

Article

The impact of cancer health literacy on the behavior and psychology of patients' families

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Abstract: Health literacy can influence preventive health behaviors related to cancer, thereby improving human quality of life and health levels. This study focuses on the cancer health literacy status of college students as family members of patients, aiming to explore its impact on the health behavior and psychological resilience of family members. This study conducted a questionnaire survey on college students from Guangzhou University, which included the Cancer Health Literacy Scale, Self Management Behavior Scale, and Related Psychological Change Scale. A total of 400 questionnaires were distributed and 372 were collected, with a response rate of 93.0%. 351 valid questionnaires were collected, with an effective response rate of 87.8%. As family members of patients, college students have a high sense of health responsibility, but their self-management ability in nutrition is relatively low. The ability to cope with cancer indirectly affects the willingness of patients' families to adopt health management behaviors through health behavior beliefs. The higher the ability to cope with cancer, the better the performance of health self-management behaviors. In addition, the overall mental health status of the patient's family members is in the healthy range, but the positive detection rate of anxiety dimension is as high as 25.07%. The attitude towards cancer presents a contradictory feature of high natural acceptance but coexistence of death fear and avoidance tendency.

Keywords: cancer health literacy; family members of patients; college student; healthy behavior; resilience

1. Introduction

Cancer is a chronic disease, and the incubation period of most cancers is as long as 10 years. The behavior harmful to health is one of the important causes of cancer [1]. With the rapid development of economy and the acceleration of population aging process, the cancer prevalence rate of Chinese residents has increased year by year, and cancer has become the primary factor threatening the health of Chinese residents [2]. Relevant data show that in the past 15 years, the overall incidence and mortality of cancer in China have increased year by year, and the prevention and control situation is extremely grim [3]. As a serious threat to human health, cancer affects not only the patients themselves, but also the family members of patients play a vital role in the whole course of the disease. Family members should not only bear the responsibility of taking care of patients, but also deal with various psychological pressures and life changes caused by cancer. Due to family responsibilities, the patient's family members assume the main care responsibility. Short term or long-term care work will lead to changes in the family members' daily lifestyle and daily work, making them lose their freedom and forced to be in a new environment [4]. In the

investigation of the World Health Organization, it is found that the impact of disease diagnosis on the family members of patients is actually greater than that of patients, and the negative psychology of the family members of patients such as anxiety, depression and post-traumatic stress is more serious than that of patients themselves [5]. As patients are the focus of attention in medical treatment and family, patients' family members pay less attention to their own physical state, and the mortality rate of patients' family members increases by 63% compared with the same kind of non caring population [6]. Therefore, it is very important to strengthen the guidance of family members' care behavior and psychological nursing to improve the quality of life. When individuals face pressure, they will have negative emotions and positive psychology at the same time. Individuals make full use of various resources to play their positive role in adversity and maintain their mental health [7]. Psychological primacy refers to a stable state in which individuals tend to develop well after encountering difficulties or setbacks. Every individual has mental toughness. Individuals with strong mental toughness are easy to recover from difficulties and setbacks, while individuals with weak mental toughness are prone to some adverse psychological and physiological reactions [8]. Health literacy is a strong indicator for predicting the health status of people. The World Health Organization points out that health literacy is closely related to morbidity and mortality, people's overall health level, life expectancy per capita, and high quality of life [9]. Health literacy plays a key role in cancer prevention and treatment. However, the research on cancer health literacy of patients' families is relatively scarce. People with low health literacy are prone to lack of management of their own health in daily life, leading to adverse health outcomes. At the same time, there are also problems such as poor communication with medical staff, low utilization of screening services, high disease incidence and mortality [10]. As a group closely related to the family members of patients, college students' cognition of family members' health literacy and the impact of family members' health literacy on their own health behavior and psychological resilience are worth further discussion.

College is the key stage to form the health concept and lifestyle. As the family members of cancer patients, developing good cancer health literacy can help college students better support their families to deal with cancer, and can also promote the development of their own health behavior and the improvement of their psychological toughness.

