Outcomes of Patients Receiving Radiofrequency Ab   lation Therapy for Hepatocellular Carcinoma: Effect of Self-Care Management Guidelines

Mona Nadr Ebraheim Ahmed [(1)] and Asmaa Said Ali Khalil [(2)]

(1) (2) Assistant professors of Medical Surgical Nursing, Faculty of Nursing -Ain Shams University, Egypt
Corresponding author: Mona Nadr Ebraheim E –mail: dr.mona.nadr@nursing.asu.edu.eg

Abstract

Background: Hepatocellular carcinoma is the sixth leading cause of cancer-related deaths worldwide. Self-care practices are crucial for relieving illness symptoms and adverse effects. Efforts are being made to use self-care techniques to improve patient outcomes throughout several diseases states. **Aim of the study** The study aimed to evaluate the effect of self-care management guidelines on the outcomes of patients receiving radiofrequency ablation therapy for hepatocellular carcinoma **Design:** Quasi-experimental post-test control group design was used. **Setting:** Intervention Radiofrequency & Vascular Radiology Unit and outpatient clinic affiliated to Ain Shams University Hospitals, in Egypt. **Subjects:** Purposive sample of 52 patients who met the inclusion criteria at previously mentioned setting and divided into two groups (study and control group) **Tools**: I: Patients' Structured interview questionnaire, II: Patients' reported self-care management practices questionnaire. III- Patients' assessment tool, IV-Beck Anxiety Inventory (BAI). **Results:** the result of this study proved that there was statistically significant improvement among study group participants as compared to control group regarding all identified outcomes namely, knowledge, self-care practices, pain, post-ablation syndrome, occurrence of post-ablation complications and time for resuming normal activity after ablation with p ≤0.05. **Conclusion:** the findings conclude that self-care management guidelines had a positive effect on all outcomes of study group participants and support all study hypotheses. **Recommendations:** All patients with hepatocellular carcinoma in health care settings should have access to a concise and comprehensive Arabic brochure/booklet with radiofrequency ablation precautions and guidelines.

Keywords: Hepatocellular Carcinoma, Outcomes, Radiofrequency ablation therapy, Self-care management guidelines.

Introduction

Hepatocellular carcinoma (HCC) is the most common type of primary liver tumor that occurs predominantly in patients with underlying chronic liver disease and cirrhosis, accounting for more than 90% of all cases. Around 85% of patients with cirrhosis develop hepatocellular carcinoma. HCC is the second greatest cause of mortality in males after lung cancer. Viral hepatitis (hepatitis B and hepatitis C), alcoholic liver disease, and non-alcoholic fatty liver disease are important risk factors for hepatocellular cancer. The incidence of HCC has been rising worldwide over the last 20 years and is expected to increase until 2030 in some countries, including the United States. The incidence of HCC is highest in Asia and Africa, where the endemic high prevalence of hepatitis B and hepatitis C strongly predisposes to the development of chronic liver disease and subsequent development of HCC (**International Agency for Research on Cancer Liver, 2020**).

Treatment options for HCC are divided into two categories: surgical and non-surgical. Surgical treatments include resection and liver transplantation, while nonsurgical treatments include ablation methods, transarterial therapies, irradiation, and systemic therapy such as chemotherapy and molecularly targeted therapy Ablation is a therapy that destroys liver tumors without removing them. These procedures can be utilized in individuals with a few tiny tumors when surgery is not an option (typically due to poor health or decreased liver function). They are less likely to cure cancer than surgery, but they can still be quite beneficial in some instances. These techniques are also utilized in individuals awaiting liver transplantation (**American Cancer Society, 2022; Criss et al. ,2023).**

Radiofrequency Ablation (RFA) is a therapy that applies high-frequency radio waves for targeting specific body locations. These procedures can be utilized on patients with tiny

tumors of little more than 3 cm in diameter, as well as somewhat bigger tumors (3 to 5 cm in diameter) that require embolization. RFA is an electrical energy source that operates at frequencies ranging from 300 kilohertz to 1 megahertz (MHz). During these operations, a needle-like probe is introduced through the skin and into the organ harboring the tumor being treated. The probe creates heat within the tumor, resulting in its death (necrosis). When tumor cells are heated for more than 3 minutes at temperatures over 45° to 50°C, intracellular protein denaturation and lipid bilayer melting cause immediate cell death. It is often performed as an outpatient procedure, with either local anesthetics or conscious sedation anesthesia **(Serra et al., 2021).**

Advantages of RFA therapy over surgical resection for small HCCs are numerous. First, it is considerably less invasive and has a decreased risk of complications. Second, RFA greatly decreases treatment expenditures, hospital stays, and blood transfusions. Third, it is now acceptable for the aging process of patients with newly diagnosed HCC and many comorbidities. RFA is associated with many risks and complications including vascular injury (vein injury, hepatic artery injury, portal vein thrombosis, and visceral injury), bleeding, infection, bile duct disorders, hepatic failure, pneumothorax, pleural effusion, pneumonia, and skin burns **(Fonseca et al., 2014)**.

Post-ablation syndrome is a common side effect of RFA for solid abdominal tumors. Post-ablation syndrome symptoms are comparable to flu, including low grade fever, pain, malaise, myalgia, nausea, and vomiting. Patients should be informed about post-ablation syndrome and its self-limiting nature before starting this therapy. Anxiety is more likely among hepatocellular carcinoma patients having RFA **(Ho et al., 2020)**.

Self-management is the uppermost priority in the medical and health services system. Nurses have a vital role in improving the knowledge of patients and increasing their self-care agency and skills in the field of the disease by applying exclusive nursing care, emphasizes that the patients themselves should undertake the accountability for self-care as the main agent and player. The self-care deficit is determined by the

nurse through the assessment of the patients with HCC following RFA. After determining the self-care need, the nurse must choose the necessary nursing practices to provide a supportive educative nursing care. The level of nursing education should be based on the patient's self-care deficits **(Afrasiabifar et al., 2016; Zaki, et al., 2021).**

There are many problems facing patients after RFA, including physical problems, potential disruption of family, social, occupational functioning, and the possibility of shortened life expectancy. Compressive supportive care and educative self-care from staff can enhance the patient's ability to cope with condition and its complications. Nurses must be knowledgeable with all steps of the RFA treatment to provide the best possible environment for patients. Nurses should prioritize patient education and vigorous hydration before administering RFA. Nurses can prevent damage during the RFA by properly positioning grounding pads, monitoring vital signs, and medicating patients as needed. Following RFA, nurses should evaluate the skin puncture site, administer suitable pain treatment, and rehydrate patients. Nurses who properly care for RFA patients help enhance patient outcomes **(Awad, 2013; Zaki et al., 2021).**

Significance of the study

Hepatocellular carcinoma (HCC) was ranked as the sixth most frequent malignancy worldwide. In Egypt, it is the fourth most frequent cancer. HCC accounts for up to 90% of all liver cancer. In Egypt, HCC is a serious public health problem. Where it is responsible for 33.63% and 13.54% of all malignancies in men and women, respectively. This was closely connected to the hepatitis C virus pandemic, which impacted around 10-15% of the Egyptian population during the previous three decades and was reported to have the world's highest HCV prevalence **(Rashed et al., 2020).**

Adverse effects of the RFA, including difficulty resuming regular activities and financial burden on individuals, families, and the healthcare system. Nurses were responsible for educating patients and families on what to expect during and after therapy, including how to handle unpleasant effects. Patient educational guidelines are critical for avoiding post-ablation syndrome and assisting patients in returning to regular

activities between the seventh and tenth days. The nurse is a qualified educator who may raise patient awareness. The nurse is primarily in charge of educating patients about post-ablation follow-up **(Khalil et al., 2018)**.

