The Role of Gender in the Quality of Life of Cancer Survivors: Health Literacy and Cognitive Functioning

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Abstract

Background: In recent decades, timely diagnosis, advancements in the pharmaceutical industry, and the introduction of new treatments have led to a significant increase in the number of cancer survivors. Just as the physical and mental well-being of cancer patients is essential, providing psychological care for survivors is equally important.

Objectives: In the realm of community mental health, cognitive function, and health literacy play crucial roles in the quality of life of cancer survivors. Furthermore, recognizing and addressing gender differences in this context can be a valuable means of enhancing and improving survivors' quality of life.

Methods: This study employed a descriptive correlational design involving 437 cancer survivors (319 female and 118 male) from the Cancer Research Center of Shahid Beheshti University of Medical Sciences (Shohada-E-Tajrish Hospital). Participants, who had completed their last treatment at least one year prior, volunteered to participate between September 1 and January 30, 2022. They responded to three assessments: The Cognitive Failure Questionnaire, the cancer health literacy Test, and the quality of life in adult cancer survivors survey.

Results: Multiple regression analysis showed that about 58% of the quality of life of cancer survivors is explained by cognitive function failure. Still, in the group of men, 30% of the quality of life can be predicted based on insufficient cognitive function and health literacy.

Conclusions: Based on the findings, it was emphasized on cognitive function training and health literacy in both genders to increase the life of patients with cancer.

Keywords: Quality of Life, Cancer Health Literacy, Cognitive Functioning, Gender, Cancer Survivors

1. Background

With social and industrial transformations, the pattern of disease infection has undergone changes in the present era, with chronic diseases being recognized as the most significant physical and mental health issues in societies. These problems are known as the primary sources of tension, imposing heavy economic costs on society, such as cancer. Cancer, as one of the major health concerns globally, poses a threat to human life, leading to numerous personal, family, and social damages in physical, mental, and social aspects (1).

Despite the advancements achieved in the field of timely diagnosis, treatment, and supportive care, the number of cancer survivors has been growing. However,

the physiological issues (such as fatigue, pain, nausea, and changes in appearance) and psycho-social complications (such as mental discomfort, relationship difficulties, financial stress, and changes in cognitive and sexual functioning) arising from cancer and its treatment can considerably compromise their quality of life (2, 3). Evidence shows that gender can impact the psychological consequences of cancer, which may be attributed to biological differences, such as chromosomes and hormones, as well as social roles, behaviors, and identities in women and men. For instance, women tend to experience more anxiety, depression, and psychological distress, while men with cancer and male cancer survivors have reported fewer issues (4). Hence, female cancer survivors, being a more vulnerable group, often face more psychological

challenges, less adjustment, and lower quality of life compared to their male counterparts (5).

According to the World Health Organization (WHO) definition (6), quality of life refers to an individual's understanding of their position in life, values, and priorities. Research results have demonstrated that cancer significantly affects the quality of life and its various aspects, such as individuals' physical, social, emotional, and cognitive health, particularly those who have recovered from chemotherapy (7). Cognitive functioning is defined as intellectual activities, such as thinking, reasoning, and learning (8). Cancer pharmacological treatments can have acute and long-term effects on cognitive functioning (9). Cognitive function failure refers to an individual's inability to perform tasks they can normally do. In other words, cognitive function failure is a series of cognitive mistakes occurring while performing tasks that an individual usually completes successfully. Cognitive function failure was first introduced by Broadbent. He believes that cognitive function failure includes failures in attention, memory, and motor functioning (10). Cognitive function failure can affect individuals' daily functioning, quality of life, and work capacity, particularly in cancer survivors (11). Cognitive functioning decreases in men with prostate cancer after starting androgen deprivation therapy (12). Additionally, in women who have recovered from breast cancer, cognitive functioning has shown a considerable reduction before and after treatment, which is associated with factors such as aging, irregular sleep, receiving chemotherapy, neuropsychological symptoms, and reduced quality of life. Other factors such as age, dosage, shorter treatment course, simultaneously or immediately after chemotherapy, and higher volumes of radiotherapy radiation can also culminate in cognitive function failure. This impairment may give rise to long-term memory loss years after treatment completion. Therefore, it is necessary to monitor the cognitive functioning of patients undergoing treatment (chemotherapy and radiotherapy) (11, 13, 14).

