Effect of Self-Care Strategies on Health Outcomes of Patients with Hepatocellular Carcinoma

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ABSTRACT

Context: Hepatocellular carcinoma is the prevailing form of primary liver cancer among adults and currently ranks as the primary cause of mortality in cirrhosis individuals. Globally, hepatocellular carcinoma holds the sixth position in terms of cancer-related fatalities. Efforts are underway to leverage self-care approaches, combining local and regional treatments with systemic therapeutic protocols to enhance patient outcomes throughout various disease stages.
Aim: Evaluate the effect of self-care strategies on patients with hepatocellular carcinoma health outcomes.
Methods: A quasi-experimental research, specifically a one-group pre/post-test design, was employed in this study. The research was conducted in the internal medicine units of Tanta Cancer Center, Tanta, Egypt. The study included a purposive sample of 60 patients of both genders over nine months. Three assessment tools were utilized: A structured interview questionnaire for gathering personal information, medical history, and patient knowledge, a self-care practice assessment scale, and a health outcomes assessment scale.
Results: Patients' knowledge scores regarding all the knowledge elements improved significantly post-implementation of self-care strategies compared with their pre-intervention levels. Total knowledge score improved post-self-care strategies implementation from 20% to 81.7% with a statistically significant difference between pre and post-implementation of the self-care strategies (X^2=5.496, p=0.019). Also, the total self-care practice score increased from 16.7% to 68.3%, with a statistically significant difference between pre and post-implementation of the self-care strategies (X^2=5.561, p=0.018). Regarding patients' health outcomes improved from experiencing severe symptoms among 53.4% to 6.7% post one month, respectively, with a statistically significant difference between pre and post-implementation of the self-care strategies regarding all assessed health outcomes (p<0.05).
Conclusion: Self-care strategies have effectively enhanced patients' knowledge, self-care practice, and overall health outcomes. The study results recommend providing ongoing patient education regarding self-care management for patients with hepatocellular carcinoma to effectively address symptoms and enhance their quality of life.

Keywords: Health outcomes, hepatocellular carcinoma, self-care strategies

1. Introduction

Hepatocellular carcinoma (HCC) represents the most prevalent type of primary liver cancer, making up more than 90% of all cases. It is frequently associated with cirrhosis, occurring in around 85% of patients. Hepatocellular carcinoma is the fifth most common cancer globally and the second most common cause of cancer-related death in men after lung cancer *(Asafo-Agyei & Samant, 2023).* Liver cancer poses a significant threat to global health, with its spread globally. Projections indicate that by 2025, over one million individuals will be diagnosed with liver cancer yearly *(Villanueva, 2019).*

The primary contributing factor to its development is infection with the Hepatitis B virus, responsible for approximately half of all incidents. Even after successful clearance of the Hepatitis C virus (HCV), individuals with cirrhosis continue to face a heightened risk of HCC. Another rapidly emerging cause of HCC is non-alcoholic steatohepatitis (NASH), often linked to metabolic syndrome or diabetes mellitus, and this etiology is on the rise *(Akinyemiju et al., 2017; Estes et al., 2018).*

Numerous factors, including but not limited to gender, age, ethnic background, and geographic location,

contribute to the elevated incidence rates of HCC. The primary culprits among the contributing factors are persistent infections with hepatitis B virus or hepatitis C virus, exposure to carcinogenic substances such as tobacco use, food contaminants, and environmental toxins, as well as genetic predispositions. Recent research has underscored the strong association between metabolic syndrome, alcohol consumption, and a high-calorie diet as the principal factors driving HCC in regions characterized by a sedentary Western lifestyle *(Suresh et al., 2020).*

Hepatic complications of HCC include worsening ascites, hepatic encephalopathy, portal vein thrombosis, variceal bleeding, pyogenic liver abscess, and obstructive jaundice. Intraperitoneal bleeding is a severe and potentially life-threatening complication associated with hepatocellular carcinoma. Patients typically exhibit symptoms such as increased abdominal size and discomfort, anemia, and low blood pressure. In descending order of occurrence, the most common locations for hepatocellular carcinoma (HCC) metastasis outside the liver are the lungs, intra-abdominal lymph nodes, bones, and adrenal glands *(Harding et al., 2018).*

Enhancing self-care management strategies, which encompass lifestyle improvements such as reducing

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obesity, adopting healthy food, refraining from alcohol consumption, stopping smoking, and improving physical activity, holds the potential to alleviate HCC symptoms. Nutrition choices are not limited to addressing obesity alone; they also play a crucial role. Consumption of polyunsaturated fatty acids and foods like fish, poultry, vegetables, and fiber is linked to a decreased risk of hepatocellular carcinoma. Conversely, consuming sugar, saturated fat, red meat, and cholesterol is associated with an elevated risk. Multiple studies consistently highlight the beneficial impact of physical activity in reducing HCC risk. It is crucial to emphasize that alcohol consumption and smoking can increase the likelihood of liver fibrosis and liver cancer, thereby heightening the risk *(Zelber-Sagi et al., 2022)*.

Nurses caring for patients with HCC need to acknowledge the quality of life (QOL) and symptom-related concerns. They should also provide robust support for effectively managing symptoms in these vulnerable patients. Supportive nursing care indicates the care aimed at enhancing the QOL of patients facing serious or life-threatening illnesses. The primary objective of supportive nursing care is to prevent or promptly address disease symptoms, treatment-related side effects, and the spiritual, social, and psychological issues associated with the illness or its management *(Shaaban, 2021)*.

The importance of the self-care concept is strongly linked to the human necessity for enhancing and maintaining health and facilitating recovery. This concept gains prominence due to a lack of accessible healthcare services, insufficient healthcare access, and rising healthcare expenses. Furthermore, self-care strategies are pivotal in alleviating disease symptoms and complications, expediting recovery, shortening hospital stays, and reducing the need for re-hospitalization. Research has shown that a lack of self-care knowledge among individuals with chronic illnesses is a primary reason for frequent visits and readmissions to healthcare facilities. Providing self-care strategies to such individuals can help minimize complications, enhance health outcomes, and reduce the overall cost of treatment *(Foreman & Mateo, 2019)*.

2. Significance of the study

Hepatocellular carcinoma (HCC) is the sixth most predominant cancer worldwide *(Forner et al., 2018)*. Unfortunately, it holds the grim distinction of Egypt's leading cause of cancer-related deaths and illness. In the specific context of Egypt's cancer profile, HCC is the fourth most frequently occurring cancer *(Akinyemiju et al., 2017)*. It is worth noting that Egypt is Africa's third most populous country and ranks fifteenth in the global population. Health authorities in Egypt grapple with the formidable challenge posed by HCC. Over a decade, the number of individuals diagnosed with HCC has doubled *(Rashed et al., 2020)*. From 2014 to 2020, Egypt conducted screenings for HCV for over 50 million people and provided treatment to over 4 million residents *(Hassanin et al., 2021)*.