Based on the previous literature, patients with HCC undergo radiofrequency ablation therapy have an increased risk for getting possible side effects and complications which may occur during and after radiofrequency ablation therapy. The nurse is responsible mainly for enhancing self-care practices regarding post ablation follow-up. Self-management guidelines are very important for post ablation syndrome for minimizing and helping patient to return to normal activity and limit post ablation syndrome. Therefore, preparing self-management guidelines based on needs assessment for those patients will help in improving their outcomes, that is why this study was conducted.

Aim of the Study:

This study aimed to evaluate the effect of self-care management guidelines on the outcomes of patients receiving radiofrequency ablation therapy for hepatocellular carcinoma through:

- Assessment of patient's knowledge related to hepatocellular carcinoma and radiofrequency ablation therapy.
- Assessment of self- care management practices among patients with hepatocellular carcinoma undergoing radio-frequency ablation therapy.
- Development and implementing self- care management guidelines based on patients' assessments.
- Evaluating the effect of implementing self-care management guidelines on outcomes for patients receiving radiofrequency ablation therapy for hepatocellular carcinoma

Research Hypotheses:

The current study hypothesizes that:

H1: There will be a positive improvement in the level of knowledge among the study group as compared to control group after implementation of self-care management guidelines.

H2: There will be a positive improvement in the level of self-care practices among the study group as compared to control group after implementation of self-care management guidelines.

H3: There will be a positive improvement regarding severity of pain among the study group as compared to control group after implementation of self-care management guidelines.

H4: There will be a positive improvement regarding severity of post-ablation syndrome among the study group as compared to control group after implementation of self-care management guidelines.

H5: There will be a positive improvement regarding occurrence of post-ablation complications among the study group as compared to control group after implementation of self-care management guidelines.

H6: There will be a positive improvement regarding time for resuming normal activity post-ablation among study group as compared to the control group after implementation of self-care management guidelines.

H7: There will be a positive improvement regarding level of anxiety among the study group as compared to the control group after implementation of self-care management guidelines.

Operational definitions:

- **Self-care management guidelines:** it means operationally provision/ education of self-management strategies/practices regarding medication, wound care, diet, activity, sleep and rest, warning signs, and follow-up, managing and preventing potential complication (pain, numbness, bleeding, and infection), pre, and post-procedure (RFA) precautions for patients under study to help them to deal better with their alterations and improve their outcomes.
- **The outcomes:** are consequences of implementation of self-care management guidelines including; patient level of knowledge, self-management practices, pain, post-ablation syndrome (fever, malaise, nausea & vomiting) that may occur after RFA therapy, occurrence of post-ablation complications (hemorrhage, infection, abscess, redness and death) , resuming normal activity after ablation in addition to anxiety level.

Subjects and Methods:

This study was portrayed under the four main designs as follows:
I.   Technical design.
II. Operational design.
III. Administrative design.
IV. Statistical design.

I. Technical design:

It includes research design, setting, subject and tools for data collection.

Research design:

Quasi-experimental post-test control group design was used to achieve the aim of the current study. This design is one of the experimental designs in which the study sample is divided into two groups, study group and a control group, the study group receives the experimental intervention, and the control group receives the routine treatment, and a post-test is given to both groups. The quasi-experimental approach aims to establish causality between an intervention and a result between two variables: the independent and dependent variables to compare between study and control groups **(Sharan , 2015).**

Setting:

The study was conducted in the Intervention Radiofrequency and Vascular Radiology Unit and outpatient clinic affiliated to Ain Shams University Hospitals, in Egypt**.** The radiofrequency room is equipped with the necessary devices, RF apparatus, ultrasound apparatus, anesthesia apparatus, monitor, and emergency cart. Three recovery rooms were associated with this unit. This is one of the health care facilities designed to provide such type of therapy and serves large number of residents in Cairo and its surroundings.

Subjects

Purposive sample of 52 patients who met the inclusion criteria at previously mentioned setting, and they would be enrolled into two equal groups (study and control group), each group consisted of 26 patients. Sample size was calculated statistically by power analysis considering the total number of patients with hepatocellular carcinoma admitted to Ain Shams university hospital based on previous studies.

Power analysis was used to determine sample with a statistical power of 80% and the confidence interval to 95% with margin of error accepted adjusted to 5% and a known total population of 52 samples divided into two groups,

26 sample in each group. The yielded sample size was 52 as a minimum. The first (twenty-six) admitted patients who received radiofrequency ablation therapy in the selected setting were considered as a control group who received the routine hospital care. The second followed (twenty-six) admitted patients received the self-management guideline for avoiding sources of any bias. Sample size equation was adopted from **Chow et al. (2007).**

$$ n = \frac{N \times p(1-p)}{\left[N-1 \times \left(d^2 \div z^2 \right) \right] + p(1-p)} $$

N= Community size
z= Class standard corresponding to the level of significance equal to 0.95 and 1.96
d= The error rate is equal to 0.05
p= Ratio provides a neutral property = 0.50

Inclusion criteria

Adult patients, from both genders, primarily diagnosed with hepatocellular carcinoma, undergoing radiofrequency ablation therapy, able to respond to instructions and had not exposed to any previous educational program about the HCC and RFA and fulfill all educational activities were recruited for this study.

Exclusion criteria

Patients with morbid comorbidities or mental disorders.

Tools for data collection:

I- Patients' structured interview questionnaire

It was designed by researchers in an Arabic based on review of recent and related literature (**Heimbach et al., 2018; Marrero et al.,2018**) regarding hepatocellular carcinoma and radiofrequency ablation therapy. It consisted of the following parts:

Part one: it was concerned with demographic characteristics of patients under study such as age, gender, marital status, educational level, occupation, residence, and monthly income.

Part two covered assessment of patients' medical clinical data. It consisted of medical diagnosis, family history, medical comorbid diseases, number of RFA sessions, ablation time, and source of information.

Part three: it was designed to assess the patients' knowledge related to 3 main areas (hepatocellular carcinoma, radiofrequency ablation and self-care management

instructions regarding RFA). It included MCQ and true/false questions and covered main areas of knowledge regarding hepatocellular carcinoma including its definition (2 items), risk factors (5 items), types (4 items), signs and symptoms (5 items), diagnostic measures (3 items), complications (5 items) and management (10 items) with total 34 items. Knowledge regarding radiofrequency ablation therapy including its definition (2 item), purposes (4 items), indications (5 items), benefits (3 items), complications (6 items) with total 20 items. Knowledge regarding self-care management instructions cover diet, drug, activities, sleep, anxiety and stress management, managing adverse events (pain, numbness, bleeding, infection), pre- and post-procedure instructions with total 28 items. Total knowledge items included 82 items.

Scoring system

Each correct answer got one score, while incorrect answer got zero scores. The total score for each knowledge domain was summed up. According to the statistical evaluation, total knowledge level is categorized as follows; satisfactory level of knowledge if the total percent score was equal or more than 75% ($\geq$ 62 grades) of the total score and unsatisfactory if the percent score was less than 75 % (< 62 grades) of the total score.

II- Patients' reported self-care management practices questionnaire.

