

Effect of Smart Phone-Based Educational Program on Self- Care Practices for Hepatitis C Patients

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Abstract

Background: Hepatitis C virus (HCV) fronts a threat disease to the health of millions of people and is a major cause of mortality and morbidity worldwide. The use of new digital health technology helps in providing quality assured education, as well, it has been proved to positively affect self-care practices. This study **aimed** to evaluate the effect of a smartphone-based educational program on self-care practices for hepatitis C patients. **Design:** A quasi-experimental research design was utilized in this study. **Setting:** This study was conducted at the medical outpatient clinic affiliated to El Nasr Insurance Hospital. **Sample:** A purposive sample of 100 Hepatitis C patients was selected and randomly divided into two equal groups. **Tools of data collection:** One tool was used, Patients' structured interview questionnaire: it included four parts: **Part 1)** Patients' demographic characteristics, **Part 2:** Past medical history. **Part 3)** patients' level of knowledge regarding HCV, and **Part 4)** patients' self-care reported practices. **Results:** The mean age of the study and control groups were (39.70 ± 7.74) and (39.560 ± 9.532) respectively. The majority of study group had satisfactory knowledge scores post smart phone program, the minority of study group had a good level of self-care practices in the pre-program phase compared to the majority of them post smart phone program implementation **Conclusion:** There were highly significant improvements in total knowledge scores, reported self-care practices post smartphone educational program among study group than control group. **Recommendation:** Updated counseling regarding self-care practices must be included in the hepatitis C management standardized protocols.

Keywords: Hepatitis C, Self-care, Smartphone-based educational program.

Introduction:

Hepatitis C virus (HCV) infection is a main worldwide health problem and it also has a great impact on the health, psychological and economic conditions of patients and society. Regardless of hepatic symptoms, chronic infection can cause major stress; affect patients' capabilities to perform daily activities, and negatively impact patients' quality of life and their

social relations. Thus, hepatitis is a foremost problem for health care services, not only because of its high incidence, but also because the likelihood of chronic complications, and long-term medical supervision (Shiha, et al. 2020).

The Sustainable Development Goals (SDGs) that were adopted by the United Nations General Assembly in 2015 involved eliminating viral hepatitis

infection as a public health threat by 2030 (Waked, et al. 2020). In May 2016, World Health Organization (WHO) has stated targets for the eradication of viral hepatitis; including reaching a 90% reduction in new infections, 80% treatment coverage, and a 65% reduction in related mortality by 2030 (WHO Global hepatitis report, 2017). To achieve these targets health care organizations must state client, practitioner, and health care systems barriers to care (Madden et al., 2018; Marshall, Madden, & Treloar, 2019).

The promotion of self-care is one of the keystones of patient-centered care (Jansa, et al. 2020). Self-care is an interactive, dynamic process in which individuals actively participate in disease management (Kong, et al. 2015). It consists of three significant self-management tasks: medical management (monitoring symptoms, treatment adherence, taking medications properly, attending medical follow up, and prevention of complications), role management (adopting a healthy lifestyle associated with a long-term condition), and emotional management (managing emotional responses associated with having a chronic disease) (Boudreault, et al. 2020).

Self-care programs are differentiated from routine patient education programs as they integrate a broad approach where patients not only learn about their illness and its treatment but also they acquire real-life coping skills (Boudreault, et al. 2020). Self-care education for chronic disease management provides patients with tools to use in coping with their diseases such as problem-solving skills, and motivation for lifestyle modifications. As well, it has been proved that the self-care approach promotes medication adherence,

emotional status, and quality of life in many chronic diseases (Cui, et al. 2019).

The development of information and communication technology (ICT) as well as the increased use of smartphones, the number of patients using mobile applications have increased in receiving medical instructions (Poushter, 2016). Mobile health applications (MHAs) are becoming progressively common as digital interventions in a wide range of health-related applications in most health care sectors (Gordon, et al. 2020). Thus, smartphones with health apps provide a good strategy to integrate all the efforts so far because of their essential qualities and acceptability to patients and health care team members (Safwan, & Atreja, 2016).

The use of health-related smartphone applications has now expanded and has led to the worldwide influence of this technology. The applications can be installed on smartphones or tablets; they are constantly available, easy to use and are easily updated. Smartphone applications can be considered as a supporter of health care programs because anyone can use them in a completely individual way. They have the opportunity to collect information in real-time and provide graphical demonstrations and also interchange and interact with the information (Kiyarosta, et al. 2020).