At Tanta Cancer Center, the incidence of HCC was 620 cases by the end of 2022 *(Tanta Cancer Center Statistical Office, 2022)*. From the previous studies, we can

determine the importance of this problem and its actual size. This study will highlight the Self-care strategies among the studied patients with HCC, which could reflect their actual physical, psychological, and social needs. This study could help plan nursing strategies to improve health outcomes and quality of life. Hence, the primary objective of this study is to evaluate how self-care strategies influence the health outcomes of individuals diagnosed with Hepatocellular carcinoma.

3. Aim of the study

Evaluate the effect of self-care strategies on health outcomes of patients with hepatocellular carcinoma.

3.1. Research Hypotheses

- Patients with hepatocellular carcinoma subjected to the self-care strategies could significantly improve their knowledge and self-care practices post-intervention compared to pre-intervention.
- Patients with hepatocellular carcinoma subjected to self-care strategies could significantly improve their health outcomes post-intervention compared to pre-intervention.
- A significant correlation could exist between patients' knowledge, self-care practice, and health outcomes post-implementing self-care strategies.

4. Subjects & Method

4.1. Research Design

A quasi-experimental research design utilizing a one-group pre and post-test approach was utilized to fulfill the aims of this study. In a quasi-experimental design, researchers assess the causal effect of an intervention on a particular population without random assignment *(Handley et al., 2018)*. This design elucidates relationships, sheds light on specific events, or both. It also examines causal connections.

However, quasi-experimental designs offer less control than experimental designs in at least one of three aspects. They involve manipulating treatment variables, manipulating the setting, or selecting subjects. In clinical nursing studies, subjects are frequently chosen based on convenience rather than through random selection *(Foreman & Mateo, 2019)*. Consequently, nursing researchers are increasingly opting for quasi-experimental studies.

Self-care strategies administered to patients for managing hepatocellular carcinoma were the independent variable. The dependent variables, conversely, encompass patient knowledge, self-care practices, and the health outcomes of individuals diagnosed with hepatocellular carcinoma.

4.2. Study setting

The study was carried out in internal medicine units at Tanta Cancer Center. It is located on the 2nd floor, including four male rooms, each accommodating three beds, and the 3rd floor for females. Each room includes six beds. Available equipment is an ECG machine, monitor, pulse oximeter, oxygen flow meter, nebulizer, and a physician's office and nursing station. The reason for taking the research sample from the Tanta Cancer Center

is that there is no liver cancer center in Benha and a lack of sufficient numbers of patients to conduct the research.

4.3. Subjects

A purposive sample of 60 patients, representing both genders, was diagnosed with HCC over nine months. Initially, were 66 patients in the total sample, but six patients from the pilot sample were excluded later.

The following equation was used to estimate the sample:

$$n= \frac{Z^2\,P\,(1-P)}{d^2}$$

Where n indicates the sample size,

Z = Z statistics indicating the level of confidence,

P indicates the expected prevalence or proportion,

d indicates the precision for the expected prevalence of 4.7% *(Bray et al., 2020)*. A sample size of 60 is required, allowing for a margin of error or absolute precision of ±5% when estimating prevalence at a 95% confidence level. This calculation considers a potential loss or attrition rate of 5%. With this sample size, the anticipated 95% confidence interval ranges from -0.3% to 9.7%. The sample size calculation was performed using the SP calculator, following the methodology described by *Naing et al. (2022).*

4.4. Tools of data collection

4.4.1. Structured Interview Questionnaire

It was adapted from *Alavinejad et al. (2019)*, and the researchers made minor modifications by adding or omitting some items. It consisted of the following three sections:

Section 1 is concerned with patient demographic information. This section comprised six inquiries about age, gender, marital status, educational background, occupation, and place of residence.

Section 2 is concerned with patients' medical history. It included nine questions about treatment dispensing, previous and current hospitalization and its cause, detection, and causes of HCC, previous frequent blood transfusion, associated chronic diseases, and medication history. Also, three questions about smoking, duration, and daily cigarette number consumed.

Section 3 is the Patients' Knowledge Assessment Questionnaire: It was adapted from *Mohammed et al. (2019); Goldsworthy et al. (2017)*, and the researchers made and minor modifications by adding or omitting some items. It consisted of 19 MCQ questions about General knowledge regarding the anatomy, function of the liver, and definition of HCC (3 questions), risk factors, causes, signs, symptoms, and diagnosis of HCC (3 questions), diagnostic and treatment measures of HCC (2 questions), complications of HCC and methods of its prevention (5 questions), precautions to relieve symptoms of HCC and dietary instructions (6 questions).

Scoring system

Each question was scored as the correct response was awarded a score of one, while an incorrect response was scored as zero. The total knowledge score was 19 points. These scores were then transformed into percentages and grouped as follows:

- Satisfactory level (70% or higher) = 13 to 19 points.
- Unsatisfactory level (less than 70%) = Fewer than 13 points.

4.4.2. Self–Care Practice Assessment Scale

Zhang et al. (2019) developed this scale to assess the patients' self-care practices. Researchers adjusted this assessment tool through the inclusion or exclusion of certain items. It is a three-point scale consisting of 30 items and categorized into four dimensions. They were nutrition management (10 questions), daily lifestyle (11 questions), medication (4 questions), and disease monitoring (5 questions).

Scoring system

The Self-care practice assessment scale was scored against a three-point scale as follows: "All the time" response received two scores, the "sometimes" response received one score, and the "never" response scored zero. The total score of self–care strategies was 60 points. The overall score was transformed into a percentage and subsequently classified in the following manner:

- Satisfactory level (70% or more) = 42 points to 60 points.
- Unsatisfactory level (less than 70%) = less than 42 points.

4.4.3. Patients' health outcomes scale

It was adapted from *Abdel Raheem and Mohamed (2017)*. It is a three-point scale consisting of nine questions, including GIT problems, inability to perform activities of daily living, general pain, joint pain, dyspnea or orthopnea, peripheral edema, weight changes, memory problems, and psychological problems such as depression or anxiety.

Scoring system

Patients' health outcomes scale was scored as follows: "All the time" scored as two scores, "some of the time" scored as one score, and "never" scored as zero. The total score of the patients' health outcomes scale was 18 points. The total score is converted into percent and then categorized according to severity.