It was prepared by the researchers for patients with hepatocellular carcinoma undergoing radiofrequency ablation in the Arabic based on a relevant literature (**Yun et al., 2016; Korean Liver Cancer Association (KLCA) & National Cancer Center (NCC), 2022**) to assess the patients self-care management practices as their self-report. The self-care management questionnaire covered assessment of studied patients for self- management practices regarding medication, wound care, diet, activity, sleep and rest, warning signs, and follow-up, managing and preventing potential complication (pain, numbness, bleeding, and infection), pre, and post-procedure (RFA) precautions with total 32 items. Each item was scored according to 3-points Likert scale (always, sometimes, never). This part was assessed pre and post self-care management guideline implementation.

Scoring system

The response of each item was scored 2 for always, 1 for sometimes and zero for never. The total score was 64 grades. The total items were summed up. Total score is categorized as follows; satisfactory level of self-care practices if the percent score was equal or more than 75 % ($\geq$48 grades) and unsatisfactory if the score was less than 75 % (<48 grades).

III- Patients' assessment tool

It was formulated by researchers based on relevant literature to assess the patients' outcomes after ablation. It covered four main parts as following.

Part one: pain numerical assessment scale.

It was focused on assessment of pain severity at puncture site among studied patients. It was adopted from ***Kumar and Tripathi1 (2014).*** It is a horizontal line with an eleven-point numeric range. It is labeled from zero to ten, with zero being an example of someone with no pain and ten being the worst pain possible.

Scoring system

The values on the pain scale correspond to the following pain levels: 0=no pain, 1–3 = mild pain, 4–6 = moderate pain, and 7–10 = severe pain.

Part two: assessment of severity of post-ablation syndrome.

It was used to assess the severity of post-ablation syndrome among studied patients receiving radiofrequency ablation therapy for hepatocellular carcinoma. It was developed by researchers based on recent and relevant literatures *(***Yamakado et al., 2014 & Jin et al., 2019***)*. Post-ablation syndrome includes fever, malaise, nausea, and vomiting. Fever and vomiting severity were determined by the researchers based on grading scales. Nausea and malaise were determined by the studied patients based on three-point Likert scale.

Scoring system

Each syndrome (nausea and malaise) was marked by the researchers according to a three-point Likert scale as follows: 1 = mild level, 2 = moderate level, 3 = severe level. Regarding vomiting, it was classified as mild (up to 1/2 cup),

moderate (1/2-2 cups), severe (3 cups or more) based on *Kim et al. (2007)*. Regarding fever, it was graded to mild fever (37.3 to 38.0 C), moderate (38.1 to 39.0 C) and severe (39.1 to 41 C) based on Islam et al. (2021).

Part three: assessment of occurrence of post-ablation complications

It focused on assessment of occurrence of post-ablation complications. It includes assessment of post-ablations complications if present or not.

Scoring system

Each item was marked as 'present' and not present. These were each scored from one in case of occurrence to zero if the complication item did not occur.

Part four: assessment of time for resuming normal activity after ablation.

It was concerned with assessment of the time for resuming normal daily living activities among studied patients after ablation as their self-report. The participants were asked at the follow up period to identify the time (in days) for resuming normal daily living activities after ablation. Based on statistical analysis, categories for time were identified.

IV-Beck Anxiety Inventory (BAI)

The BAI is a self-report anxiety inventory consisting of 21 questions. The BAI assesses frequency of anxiety symptoms over a one week period. It is standardized scale, adapted from **Hewitt & Norton (1993)**. It was translated and retranslated into Arabic. Patients rate the severity of each of these items on a 4-point Likert scale from 0 to 3, where 0 is not at all, 1 is mildly bothered, 2 is moderately bothered, and 3 is severely bothered.

Scoring system

The overall BAI score may vary from 0 to 63, with minimal anxiety levels falling between 0 and 7, mild anxiety between 8 and 15, moderate anxiety between 16 and 25, and severe anxiety between 26 and 63.

Self-care Management Guidelines regarding patients with HCC undergoing RFA:

It was prepared by the researcher based on baseline assessment of knowledge and self-care practices deficits as well as relevant scientific resources (**University of Washington Medical Center, 2014 & Virtual Health Care Agency,** **2023)**. It was delivered in theoretical and practical teaching sessions. Arabic illustrative booklet was distributed simultaneously with start of guidelines implementation to help patients to reinforce information. Theoretical part included structure and function of the liver, definition of HCC, types, risk factors, clinical manifestation, diagnostic measures, and management as well as definition of RFA therapy, its technique, purposes, indications, benefits, and complications. The practical part focused on post-ablation self-care management practice guidelines regarding diet, drug, wound care, activities, sleep, anxiety management, preventing and managing adverse events/ complication (post-ablation syndrome & complications) and follow-up care.

II.   Operational design:

It includes preparatory phase, pilot study and field work.

Preparatory Phase

It includes reviewing the related literature and theoretical knowledge of varies aspects of the study using books, articles and periodicals.

Tool validity and reliability:

Validity:

The tools were revised by a panel of seven experts, five of them were professors from medical surgical nursing faculty staff at Ain shams university and the other two were assistant professors from radiology unit, faculty of medicine, Ain shams university who reviewed the content of the tools for clarity, relevance and comprehensiveness and the necessary modifications were done accordingly.

Reliability:

It was tested statistically to assure that the internal consistency of the tools is reliable by using the alpha Cronbach test. Cronbach's alpha reliability values for study tools were determined to be 0.850, 0.893, 0.802, and 0.881 for tool I (Patients' Structured interview questionnaire), tool II (Patients' reported self-care management practices questionnaire), tool III (Patients' assessment tool) and tool IV (Beck Anxiety Inventory (BAI) respectively which indicated consistency of study tools.

Ethical Considerations:

The research approval was obtained from the ethical research committee in the faculty of nursing, Ain Shams University before starting the study with code 23.04.55 on 10/4/2023. An informed verbal consent was obtained from each participant. The researchers assure anonymity and confidentiality of subjects' data. Patients under study were informed that they are allowed to choose to participate or not in the study and that they have the right to withdraw from the study at any time. Ethics, values, culture, and beliefs were respected. Confidentiality of any obtained information was ensured through coding of all data. The researchers reassured patients that the data would be used for only the research purpose. The control group received the same self-care management guidelines at the end of the study.

Pilot Study:

A pilot study was carried out on 10% of the study patients (5 patients) (to test the feasibility and applicability of the study; as well as to estimate the time that was needed for each tool to be filled in. There were minimal modifications were done according to the results of the pilot study. Hence the patients who were included in the pilot study were included in the study sample.

Field work:

The study was carried out within seven months from the beginning of May to the end of November 2023. Data were collected by the researchers three days per week, at morning and afternoon shifts in the previously mentioned setting. It was conducted through three phases: assessment and planning (pre-implementation), implementation, and evaluation phases. Study participants were divided into two groups; control and study group, each group consisted of 26 patients diagnosed with HCC who undergo radiofrequency ablation therapy. The first (twenty-six) admitted patients who were undergo radiofrequency ablation therapy in the selected setting was considered as a control group who received the routine hospital care, while the second followed (twenty-six) admitted patients were considered as study group to avoid sources of any bias.