Recent studies have indicated that, along with cognitive functioning, patients' health literacy plays a crucial role in determining their quality of life (15). Patients with cancer and survivors face problems in maintaining and benefitting from health information due to the psychological helplessness they experience. Therefore, health literacy is of great importance in cancer care and urgent attention must be paid to this issue (16-18). Behavioral changes through enhanced health literacy can play a significant role in medical decision-making and help individuals make more informed health decisions.

The WHO declares health literacy as one of the substantial factors in determining individuals' health and links it to health outcomes (19). The Institute of Medicine defines health literacy as the ability of individuals to achieve, process, and perceive basic information and services needed to make appropriate health decisions (20). Since knowledge in the field of health can play a crucial role in promoting individuals' health and quality of life, the significance of health literacy has been paid more attention.

Research has demonstrated that individuals with low health literacy have limited access to health services and experience a lower quality of life (16). On the contrary, those with high health literacy possess more health knowledge and engage in more favorable health behaviors (21, 22). Thus, promoting health literacy can greatly enhance individuals' quality of life (15).

Some studies have suggested that the link between health literacy and quality of life may be influenced by various factors such as cultural characteristics, geographical location, self-efficacy, perceived social support, age, gender, education level, and health skills (23-26). However, previous research (27) indicated that education level, gender, and even the presence of a chronic diseases are unreliable predictors of health literacy and do not correlate with the quality of life (17, 27).

On the other hand, as other studies found, gender can play a predictor role in relation to health literacy and quality of life. Research has shown that women are more inclined than men to understand and complete medical forms, comprehend instructions on the medicine bottles, and understand their writing; in other words, women possess higher health literacy than men (28). Studies have acknowledged that women perform better than men in health literacy-related tasks, which can be due to women's greater familiarity with healthcare systems (28, 29).

On the other hand, according to research (30), women's health literacy was not regarded as a predictor for quality of life, while women were able to actively participate in managing their health and healthcare. Furthermore, health literacy is also crucial for men. For instance, a recent study (31) has demonstrated that men with prostate cancer with higher communication skills and knowledge to enjoy a better quality of life. Therefore, improved mental health is primarily correlated with men's ability to actively interact with healthcare providers and better physical health is correlated with having adequate information to

manage their own health. In other words, it is essential for men to have the capability to deal with health challenges and to communicate effectively with healthcare professionals (31, 32).

2. Objectives

The present study aimed to recognize gender differences in the association between health literacy and cognitive functioning with the quality of life of cancer survivors scince the study of these two structures, taking into account the goal of improving and increasing the quality of life of cancer survivors, leading to better understanding, more appropriate decisions, and the creation of a comprehensive care plan. Therefore, this study intends to answer the question, "Does gender play a role in the relationship of health literacy and cognitive activity with the quality of life of cancer survivors?"

3. Methods

3.1. Method

The present descriptive-correlational research was conducted on cancer survivors from the Cancer Research Center of Shahid Beheshti University of Medical Sciences (Shohadaye Tajrish Hospital). The inclusion criteria for cancer survivors included being at least 18 years old, having at least a basic level of literacy (reading and writing), having completed at least one year since the last treatment without relapse, and providing written consent. The exclusion criteria for these individuals included survivors under 18 years old, those who had recovered less than one year ago, and those who had experienced a relapse.

