57	51.4

Physical symptoms			
	No	37	33.3

Have Sleep disturbance	54	48.6
Nutritional risk		
Suspected mild or moderate malnutrition	31	27.9
Severe malnutrition	80	72.1
Anxiety		
Normal	111	100
Social support		
Low level perceived social support	1	0.9
Moderate level perceived social support	95	85.6
High level perceived social support	15	13.5

Table 5 The result showed that the actual score of sleep disturbance ranged from 0 to 17 with a mean score of 5.6 (SD = 3.9) indicating no sleep disturbance. The mean score of nutritional risk was 11.5 (SD = 4.4), ranging from 3-21 showing severe malnutrition. The mean score of anxiety was 28.5 (SD = 5.4), ranging from 20-41 showing no anxiety. Mean score of social support was 36.2 (SD = 7.2), indicating moderate level of social support (Actual score 22-51).

Table 5 Range, mean, standard deviation and meaning of related factors (n = 111)

Related factors	Range		M	SD	Meaning
	Possible score	Actual score			
Sleep disturbance	0 ~ 24	0 ~ 17	5.6	3.9	No sleep disturbance
Nutritional risk	0 ~ 50	3 ~ 21	11.5	4.4	Severe malnutrition
Anxiety	20 ~ 80	20 ~ 41	28.5	5.4	Normal
Social support	12 ~ 66	22 ~ 51	36.2	7.2	Moderate level of perceived social support

Relationships between CRF and related factors

The result indicated that sleep disturbance, nutritional risk, and anxiety had positive significant correlation at moderate level with CRF ($r = .37$, $r = .35$ and $r = .57$, $p < .001$, respectively). Social support had negative significant correlation at moderate level with CRF ($r = -.40$, $p < .001$). The results were presented in the table 6.

Table 6 Correlation coefficients between sleep disturbance, nutritional risk, anxiety, social support and CRF (n =111)

Variables	Correlation coefficient (r)
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Sleep disturbance	.37***
Nutritional risk	.35***
Anxiety	.57***
Social support	-.40***

*** = <.001

Discussions and Conclusion

In this study, 100% of the participants reported CRF. The mean score of CRF among advanced gastric cancer patients one month after gastrectomy was 2.7 out of 10 (SD=1.5), However, 80.2% of the participants reported in mild level of CRF, 19.8% of them were at moderate level. This is consistent with previous studies, Zou, Li, Xu, Li 41 found the incidence of CRF was 91.6% at severe level among preoperative and postoperative gastric cancer survivors. In addition, the preoperative CRF was found to be 85% at mild level and the postoperative CRF was up to 99.2% at moderate level in the study of Zhang 8. Moreover, the study of Qiu24 found that the incidence of CRF in patients with gastric cancer was as high as 80.56%, with moderate to severe fatigue predominating. In the systematic review of CRF in cancer patients, Ma et al.7 reported the prevalence of CRF was 14% to 100% and an average prevalence rate was 56%, with was at mild level 18%, moderate level 23% and severe level 15%. From what has been discussed above, the incidence of postoperative CRF was significantly high, consistent with the results of this study. However, the participants in this study had reported relatively mild levels of CRF.

In this study, 80.2% of the participants were the elderly (age > 60 year), thus reporting a high rate of CRF. There are many studies point out that the older patient is more intense the fatigue feeling.8, 23 This is mainly due to the fact that with age growth, their body's physiological indicators all decline to varying degrees and the body's tolerance decreases, moreover, the participants just experienced stomach surgery that their immunity and ability to recover after treatment is reduced compared to younger people, makes elderly patients more prone to symptoms such as fatigue, restless sleep and forgetfulness 8, 23, that caused them face with CRF.

About one-third of the participants had never been to school and half of the patients had only primary school level education. It is evident that they were less educated which

result higher incidence of CRF, that is consistent with previous study.²³ This may be because the educated the patients are easier to use their knowledge and skills to seek information about the disease, and to have a greater sense of control over their disease.⁴² In addition, the high incidence of CRF in this study was also associated with the low level of BMI, accounting for nearly one third of the cases were underweight (BMI<18.5), which is consistent with previous studies that CRF was negatively associated with BMI.⁴³

In addition, 71.2% of the participants in this study were males. Males are physically stronger than females this could be explained lower level of severity of CRF in male.⁴⁴ Moreover, all of the participants in this study had caregivers and most of them (64.9%) were not required to work, which gave the patients more time to rest that resulted in lower level of CRF.⁴³ Furthermore, 73.9% of patients had daily walking exercise. A research concluded that aerobic exercise could effectively improve cardiopulmonary function, increase their activity endurance, and relieve fatigue in oncology patients.⁴⁵

In this study 62.2% of participants underwent subtotal gastrectomy, may be the reason why they feel less fatigue. Compared to patients after total gastrectomy, that patients after subtotal gastrectomy with a gastric reservoir which facilitates food intake, digestion and absorption.⁴⁶ For the diet in this study, 86.5% of the participants had 5-7 meals per day, while 94.6% ate 0.5 or more than 0.5 bowl per meal. This means that majority of patients were getting enough nutrition to reduce fatigue.¹² Taken together, these phenomena explain well why the participants reported mild degree of CRF.