Significance of the study :

Viral hepatitis poses a serious threat to the health of millions of people and is a major cause of mortality and morbidity worldwide. Globally, an estimated 71 million people are living with hepatitis C infection (HCV) (Polaris Observatory HCV Collaborators, 2017), with 3-4 million new infections are diagnosed and 400,000 infected persons

die annually as a consequence of HCV-related complications (Petruzzello et al. 2016; WHO Hepatitis C fact sheet. 2017).

Egypt has the highest worldwide prevalence of hepatitis C virus infection, which is associated with significant disease and a financial burden (Blach, et al. 2016; Abdel-Razek, et al, 2019), hence; hepatitis C virus elimination became a national health priority. World health organization estimated that higher than 10% of the general population is infected. There were approximately, 3.7 million persons in Egypt who had chronic hepatitis C virus infection in 2015 (El-Ghitany, 2019). The high incidence of hepatitis C virus is another vital issue, where about 160,000 to 500,000 new hepatitis C virus infections occur annually (El-Adly, Wardany, & Morsy, 2020).

Nurses play a vital role in the management of the hepatitis C virus. Nurses can support and empower hepatitis C virus patients to self-care for their disease and decrease the opportunities for developing further complications. During the current pandemic of the novel coronavirus disease, the use of mobile health applications has been greatly increased (Kernebeck, et al. 2020). So, new nurses' roles had emerged to apply their skills in different ways and use emerging technologies, such as applications of smartphones as zoom, Whats App and social media to provide many patients by healthy solutions for complex health care problems (Betty Irene Moore School of Nursing, 2019). This is particularly beneficial for hepatitis C virus patients who need a long time waiting for visiting a doctor or those who have problems of far distance to the health care settings (Bashir & Bastola, 2019).

Aim of the Study:

The study aimed to:

Evaluate the effect of smartphone-based educational program on self-care practices for hepatitis C patients through:

1- Assessing patients' knowledge and their self-care practices regarding hepatitis C.

2- Planning and implementing a smartphone-based educational program regarding hepatitis C.

3- Evaluating the effect of smartphone-based educational program on self-care practices for hepatitis C patients.

Research Hypothesis:

The application of the smartphone-based educational program will have an improvement effect on the knowledge and self-care practices of hepatitis C patients among study group than control group.

Operational Definition:

The smartphone-based educational program is a type of digital education using a smartphone applications (WhatsApp and zoom) which facilitate patients' interaction with the health care provider and promote accessibility to the educational program contents.

Material and Methods:

Technical Design:

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

Research design:

A quasi-experimental design was utilized to achieve the aim of this study.

Quasi-experimental research designs examine whether there is a causal relationship between independent and dependent variables (**Rogers, & Revesz, 2019**). In quasi-experimental research, patients or groups of patients self-select or their providers select them into one of several different treatment groups to compare the real-world effectiveness and safety of those non-randomized treatments (**Maciejewski, 2020**).

Setting:

The study was conducted at the medical outpatient clinic affiliated to El Nasr Insurance Hospital. This setting was selected as it's a health insurance hospital providing health services for employees and workers. The medical outpatient clinic contained one room with a stretcher and a waiting hall.

Subjects:

A purposive sample of 100 patients was included in the study.

The sample size was determined according to the statistical calculation which guided by the power of the test = 80%

Confidence Level =95%.

The accepted level of error =5%.

Inclusion Criteria:

Patients' age above 18 years, from both sexes, agreed to participate in the study, read and write well and have smartphone and internet access.

Sample size calculation:

The sample size estimated by using the following equation:

$$N = \frac{N \times p (1-p)}{\{N-1 \times (d^2 \div z^2)\} + p (1-P)}$$

- Type I error with significant level (α) = 0.5.
- Type II error by power test = 90%. (**Suresh & Chandrashekar, 2012**).

Based on the equation, the sample size was 100 patients participated in this study. The researchers divided them randomly into two groups, the study group (50 patients) received smartphone-based educational program and routine care and the control group (50 patients) received routine care.

Study tools:

Tool: Patients structured interview questionnaire: It included 4 parts:

Part I: Patients' demographic characteristics

This tool was developed by the researchers based on an extensive literature review (**El-Adly, Wardany, & Morsy, 2020; Hassinine, et al. 2018**). It contained 7 items regarding patients' data such as (age, gender, residence, marital status, level of education, occupation, and family income).

Part 2: Past Medical History

It was developed by the researchers, based on reviewing the most recent and relevant literature (**Elsayed, &**

Abd El-Aal, 2017; Youssef, et al. 2017; Abdel-Razek, et al. 2019), which included series of questions to elicit patient's past medical history regarding risk factors for HCV, Symptoms of HCV, Treatment paying, and ways of discovering disease.