2. Research design

2.1. Research subjects

In this study, a stratified random sampling method was used to conduct a questionnaire survey of undergraduates in the undergraduate student population of Guangzhou University whose "immediate family member or close relative is a cancer patient". 400 questionnaires were randomly selected from each stratum from the first to the fourth year of college in the proportion of 1:1:1:1, based on the unit of grades. The survey subjects are required to voluntarily complete the survey questionnaire and organize the collected questionnaires, removing invalid questionnaires such as those that do not meet the requirements and those that are missing or incorrectly filled in.

The two persons double entry method is used to input the valid questionnaires into the data, and a second round of proofreading is conducted after the data is entered.

2.2. Questionnaire survey method

2.2.1. General characteristics survey information

The general characteristic survey data includes the gender, grade level, insurance coverage, annual medical expenses, self-assessment of health status, and channels for obtaining cancer-related information of college students' families.

2.2.2. Cancer health literacy survey scale

This study made moderate modifications to the questionnaire of the "Resident Cancer Health Literacy Scale" to construct a scale suitable for evaluating the perceived cancer health literacy of patients' family members among college students, ensuring the scientific and accurate nature of the research data [11]. The assessment tool covered three subscales with a total of 32 entries, which were related to cancer cognitive ability, cancer coping ability and health behavior beliefs. In the cancer cognitive ability subscale, four dimensions were included, namely, basic knowledge of cancer, knowledge of risk factors, cancer treatment and early detection, and knowledge of physical symptoms; while the cancer coping ability subscale consisted of three dimensions, namely, communication skills, access to social support, and cancer treatment intention. The Likert 5 scale was used for quantitative evaluation, and 1–5 points were given from "very disagree" to "very agree" or "never" to "always". When scoring, first add the scores of items in each subscale and divide by the number of corresponding items to obtain the average score of each subscale: the average score = $(q1 + q2 + \dots + qn)/n$, and then get the standard score according to the average score: the standard score = $[(\text{average score} - 1)/4] \times 100\%$, and get the grade of cancer health literacy according to the standard score. The grade classification is shown in **Table 1**.

Table 1. Classification of cancer health literacy levels.

Dimension	Low	Medium	High
Cancer cognitive abilities	≤ 50	50–85	≥ 85
Cancer coping abilities	≤ 50	50–80	≥ 80
Health behavior beliefs	≤ 45	45–80	≥ 80
Overall health literacy	≤ 55	55–80	≥ 80

2.2.3. Health self-management behavior survey scale

The Health Self-Management Behavior Assessment Scale includes four dimensions: nutritional intake, psychological comfort, physical exercise, and health responsibility, with a total of 21 items. The scale adopts the Likert five-point scoring method, with "completely disagree" scoring 0 points and "completely agree" scoring 5 points. The calculation formula for scoring indicators is: dimension score/highest dimension score $\times 100\%$. According to the score, the health self-management ability of the survey subjects can be graded: $<40\%$ is at a low level, $40\text{--}80\%$ is at a moderate level, and $>80\%$ is at a high level.

2.2.4. Mental health survey scale

The scale, also known as symptom checklist (SCL-90), consists of 90 items and contains a wide range of psychiatric contents, mainly involving feelings, thinking, emotions, consciousness, behavior habits, interpersonal relationships, diet and sleep, and uses 10 factors, including interpersonal sensitivity, anxiety, depression, paranoia, compulsion, hostility, terror, somatization, psychoticism, and others, to reflect the subjects' mental health status in 10 aspects. The 90 items of the scale used in this study are all single choice questions, using a 5-level scoring system, representing the symptoms of no, very mild, moderate, heavy, and severe. Finally, the total score is obtained by adding the scores of the 90 items.

2.2.5. Cancer attitude mapping scale

There are 32 items in the scale, which are divided into five dimensions: natural acceptance, approaching acceptance, avoidance acceptance, fear of death and avoidance of death, among which fear of death and avoidance of death are negative attitudes; Natural acceptance, approaching acceptance and avoiding acceptance are positive attitudes. Likert grade 5 was used to score the scale, which was 5-1 points according to the order of "very agree", "agree", "neutral", "disagree" and "very disagree". The higher the score of the dimension, the more inclined to the views expressed in this dimension.