Assessment and planning phase:

During the assessment phase, the researchers prepared the data collection tools. All patients under study (study and control group patients) were assessed using study tools. The researcher assessed all newly admitted patients who undergo RFA therapy to ensure they met the study's inclusion criteria. The researchers held the first meeting with each patient in the study setting to introduce themselves and briefly explained the nature and the purpose of the study. They were informed that participation in this study was voluntary, and they had the right to withdraw at any time. The researchers took telephone numbers at the first contact to determine the next appointment to complete the data collection process. What's Apps group chats were held between the researchers and patients' participants to respond to any question and plan the next meetings.

The researcher provided an overview and clarification about the tools, then, researchers interviewed each participated patient individually to assess demographic features, medical data, knowledge about the disease and RFA, pain severity and anxiety level using tools I & IV. These tools were fulfilled within a time ranged from 25 minutes to 35 minutes. The data obtained during this phase constituted the baseline for further comparisons to evaluate the effect of the self-care management guidelines.

Based on the identified needs of the patients under study and reviewing relevant literature, the researcher developed self-care management guidelines with attached printed Arabic booklet to satisfy the patients' knowledge deficit and self-management practices.

Implementation phase:

Both study and control group participants received the routine care given to the patients who undergo RFA either before and after therapy or even the follow up care in the outpatient clinic. Self-care guidelines were implemented for study group according to baseline assessment and reviewing relative scientific resources. The teaching sessions were conducted in the out-patient clinic and lecture classrooms in Interventional and Vascular Radiology Unit. The family members were involved in all teaching sessions. Each session took about 45-60 minutes. These sessions were conducted for small groups ranging from 1-5 patients. Three to five sessions were conducted daily according to availability of patients.

The self-care management guidelines were delivered in three scheduled sessions and included theoretical and practical parts. Theoretical part included structure and function of the liver, definition of HCC, types, risk factors, clinical manifestation, diagnostic measures, and management as well as definition of RFA therapy, its technique, purposes, indications, benefits, and complications. The practical part focused on post-ablation self-care management practice guidelines regarding diet, drug, wound care, activities, sleep, anxiety management, preventing and managing adverse events/ complication (post-ablation syndrome and complications) and follow-up care.

Small group discussion of the theoretical part, demonstration and redemonstration of self-care practices were used in implementation of guidelines in addition to use of PowerPoint presentation (15-inch laptop monitor) and relevant videos. An illustrative self-care management guideline Arabic booklet was distributed to all patients in the first session to encourage reinforcement of study guidelines. The researchers communicate with study group participants after their discharge through WhatsApp chat and answer all the questions of patients and their families.

Evaluation phase:

Evaluation was emphasized on investigating the effect of self-care management guidelines on patient's outcomes including; patient level of knowledge, self-care management practices, post-ablation syndrome (pain, fever, malaise, nausea & vomiting), occurrence of post-ablation complications, resuming normal activity after ablation in addition to anxiety level by comparing the outcomes between study and control groups at pre and post implementation of self-care guidelines using the same data collection tools.

Assessment for study and control groups regarding patients 'knowledge, pain severity (tool I), and anxiety level (tool IV) was done two times, first on their admission and the second time was done one week after ablation for control group and one week after implementation of self-care management guidelines for study group (at first follow-up visit at out-patient clinic).

Evaluation for study and control groups regarding self -care management practices (tool II), post-ablation syndrome, post-ablation complications and resuming normal activity using tool III was done three weeks after ablation for control group and after implementation of self-care management guidelines for study group (at third follow-up visit at out-patient clinic).

III. Administrative design:

An official approval with a written letter, clarifying the purpose and setting of the study was obtained from the dean of the Faculty of Nursing, Ain Shams University.

IV. Statistical design:

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done including the comparison between groups with qualitative data was done by using Chi-square test. The independent-samples t-test of significance was used when comparing between two means. Pearson's correlation coefficient (r) test was used to assess the degree of association between two sets of variables. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

– P-value <0.05 was considered significant.
– P-value <0.001 was considered as highly significant.
– P-value >0.05 was considered insignificant.

Results

Table (1) shows that the mean age of the study group was 56.61 ± 4.12 years while mean age in the control group was 57.2 ± 7.80 years. Regarding gender, 69.2% and 61.5% were male in the study and control group respectively. Furthermore, 88.5% and 84.6% of the study and control groups were married, while 42.3% of both groups were highly educated. In addition, 53.8% of the study group versus 42.3% of control group were residents in urban areas. In addition, 57.7% and 61.6% of the study and control groups had sedentary work, while 65.4% and 57.7% of study and control groups respectively had 2-3 members in their families. Notably, there were no statistically significant differences between the study and control groups regarding their all-demographic characteristics at p >0.05.

Table (2) presents frequency and percentage distribution of the patients under study regarding their medical clinical data, the findings illustrated that 38.5% and 34.6% of study and control groups respectively had chronic hepatitis virus C, meanwhile, hypertension was prevalent among 38.5% and 34.6% in the study and control group respectively. Also, 61.5% of study group compared to 53.8% of control group had family history of liver cancer. In addition, 46.2 % and 38.5% of study and control group participants respectively their duration for hepatocellular carcinoma were <6 months. Moreover, 53.8% and 57.7% of the study and control group took previous RFA sessions.

Additionally, 50% and 57.7% of the study and control group respectively their ablation time was <30min. Meanwhile, 73.1% of study group versus 61.5% of the control group received knowledge about RFA and HCC, 50% and 69.2% of study and control group respectively exhibited that social media is the main source of knowledge. There were no statistically significant differences between the study and control groups regarding their medical clinical data at p >0.05.

As shown in table (3), the findings revealed that there was statistically insignificant variation between study and control group patients regarding satisfactory level of knowledge about HCC, RFA, self-care management instructions about RFA as a baseline assessment before self-care guideline implementation (P>0.05). However, statistically significant increase of the level of satisfactory knowledge among study group as compared to control group after self-care guideline implementation regarding HCC, RFA, self-care management instructions about RFA as indicated from statistical test analysis (X^2= 9.831 & p = 0.002; X^2= 5.382 & p = 0.023; X^2= 6.382 & p = 0.011 respectively). In addition, 69.2% of the study group versus 34.6% of the control group had total satisfactory level knowledge post implementation of self-care guidelines with statistically significant difference between study and control groups as proved by statistical test analysis (X^2= 4.930 & p = 0.026).

Table 4 demonstrated the comparison between study and control groups regarding satisfactory level of reported self-care practices after implementation of self- care guidelines. The results show highly statistically significant increase of the satisfactory level of self-care practices among study group participants as compared to control group at post-implementation phase regarding management of post-ablation syndrome and management of anxiety (X^2=11.502, 11.901 & p <0.001 respectively). Moreover, statistically significant differences were found between study and control groups regarding self-care practices about drug, diet, activity, sleep and rest, wound, managing and preventing potential complication as well as pre- and post-procedure precautions regarding RFA at p ≤0.05.

Furthermore, 76.9% of the study group in comparison to 38.5% only of the control group had satisfactory level of self-care practices post implementations of self-care guidelines with statistically significant difference between two groups regarding the total level of self-care practices at (X^2=6.382 & p=0.011).

Figure (1) clarifies that 23.1% of the study group compared to 11.5% of the control group had no pain, meanwhile, 11.5 % of study group versus 38.5% of control group had severe pain at post-implementation phase with statistically significant variation was detected between both groups (X^2=7.317 & p =0.047). Notably, there were statistically insignificant variations between both groups under study regarding severity of pain at pre-implementation phase (X^2=0.427 & p =0.808).