Part 3: Patients' level of knowledge regarding HCV:

It was developed by the researchers, based on reviewing the most relevant literature (; (El-Akel, et al. 2017; El-Ghitany, 2019; Schillie, et al. 2020). It contained 20 closed end questions reflecting 6 parts: (1) meaning of HCV disease and modes of transmission; (2) signs and symptoms of HCV (3) complications of HCV; (4) diagnostic studies; (5) pharmaceutical treatment for HCV; (6) side effects of anti-viral treatment

Scoring system of Patients' level of knowledge regarding HCV:

One mark for correct answer, and zero for the incorrect answer. The total knowledge score was (20) marks. It divided as the following:

- The satisfactory level of knowledge if score $\geq 60\%$.
- The unsatisfactory level of knowledge if score $< 60\%$.

Part 4: Patients' self-care reported practices:

This tool was developed by the researchers to assess self-care practices as reported by patients with Hepatitis C. It consists of 25 closed ended questions measuring 6 domains: (1) nutrition and hydration (2) monitoring and managing symptoms (3) treatment adherence (4) follow-up, and prevention of

complications (5) adopting a healthy lifestyle (6) managing emotional responses.

Scoring system of Patients' self-care reported practices:

One mark for each done and zero for the not done answer with a total self-care practices score was (25) marks and the total practices score was categorized as follows:

- Poor practices if score $< 50\%$.
- Average practices if score 50% to $< 75\%$.
- Good practices if score 75% - 100%.

Smartphone-based educational program:

A type of digital education using a smartphone application (WhatsApp), it included two parts (knowledge about HCV & patients' self-care practices). The program aimed to help patients to acquire knowledge and self-care practices to reflect on their quality of life.

First part: Knowledge about HCV

It included general knowledge about HCV disease, risk factors, modes of transmission and how to prevent it, the stages of the disease, signs and symptoms, hepatitis C tests and diagnosis, medical treatment for HCV and side effects of anti-viral treatment, factors contributing to the complications of the hepatitis C, signs of complications (cirrhosis, liver failure, and hepatocellular carcinoma).

Second part: Self-care practices of HCV

It included healthy diet and hydration, monitoring for signs and symptoms of complications, the importance of treatment adherence and follow up, and prevention of complications, adopting a healthy lifestyle (Protection from risky behaviors, fatigue management, substance abuse treatment, and safe injection practices); and managing emotional responses.

Operational Design:

The operational design includes the preparatory phase, tools validity and reliability, pilot study, and fieldwork.

The preparatory phase:

▪ The first step of this phase was concerned with a review of the related literature to the topic of the study, using books, articles, periodicals, magazines, and internet research.

▪ Select and modify the proper tools for data collection.

▪ Test tools validity and reliability.

Content validity

Content validity was conducted to test the tools for appropriateness, relevance, correction, comprehension, and clearance through a jury of five experts, from the medical-surgical nursing staff. Juries were from different academic categories (professors and assistant professors). Their opinions were elicited regarding the tool format layout, consistency, and scoring system.

Testing reliability:

Testing reliability was measured by Cronbach's alpha test to measure the internal consistency of the tools used in

the study as follows; Patients' level of knowledge regarding HCV= 0.819, patients reported self-care practices= 0.785. The values of Cronbach's alpha of the study tools are considered acceptable.

Ethical considerations:

The researchers explained the aim of the study to patients who agreed to participate in the study. Oral consent was obtained from patients who agreed to participate in the study. The researchers assured maintaining anonymity and confidentiality of the subjects' data. Patients were informed that they have the right to withdraw from the study at any time.

Pilot study:

A pilot study was carried out on 10% of the sample (10 patients) to test the feasibility and applicability of the tools; as well as to estimate the time needed for each tool to be filled in. Patients who participated in the pilot study were included in the main study sample because there were no modifications in the tools.

Field Work:

Data collection was started and completed within 6 months in the period from the beginning of January 2020 until the end of June 2020.

The purpose of the study was explained by the researchers to patients before any data collection; the study sample was randomly and alternatively divided into study and control group. The study tools were filled in and completed by the researchers in two stages (pre & post the implementation of the smartphone-based educational program).

Data collection was done through the following four phases:

The first phase (Assessment phase):

In this phase, the researchers interviewed both groups to collect data starting with the control group then study group. The collection of data was begun by the patient structured interview questionnaire which includes (Patients' demographic data and past medical history). The time needed for completing this questionnaire was about 10-15 minutes for each patient. After that, Patients' level of knowledge about HCV, took about 10-15 minutes. Self-care of HCV questionnaire took about 10-15 minutes.