2.3. Mathematical and statistical method

In this study, the data of two persons were input and analyzed by SPSS 25.0 statistical software. The general demographic characteristics, cancer health literacy and health self-management behavior of undergraduate students were described by means of mean, percentage, constituent ratio and standard deviation. The differences of cancer health literacy and health self-management behavior among students, as well as their mental health and attitudes towards cancer death were analyzed by independent sample *t*-test.

3. Results

3.1. General situation

A total of 400 questionnaires were distributed and 372 questionnaires were recovered, with a recovery rate of 93.0%. After screening the recovered questionnaires and removing the missing and wrong filled invalid questionnaires, 351 valid questionnaires were recovered, with an effective recovery rate of 87.8%. In this survey, there were 132 boys and 219 girls, with the majority of girls, accounting for 2/3 of the total; There are 96 freshmen, 85 sophomores, 91 juniors and 79 seniors in all grades. In the surveyed population, 91 people's medical expenses in the past year were less than 100 yuan, 161 people's medical expenses in the past year were 100–500 yuan, 53 people's medical expenses in the past year were 500–1000 yuan, and 46 people's medical expenses in the past year were ≥ 1000 yuan; Among the people surveyed, 254 thought they were very healthy, 89 thought they were in average health, and only 8 thought they were unhealthy; The media is the main way for the investigated population to obtain cancer-related information, and medical staff and

family and friends are also important ways for the investigated population to obtain cancer-related information; Among the surveyed population, 336 people participated in medical insurance for urban and rural residents or other types of insurance, and only 15 people did not participate in any form of medical insurance (**Table 2**).

Table 2. General situation (*n*:351).

Variable	Group	N	Rate
Sex	Man	132	37.61
	Woman	219	62.39
Grade	Freshman	96	27.35
	Sophomore	85	24.22
	Junior	91	25.93
	Senior	79	22.51
Medical expense	< 100	91	25.93
	100–500	161	45.87
	500–1000	53	15.1
	≥ 1000	46	13.11
Self-rated health	Healthy	254	72.36
	Commonly	89	25.36
	Unhealthy	8	2.28
	Medical staff	151	43.02
Access to information (multiple choice)	Family and friends	122	34.76
	Government sector	23	6.55
	Media	300	85.47
	Nothing	9	2.56
Participate in insurance (multiple choice)	Urban and rural residents' medical insurance	297	84.62
	Other types of insurance	85	24.22
	Nothing	15	4.27

3.2. Current status of cancer health literacy among college students

The survey results show that the overall level of cancer health literacy perceived by college students' family members needs to be improved. The average score of cancer health literacy among the surveyed family members was 119.12 ± 11.81 , which was the highest in the dimension of cancer cognitive ability, with an average score of 61.17 ± 6.63 . In the dimension of cancer coping ability, the average score was 37.26 ± 4.29 . The score of health behavior belief dimension is the lowest, with an average score of 20.69 ± 4.35 , as shown in **Table 3**. In the dimension of cancer coping ability, the average score was 37.26 ± 4.29 . Most of the college students' cancer health literacy is at the medium level. There are 5 students with low cancer cognitive ability dimension literacy, 257 students with medium cancer cognitive ability dimension literacy and 89 students with high cancer cognitive ability dimension literacy; There were 6 people with low and 189 people with medium literacy in the dimension of cancer coping ability. The number of people with high literacy was 156 at most, accounting for 44.44% of the total number; The number of people with low literacy in

the dimension of health behavior beliefs is 47 at most, 260 at medium level and 44 at high level, as shown in **Table 4**. The number of people with high level of cancer coping ability dimension is the most, and the number of people with low level of health literacy in health behavior belief is the most. In general, college students, as family members of patients, possess a high level of cancer cognitive ability and cancer coping ability, but their health behavior willingness level is low.

Table 3. The scores of each dimension and total score of college students' cancer health literacy ($n:351$).