3.2. Sample Size Determination and Procedure

According to Klein (33), In correlation designs, the sample size should range from 2.5 to 5 times the number of females; thus, the sample size was calculated to be 437 people (118 male and 319 female) from cancer survivors using a non-random voluntary method (in-person or online) from September 1 to January 30, 2022. A group of survivors participated in the study by visiting the Cancer Research Center of Shahid Beheshti University of Medical Sciences (Shohadaye Tajrish Hospital) to check the disease conditions after recovery, while another group participated in the research online (cyberspace) due to the coronavirus disease 2019 (COVID-19) conditions by studying their medical records and meeting the inclusion criteria. As shown in Table 1,

the survivors' age range was 21 - 79 years, with a mean age of 48 years and a standard deviation of 11.55 years.

3.3. Measuring Tools

In this study, a Cognitive Failure Questionnaire (10), Cancer Health Literacy Test (19), and the quality of life in adults surviving cancer (3) were used.

3.3.1. Cognitive Failure Questionnaire

The Cognitive Failure Questionnaire is a widely used tool for evaluating cognitive processes in individuals aged 18 to 85. It consists of 25 items categorized into three subscales: Distractibility (9 items), forgetfulness (8 items), and false triggering (8 items). Respondents are required to use a 5-point Likert Scale to indicate how often they experience the errors described in the questionnaire. The scores range from zero to 100, with higher scores indicating a higher frequency of errors. Broadbent et al. reported a Cronbach's alpha coefficient of 0.96 for the Cognitive Failure Questionnaire (10). Zanesco et al. obtained Cronbach's alpha coefficients ranging between 0.91 and 0.94, indicating high internal consistency (34). The retest reliability of the questionnaire was found to be 0.77 with a 1-month interval, and the reported Cronbach's alpha coefficient was 0.83 (35). In this study, Cronbach's alpha coefficient was 0.77.

3.3.2. Cancer Health Literacy Test

The Cancer Health Literacy Test is one of the tools used to assess the health literacy of patients with cancer ranging in age from 18 to 93 years. The 30-item test, which deals with cancer treatment, drug side effects, and other related topics, was conducted in 2011 and 2013 at the University of Virginia and oncology clinics. This one-dimensional test includes knowledge (a survey of cancer knowledge and feedback on cancer), skills (for example, the ability to read medication labels, appointment cards, and insurance forms), and items that require a combination of knowledge and skills. The cancer health literacy test is provided to the subject to choose the correct answer to each material from the options provided. Scoring is based on the number of correct answers ranging from 0 to 30. The higher the number of correct answers, the higher the score and the higher the literacy level. Response to the materials takes between 10 and 15 minutes (19). In the study of Echeverri et al. (36), the validity of the health literacy test in the Spanish version was estimated to be 0.88. In this study, Cronbach's alpha coefficient was 0.71.

Table 1. Demographic Information Based on Age, Gender, Level of Education, and Marital Status

Variables	Frequency (%)
Education	
High school	64 (14.64)
Diploma	121 (27.69)
Associate degree	49 (11.21)
Bachelor's degree	133 (30.44)
Master's degree	63 (14.42)
PHD	7 (1.6)
Marital status	
Single	59 (13.50)
Married	340 (77.81)
Divorced	25 (5.71)
Widow	13 (2.98)
Age	
Young	121 (28)
Middle-aged	283 (65)
Old	33 (8)
Gender	
Women	319 (73)
Men	118 (27)

3.3.3. Quality of Life in Adult Cancer Survivors

Avis et al. (3) designed this tool for adult cancer survivors, who have been diagnosed with cancer for at least 1 to 5 years, ranging in age from 29 to 92 years, with 47 items and 12 domains (7 are considered generic and 5 cancer-specific). The general dimension covers areas that are not necessarily related to cancer: Physical pain, positive feelings, negative feelings, cognitive problems, sexual problems, social avoidance, and fatigue. The cancer-specific dimension includes cancer-related areas such as financial problems caused by cancer, family-related distress, distress over recurrence, apparent concerns, and the benefits of cancer (for example, Patients may find that cancer helped them a better deal with problems (32). Answers are scored on a 7-point Likert from 1 to 7 [1 (never), 2 (seldom), 3 (sometimes), 4 (about as often as not), 5 (frequently), 6 (very usually), 7 (always)]. Scoring is the realm of inverse positive emotions. In the general dimension, the range of each the domain is from 4 to 28, and by adding the scores of each of the 7 domains, the total score is obtained with the range of 28 to 196. In the cancer-specific dimension, cancer benefit scores are reported separately, and the sum of the scores of the 4 areas (excluding the cancer benefit area) is shown in the range of 16 to 112 (three items multiply the family-related helplessness score by 1.33). The lower the score, the higher the quality of life,