Second Phase (Planning phase):

- An educational booklet as a teaching aid was prepared and written in simple Arabic language and based on the patients' knowledge level in the pretest.

- In a face to face meeting, the researchers clarified to patients the benefits of using smartphone-based educational program such as providing a method for the researchers to communicate with patients and can facilitate ask and answer sessions between patients and the researchers. So, it can increase the speed, quality, and safety of patient care interventions and decrease the costs of direct care for patients.

- The researchers obtained patients' telephone number from each patient and the researcher's telephone number was provided to the patients for contact purposes

- The researchers discussed with patients the methods of their communication through WhatsApp groups, Zoom meeting and messenger.

Then they made two WhatsApp groups one for control group and for study group.

- WhatsApp groups were developed to upload the contents of the program (booklet, brochures, powerpoint, illustrative pictures, videos, text and voice messages).

Third Phase (Implementation phase):

The study group (smartphone-based educational program and routine care).

- For the study group, the researchers discussed with patients the plan of uploading the program contents and the most suitable time for them to implement a WhatsApp meeting or chat session.

- It was most suitable to communicate with patients and implement a WhatsApp meeting or chat session on Saturday weekly as about half of the study patients were employee.

- The contents of the educational program were divided in to eight sessions (4 theoretical sessions and 4 sessions related to self-care practices) to upload each part weekly to the WhatsApp group. Each chat session had a time (45-60 minutes).

- Before each session, the researchers sent text and voice messages as reminders to patients to join the meeting on time. Then, they upload the educational materials of each session and allowed for interactive learning through open discussion between all group members and answering any patients' questions.

- Patients and researchers interacted with each other's depending on the patients' needs and their conditions,

and the researchers sent messages as weekly reminders to patients for adopting hepatitis C self-care practices and guidelines for patients to live healthy.

- The researchers sent notifications continually to the patients to encourage them to be in constant interaction between each other as well as with the educational program materials.

The control group (routine care only)

- The patients in the control group received routine care, which included taking medicines and follow up at outpatients' clinic.

- For the control group patients, WhatsApp group was used to answer any questions related to hepatitis C management and routine care they were receiving.

- The control group was provided with the educational contents of smartphone-based educational program post data collection.

Fourth Phase (Evaluation phase):

- Evaluation for both groups was conducted through interviewing patients at the outpatients' clinic by using the same tools to evaluate the effect of the implemented smartphone-based educational program on knowledge and self-care practices of hepatitis C patients.

3- Administrative Design:

To carry out the study, the necessary approvals were obtained from the hospital director and nursing director of El Nasr Insurance Hospital. Official letters were issued to them explaining the

aim of the study to obtain permission for data.

4-Statistical analysis:

The data obtained were synthesized, analyzed, and presented in numbers; percentage in the form of tables, figures, and diagrams as required, and suitable statistical tests were used to test the significance of results obtained using SPSS.

Results:

Table (I): Illustrates that 40.0% and 34.0% of patients in the study and control groups respectively were in the same age group from 40 years to less than 50 years old with a mean age (39.70 ± 7.74) and (39.560 ± 9.532) respectively. 64% and 58% of the studied patients were males. 81.0% and 84.0% of the patients in the study and control group respectively were married. As well, 46.0% and 48.0% of them had secondary education. While, 88%, and 90% of them were from the urban area. Concerning **family income**, 86.0% and 88.0% of the study and control groups respectively had not enough family income.

Table (2): Reveals that 42.0% & 44% and 36.0% & 40% of the study and control groups had a previous history of hospitalization and surgical operation respectively, while the 88.0% & 78% of them had previous visits to the dental clinic. Concerning symptoms of HCV, also 70.0% & 64.0% of the study and control groups respectively were suffering from fatigue, while 64.0% of the study group and 88.0% of the control group were suffering from anorexia. As regards **treatment paying**, 80.0% and 96.0% of the study and control groups received their treatment from the government. Also

48.0% and 46.0% of the study and control groups discovered their disease by symptoms respectively.

Figure (1): Reveals that there was a statistically significant improvement of study group's total satisfactory knowledge scores post-implementation to smart phone educational program with high statistically significant differences between pre and post-program where $p \leq 0.001$.

Figure (2): Shows that there were no statistically significant differences in total satisfactory knowledge scores of control group between pre and post-program where $p \leq 0.125$.