Dimension	Average score of entries	Minimum total score	Maximum total score	Average score
Cancer cognitive abilities	4.07 ± 0.44	30	75	61.17 ± 6.63
Cancer coping abilities	4.15 ± 0.48	19	45	37.26 ± 4.29
Health behavior beliefs	3.45 ± 0.73	8	30	20.69 ± 4.35
Overall health literacy	3.97 ± 0.39	74	150	119.12 ± 11.81

Table 4. Distribution of each dimension and total score level of college students' cancer health literacy ($n:351$).

Dimension	Low	Medium	High
Cancer cognitive abilities	5 (1.42%)	257 (73.22%)	89 (25.36%)
Cancer coping abilities	6 (1.71%)	189 (53.85%)	156 (44.44%)
Health behavior beliefs	47 (13.39%)	260 (74.07%)	44 (12.54%)
Overall health literacy	8 (2.28%)	251 (71.51%)	92 (26.21%)

3.3. Status of self-management behaviors among college students

The survey results show that the average score of self-management behavior among patients' family members was 28.37 ± 6.25 , and the overall situation needs to be further optimized. Among the four dimensions, the average score of nutrition dimension is 6.89 ± 2.34 , the average score of sports dimension is the lowest, which is 4.73 ± 1.59 , the average score of psychological well-being dimension is the highest, which is 10.86 ± 2.74 , and the score of health responsibility dimension is 5.89 ± 1.29 , as shown in **Table 5**. Most college students' health self-management ability is at the medium level, and the number of students with high health self-management level is only 43. The number of students with high health responsibility dimension score is up to 81, the number of students with medium psychological well-being dimension score is up to 267, and the number of students with low sports dimension score is up to 66, as shown in **Table 6**. College students, as family members of patients, have a high level of health responsibility, but their self-management ability in nutrition is low. The number of college students with low self-management ability in sports is the most, indicating that nutrition and sports are the breakthrough to improve college students' health self-management behavior.

Table 5. Scores of each dimension and total score of college students' self-management behavior ($n:351$).

Dimension	Average score of entries	Minimum total score	Maximum total score	Average score
Nutrition	2.30 ± 0.78	0	12	6.89 ± 2.34
Exercise	2.36 ± 0.79	0	8	4.73 ± 1.59

Table 5. (Continued).

Dimension	Average score of entries	Minimum total score	Maximum total score	Average score
Psychological comfort	2.71 ± 0.69	0	16	10.86 ± 2.74
Health Responsibility	2.95 ± 0.64	0	8	5.89 ± 1.29
Self-management behavior	2.58 ± 0.57	0	44	28.37 ± 6.25

Table 6. Distribution of each dimension and total score level of college students' self-management behavior (n:351).

Dimension	Low	Medium	High
Nutrition	49 (13.96%)	264 (75.21%)	38 (10.83%)
Exercise	66 (18.80%)	246 (70.09%)	39 (11.11%)
Psychological comfort	17 (4.84%)	267 (76.07%)	67 (19.09%)
Health Responsibility	9 (2.56%)	261 (74.36%)	81 (23.08%)
Self-management behavior	10 (2.85%)	298 (84.90%)	43 (12.25%)

3.4. Relationship between cancer health literacy and health self-management behavior among college students

By comparing the average scores of the items of the health self-management behavior scale for the family members of patients with different levels of cancer health literacy and each dimension score, it was found that there were significant differences in the scores of cancer cognitive ability, cancer coping ability, health behavior belief and overall cancer health literacy scores among the family members of patients with different levels. Those with high ranks in cancer health literacy and its dimensions had the highest levels of health self-management and those with low ranks had the lowest levels of health self-management. From the average score of the items in the survey results of health self-management behavior, the people with high health behavior beliefs have the highest level of health self-management, and the people with low cancer coping ability have the lowest level of health self-management, as shown in **Table 7**. Cancer cognitive ability can not only directly affect the health self-management behavior of patients' family members, but also indirectly affect the willingness of patients' family members to carry out health management through cancer coping ability and health behavior beliefs [12]. Cancer coping ability indirectly affects the willingness of family members of patients to adopt health management behavior through health behavior beliefs. The higher the cancer coping ability, the better the health self-management behavior of family members of patients; as the intermediary factor, health behavior belief can effectively promote the implementation of family members' health self-management behavior.