- Minimal: Scores between 0 and 4
- Low: Scores between 5 and 9
- Moderate: Scores between 10 and 14
- High: Scores between 15 and 18

4.4.4. Self-Care Strategies Booklet

After an extensive literature review, the researcher developed a self-care strategies booklet based on *Awadallah et al. (2020)*. It consists of two parts:

- The theoretical part included the definition, risk factors of HCC, signs and symptoms, diagnostic measures, investigations, management, and instructions about the preventive measures for complications.
- Self-care strategies (practical part): It included daily-life management of HCC, dietary instructions, illness monitoring, medication management, mouth care, enema, and care of pruritus.

4.5. Procedures

Permission to carry out the study was obtained by submitting an official letter from the Dean of Benha University's Faculty of Nursing to the Director of the Tanta

Cancer Center, clarifying the study's aim and expected outcomes.

Ethical considerations: Approval was obtained from the Scientific Research and Ethics Committee at Benha University's Faculty of Nursing before initiating the research. Before data collection, the research team provided the involved patients with a comprehensive overview of the study's objectives. Verbal consent was sought from the studied patients to confirm their voluntary participation. The researchers assured the complete confidentiality and anonymity of all collected data. Patients were told they had the autonomy to decide whether to participate in the study and retained the right to withdraw at any time.

The preparatory phase involved reviewing current literature on various aspects of research to develop tools and self-care strategies. The tool's validity and reliability were carefully assessed. Five professors in Medical-Surgical Nursing at the Faculty of Nursing, Benha University, evaluated the tool's content and face validity and provided valuable feedback, leading to necessary adjustments. Cronbach's alpha coefficient was calculated to gauge the reliability of the knowledge assessment questionnaire, resulting in a high score of 0.980. As for the second tool, assessing self-care practice, its reliability was determined to be 0.830, while for patients' health outcomes, it was found to be 0.977. These findings unequivocally demonstrate that this instrument is highly reliable.

Pilot study: To ensure the clarity and practicality of the study instruments, estimate the time required for data collection, identify potential challenges, and assess the feasibility of the research process. A pilot study involving 10% of the study's participants (6 patients) was conducted. Based on the insights gained from the pilot study, necessary adjustments were made to improve the data collection tools. Notably, the pilot study patients were excluded from the final group of study participants. This pilot study occurred two weeks prior to the commencement of the main study.

Fieldwork: The Director of the Tanta Cancer Center granted formal authorization. The data collection process spanned nine months, commencing from October 2022 and concluding at the end of June 2023.

During the assessment phase, which lasted for two months, each patient underwent a structured interview using a questionnaire to evaluate their baseline needs.

The planning phase extended over two months, during which the self-care strategies were devised, reviewed, and adjusted following the patients' individual needs.

The implementation phase, spanning three months, involved the researchers delivering the self-care strategies to the patients immediately after data collection. The self-care strategies were implemented through five sessions, each lasting one hour and accommodating five patients.

Session one was constructed to orient the patient with program sessions, explain its purpose, and discuss the definition, causes, signs, and symptoms of hepatocellular carcinoma.

Session two was constructed to discuss the patients' knowledge related to methods of diagnosis of hepatocellular carcinoma.

Session three included treatment of hepatocellular carcinoma, dietary regimen, and general advice to patients.

Session four educates the patients about the importance of self-measuring blood glucose levels and medications that patients should avoid.

Session five concerns practical parts such as enema, oral, and skincare.

Evaluation phase: Patients' knowledge was evaluated immediately after program implementation. Patients' health outcomes were evaluated after one month of applying self-care strategies.

4.6. Data analysis

The collected data were systematically organized and analyzed using the IBM computer with Statistical Package for Social Science (SPSS), version 25. Descriptive statistics such as mean and standard deviation were utilized for numeric data, while qualitative data were represented in frequency and percentage. Chi-square tests were employed to investigate associations between qualitative variables. Pearson correlation coefficients were utilized to examine relationships among numerical variables. For a multivariate analysis of patients' health outcomes, with the dependent variable being patients' health outcomes, linear regression was employed. Statistical significance was set at $p \leq 0.05$, with a p-value of 0.001 considered highly significant.

5. Results

Table 1 illustrates that 50% of patients diagnosed with HCC were 50-60 years old, with a mean age of 49.42 ± 0.65. Among these patients, 75% were males, and 80.1% were married. Regarding educational background, 46.6% had basic literacy skills (reading and writing), 55% were engaged in manual labor, and 80% resided in rural areas.

Table 2 demonstrates that 58.3% of HCC patients were treated at the government's expense, and 45% were hospitalized twice before due to hepatic coma and discovered the disease through symptoms (63.3%). While 65% had cirrhosis as a cause of the disease, and 50% received blood transfusions twice. While 33.4% and 30% of them had comorbidities such as diabetes mellitus and heart disease, respectively, and take medications for these diseases. Also, 46.6% were cigarette smoking, 80% were smoking for more than three years, and 51.6% smoked a full pack (20) of cigarettes daily.

Table 3 demonstrates statistically significant differences in all knowledge elements related to hepatocellular carcinoma and its self-care pre- and immediately post the application of self-care strategies (p-value ≤ 0.05).

Figure 1 reveals an enhancement in patients' overall knowledge level post implementing self-care strategies. The initial total knowledge score, which stood at 20%, showed improvement, reaching 81.7% post-integrating self-care strategies in the patient's treatment plan.

Table 4 clarifies that statistically significant differences existed across all aspects of total self-care practices among the studied patients pre- and immediately after implementing self-care strategies (p-value ≤ 0.05).

Figure 2 illustrates an enhancement in the overall self-care practice level among the studied patients pre-

implementation of self-care strategies, initially at 16.7%, and progressed to 68.3% following the adoption of self-care strategies.

Table 5 reveals highly significant statistical differences in health outcomes among the studied patients pre- and one month post applying self-care strategies across all items (p-value < 0.001). The only exceptions were the items related to experiencing gastrointestinal symptoms and feeling fatigued during activities of daily living, where statistically significant differences were observed (p-value ≤ 0.05).

Figure 3 demonstrates that patients' health outcomes had improved from 53.4% feeling of severe symptoms pre-self-care strategies implementation and reached 6.7% post-one month of follow-up.

Table 6 demonstrates a statistically significant association between patients' age, gender, educational level, occupation, and overall knowledge level after implementing self-care strategies (p-value <0.001). Additionally, there were statistically significant associations between patients' age, gender, marital status, educational background, occupation, and residence with their total practice level post adopting self-care strategies (p-value ≤0.05). However, no significant relationship was found between the total knowledge level and patients' residence post-self-care strategies application.