Table (3): shows that there was high statistically significant difference of total mean knowledge scores pre and post smart phone program implementation within the study group with ($p \leq 0.001^{**}$). While there were no statistically significant difference between pre and post program in the control group with ($p < 0.125$).

Table (4): Illustrates that there was a statistically significant improvement was noticed among the study group through the study phases. Where 18.0% of study group had a good level of self-care practices in the pre-program phase compared to 72.0% of them post- smart phone program implementation. While 56.0% of control group had poor level of self-care in the pre-program phase compared to 50.0% post-program implementation.

Table (5): Clarifies that, there was a statistically significant relation between total knowledge scores and total self- care practices scores post smart phone educational program implementation among the study and control groups, where ($P = 0.001$ & 0.041) respectively.

Table (6): Shows that there was no statistically significant relation between demographic characteristics of the studied patients and satisfactory level of knowledge post smart phone educational program implementation except for age, educational level and family income.

Table (1): Demographic Characteristics of the Studied Patients.

	Study group (50)		Control group (50)		Chi-square	P-Value
	N	%	N	%		
Age in years						
18 -<30 year	8	16.0	8	16.0	0.98	0.914
30- < 40 year	13	26.0	17	34.0		
40-< 50 year	20	40.0	17	34.0		
≥50 year	9	18.0	8	16.0		
Mean± SD	39.70± 7.74		39.560 ± 9.532			
Gender						
Male	32	64.0	29	58.0	1.388	0.705
Female	18	36.0	21	42.0		
Marital status						
Single	4	8.0	3	6.0	4.179	0.239
Married	40	80.0	42	84.0		
Widow	2	4.0	1	2.0		
Divorced	4	8.0	4	8.0		
Level of education						
Read And Write	11	22.0	9	18.0	3.398	0.311
Secondary	23	46.0	24	48.0		
University	16	32.0	17	34.0		
Occupation						
Employee	21	42.0	20	40.0	6.396	0.159
House Wife	10	20.0	11	22.0		
Worker	16	32.0	17	34.0		
Not Working	3	6.0	2	4.0		
Residence						
Urban	44	88.0	45	90.0	0.509	0.477
Rural	6	12.0	5	10.0		
Family income						
Not Enough	43	86.0	44	88.0	43.1	78.2
Enough	5	10.0	4	8.0		
Enough and save	2	4.0	2	4.0		

Table (2): Distribution of Studied Patients according to their Health History.

	Study group (50)		Control group (50)	
	N	%	N	%
* Risk factors for HCV				
Hospitalization	21	42.0	22	44.0
Surgical operation	18	36.0	20	40.0
Blood transfusion	4	8.0	5	10.0
Bilharzias treatment	13	26.0	20	40.0
Dental visits	44	88.0	39	78.0
* Symptoms of HCV				
Fatigue	70	70.0	32	64.0
Anorexia	32	64.0	44	88.0
Nausea	18	36.0	21	42.0
Fever	8	16.0	19	38.0
Abdominal Pain	18	36.0	7	14.0
Treatment paying				
Governmental	40	80.0	48	96.0
Work	1	2.0	0	0.0
Health Insurance	9	18.0	2	4.0
Ways of discovering disease				
By symptoms	24	48.0	23	46.0
By medical checkup	12	24.0	11	22.0
By chance	14	28.0	16	32.0

* Each patient had multiple answers

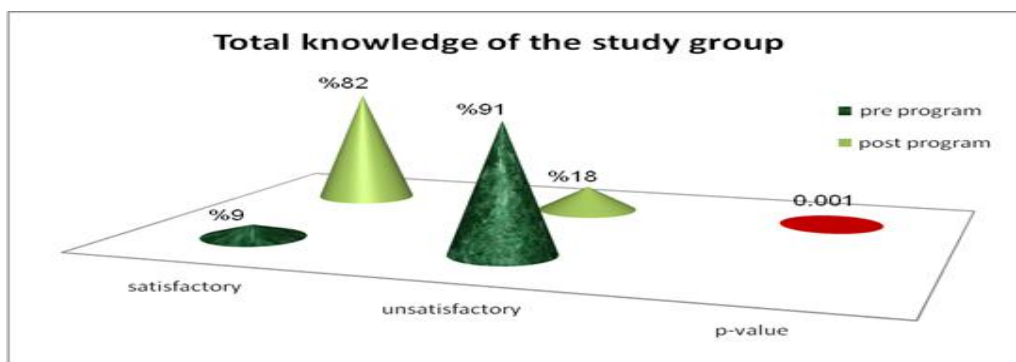


Figure (1): Percentage Distribution of Total Satisfactory Knowledge Scores for the Study Group Pre-post Smart Phone educational Program Implementation.