However, the participants got severe malnutrition from the scores of PG-SGA in this study. This may be due to the fact that it is only one month after surgery and the food intake may not be enough. Because this population, they had already experienced weight loss and nutritional deficiencies before surgery due to various digestive problems.¹² After surgery, they were allowed to consume liquid food for around 3 weeks. Secondly, it may be related to absorption disorders and metabolic changes.⁴⁶

Factors related to Cancer-related fatigue

Sleep disturbance

In consistent with the hypothesis of the study, sleep disturbance is positively associated with CRF among advanced gastric cancer patients one month after gastrectomy

in Wenzhou, China. This result was similar to previous studies which show that sleep disturbance was positively correlated with CRF among cancer patients,^{18, 47} this relationship can be explained by the TOUS. CRF is an unpleasant symptom which the patient is experiencing. Sleep disturbance belonged to physiological influencing factor domain which affect the unpleasant symptom of CRF. If participants had poor quality of sleep, then their CRF would be enhanced.^{18, 47} In this study, 48.6% of the patients reported they had sleep disturbance. Even if patients suffering from malignant tumors, the fear for cancer and the pain from anti-cancer treatment put patients under great psychological pressure for a long time, which seriously affects their sleep quality, mainly manifesting as poor mental state, early waking, dreaminess, restless sleep at night, irritable temper and other symptoms.^{16, 47}

First of all, sleep disturbance can lead to reduced physical strength in the daytime, which in turn affects the amount of daytime activity, causing symptoms such as loss of appetite, shortness of breath, and constipation. Sleep disturbance also affects autoimmune function, then that all aggravate fatigue.^{18, 47} Secondly, sleep disturbance disrupts the circadian rhythm, disrupts the immune system and endocrine disorders, which seriously hinders the body's self-recovery function and aggravates the symptoms of fatigue.^{18, 47} So, this is consistent with this study that sleep disturbance has the relationship with CRF.

Nutritional risk

Consistent with the hypothesis of the study, nutritional risk is positively associated with CRF among advanced gastric cancer patients one month after gastrectomy. In the TOUS, nutritional risk is a physiological variable which affect the unpleasant symptom. For advanced gastric cancer patients, the malignancy tumor of the stomach affects the stomach function, which result in a decrease in energy intake and a sharp increase in energy consumption.¹² Loss of appetite in cancer patients from interplay of patient, tumor, and treatment-related factors.⁴⁸ Tumor infiltration can directly impair function and motility of the gastrointestinal tract. Some tumors also produce substances that cause early satiety. In these circumstances, any relief of obstruction and anticancer treatment have the potential to improve appetite. In addition, chemotherapy and radiotherapy may cause dry mouth, taste or olfactory changes, mucositis, abdominal

cramps, diarrhea or constipation, and severe nausea and vomiting, thus reducing the patient's appetite.⁴⁸ This can also lead to malnutrition and weight loss, as a result the patients feel fatigue.¹² Then surgical stress increases protein metabolism, resulting in a negative nitrogen balance.²¹ In addition, postoperative reconstruction of the gastrointestinal tract in gastric cancer patients results in a prolonged period of liquid food consumption.¹² From above all, those lead to a lack of energy and protein, resulting in malnutrition and increased fatigue.²¹ So, advanced gastric cancer patients with high risk of malnutrition status performed high level of CRF than those with low nutritional risk.^{20, 21} In this study, 100% of patients were in moderate and severe malnutrition status according to PG-SGA scores, with the mean score was 11.5 (SD = 4.4). The level of CRF was significantly positively correlated with nutritional risk ($r = .35, p < .001$). Consistent with the study by Wei and Li²¹, PG-SGA identified severe malnutrition in 94.29% of 70 postoperative colorectal cancer patients and, nutritional risk had correlation with CRF ($r = .33, p < .01$).