Table 7 indicates a statistically significant positive correlation between patients' overall knowledge and their total self-care practice level post implementing self-care strategies (p-value < 0.001).

Table 8 presents that patients' health outcomes were best predicted by knowledge level post-self-care strategies implementation, presence of comorbidities, and practice level (p= <0.001, 0.003, and 0.036, respectively), accounting for 88.9% of the variance of patients' health outcomes.

6. Discussion

Hepatocellular carcinoma (HCC) is the most prevalent form of primary liver cancer. It primarily afflicts individuals with chronic liver ailments, notably cirrhosis resulting from hepatitis B or hepatitis C infection *(Nartey et al., 2022)*. Self-care encompasses individuals' capacity to take charge of their symptoms, treatment, physical and psychological repercussions, and lifestyle adjustments. Self-care refers to the fundamental human ability to regulate various aspects of one's health, placing individuals in control. It holds particular significance for patients with chronic conditions, as they are often tasked with making numerous daily decisions and self-managing their illnesses. Effective self-management is paramount; self-management education complements conventional patient education within primary care settings. It aims to empower patients to lead the highest possible quality of life while managing their chronic conditions *(Foreman & Mateo, 2019)*. Evaluate the effect of self-care strategies on health outcomes of patients with hepatocellular carcinoma.

Table (1): Frequency and percentage distribution of HCC patients' characteristics (n= 60).

Patients' demographic variables	No.	%
Age/years		
30 - < 40	5	8.3
40- <50	25	41.7
50 – 60	30	50.0
Mean ± SD	49.42±0.65	
Gender		
Male	45	75.0
Female	15	25.0
Marital status		
Single	2	3.3
Married	48	80.1
Divorced	5	8.3
Widowed	5	8.3
Educational level		
Cannot read and write	22	36.7
Read and write	28	46.6
Intermediate qualification	6	10.0
High qualification	4	6.7
Occupation		
Manual work	33	55.0
Employee	13	21.7
Not working	14	23.3
Residence		
Rural	48	80.0
Urban	12	20.0

Table (2): Frequency and percentage distribution of HCC patients' medical history (n=60).

Patient's medical history	No.	%
Treatment is dispensed through		
At the government's expense	35	58.3
Comprehensive medical insurance	21	35.0
At the patient's own expense	4	6.7
Previous hospitalization		
Once	13	21.7
Twice	27	45.0
Three times or more	20	33.3
Reason for current admission to the hospital		
Bleeding from varicose veins	2	3.3
Hepatic coma	38	63.3
Ascites in the abdomen	10	16.7
A defect in awareness and mental abilities	10	16.7
How was the disease discovered		
Having symptoms	38	63.3
By investigations	22	36.7
The cause of the disease		
Liver cirrhosis	39	65.0
Unknown cause	21	35.0
Had a blood transfusion		
Once	22	36.7
Twice	30	50.0
Three times or more	8	13.3
Presence of comorbidities		
Kidney disease	8	13.3
Diabetes	20	33.4
Hypertension	14	23.3
Heart disease	18	30.0
Take any medications		
Medicines to treat kidney disease	8	13.3
Hypoglycemic drugs	20	33.4
Antihypertensive drugs	14	23.3
Medications for cardiac disease	18	30.0
Smoking		
None smoker	19	31.7
Cigarette smoker	28	46.6
Shisha smoker	13	21.7
The duration of smoking		
1-3 years	12	20.0
> 3 years	48	80.0
Number of cigarettes smoked per day		
Less than five cigarettes	4	6.7
5-10 cigarettes	10	16.7
A full pack (20 cigarettes)	31	51.6
More than one pack	15	25.0

The current study discloses that approximately half of the patients fell within the age range of fifty to sixty years, with a mean age of 49.42±0.65 years. This observation may be attributed to the higher prevalence of liver disease in middle-aged and elderly individuals compared to younger age groups. This finding aligns with a study conducted by *Le et al. (2019),* which investigated the primary liver cancer burden and its underlying causes from 1990 to 2015 at a global, regional, and national level. The study revealed that the typical age of hepatocellular carcinoma (HCC) diagnosis was 58 years.

The current study findings contradict *Atya et al. (2019),* who investigated the effect of nursing teaching guidelines on the knowledge regarding lessening hepatic encephalopathy of patients with cirrhosis. They found that the age group of sixty to less than sixty-five constitutes more than half of the studied patients, with a mean age of 59.16±6.04 years.

The current study indicates that three-quarters of the patients were males. This finding could be attributed to the higher prevalence of liver disease among males than females in rural communities, which is evident in this study that eighty percent of patients were living in rural communities. This observation aligns with the findings of *Shedeed (2021),* who studied the effect of the home healthcare model on the post-liver transplantation quality of life. Similarly, around two-thirds of the patients in the study were males.