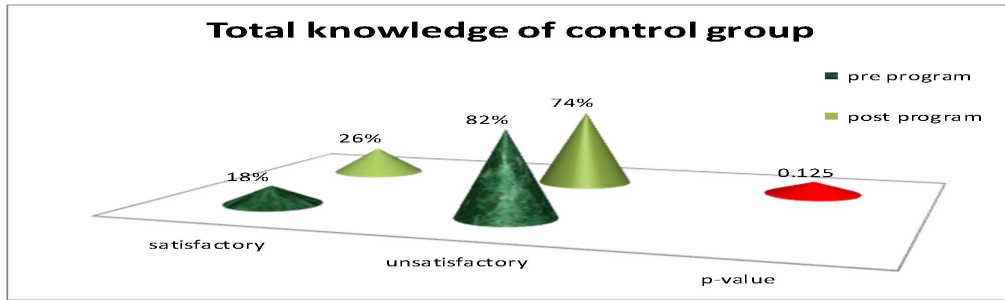


Figure (2): Percentage distribution of Total Satisfactory Knowledge Scores of Control Group Pre-post Smart Phone educational Program Implementation.

Table (3): Comparison of Total Mean Knowledge Scores among the Study and Control groups pre-post Smart Phone educational Program Implementation.

Item	Total knowledge	Pre program Mean ± SD	Post program Mean ± SD	Chi-square	P- value
Study group		9.24 ± 5.42	15.41 ± 3.25	2.557	0.001**
Control group		10.18 ± 4.92	12.86 ± 5.33	45.014	0.125

** High significant (p<0.001**)

Table (4): Percentage Distribution of Total Self-care Practice Scores of Studied Patients Pre-Post Smart Phone Educational Program Implementation.

Practice	Study group				Control group			
	Pre		Post		Pre		Post	
	No	%	No	%	No	%	No	%
Poor	25	50.0	3	6.0	28	56.0	25	50.0
Average	16	32.0	11	22.0	15	30.0	17	34.0
Good	9	18.0	36	72.0	7	14.0	8	16.0
Chi- square	6.02				1.36			
P-value	0.0021*				0.425			

* Significant P<0.05

Table (5): Relation between Studied Patients' Total Knowledge scores and Total Self-Care Practices Scores Post Smart Phone Educational Program implementation (N=100).

Total Practices	Total Knowledge scores				χ ²	p-value
	Satisfactory Knowledge (≥60%)		Unsatisfactory Knowledge (<60%)			
	No.	%	No.	%		
Study group						
● Poor	0	0.0%	3	6.0%	45.213	0.001*
● Average	7	14.0%	4	8.0%		
● Good	34	68.0%	2	4.0%		
Control group						
● Poor	1	2.0%	24	48.0%	38.547	0.041
● Average	5	10.0%	12	24.0%		
● Good	7	14.0%	1	2.0%		

*Significant (S)

p < 0.05

Table (6): Relation between Studied Patients' Demographic Characteristics and their satisfactory Level of Knowledge Post-program Smart Phone educational Implementation.

Variables		Total knowledge				Chi-square	P-value
		Satisfactory		Unsatisfactory			
		No.	%	No.	%		
Age	• 18 -<30 year	8	16.0	0	0.0	11.832	0.015*
	• 30- < 40 year	12	24.0	1	2.0		
Study group	• 40-< 50 year	17	34.0	3	6.0		
	• ≥50 year	4	8.0	5	10.0		
Control group	• 18 -<30 year	5	10.0	3			
	• 30- < 40 year	5	10.0	12	6.0		
	• 40-< 50 year	2	4.0	15	24.0		
	• ≥50 year	1	2.0	7	30.0		
					14.0	10.231	0.452*
Gender	• Male	26	52.0	6	12.0	6.341	
Study group	• Female	15	30.0	3	6.0		0.615
Control group	• Male	6	12.0	23	46.0	6.591	0.6.27
	• Female	7	14.0	14	28.0		
Marital Status	• Single	3	6.0	1	2.0		
Study group	• Married	36	74.0	4	8.0		
	• Widow	0	0.0	2	4.0		
	• Divorced	2	4.0	2	4.0	6.921	0.703
Control group	• Single	2	4.0	1	2.0		
	• Married	10	20.0	32	64.0	6.869	0.712
	• Widow	1	2.0	0	0.0		
	• Divorced	1	2.0	3	6.0		
Level of education	• Read and write	6	12.0	5	10.0		
Study group	• Secondary	20	40.0	3	6.0	12.963	0.102*
	• University	15	30.0	1	2.0		
Control group	• Read and write	0	0.0	9	18.0		
	• Secondary	4	8.0	20	40.0	11.876	0.213*
	• University	9	18.0	8	16.0		
Occupation	• Employee	19	28.0	2	4.0		
Study group	• House Wife	7	14.0	3	6.0	5.897	0.802
	• Worker	13	26.0	3	6.0		
	• Not Working	2	4.0	1	2.0		
Control group	• Employee	5	10.0	15	30.0		
	• House Wife	4	8.0	7	14.0	6.103	0.873
	• Worker	3	6.0	14	28.0		
	• Not Working	1	2.0	1	2.0		
Residence	• Urban	37	74.0	7	14.0		
Study group	• Rural	4	8.0	2	4.0	5.968	0.502