Anxiety

The result of this study is consistent with the hypothesis of the study, anxiety is positively associated with CRF among advanced gastric cancer patients one month after gastrectomy. The study by Li¹⁸, similarly identified anxiety as one of the factors that was positively correlation with CRF in cancer patients ($r = .34, p < .01$). Base on TOUS, anxiety is a psychological factor affecting unpleasant symptom of CRF. In this study, the mean anxiety score of patients with advanced gastric cancer was 28.5 (SD = 5.4), which was positively associated with CRF ($r = .57, p < .01$). Overall, patients with more anxiety, the higher levels of fatigue they were. Even if, the participants in this study they report lower levels of CRF. This result is closely related to Chinese traditional culture, once a patient is diagnosed with cancer, most families choose to hide the patient's illness because they believe that negative emotions would accelerate the progress of the disease.⁴⁹ Therefore, the patient's family will try to reduce the patient's anxiety by hiding the illness and by providing companionship and support to help the patient recover better and faster.

At the same time, a study has shown that negative emotions increase the degree of physical exertion of patients, reduce their resistance, lead to serious dysregulation of the

body's hormonal secretion system, and increase fatigue sensitivity.⁴⁹ For cancer patients, they have fear and resistance to cancer and treatment, worry and uncertainty about the choice, effect, risk and complications of treatment, which are characterized by tension, fear and unease. So, the patients are prone to varying degrees of anxiety.⁸ Meanwhile, impaired daily activities, decreased ability to maintain social and family roles, and economic difficulties related to following treatment might lead to a serious anxiety after surgery for cancer patients.²² When the degree of anxiety of patients with advanced gastric cancer one month after gastrectomy is more serious, their emotional consumption will be more, which will make the patients have emotional fatigue.²³ In addition, advanced gastric cancer patients with CRF after surgery believe that the persistence and aggravation of CRF is the manifestation of the aggravation of disease or ineffective treatment. They should excessively worry about their prognosis, which increase the psychological burden with more anxiety.²³ So, this is consistent with this study that anxiety has the relationship with CRF.

Social support

Consistent with the hypothesis of the study, social support is negatively associated with CRF among advanced gastric cancer patients one month after gastrectomy. This result was consistent with many studies which found that social support was negatively associated with CRF.^{8, 23, 50} According to TOUS, social support belongs to situational factors includes one's social support network and interpersonal relationships, which affect the unpleasant symptom of CRF. In this study, 85.6% of patients were in moderate level of social support, with the mean score was 36.2 (SD = 7.2). Moreover, social support was significantly negatively correlated with CRF ($r = -.40, p < .001$). In the study by Yuan et al.⁵⁰, it showed that social support is negatively correlated with CRF in cancer patients ($r = -.32, p < .01$) which was similar with this study. In the recovery process of gastric cancer patients after surgery, if their families can provide careful care, then they rest more and will have less body fatigue. The emotional fatigue in patients with gastric cancer can be reduced if their families provide moral support and encouragement.²³ In the strong Chinese culture of kinship, once someone gets sick, other family members take on the responsibility of caring for the patient. All patients in this study had caregivers with higher level of social support, then they

can get more caring and support, felt less isolation and less symptomatic distress, and had lower levels of CRF.8 Therefore, supporting from family members can help patients jump out of the negative cognitive mode, relieve negative emotions, actively face their own situation, better cooperate with treatment, thus reducing physical and mental distress accordingly.8 So, this is consistent with this study that social support has the negative relationship with CRF.

Conclusion

This study found that all of the advanced gastric cancer patients one month after gastrectomy in Wenzhou, China reported mild level of cancer-related fatigue. Sleep disturbance, nutritional risk, and anxiety were significant positively associated with CRF among participants. While social support was significant negatively associated with CRF in these participants.

Strengths and weaknesses

Strengths: This study is significant in the following respects. In terms of nursing practice, the results of this study provide comprehensive understanding of CRF among advanced gastric cancer patients one month after gastrectomy. It also can stimulate nursing research about patients with advanced gastric cancer and establish evidence for nursing practices. In addition, this study could help nurses know more about the symptoms of patients with cancer by understanding their fatigue and coping strategies.

Weakness: Despite the practical potential of the study, the weaknesses of the study is study in one setting.

Implications

The clinical nurses who take care cancer patients can use this research result to develop appropriate nursing interventions to prevent and reduce CRF in patients with advanced cancer by improving their sleep quality, enhancing nutrition status, reducing anxiety and providing more social support. The ultimate goal is to improve patients' health status and quality of life for the rest of their lives.

Recommendation for future research

This study is only established correlations between sleep disturbance, nutritional risk, anxiety, social support and cancer-related fatigue; causality needs further study. Further intervention studies are needed to develop appropriate nursing interventions to improve sleep quality, enhance nutrition status, reduce anxiety and provide more social

support to enable advanced gastric cancer patients after gastrectomy to reduce cancer-related fatigue.

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Ethical Issues

The proposal was approved by the Ethics Committee of Burapha University (BUU) (NO. G-HS045/2564) and the First Affiliated Hospital of Wenzhou Medical University, China (NO. 2021-096).

Conflict of Interest

The authors declare that there is no conflict of interest.

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