**Tables (3): Comparison of patients' knowledge pre and post self-care strategies implementation (n=60).**

Knowledge elements	Pre		Post		X² test	P value
	No.	%	No.	%		
General knowledge about liver cirrhosis						
Satisfactory	8	13.3	41	68.3	4.278	0.039
Unsatisfactory	52	86.7	19	31.7		
Risk factors and causes of liver carcinoma						
Satisfactory	9	15.0	42	70.0	4.538	0.033
Unsatisfactory	51	85.0	18	30.0		
Diagnostic and treatment measures						
Satisfactory	12	20.0	45	75.0	5.000	0.025
Unsatisfactory	48	80.0	15	25.0		
Complications of liver cirrhosis and its preventive measures						
Satisfactory	20	33.3	44	73.3	11.760	0.001
Unsatisfactory	40	66.7	16	26.7		
Precautions to relieve symptoms						
Satisfactory	13	21.7	46	76.7	5.051	0.025
Unsatisfactory	47	78.3	14	23.3		
Dietary instructions						
Satisfactory	12	20.0	47	78.3	4.149	0.042
Unsatisfactory	48	80.0	13	21.7		
Total knowledge score						
Satisfactory	12	20.0	49	81.7	5.496	0.019
Unsatisfactory	48	80.0	11	18.3		
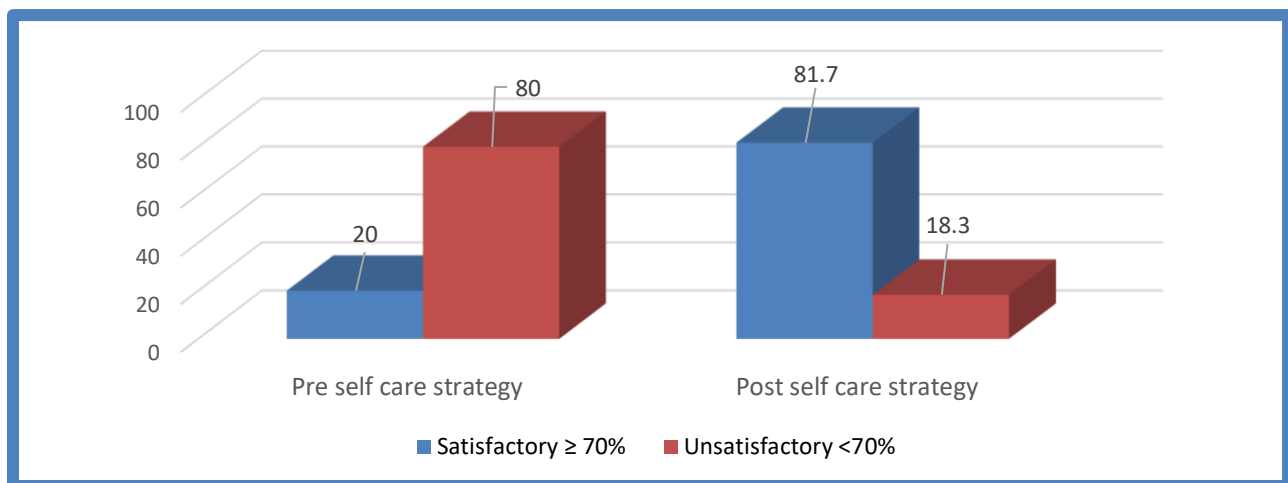
Figure (1): Percentage distribution of total knowledge score of the studied patients' pre- and post-self-care strategies implementation (n=60)

Table (4): Comparison of studied patients' self-care practice pre- and post-self-care strategies implementation (n=60)

| Patients' self-care practices	Pre		Post		X² test	P-value
	No.	%	No.	%		
Dietary habits						
Satisfactory	14	23.3	41	68.3	8.462	0.004
Unsatisfactory	46	76.7	19	31.7		
Daily lifestyle						
Satisfactory	10	16.7	34	56.7	9.176	0.002
Unsatisfactory	50	83.3	26	43.3		
Taking medication						
Satisfactory	24	40.0	52	86.7	13.846	<0.001
Unsatisfactory	36	60.0	8	13.3		
Disease follow up						
Satisfactory	5	8.3	34	56.7	4.171	0.041
Unsatisfactory	55	91.7	26	43.3		
Total self-care practice						
Satisfactory	10	16.7	41	68.3	9.101	0.018
Unsatisfactory	50	83.3	19	31.7		
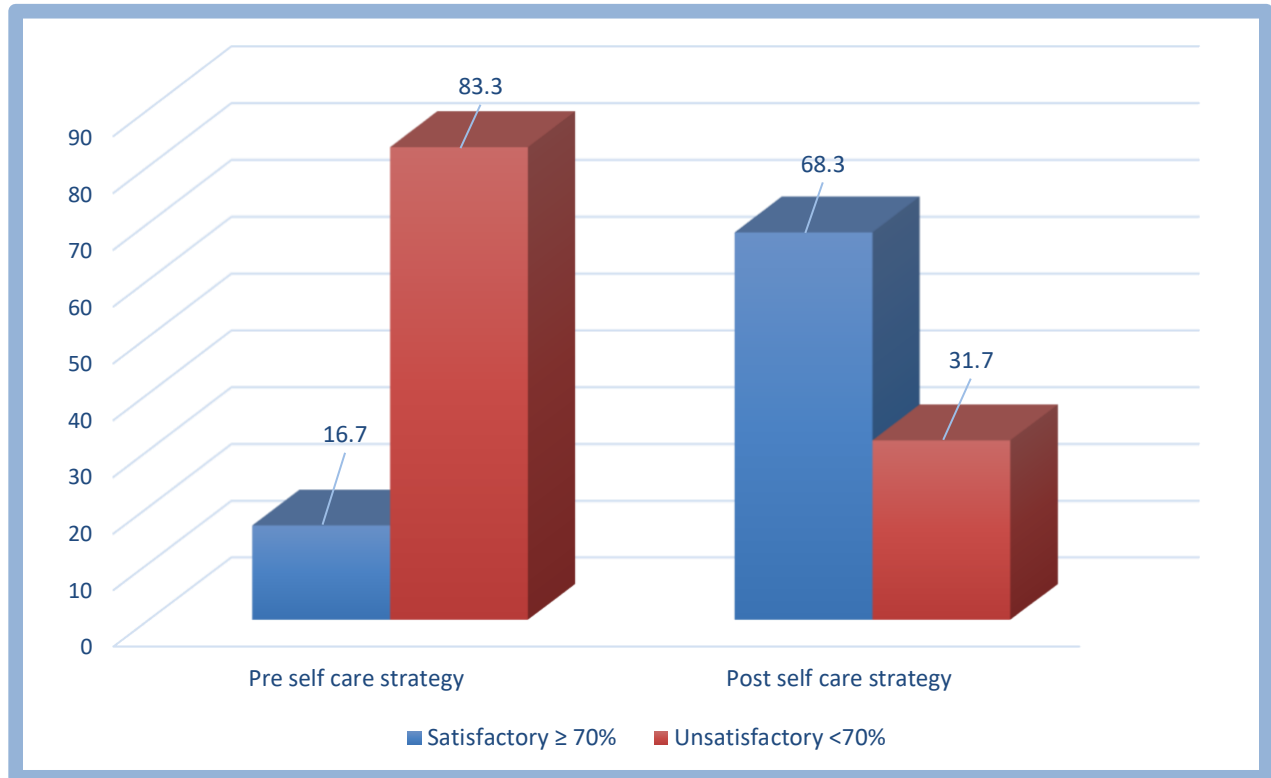
Figure (2): Percentage distribution of total self-care practice score of the studied patients' pre- and post-self-care strategies implementation (n=60).