Control group	• Urban	10	20.0	35	70.0	6.874	0.597
	• Rural	3	6.0	2	4.0		
Family income Study group	• Not Enough	38	76.0	5	10.0	12.341	0.301*
	• Enough	1	2.0	4	8.0		
	• Enough and save	2	4.0.0	0	0.0		
Control group	• Not Enough	9	18.0	35	70.0	12.453	0.321*
	• Enough	3	6.0	1	2.0		
	• Enough and save	1	2.0	1	2.0		

*Significant (S)

p < 0.05

Discussion

The use of new digital health technology, which has been increasingly prevalent, helps in providing appropriate and quality-assured patients' education. As well, in case of insufficient health care resources or limited patient's access to care, technology can extend the reach of education and support (Mesko, 2018). Thus, in this study, a smart phone educational Based education program through Whats App was developed and used by the researchers to present the contents of the program to be an easily available for better-educating patients regarding HCV self-care practices.

Regarding the demographic characteristic of patients, more than one-third of patients in the study and control groups were in the same age group from 40 years to less than 50 years old. This result is in disagreement with (Shiha, et al. 2020), in a very recent study entitled "An Educate, test and treat model towards the elimination of hepatitis C infection in Egypt: Feasibility and effectiveness", mentioned that more than one-third of the studied HCV patients were aged 50-59 years. As well, this result is inconsistent with (Tsertsvadze, et al. 2020), who reported outcomes of Sofosbuvir based treatment

regimens in patients with chronic HCV infection and found that more than half of the study sample were between 45-60 years old.

Concerning to patients' gender, the results of the present study revealed that more than two-thirds of patients in the study group and more than half in the control group were males. This result is going in line with (Leo, et al. 2019) who reported in a study about "Impact of a Smartphone-Based Artificial Intelligence Platform on Hepatitis C Adherence in a Real-World Population", found that two thirds of the study group and more than half of the control group were males. While, this result is inconsistent with (Kong, et al. 2015) who studied "Development of Self-Management Indicators for Chronic Hepatitis Patients on Antiviral Therapy", clarified that the majority of the patients were female. This high number of males than females can be explained by their higher exposure level due to various risk factors of HCV transmission as related to their lifestyle.

In the current study, the results showed that the majority of the study and control group were married. This finding goes in line with Cui, et al., (2019) who examined the quality of life (QOL), psychological effects, and behavioral

changes of a self-management program which allows continuity of care for chronic hepatitis B and C patients and mentioned that the majority of their study sample was married. As well, this result is congruent with **Yang, et al. (2020)** in a recent study about "Evaluation of the effect of an Internet plus medical-based health management service model in patients with nonalcoholic fatty liver disease", signified that the majority of the study sample was married. This may be due to about half of the study sample was in their fourth decade of age and typically, by this age, they are married according to Egyptian culture.

Concerning to the **educational level**, less than half of the study group and the control group had secondary education. This result is consistent with **Hassinine, et al. (2018)** in a study about "Effect of Psycho-educational Program on Psychological Stress and Quality of Life among patients with Hepatitis C Virus" who stated that less than half of their studied patients had secondary education. While this result is in disagreement with **Cossais, et al. (2019)** who evaluated the clinical and non-clinical determinants of health-related quality of life associated with untreated chronic hepatitis C and mentioned in their study that more than half of their study sample had a bachelor level of education.

Regarding to the **patient's occupation**, this study result illustrated that about half of the study patients were employee. This result is consistent with **Souzaa, et al. (2015)** who assessed the health-related quality of life of patients with chronic liver disease, mentioned that less than half of study sample were employees. While this result is in disagreement with **Cossais, et al. (2019)**, who mentioned that more than half of the study sample were working. This result is

consistent with the mean age and educational level of a high proportion of the study patients, which qualified them to their jobs.