and higher scores indicate more problems or lower quality of life (3). In Avis et al.'s study (3), Cronbach's alpha coefficient was 0.72 and the retest was 0.72. In another study by Sohl et al. (37), Cronbach's alpha coefficients for 12 domains were reported to be 0.70 to 0.91 with good convergent and divergent validity and retest higher than 0.70 with high internal coordination. In Iran, Cronbach's alpha range for the 2 dimensions of the questionnaire was 0.74 and 0.93 with an internal coordination of 0.99 (38). In the present study, Cronbach's alpha coefficient was calculated for the general dimension of 0.92 and the specific dimension of 0.81.

4. Results

4.1. Data Description

The statistical characteristics (such as the lowest, the highest, dispersion indices and indices of tendency to the center, etc.) of the measurements obtained from the research questionnaires, separated by three variables, along with the difference between the averages of the two groups of men and women are shown in Table 2.

As shown in the table 2, the mean score of the cognitive impairment variable is higher in the female group than in the male group; the mean score of the quality of life variable is lower in the female group than in the male group; and the mean score of the health

Table 2. The Characteristics of Descriptive Statistics Cognitive Failure, Health Literacy, and Quality of Life on Gender Segregation in Cancer Survivors

Variables	Women				Men				t
	Minimum-Maximum	Crookedness	The Standard Deviation	Average	Minimum-Maximum	Crookedness	The Standard Deviation	Average	
Cognitive failure	6 - 85	0.274	14.4	40.2	13 - 64	0.175	12.1	37.5	1.81
Health literacy	6 - 30	0.113	4.7	21.9	7 - 28	-1.22	4.5	22	2.21 [a]
Quality of Life	67 - 273	- 0.091	43.7	172.1	69 - 255	-0.209	32.1	181.9	0.17

[a] P < 0.05.

Table 3. Correlation Coefficients Between the Three Variables of Cognitive Failure, Health Literacy, and Quality of Life

Variables	1	2	3
1. Cognitive failure	-	0.24 [a, b]	-0.11 [b]
2. Health literacy	0.58 [c]	-	0.15 [b]
3. Quality of life	-0.12 [a]	-0.06	-

[a] P < 0.05.
[b] The diameter correspond to the men's group.
[c] P < 0.01.

literacy variable is almost equal in both groups. The standard deviation values of all three variables are higher in the female group than in the male group, indicating that the score heterogeneity is greater in this group. The skewness values of the cognitive function failure scores in both groups and the skewness values of the health literacy scores in the female group are positive, showing that most of the individuals scored below the average. The skewness values of the quality of life is negative in both groups, suggesting that most individuals in the sample group scored higher than the average. The only significant difference between the mean scores of the two groups belonged to health literacy ($t = 2.21$, P < 0.05), indicating that the mean score of this variable is significantly higher in the male group then in the female group.

As shown in Table 3, There is a significant negative association (r = -0.12) between cognitive function failure and quality of life in the female group. In other words, as cognitive function failure increases in the female group, their quality of life decreases. This relationship was not significant in the male group. No significant relationship was found between health literacy and quality of life in the two groups (r = -0.06 for females; r = 0.58 for males).

4.2. Data Analysis

To analyze the data, we first examined the relationship between the research variables using the Pearson correlation method and the multiple regression method. The results are displayed in Table 4, which shows the total scores of each variable.

In order to test the research hypothesis, the multiple regression model was used for each group separately.