Table (5): Comparison of health outcomes of the studied patients' pre and post-one-month self-care strategies implementation (n=60)

Patients' health outcomes	Pre						Post						X² test	P value
	Always		Sometimes		never		Always		Sometimes		never			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
- Feel symptoms of a gastrointestinal disorder	42	70.0	12	20.0	6	10.0	0	0.0	16	26.7	44	73.3	9.35	0.009
- Feel tired when doing the activities of daily life	39	65.0	17	28.3	4	6.7	0	0.0	10	16.7	50	83.3	6.46	0.040
- Feel joint pain when climbing stairs or when doing light sports	36	60.0	19	31.7	5	8.3	0	0.0	23	38.3	37	61.7	24.86	<0.001
- Feel shortness of breath when sleeping or when making a slight effort	32	53.3	24	40.0	4	6.7	9	15.0	29	48.3	22	36.7	41.90	<0.001
- Notice swelling in the extremities when adding salt with food or standing for a long time.	33	55.0	22	36.7	5	8.3	5	8.3	19	31.7	36	60.0	107.50	<0.001
- Weight loss occurs despite eating enough food	26	43.3	27	45.0	7	11.7	4	6.7	26	43.3	30	50.0	75.65	<0.001
- Sometimes feel that there is a memory problem	19	31.7	31	51.6	10	16.7	7	11.7	33	55.0	20	33.3	93.51	<0.001
- Feel the presence of psychological symptoms as a result of a chronic illness.	28	46.7	25	41.6	7	11.7	9	15.0	22	36.7	29	48.3	98.54	<0.001
- Feel sporadic pain in the body in general	43	71.7	14	23.3	3	5.0	10	16.7	26	43.3	24	40.0	39.93	<0.001
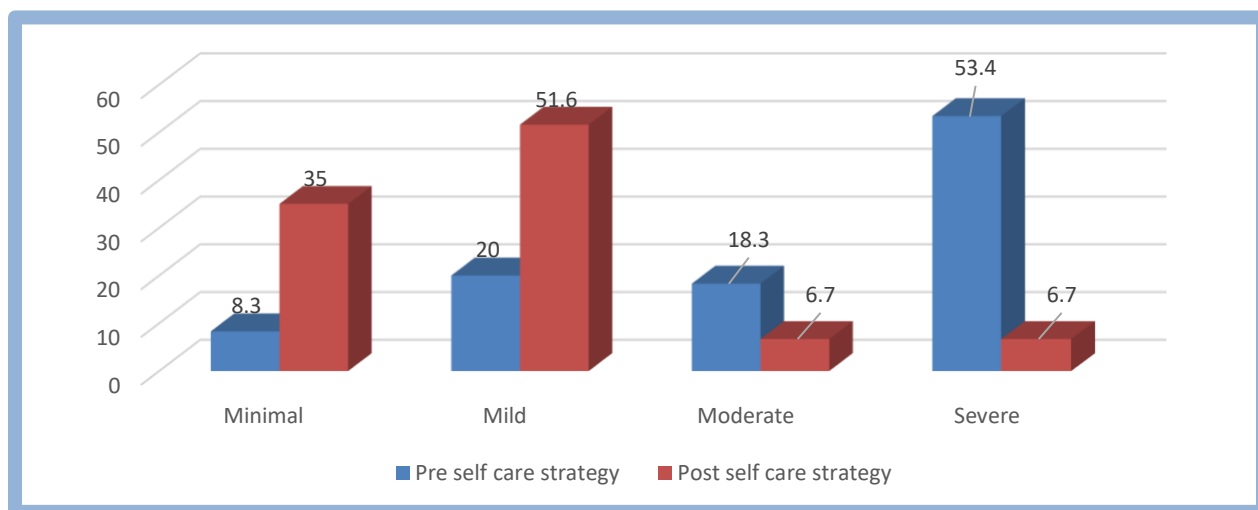
Figure (3): Percentage distribution of total health outcomes score of the studied patients' pre- and post-s self-care strategies implementation (n=60).

Table (6) Relation between socio-demographic characteristics with total knowledge and practice levels among the studied patients immediately post self-care strategies implementation (n=60).

variables	Total knowledge level						Total self-care practice level					
	Satisfactory (n=49)		Un Satisfactory (n=11)		X^2 Test	P value	Satisfactory (n=41)		Un Satisfactory (n=19)		X^2 Test	P value
	No.	%	No.	%			No.	%	No.	%		
Age												
30 - < 40	5	10.2	0	0.0			5	12.2	0	0.0		
40- <50	25	51.0	0	0.0	13.46	0.001	25	61.0	0	0.0	27.80	<0.001
50 - 60	19	38.8	11	100.0			11	26.8	19	100.0		
Gender												
Male	34	69.4	11	100.0	4.49	0.034	26	63.4	19	100.0	9.26	0.002
Female	15	30.6	0	0.0			15	36.6	0	0.0		
Marital status												
Single	22	44.9	0	0.0			22	53.7	0	0.0		
Married	17	34.7	11	100.0	15.39	0.002	9	22.0	19	100.0	31.77	<0.001
Divorced	6	12.2	0	0.0			6	14.5	0	0.0		
Widowed	4	8.2	0	0.0			4	9.8	0	0.0		
Educational level												
Cannot read and write	0	0.0	2	18.2			0	0.0	2	10.5		
Read and write	39	79.6	9	81.8	11.16	0.011	31	75.6	17	89.5	9.26	0.026
Intermediate qualification	5	10.2	0	0.0			5	12.2	0	0.0		
High qualification	5	10.2	0	0.0			5	12.2	0	0.0		
Occupation												
Manual work	22	44.9	11	100.0			14	34.1	19	100.0		
Employee	13	26.5	0	0.0	11.02	0.004	13	31.8	0	0.0	22.74	<0.001
Not working	14	28.6	0	0.0			14	34.1	0	0.0		
Residence												
Rural	37	75.5	11	100.0	3.36	0.067	29	70.7	19	100.0	6.95	0.008
Urban	12	24.5	0	0.0			12	29.3	0	0.0		

Table (7) Correlation between total knowledge and self-care practice among the studied patients post self-care strategies implementation (n=60).

Variables	otal knowledge	
	r	P value
Total practice (Post self-care strategies)	0.772	<0.001

Table (8): Multiple linear regression analyses for predictor variables of patients' health outcomes post self-care strategies implementation (n=60)

Patients' health outcomes	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value
	B	**Std. Error**	**Beta**		
(Constant)	6.200	1.932		3.209	0.002
Age	0.301	0.401	0.095	0.750	0.457
Sex	1.047	0.601	0.224	1.743	0.088
Education level	-0.495	0.353	-0.253	-1.401	0.168
Marital status	-0.518	0.472	-0.162	-1.098	0.278
Occupation	-0.008	0.220	-0.006	-0.037	0.971
Residence	0.115	0.651	0.023	0.177	0.860
presence of comorbidities	0.996	0.317	0.415	3.144	0.003
smoking habit	0.779	0.428	0.278	1.823	0.074
Knowledge level post-strategy implementation	-0.596	0.083	-0.623	-7.188	<0.001
Practice-level post-strategy implementation	-0.814	0.377	-0.332	-2.159	0.036
	Adjusted R^2= 0.889		P = <0.001		

(B) Beta Co-Efficient   *(SEB) Standard Error*

Conversely, *Ismail et al. (2018)* conducted a study on chronic hepatitis C patients treated with Sofosbuvir to assess their auditory functions. They reported that over half of their study participants were females.