Table (5) reveals that, there were statistically significant improvement regarding severity of post ablation syndrome in the study group than control group as indicated by statistically significant difference between both groups regarding fever, malaise and nausea (X^2=12.762 & p =0.002; X^2=10.705& p =0.013; X^2=14.962 & p =0.002 respectively). Also, there was highly statistically significant improvement of severity of vomiting among study group participants as compared to control group regarding severity of vomiting (X^2=18.121& p <0.001).

Table (6) shows comparison between study and control groups regarding occurrence of post-ablation complications after implementation of self-care guidelines. The findings revealed that there was statistically significant reduction of occurrence of post-ablation complication among study participants as compared to control group as regards hemorrhage from needle track, wound infection and inflammation and redness of needle insertion site as proved by statistical test analysis and p-significance values (X^2=5.532 & p =0.019; X^2=4.956 & p =0.026; X^2=6.586 & p =0.010 respectively).

Figure (2) clarifies that there was statistically insignificant variation between both groups under study related to anxiety level at the pre-implementation phase (X^2= 0.525 & p=0.913). However, 26.9% of the study group had minimal level of anxiety versus no one (0%) in the control group and 3.8% of the study group participants versus 34.6% of the control group had severe

anxiety at the post-implementation phase with statistically significant differences between two groups at $X^2 = 13.659$ and p=0.003.

Table (8) displays marked statistically significant differences between study and control groups regarding time for resuming normal activity at post implementation phase (X2= 16.371 & p p<0.001).

Table (9) reveals, there were statistically insignificant correlation between total level of knowledge and total self-care practices, anxiety, time to resume to normal activity and pain among study group participants before implementation of self-care management guidelines (p>0.05). However, statistically significant positive correlations were detected between total level of knowledge and total self-care practices, anxiety, time to resume to normal activity and pain after implementation of self-care management guidelines (P ≤0.05).

Table (1): Frequency and Percentage Distribution of Demographic Characteristics of the Patients Under Study (n=52).

Demographic characteristics	Study group. n=26		Control group. n=26		Chi-square	
	No.	%	No.	%	X^2	P-value
Age						
▪ 30 < 40	2	7.6%	3	11.5%	0.758	0.684
▪ 40 < 50	6	23%	8	30.8%		
▪ ≥ 50	18	69.4%	15	57.7%		
▪ Mean ±SD	56.61±4.12		57.2±7.80			
Gender						
▪ Male	18	69.2%	16	61.5%	0.085	0.771
▪ Female	8	30.8%	10	38.5%		
Marital status						
▪ Single	3	11.5%	4	15.4%	0.014	0.972
▪ Married	23	88.5%	22	84.6%		
Educational level						
▪ Read and write	5	19.2%	4	15.4%	0.159	0.924
▪ Basic education	10	38.5%	11	42.3%		
▪ High education	11	42.3%	11	42.3%		
Residence						
▪ Rural	12	46.2%	15	57.7%	0.308	0.579
▪ Urban	14	53.8%	11	42.3%		
Occupation						
▪ Retired /housewife/no work	8	30.8%	6	23%	0.461	0.794
▪ Sedentary work	15	57.7%	16	61.6%		
▪ Manual work	3	11.5%	4	15.4%		
Family members						
▪ No	3	11.5%	5	19.2%	0.625	0.732
▪ 2 -3	17	65.4%	15	57.7%		
▪ >3	6	23.1%	6	23.1%		
Monthly income as perceived by patients						
▪ Enough for health care cost	7	26.9%	9	34.6%	0.090	0.764
▪ Not enough for health care cost	19	73.1%	17	65.4%		

In-significant P>0.05   *P≤0.05 significant   **P ≤ 0.001 highly significant

Table (2): Frequency and Percentage Distribution of the Patients under Study Regarding their Medical Clinical Data (n= 52).

Medical clinical data	Study group n=26		Control group n=26		Chi-square	
	No.	%	No.	%	X^2	P-value
Types of Co- morbid diseases						
▪ Chronic hepatitis virus C	10	38.5%	9	34.6%	0.380	0.984
▪ Chronic hepatitis virus B	8	30.8%	7	26.9%		
▪ Fatty liver	4	15.4%	5	19.2%		
▪ Diabetes	4	15.4%	5	19.2%		
▪ Hypertension	10	38.5%	9	34.6%		
Family history of liver cancer						
▪ No	10	38.5%	12	46.2%	0.079	0.779
▪ Yes	16	61.5%	14	53.8%		
Duration of hepatocellular carcinoma						
▪ < 6 months	12	46.2%	10	38.5%	0.318	0.853
▪ 6-12 months	6	23%	7	26.9%		
▪ > 12 months	8	30.8%	9	34.6%		
Mean ± SD						
Previous RFA sessions					0.004	0.972
▪ Yes	14	53.8%	15	57.7%		
▪ No	12	46.2%	11	42.3%		
Ablation time (min.)						
▪ < 30 min.	13	50%	15	57.7%	0.077	0.781
▪ > 30 min.	13	50%	11	42.3%		
Receiving knowledge regarding RFA and HCC						
▪ Yes	19	73.1%	16	61.5%	0.350	0.554
▪ No	7	26.9%	10	38.5%		
If yes, the source of knowledge						
▪ Physician	10	38.5%	12	46.2%	1.130	0.769
▪ Nurse	3	11.5%	5	19.2%		
▪ Other patients	8	30.8%	6	23.1%		
▪ Social media	13	50%	18	69.2%		

P>0.05 in-significant   *P≤0.05significant   **P ≤ 0.001 highly significant

Table (3): Comparison between Study and Control Groups Regarding Satisfactory Level of Knowledge at Pre and Post Implementation of Self- Care Guidelines (n=52).

Items of Knowledge	Pre-guideline implementation				Post-guideline implementation				Pre-guideline implementation		Post-guideline implementation/	
	Study group n=26		Control group n=26		Study group n=26		Control group n=26					
	No	%	No	%	No	%	No	%	Test (X$^{2)}$)	P-value	Test (X^2)	P-value
level of Knowledge regarding hepatocellular carcinoma												
▪ Satisfactory	8	30.8%	9	34.6%	22	84.6%	10	38.5%	0.020	0.981	9.831	0.002*
▪ Unsatisfactory	18	69.2%	17	65.4%	4	15.4%	16	61.5%				
level of Knowledge regarding radiofrequency ablation												
▪ Satisfactory	7	26.9%	8	30.8%	19	73.1%	10	38.5%	0.005	0.975	5.382	0.023*
▪ Unsatisfactory	19	73.1%	18	69.2%	7	26.9%	16	61.5%				
level of Knowledge regarding self-care management instructions about RFA												
▪ Satisfactory	5	19.2%	4	15.4%	16	61.5%	6	23.1%	0.002	0.986	6.382	0.011*
▪ Unsatisfactory	21	80.8%	22	84.6%	10	38.5%	20	76.9%				
Total knowledge												
▪ Satisfactory	7	26.9%	8	30.8%	18	69.2%	9	34.6%	0.005	0.975	4.930	0.026*
▪ Unsatisfactory	19	73.1%	18	69.2%	8	30.8%	17	65.4%				
Total mean ±SD Range (0 -82)	21±4.27 (3- 46)		22±4.39 (2- 44)		55±6.35 (12-69)		23±5.12 (2- 44)		t -test 1.183	0.476	t-test 7.583	<0.001**

P>0.05 in-significant   *P≤0.05significant   **P ≤ 0.001 highly significant

Table (4): Comparison between Study and Control Groups Regarding the Satisfactory Level of Reported Self-care Practices Post Implementation of Self- care Guidelines (n=52).