An assessment of the statistical assumptions for this model revealed the following:

1. The assumption of low multicollinearity was met, as the correlation coefficients between predictor variables in both groups were less than 0.8.

2. The sample size was adequate, with 15 to 20 participants for each independent variable, ensuring that the total sample size did not fall below 100 individuals.

3. The linearity of the relationship was also established according to the regression analysis of the distribution diagram of the variables (39).

As depicted in the table, the regression coefficient for predicting quality of life based on cognitive function failure function is statistically significant in both the female group (β = 0.58, P < 0.01) and the male group (β = 0.26, P < 0.01) at a significance level below 0.01. However, the regression coefficient for predicting quality of life based on health literacy is only statistically significant in the male group (β = 0.19, P < 0.05) at a significance

Table 4. Results of Linear Regression Analysis to Predict Quality of Life Based on Cognitive Failure and Health Literacy by Gender

Predictor Variables	Men				Women			
	F	P	β	b	F	P	β	b
Cognitive failure	5.72	0.01	0.26	0.71	81.6	0.01	0.58	1.77
Health literacy	-	0.03	0.19	1.37	-	0.81	0.01	0.09

level below 0.05. Thus, men's quality of life can be predicted based on both cognitive function failure and health literacy variables, while in the female group, quality of life can only be predicted based on cognitive function failure.

The coefficient of determination (R2) was 0.58 for the female group and 0.31 for the male group. Thus, it can be concluded that approximately 58% of women's quality of life is explained by cognitive function failure, while in the male group, 30% of the variance in quality of life can be explained by the two predictive variables.

5. Discussion

The findings of the present research revealed that the cognitive functioning of cancer survivors decreased, culminating in a reduction in their quality of life which is consistent with previous research findings ([11], [13], [14], [34]). Studies have shown that in survivors who were treated several years ago, besides biological causes (such as the patient's personal characteristics, underlying causes, cancer, and treatment complications), psychosocial factors also play a role in maintaining and developing cognitive function failure. For example, chemotherapy can culminate in increased inflammatory levels in the brain. Also, chronic inflammation is associated with higher levels of pro-inflammatory cytokines and cytokine receptors. Moreover, if the permeability of the blood-brain barrier is impaired, the inflammatory components may reach the nerve tissue, potentially causing nerve cell damage and ultimately reducing cognitive functioning (attention, concentration, processing speed, motor functioning, language, and visual and verbal memory). These effects can persist for years after cancer treatment. Among the psychosocial factors affecting cancer survivors are anxiety and depression, which may contribute to sluggish cognitive functioning, difficulties in decision-making, and ultimately a worsened quality of life, compromising patient survival ([14]).

Another finding of the current study demonstrated that health literacy in men can predict the quality of life, which is consistent with the results of previous studies ([25], [27], [30-32]). Research findings revealed a positive correlation between health literacy and quality of life.

Patients and survivors with high health literacy are more likely to acquire health-related knowledge and improve their health behavior ([25]). According to preliminary evidence, health literacy is crucial for men with cancer, as they need to achieve a huge amount of information to make treatment decisions, manage the disease, and enhance the quality of life thereafter. Hence, patients with higher health literacy experience better psychological well-being compared to those with lower health literacy ([27]). Research ([32]) suggests that male cancer survivors with varying levels of health literacy may have a similar quality of life in the physical aspect, but their emotional well-being differs considerably. Finally, on the one hand, the negative effect of low health literacy at the time of cancer diagnosis extends to their recovery, when patients and survivors must navigate complex information and make treatment decisions ([32]). On the other hand, having a wealth of information alone is insufficient, but understanding and using it in clinical decision-making is very important ([31]). For instance, research ([32]) has found that prostate cancer survivors with higher health literacy had a better quality of life in physical, cognitive, and social aspects, resulting in ascending mental well-being. Numerous studies ([31]) demonstrated that interventions designed to enhance health literacy and give rise to increased patient treatment adherence rates. Consequently, programs aimed at reducing anxiety contribute to improved health literacy and comprehension of their disease ([31]).