Regarding patients' marital status, the current study reveals that most were married. This trend may be attributed to cultural factors within the studied sample community. This observation supports the work of *Abdullah et al. (2021)*, who conducted a study at Al-Rajhy Liver Hospital, Assiut University, to assess the quality of life among elderly with chronic liver diseases," they also found that most of their study sample was married.

Regarding the educational level, the present study's findings reveal that fewer than fifty percent of the studied patients possess basic literacy skills (reading and writing). This outcome may be attributed to the predominantly rural background of the studied patients, mostly farmers. This observation aligns with the conclusions of *Zhu et al. (2016)*, who study depression in patients with chronic hepatitis B and cirrhosis. They found that depression is closely associated with the severity of liver cirrhosis. Additionally, they pointed out that liver cirrhosis tends to be more prevalent among individuals with a middle school education.

Concerning their occupation, the results of the present study show that more than half of them had manual work; it might be due to their level of education and residence, as most were from rural areas. The result follows *Abdel Rehaim and Mohamed (2017)* in their study on "Knowledge of patients with liver cirrhosis regarding ascites self-management and noted that most of the patients had occupations in farming or manual labor. In contrast, *Al-Johani et al. (2018)* described that around two-thirds of the participants were employed in traditional job roles.

Regarding patients' residences, the current study indicates that most participants come from rural counties. This observation may be attributed to the geographic location of the Cancer Center in Tanta, which serves numerous rural counties within the Al-Gharbia governorate. This finding aligns with the research conducted by *Abdullah (2020)*, which explored the psychological problems among patients suffering from liver cirrhosis and found that a significant proportion of the studied patients also lived in rural regions. Conversely, *Majeed and Atiyah (2015)*, in their investigation at Baghdad Teaching Hospitals, about the

effect of liver cirrhosis on patients' daily living activities. They reported that more than half of their study participant hailed from urban regions.

Furthermore, the current study demonstrates that more than fifty percent of the patients received treatment at the government's expense. This outcome is agreed with *Phan et al. (2017)*, who studied the treatment cost of hepatocellular carcinoma in Vietnam. They noted that a substantial portion of the treatment expenses, specifically 83% covered by healthcare insurance, with the remaining 17% being the patients' responsibility.

The current study demonstrates that around half of the HCC patients had been hospitalized twice before. This finding could be attributed to the chronic nature of liver disease, which often necessitates frequent hospitalization. This finding aligns with the results of *Hassainine et al. (2018)*, who studied the effect of psycho-educational program on psychological stress and quality of life among patients with hepatitis C virus. The study revealed that around half of the participants had experienced two prior hospitalizations. Similarly, the study's results agree with those of *Soultan et al. (2019)*, who researched the effect of health education on the quality of life among liver transplant patients. They reported that most of their study's participants had a history of previous hospital admissions.

Conversely, the current study finding contradicts the results of *Ibrahim (2016)*, who studied the correlation between psychological distress and liver enzymes in patients with the hepatitis C virus. Only one-third of the studied sample had a previous history of hospitalization.

Furthermore, the current study emphasizes that hepatic coma was the reason for hospitalization among nearly two-thirds of the studied patients. This observation is likely linked to the high incidence of hepatic coma as a complication of liver cirrhosis. This finding aligns with the results presented by *Nartey et al. (2022)* in their study aimed to assess mortality rates from liver cirrhosis and hepatocellular carcinoma in Ghana: examining risk factors and identifying predictors of low survival rates during hospitalization, where it was noted that hepatic coma was the primary cause of admission for more than half of the patients.

However, *GBD 2017 Cirrhosis Collaborators (2020)* reported different findings in a study assessing the burden of

cirrhosis in 195 countries from 1990 to 2017. Their research indicated that lower limb edema was the most common cause of hospitalization among cirrhosis patients. Similarly, *Saleh et al. (2014)* reported that lower limb edema was the cause of hospitalization among more than half of the studied cirrhotic patients in a study about nutritional status in chronic liver disease.

The current study reveals that most patients included in the research became aware of their disease due to having symptoms. This finding may be attributed to a common practice in the Egyptian population, where routine checkups are not prioritized, and individuals typically seek medical advice only when they experience symptoms. This result aligns with *Elshamy et al. (2018)*, who investigated the influence of preoperative teaching regarding immunosuppressive therapy on patients' outcomes post-liver transplantation. Their research noted that over seventy-five percent of the patients became conscious of their illness once symptoms appeared. Similarly, this outcome corresponds with the study conducted at Mansoura University Hospitals by *Mohammed (2014)*, who assessed the self-care practices of patients with liver cirrhosis. Mohammed reported that the presence of symptoms was signaling the patient's awareness of the disease.

Regarding the primary cause of the disease, the present study indicates that nearly two-thirds of the patients with cirrhosis had contracted it due to cirrhosis. This high prevalence of hepatitis C-related cirrhosis may be attributed to the long-standing epidemic of hepatitis C in Egypt. These study findings agree with the findings of *Totti et al. (2019)*, who investigated post-operative outcomes after 12 months of a supervised exercise program provided to liver transplant recipients. The assessed outcomes included physical condition, liver function, glycemia, and quality of life. They reported that hepatitis C was the predominant cause of cirrhosis and liver damage in their study population.

Furthermore, this discovery aligns with a study conducted by *Atya et al. (2019)*, which revealed that most patients were diagnosed with hepatitis C, a known cause of liver disease. Additionally, *in their research, Volk et al. (2013)* assessed the patient knowledge regarding self-management of cirrhosis," reported that nearly half of the studied patients developed liver cirrhosis as a result of hepatitis B or C.

Regarding the history of blood transfusions, it was observed that half of them had received blood transfusions on two separate occasions. This pattern of blood transfusion may be attributed to the patient's overall health status, which often necessitates blood transfusions. These findings align with the results of *Awadallah et al. (2020)*, who studied the health behavior adjustment of elderly patients with chronic liver cirrhosis and reported that less than half of the elderly patients reported having previous blood transfusions. Conversely, *Kakkar et al. (2021)*, in their research on cirrhotic patient transfusion practices at a tertiary liver care center in Northern India, found that more than half of their patients did not require blood transfusions.