Table 7. Relationship between cancer health literacy and health self-management behavior of College Students (n:351).

dimension	Grade	n	Score	F	P
Cancer cognitive abilities	Low	5	2.20 ± 0.74	17.586	0.000
	Medium	257	2.48 ± 0.50		
	High	89	2.87 ± 0.64		

Table 7. (Continued).

dimension	Grade	n	Score	F	P
Cancer coping abilities	Low	6	1.74 ± 0.63	22.328	0.000
	Medium	189	2.43 ± 0.44		
	High	156	2.79 ± 0.62		
Health behavior beliefs	Low	47	2.11 ± 0.52	63.827	0.000
	Medium	260	2.55 ± 0.45		
	High	44	3.26 ± 0.63		
Overall health literacy	Low	8	1.85 ± 0.42	47.455	0.000
	Medium	251	2.45 ± 0.46		
	High	92	3.01 ± 0.61		

3.5. Scores of college students' mental health

The scores of the patient's family members mental health status are shown in **Table 8**. The overall score is in the healthy range. Taking each factor score > 2 as the positive screening standard, the positive detection rate of 351 college students' each dimension is analyzed. It is found that the number of positive detection of anxiety dimension reaches 88, with a detection rate of 25.07%, which is the highest among all dimensions, reflecting that many students have anxiety problems; The detection rate of interpersonal relationship dimension was 9.40%, and the detection rate of depression dimension was 7.69%; The positive rate of psychosis dimension was 0.85%. By comparing the data of each dimension, it can be seen that some family members' psychological resilience needs to be strengthened when facing cancer-related pressure, which reflects their difficulties in adapting to life changes and stress caused by cancer.

Table 8. Mental health scores of College Students (n = 351).

Dimension	Score	Number of positive persons	Positive detection rate
Anxious	1.44 ± 0.48	88	25.07%
Interpersonal relationship	1.66 ± 0.65	33	9.40%
Depressed	1.52 ± 0.55	27	7.69%
Force	1.63 ± 0.63	19	5.41%
Hostile	1.49 ± 0.58	15	4.27%
Bigotry	1.47 ± 0.51	13	3.70%
Somatization	1.37 ± 0.51	10	2.85%
Terror	1.33 ± 0.47	7	1.99%
Psychosis	1.27 ± 0.38	3	0.85%

3.6. Score of college students' attitude towards cancer

Indicating that; **Table 9** shows the scores of each dimension and total score of the patient's family members' attitude towards cancer. The average score of natural acceptance dimension was the highest, indicating that family members had the most positive attitude towards "natural acceptance of cancer"; The average score of fear of death was the lowest, which reflected the relatively negative attitude towards fear of

death. There was a significant difference in the total score of each dimension, and the total score of natural acceptance ranged from 16 to 26, reflecting the high overall acceptance of this dimension; The total score of avoidance acceptance ranged from 8 to 21, indicating that the willingness to accept in this dimension was weak. The average scores of natural acceptance and approaching acceptance are relatively prominent, and the scores of death avoidance and death fear are relatively low, indicating that the patient's family members have a strong active attitude towards cancer, but there are some avoidance and fear of death related issues.

Table 9. Scores of each dimension and total score of college students' attitude towards cancer ($n = 351$).

Dimension	Average score of entries	Minimum total score	Maximum total score	Average score
Natural acceptance	3.75 ± 0.65	16	26	20.60 ± 2.79
Approach acceptance	2.52 ± 1.07	10	36	23.87 ± 6.83
Avoid acceptance	2.31 ± 0.62	8	21	14.86 ± 3.85
Escape from death	2.88 ± 0.73	7	20	13.19 ± 3.84
Fear of death	2.75 ± 0.74	9	30	19.14 ± 5.86

4. Discussion

In recent years, the incidence and mortality of cancer in China have continued to rise. There are about 1.6 million newly discovered cancer patients and about 1.3 million deaths each year. Cancer has brought a heavy burden to patients and their families [13]. As an important participant in the process of cancer prevention and treatment, the level of cancer health literacy of patients' families has a significant impact on their health behavior and psychological resilience [14]. This study investigated the related situation of patients' families from the perspective of college students, and systematically improved the cancer health literacy and guided the health self-management behavior of patients' families, which will help to cultivate their excellent self-management skills.