Items of reported self- care management practices	Study group n=26		Control group n=26.		Test -p value	
	Satisfactory level of self-care practices					
	No	%	No	%	Test (X^2)	P-value
▪ **Drug management**	21	80.8%	10	38.5%	7.988	0.005*
▪ **Diet management**	15	57.6%	5	19.2%	6.581	0.010*
▪ **Activity management**	16	61.5%	10	38.5%	4.340	0.037*
▪ **Sleep and rest management**	21	80.8%	11	42.3%	6.581	0.010*
▪ **Wound management**	18	69.2%	11	42.3%	4.980	0.031*
▪ **Management of post-ablation syndrome**	22	84.6%	9	34.6%	11.502	<0.001**
▪ **Managing and preventing potential complication**	18	69.2%	10	38.5%	3.792	0.049*
▪ **Self-care management of anxiety and emotional disturbances**	17	65.4%	4	15.4%	11.901	<0.001**
▪ **Pre- and post-procedure precautions regarding RFA.**	20	76.9%	11	42.3%	5.112	0.024*
Total satisfactory level	**20**	**76.9%**	**10**	**38.5%**	**6.382**	**0.011***
Mean ±SD **Range (0 -64)**	41.5±6.21 (8- 56)		21.4±4.06 (4- 41)		t-test 8.557	<0.001**

P>0.05 in-significant   *P≤0.05significant   **P ≤ 0.001 highly significant

Figure (1): Comparison between Study and Control Groups Regarding Severity of Pain at Pre and Post Implementation of Self-care Guidelines (n=52).

	Pre Test (P-value)	Post Test (P-value)
	0.427 (0.808)	7.317 (0.047*)
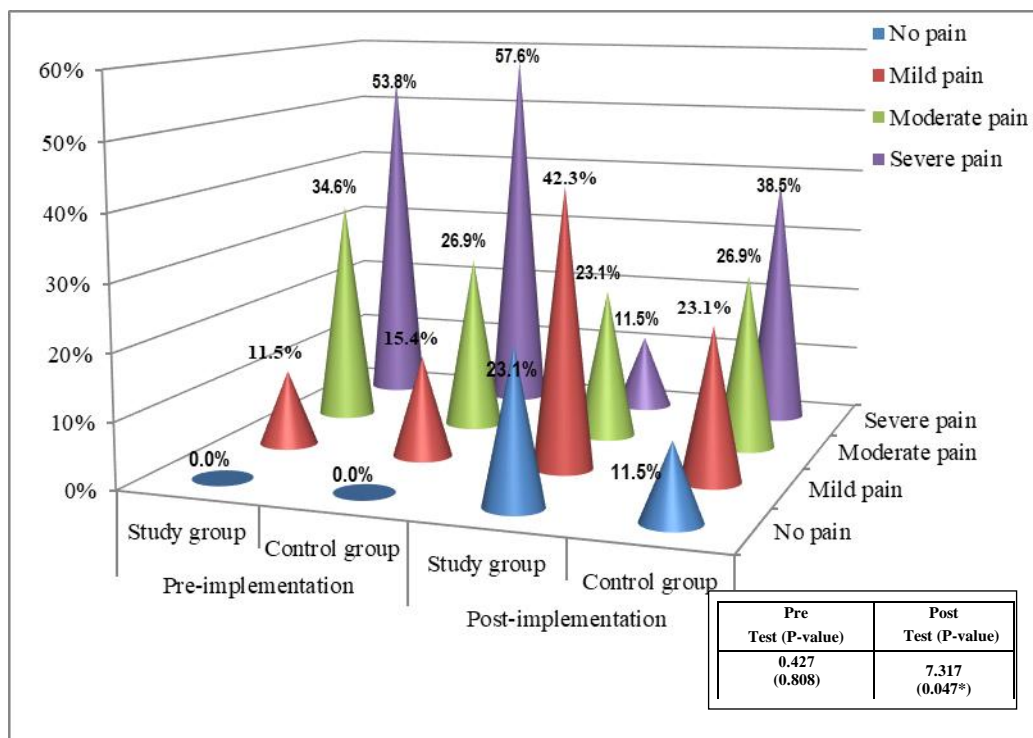
P>0.05 in-significant   *P≤0.05significant   **P ≤ 0.001 highly significant

Table (5): Comparison between Study and Control Groups Regarding Severity of Post-Ablation Syndrome Post Implementation of Self-Care Guidelines (n=52).

post-ablation syndrome	Study group (n=26) Number (%)				Control group (n=26) Number (%)				Test (X^2)	P-value
	None	Mild	Moderate	Severe	None	Mild	Moderate	Severe		
▪ **Fever**	16 (61.5%)	10 (38.5%)	0	0	5 (19.2%)	15 (57.7)	6 (23.1%)	0	12.762	0.002*
▪ **Malaise**	7 (26.9%)	10 (38.5%)	9 (34.6)	0	3 (11.5%)	12 (46.2)	4 (15.4%)	7 (26.9%)	10.705	0.013*
▪ **Nausea**	15 (57.7%)	11 (42.3%)	0	0	5 (19.2%)	17 (65.4%)	4 (15.4%)	5 (19.2%)	14.962	0.002*
▪ **vomiting**	3 (11.5)	23 (88.5)	0	0	3 (11.5%)	10 (38.5%)	6 (23.1%)	7 (26.9%)	18.121	<0.001**

Insignificant. >0.05   Significant. ≤0.05   * High sig. ≤0.001**

Table (6): Comparison between Study and Control Groups Regarding Occurrence of Post-Ablation Complications after Implementation of Self-Care Guidelines (n=52).

Post-ablation complications	Study group n=26		Control group n=26		Test	P-value
	No.	%	No.	%		
▪ **Hemorrhage from needle track**	2	7.7%	9	34.6%	5.532	0.019*
▪ **Wound infection**	7	26.9	15	57.7	4.956	0.026*
▪ **RFA lesion abscess**	1	3.8	4	15.4	1.977	0.159
▪ **Inflammation and redness of needle insertion site**	5	19.2	14	53.8	6.586	0.010*
▪ **Death**	0	0	0	0	0.000	1.000