Moreover, the current study demonstrates that nearly one-third of the patients had comorbidities such as heart disease and diabetes mellitus, for which they received medications. This prevalence of comorbidities may be attributed to the association between cirrhosis and chronic diseases. These results agree with *Kuo et al. (2017)*, who conducted a study on patients with end-stage liver disease regarding factors linked to medication non-adherence. According to their findings, just under fifty percent of the patients in the study had hypertension, a little over a quarter had diabetes, and a small portion had coronary artery disease.

Mohamed and Mostafa (2018) reported similar findings that more than two-thirds of the liver transplant recipients had hypertension and diabetes in a study about the effects of education on self-care behavior and clinical outcomes in patients who had liver transplantation. Conversely, *Atya et al. (2019)* found that few patients had diabetes mellitus and hypertension, and no one of the studied patients had renal disorder.

Regarding smoking habits, the present study indicates that around half of the patients under study were cigarette smokers, and most of them had been smoked for more than three years. Additionally, over half of them smoked a full pack of cigarettes daily. These findings disagree with *Magalhães et al. (2018)*, who investigated patients' respiratory profile and exercise capacity after Orthotopic liver transplantation and reported that around three-quarters of patients were non-smokers.

Also, these results disagree with *Ali et al. (2017)*, who investigated the liver transplant patients' performance after the instructional scheme and found that more than half of the studied patients did not smoke. Additionally, these results do not align with a study conducted at Sharq Al-Madina Hospital in Alexandria, Egypt, by *Gamal Eldin et al. (2022)*, who examined the quality of life among chronic hepatitis C patients treated with Sovaldi regimen." The latter study reported that approximately three-fourths of the studied patients were non-smokers.

The current study demonstrates a statistically significant enhancement in patients' all knowledge elements after implementing self-care strategies compared to before the strategies were introduced. This improvement can be attributed to the theoretical sessions provided, which comprehensively covered various aspects of the disease and its management. This finding aligns with the first research hypothesis. These results are consistent with a study conducted by *Yehia et al. (2020)* in Menoufia Governorate, Egypt, regarding the effect of health education on risk factor prevention among patients with hepatocellular carcinoma. The study revealed that health education significantly increased the percentage of participants with good knowledge scores regarding HBV, HCC, HCV, aflatoxins, pesticides, and total knowledge scores at a p-value of 0.000 for each knowledge element.

Additionally, the present study shows an improvement in patients' self-care practices regarding dietary habits, daily lifestyle, taking medication, and follow-up following the application of self-care strategies compared to before implementation. This improvement may be attributed to the practical advice regarding the self-care strategies that involve important self-care aspects that help enhance the

healthy behaviors of patients with HCC. This result supports the first research hypothesis. These findings agree with *Yehia et al. (2020)*, who demonstrated that educational interventions effectively increased safe practice scores among study participants, improving scores from 20% and 23% before the intervention to 94.3% and 93.1% after the intervention, respectively.

Regarding patient health outcomes, the current study highlights a significant reduction in the experience of symptoms and discomfort during the first month following the implementation of self-care strategies compared to the period before their implementation. This improvement in health outcomes is likely attributable to patients adopting healthier behaviors taught in the self-care strategies program across various aspects of their daily lives. This finding supports the second research hypothesis. These results agree with *Israelsen et al. (2015)*, who reported a significant decrease in abdominal symptoms after health education in the case group. In contrast, the control group did not show any significant change.

Furthermore, the current study reveals a statistically significant association between socio-demographic factors and the overall levels of knowledge and practice among the studied patients immediately after applying self-care strategies. This association may be attributed to the patients living in rural areas. Moreover, a low educational level is accompanied by inadequate knowledge. It is also a factor in the determination of knowledge level, so when the individual has more education and has a social situation at an acceptable level, they can be more knowledgeable and improve their practice. These findings are consistent with those of *Ali (2018)*, who studied the lifestyle patterns of patients with hepatocellular carcinoma at the National Liver Institute and identified a highly significant statistical relationship between patients' total knowledge scores and their demographic characteristics. Additionally, these results align with the findings of *Al-Johani et al. (2018)* in their evaluation of knowledge regarding liver cirrhosis in the Saudi Population; they reported a significant positive correlation between younger age and higher educational levels with patients' knowledge.

Moreover, the research reveals a noteworthy and positive association between the overall knowledge and the patients' self-care practices following the implementation of self-care strategies. This link can be credited to the advantageous influence of continuous education on improving the self-care abilities of the patients involved in the study. These findings support the third research hypothesis and align with *Zaki et al. (2021)*, who conducted a study on the effect of self-care strategies education on HCC patients' quality of life after radiofrequency ablation and reported a highly statistically significant positive correlation between overall quality of life, total self-care practices, and the total knowledge of the study group pre and post application of self-care guidelines (p < 0.001).

After applying self-care strategies, the present study also establishes a significant correlation between patients' comorbidities, their total knowledge, practice levels, and health outcomes. This relationship is likely attributed to the

fact that hepatocellular carcinoma is associated with poor health status, and it is one of the principal causes of physical disability and decreased quality of life among patients. Our finding may be because a large number of the sample were living in rural areas with a lack of medical services, decreased monthly income, and more comorbidities. So, education is the key to successfully managing a patient with hepatocellular carcinoma; minimizing its impact and providing adequate education can alter behavior and empower the patient to make positive improvements in their health status, positively impacting patients' outcomes. Furthermore, this result can be justified by the greater the knowledge of patients with hepatocellular carcinoma, the more the adoption of healthy behaviors on patients' overall health status and health outcomes. These findings agree with *Besely et al. (2022)*, who investigated the effect of an educational nursing intervention on the severity of extra-hepatic manifestations among patients with chronic hepatitis C virus. Their study revealed that providing patients with knowledge enhanced patients' understanding of their diseases and their ability to manage symptoms and self-care practices. This improvement reduced patients' complaints, particularly regarding decreased fatigue levels.

7. Conclusion

Based on the findings of the current study, it can be concluded that self-care strategies implementation has shown to be effective in improving knowledge, self-care practice, and health outcomes for patients with hepatocellular carcinoma, which was best predicted by knowledge level and practice scores and the presence of comorbidities that can be recommended as improving patients' health outcomes, which supports the study hypotheses.

8. Recommendations

- Continuous education for hepatocellular carcinoma patients about self-management to manage symptoms and improve their QOL.
- Replication of the study on a larger probability sample in different hospital settings to generalize the results.
- Make further research on the effect of self-care protocol on liver cirrhosis patients' self-efficacy.

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