According to the current status of cancer health literacy, 71.51% of the family members of college patients had a moderate level of cancer health literacy, with better performance in the dimension of cancer coping ability, but the lowest score in the dimension of health behavior beliefs. Family members' knowledge of cancer and coping ability can be enhanced through the improvement of health literacy, but their willingness to translate their knowledge into actual health behaviors is often affected by long-term habits and health beliefs, resulting in a "cognitive-behavioral" transformation gap [15]. This is consistent with the lowest score of beliefs about health behaviors in this study, which may be related to factors such as long-established habits and lack of awareness of the importance of health behaviors. In terms of health self-management behaviors, most of the overall scores of patients' family members were at a moderate level, with low scores in the nutrition and exercise dimensions. One study found that about 60% of the family members of cancer patients have irrational dietary structure and insufficient frequency of exercise, which makes it difficult to maintain healthy behaviors even with basic health knowledge [16]. Schools and society should strengthen health education for this group of family members, such as carrying out nutritional knowledge lectures and organizing exercise activities, to

encourage family members to improve their dietary structure and increase the amount of exercise, in order to enhance the ability of health self-management. Cancer coping ability has a positive correlation with health self-management behavior by influencing health behavior beliefs [17]. Family members with good cancer coping ability can more accurately obtain cancer related information in communication. In this study, cancer coping ability was mainly reflected in three aspects: communication ability, social support acquisition and cancer treatment willingness. The ability of communication is reflected in the ability to read written information without difficulty, understand cancer related knowledge in daily life and obtain the required information through communication with doctors. Social support can provide economic and emotional support for individuals, improve their self-care awareness, form positive health belief. The dimension of cancer treatment willingness reflects the individual's medical habits and attitudes. People with good medical habits and positive attitudes will pay more attention to their own health, so they will also want to take the initiative to take healthy behavior to maintain healthy physique.

In addition, according to the results of the study, although the psychological toughness of the patients' family members was overall in the healthy range, the positive detection rate of the anxiety dimension was as high as 25.07%, and a survey by the World Health Organization has confirmed that the psychological impact of the disease diagnosis on the family members of the patients is often greater than that of the patients themselves, and that the family members' negative emotions, such as anxiety and depression, are more significant [18]. It is suggested that college students, as a group of young family members, are still prone to anxiety when faced with the stress of caregiving and uncertainty of the future brought about by cancer, although their psychological resilience is better overall. Individuals alleviate anxiety about the fragility of life by avoiding the topic of death [19]. This is a good explanation for the paradoxical feature of "natural acceptance and fear of death" in this study, which may lead to the difficulty of rational decision-making by family members in the face of serious situations such as terminal cancer, and suggests the need to carry out targeted death education to help family members balance rational cognition and emotional management. Young family members are more adept at obtaining support through social media and peer groups to make up for the lack of family support [20]. However, this study also found that this kind of social support stays more at the emotional level, with limited practical promotion of health behaviors, which may be another reason for the low scores of health behavior beliefs.

To summarize, cancer health literacy education can be incorporated into university-based curricula, with modules on cancer awareness, nutrition and exercise management, and anxiety coping to make up for students' shortcomings in nutrition and exercise self-management. Jointly launching health practice camps in the community, disseminating science through the media, and improving health behavior beliefs through punch card incentives. The sample of this study was only from Guangzhou University, which may have geographical limitations, and future studies could be expanded to other demographic groups or socioeconomic backgrounds in order to gain a more comprehensive understanding of the differences in cancer health literacy among different populations and to identify targeted interventions.

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