Insig. >0.05   Sig. ≤0.05   * High sig. ≤0.001**   Using: Chi-square test

Figure (2): Comparison between Study and Control Groups Regarding the Level of Anxiety Pre and Post Implementation Self-Care Guidelines (n=52).
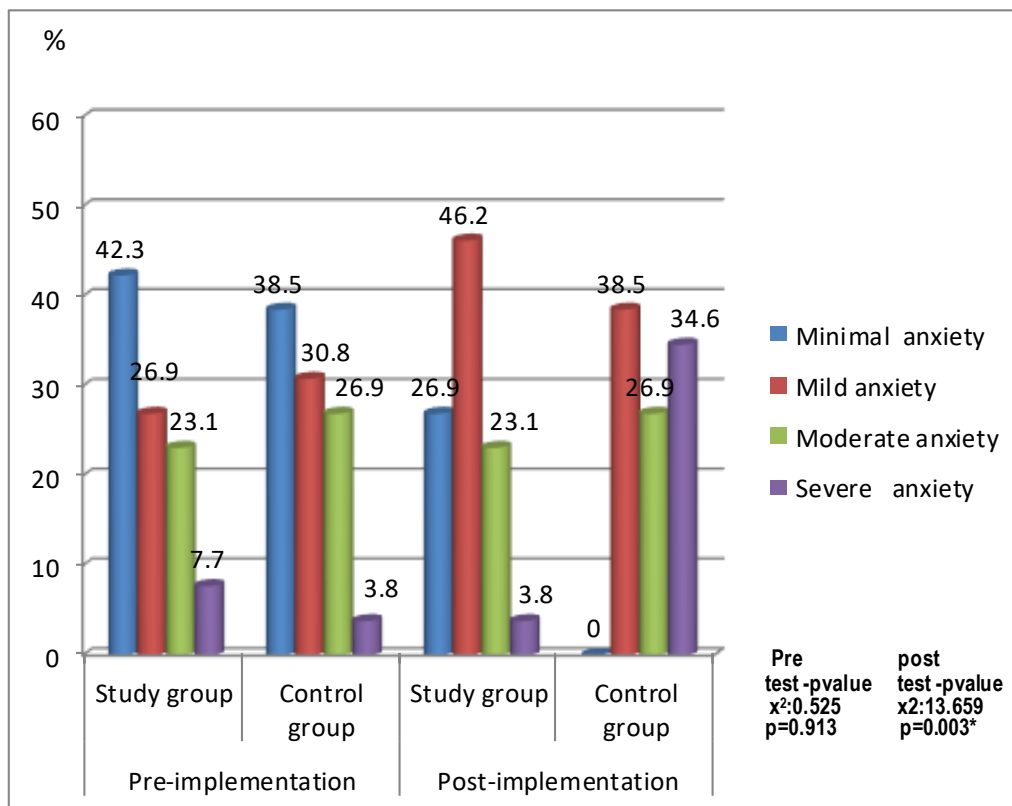
Table (8): Comparison between Study and Control Groups Regarding Time for Resuming Normal Activity at post Implementation phase (n=52).

Item	Post -implementation				Test P-value
	Study group		Control group		
	No	%	No	%	
▪ 5-<7 Days	10	38.5%	0	0%	$x^2 = 16.371$ p<0.001**
▪ 7-<10 days	9	34.6%	7	26.9%	
▪ 10-14 days	5	19.2%	10	38.5%	
▪ > 14 days	2	7.7%	9	34.6%	

Insig. >0.05   Sig. ≤0.05   * High sig. ≤0.001**

Table (9): Correlation between Mean scores of Pain, Anxiety, knowledge, Self-Care Practices, Post-ablation Syndrome, and Time for Resuming Normal Activity among Study Group Pre and Post Guideline Implementation.

Items	Total knowledge			
	Pre		Post	
	r	P-value	r	P-value
Total self –care practices	0.158	0.687	0.665	0.013*
Anxiety	0.206	0.544	0.703	<0.001**
Time to resume to normal activity	0.284	0.532	0.565	0.017*
Pain	0.181	0.618	0.422	0.004*

Insig. >0.05   Sig. ≤0.05   * High sig. ≤0.001**

Discussion

Hepatocellular carcinoma (HCC) is the most frequent form of primary liver cancer. Radiofrequency Ablation (RFA) is an alternative therapy for HCC when resection cannot be performed, the risks associated with RFA are relatively minor compared to those associated with many other cancer treatments However, no procedure is risk-free, but it has many side effects and serious complications. Efforts are being made to use self-care approaches, combining local and regional treatments with systemic therapeutic protocols, to improve patient outcomes across different disease stages **(Sherman, 2019).**

The study aimed to evaluate the effect of self-care management guidelines on the outcomes of patients receiving radiofrequency ablation therapy for hepatocellular carcinoma through assessment of patient's knowledge and self- care management practices among patients with hepatocellular carcinoma undergoing radio-frequency ablation therapy, development and implementing self- care management guidelines based on patients' assessments and then evaluating the effect of implementing self- care management guidelines on outcomes for patients receiving radiofrequency ablation therapy.

This study showed that the mean age of the study group was 56.61±4.12while mean age in the control group was 57.2±7.80. According to **Elkenawy et al. (2022),** the incidence of HCC is higher in patients above the age of 50. Also, this finding is agreed with study done by **Ezzat et al. (2021)** who mentioned that the mean age of the patient with hepatocellular carcinoma was 55.42 years, but this result is not agreed with **Yehia et al. (2020)** who proved in their study that the mean age of the study samples was 38.74 + 11.746 years.

Regarding gender, more than two thirds of the study group patients and more than three fifths of control group were males, and this result is supported by **(Abudeif, 2019)** who mentioned in his study that, HCC occurs in males 2 to 3 times higher than in females. Also, this result agreed with statistical analysis observed by the World Health Organization **(The World Health Organization, 2022)** that estimates that 900,000 individuals develop each year hepatocellular carcinoma (HCC), and the most common form of liver cancer occurs

in male than females. The findings of the current study revealed that, majority of the sample in the study and control groups were married, and slightly more than two fifths of the patients in the study and control groups had high education, this result was inconsistent with **Sheta and Abo El-Fadl. (2023)** who mentioned that minority of studied subjects had high education. This discrepancy may be due to different settings that both studies were conducted.

Studying the residence among studied patients revealed that slightly more than half of the patients in the study group and less than half of control group were residents in urban area. This finding was supported by study results done by **Rashed et al, (2020)** whose study findings reported that HCC is slightly lower in rural compared with urban communities. Also, the current study showed that about three fifths of study and control groups had sedentary work and had 2-3 members in their families. Also,

The current study showed that, two fifths of the study group participants and more than one third of control group had chronic virus C and hypertension respectively, this results was consistent with study done by **Ezzat et al. (2021**) who stated that, HCC occurred more frequently in patients with hepatitis C virus than in those with hepatitis B virus and explained that the high prevalence may be attributable to Egypt's long-standing hepatitis C pandemic. The current study showed that, about three fifths of the study group and more than one half of the control group respectively had family history of liver cancer, and this finding was agreed with **The World Health Organization (2022**) who reported that patients with family history of liver cancer were at the highest risk of developing hepatocellular carcinoma.

The current study revealed that, nearly one half and nearly two fifths of study and control groups respectively their duration for hepatocellular carcinoma were less than six months. Also, the current study revealed that more than half of the patients in the study and control groups receive previous RFA session. Regarding ablation time, the current study showed that one half of patients of the study group and more than one half of the control group their ablation time was less than 30 minutes. these findings were in accordance with **Ongiem, et al., (2016)** who mentioned in his study that slightly more than two thirds of the study subjects had one previous session of RFA therapy and the majority of them, their ablation time was less than 30 minutes. However, this result is somewhat disagreed with **Zaki et al. (2021)** who stated that, more than two thirds of the patients in the study and control groups had no previous session of RFA.

Furthermore, the present study revealed that one half of study group and more than three quarters of the control group received knowledge regarding RFA and HCC from social media while minority of both groups reported that the nurse was the source of knowledge and this refers to patient`s motivation to acquire the knowledge regarding this topic and suggest future training of nurses to enhance their role for such group of patients. Notably, the results of the study showed that there were no statistically significant differences between the study and control groups regarding all their demographic characteristics and medical clinical data which indicate homogeneity of both groups under study and prove reliability and give more verification of the study findings.