Zhou et al. concluded that gender is related to health literacy, indicating that women had higher health literacy compared to men ([28]). However, in the current study, health literacy was almost equal in both female and male groups. This could be due to the emphasis on seeking help for health literacy and emotional support in Iranian culture. Also, in Iranian society, both men and women who frequently discuss with family members about using the Internet to access health resources are more likely to have higher health literacy levels. This suggests that the more they engage in conversations with family members about finding health information, the greater their health literacy ([28]). However, the findings of Zibrik L et al. (as cited by Zhang et al.) were

contrary. In other words, male survivors had higher health literacy than females in Escoffery, making them more likely to participate in a clinical trial and report fewer concerns. Escoffery (as cited by Zhang et al.) found no difference in health literacy between genders, attributing this to cultural differences (25). In some studies (28), insufficient health literacy in both genders has been shown to negatively affect health-related quality of life in patients with breast, lung, colon, prostate, and head and neck cancer, the reason of which has been attributed to inadequate use of healthcare services, higher mortality rates, worse health, and poorer physical functioning (26). Nevertheless, according to research (34), sufficient evidence was not found to confirm the association between health literacy and quality of life in women with cancer.

Therefore, some factors, such as cultural characteristics, geographic location, self-efficacy, age, gender, education level, and health skills may be effective in the relationship between health literacy and quality of life (23, 24). Research findings (30) have demonstrated that one reason for the lack of correlation between health literacy and quality of life among women with cancer was the similarity in responses to health literacy questions or the dual nature of the tools used to assess health literacy, as most survivors had adequate health literacy. In addition, another research indicated that inadequate health literacy was significantly associated only with lower social-emotional quality of life and not with the physical aspect of quality of life (26). Some researchers have found that quality of life differs depending on the varying levels of health literacy. For example, individuals with low health literacy who are part of a care coordination system experience an improvement in the physical aspect of their quality of life post-treatment, whereas no changes are noted in the quality of life of individuals with moderate and high health literacy (17). Furthermore, in another study, low health literacy and academic achievement had a direct relationship with the physical aspect, while no such relationship was observed in individuals with high health literacy (18). In conclusion, further research and investigations seem to be crucial to elucidate the association between gender and health literacy across different cultures, and considering mediating and moderating variables (age, education level, income, self-efficacy, etc.).

5.1. Research Limitations

Due to being exposed to the conditions of Covid-19 and its impact on the quality of life in this study,

considering that the research sample was selected from a hospital using voluntary sampling with the help of a self-report questionnaire, caution should be observed in generalizing the results.

5.2. Suggestions

5.2.1. Research Suggestions

- The research has been done in COVID-19 conditions. For better generalization of the results, it is suggested to repeat the research in normal conditions.

- In examining the relationship between cancer health literacy and the quality of life of cancer survivors, the mediating role of other variables (such as gender, age, perceived social support, self-efficacy, cultural differences, different geographical areas, and socio-economic status) should also be examined.

- To have a clearer understanding of cognitive dysfunctions, and the side effects of therapies and to provide appropriate coping strategies, it is necessary to do more research in this area.

5.2.2. Practical Suggestions

Physicians, nurses, and health care providers should pay attention to patient-reported cognitive function, even when objective assessments do not indicate deficits. To improve quality of life and increase cognitive function, cognitive-behavioral training, mindfulness, music therapy, yoga, exercise, and regular physical activity should be included in improved rehabilitation. Providing information about cognitive functions after treatment and ways to deal with them by preparing brochures and simple pamphlets should also be considered.

5.3. Conclusions

The research findings indicate that the quality of life for cancer survivors is generally low. The study investigated the connection between health literacy, cognitive function, and the quality of life of male and female cancer survivors. Both health literacy and cognitive function significantly impacted the quality of life for both genders, with cognitive function having the greatest impact. Therefore, to enhance the quality of life for cancer survivors, it is important to focus on cognitive function failure for both men and women and to increase health literacy specifically for men following treatment.

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