As regards the effect of implementing self- care management guidelines on knowledge of patients receiving radiofrequency ablation therapy for hepatocellular carcinoma, it was revealed that there was statistically significant increase of the level of satisfactory knowledge among study group as compared to control group after self-care guideline implementation regarding HCC, RFA, self-care management instructions as well as total satisfactory level knowledge after implementation of self-care guidelines with statistically insignificant variation was detected between both groups before guideline implementation regarding the same knowledge items. This enhancement of knowledge among study group participants as compared to control one may be attributed to the positive effect of self-care management guidelines and associated Arabic booklet in knowledge allocation regarding RFA.

The previous result was supported by **Mohamed and El-Shishtawy (2022)** in their study titled "Effect of Nursing Strategies on the Performance and Satisfaction of Patients with Hepatocellular Carcinoma undergoing Radiofrequency Ablation Therapy" and found that, patients in both the study and control groups had little knowledge about radiofrequency ablation therapy before strategies application. However, after implementing techniques, there was a significant improvement among study group versus control group.

Regarding the effect of implementing self- care management guidelines on self-care practices among studied patients, the current study showed that, there was significant improvement in subtotal and total level of self-care practices about drug, diet, activity, sleep and rest, wound, managing and preventing potential complication as well as pre- and post-procedure precautions regarding RFA post implementations of guidelines for study group in comparison to control group in which there was statistically significant difference between the two groups regarding this item. From researchers' point of view, this improvement might be attributed to efficiency of theoretical and practical self-care management guideline to change self-care knowledge and practices regarding RFA in addition to nature of RFA as a crucial therapy which force patient for adherence to self-care practices guidelines.

Similarly, **Sheta and Abo El-Fadl (2023)** in their study titled " Effect of Self-Care Strategies on Health Outcomes of Patients with Hepatocellular Carcinoma. Evidence-Based Nursing Research" reported that patients' self-care practices in terms of food habits, daily lifestyle, medication use, and follow-up improved after using self-care measures compared to previously. They added that this improvement may be attributable to practical guidance on self-care tactics, which include essential self-care measures that assist patients with HCC maintain healthy behaviors.

Regarding severity of pain after implementation of self-care guidelines, the results showed that one fourth of the study group participants versus one tenth of control group had no pain, while one tenth of study group versus two fifths of control group had severe pain with statistically significant reduction of severity of pain among study group as compared to control group. This might be because study group received self-care management guidelines which focused on wound management, activity management in addition to pain management which consequently help patient to deal better with ablation insertion site and feel more comfortable. This finding was in agreement with study conducted by **Wang et al. (2022)** in their study about the effect of nursing management of patients undergoing interventional therapy for liver cancer compared with standard care on patient-reported outcomes who reported that the intervention group's rate of pain severity was significantly reduced, as well as the severity of pain when compared to the control due to the effect of nursing instructions.

The current study showed that, there were significant improvement regarding severity of post ablation syndrome regarding fever, malaise, and nausea among the study group patients than control group after implementation of self-care management guidelines with statistically significant difference was observed between both groups which convey the positive effect of self-care management practices regarding management of post-ablation syndrome. This result is in the same line with **Khalil et al. (2018)** in a study titled "Effect of Educational Nursing Instructions on Outcomes of Patients Receiving Percutaneous Alcohol Ablation Therapy for Hepatocellular Carcinoma Treatment" who explored that the severity of post-ablation syndrome among study group patients was improved significantly when the educational nursing instructions were implemented. In the same line, **Mohamed et al. (2020)** in their study about the effect of nursing care instructions on outcomes of patients with hepatocellular carcinoma and illustrated that there were statistically significant differences between the two groups under study in terms of nausea and vomiting.

Regarding occurrence of post ablation complications, the finding of this study showed that, there was statistically significant reduction of occurrence of post-ablation complication

among study participants as compared to control group as regards hemorrhage from needle track, wound infection and inflammation as well as redness of needle insertion site. This finding supports study hypothesis and proves the efficacy of study guidelines to assist study group participants to prevent and deal with post-ablation complications due to enhancement of their self-care practices. In this respect, **Mohamed et al., (2020)** who illustrated in their study that, more than two thirds of patients in control group were having infection after procedure and there was a highly statistically significant difference between study and control groups regarding post ablation complications.

Regarding the effect of self-care management guidelines on the level of anxiety among studied patients, the current study showed that about one fourth of the study group had minimal level of anxiety versus no one in the control group and minority of the study group participants versus one third of the control group had severe anxiety at the post-implementation phase with statistically significant differences between two groups. From researchers 'point of view, this finding may be due to enhancement if patients' knowledge, self-care practices, reducing severity of pain and post-ablation syndrome which reflect positively on the severity of anxiety among study group. This was in accordance with **Salah et al. (2022)** in a study titled "Quality of life for patients with Hepatocellular carcinoma undergoing Radio frequency Ablation " who discovered that, the majority of the patients in both groups under study had moderated and severed anxiety pre guidelines. While post guidelines the degree of moderate and sever anxiety decreased in study group compared to control group.

Furthermore, the current study revealed that the study group took shorter time to resume to normal activity after ablation than control group and with a statistically significant difference between study and control groups regarding this item. This may reflect the effect of receiving pre, and post-procedure RFA precautions among study group participants and reinforcement of these precautions through Arabic booklet in addition to activity management as a part of self-care guidelines which help them to resume faster to normal activity post-ablation as compared to control group who didn't receive them. Similarly, **Salah and her colleagues (2012)** in earlier study titled " Radiofrequency Ablation Therapy: Effect of Educational Nursing Guidelines on Knowledge and Post Ablation Syndrome for Patients with Hepatocellular Carcinoma" found significant differences between the study and control groups as regards resuming to normal activity duration.

Regarding correlation between patient`s knowledge and self-care practices, the result showed that, there were statistically significant correlations between total level of knowledge and total self-care practices, anxiety, time to resume to normal activity and pain after implementation of self-care guidelines. These findings might be attributed to improvement of patients' knowledge which in role enhance and empower their self-care practices that result in reducing pain, post-ablation syndrome and consequently reduce anxiety among study group patients after implementation of self-care management guidelines. This was in agreement with **Zaki et al. (2021)** who founded that there was highly statistically significant difference and positive **co**rrelation between total self-care practices and total quality of life with their total knowledge of the study group post implementation of self-care guidelines.

Conclusion

Based on the results of the present study, it can be concluded that the implementation of self–care guidelines for patients with hepatocellular carcinoma undergoing radiofrequency ablation therapy (RFA) had a significant positive effect on improving patient`s knowledge regarding HCC and RFA, improving total self-care practices, reducing severity of pain and post-ablation syndrome, reduction of occurrence of post-ablation complications and faster resuming to normal activity. These findings support and prove all the study hypotheses.

Recommendations:

- All patients with hepatocellular carcinoma in health care settings should have access to a concise and comprehensive Arabic brochure/booklet with radiofrequency ablation precautions and guidelines.

- Training programs for nurses in radiofrequency ablation units and out-patient clinics regarding their role as a health educator for such group of patients.

- More research with a larger sample size in different geographical areas are needed to confirm and generalize the results.

- longitudinal study should be conducted to assess effect of patients 'education on long-term outcomes for patients with HCC undergoing RFA as quality of life for such groups.

- Developing educational programs for patients regarding HCC, radiofrequency ablation therapy and other treatment modalities and delivering it through social platforms and media.

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