As regard to **family income**, the present study showed that the majority of the study and control group didn't have enough family income. This result is in agreement with **Awad, Abd El Mageed, & Hasanin, (2017)**, who assessed the quality of life of hepatitis "C" patients undergoing interferon therapy in Benha City, and found that about two thirds of the study sample hadn't enough monthly income. This finding confirms the low socioeconomic level of the study sample, which indebted them to receive governmental treatment paying through different sponsors including the National Committee for Control of Viral Hepatitis (NCCVH), and health insurance.

With respect to the **patient's residence**, the majority of the study and control group lived in an urban area. This result is congruent with **Youssef, et al. (2017)**, in a study about "Health-related Quality of Life in patients with chronic hepatitis C receiving Sofosbuvir-based treatment, with and without Interferon", stated that the majority of the study sample were from urban areas. While this result incongruent with **El-Adly, Wardany, & Morsy, (2020)**, in a study about "Prevalence and Risk Factors for Hepatitis C Virus Infection among General Population in Luxor Governorate", who found that the majority of studied sample lived at a rural community.

In relation to **patients' risk factors for developing HCV**, this study revealed that less than half of the study and control group had a history of surgical operation, while the majority of them had a health history of dentist visits.

These study findings are congruent with **El-Adly, Wardany, & Morsy, (2020)**, who mentioned in a study that exposures to surgery showed low association with HCV, while HCV exposure risk remains highest in people who underwent dental treatment as compared with people who did not undergo dental treatment.

Concerning to **symptoms of HCV**, about two-thirds of the study and control groups were suffering from fatigue as well; about two-thirds of the study group and the majority of the control group were suffering from anorexia. This result is in accordance with **Chen, et al. (2017)** in a study about "Assessment of Educational Needs and Quality of Life of Chronic Hepatitis Patients"; indicated that the most of patients had experienced severe fatigue. Moreover, this result is supported by **World Health Organization (2020)**, in Hepatitis C fact sheets which state that symptomatic patients may exhibit fever, fatigue, decreased appetite, nausea, vomiting, and abdominal pain.

Relating to the **treatment paying**, the majority of study and control groups received their treatment from the government. This result is congruent with **Abdel-Razek, et al. (2019)**, who mentioned in a study about "Hepatitis C Virus in Egypt: Report from the World's Largest National Program", that the majority of patients funded by the state through different sponsors including National Committee for Control of Viral Hepatitis (NCCVH), and health insurance organization. As well, this result goes in line with **Youssef, et al. (2017)**, who illustrated that most of the study patients received governmental treatment paying.

This finding assured the vital role of the National Committee for Control of Viral Hepatitis (NCCVH) in treating

hepatitis C patients which had established many specialized centers for treatment of viral hepatitis within MOHP (Ministry of Health and Population) healthcare facilities. To ensure better access to care and treatment for patients everywhere, these centers were planned to be geographically distributed in the most populated regions. These centers are managed through a well-trained team of specialized hepatologists providing the standard of care management according to the standardized protocols. More than 54 centers were established between 2007 and 2016 providing care and treatment to nearly 800 000 chronic HCV-infected persons (**El-Akel, et al. 2017**).

Concerning to **ways of discovering disease**, the present study results illustrated that only less than half of the study group and less than one-third of the control group discovered disease by symptoms. This finding is consistent to the results of **Elsayed, & Abd El-Aal, (2017)** who evaluated the quality of life for chronic hepatitis C patients' adherent to sofosbuvir based regimen, and stated that the majority of their study sample discovered HCV by symptoms.

In relation to **the patients' total knowledge scores**, this study reveals that there was a significant improvement of total satisfactory knowledge scores among study group post-implementation of smart phone educational program with highly statistically significant differences between pre and post-program. This can be explained by the effectiveness of smart phone educational program which facilitated patients' interaction with the health care providers and improved the patients' knowledge level. This finding is in accordance with **Elsayed, & Abd El-Aal, (2017)** who stated that there was an improvement of patients' general knowledge regarding chronic hepatitis C

and treatment regimen during treatment and follow-up phases than pre-treatment with a highly statistically significant difference between three phases.

With regard to **self-care practices of hepatitis C patients**, the present study results illustrated there was a statistical significant improvement in total scores of self-care practices among the study group. Where less than one-quarter of the patients had a good level of self-care practices in the pre-program compared to more than two-thirds of patients who had a good level of self-care post-program implementation. This may be due the continuous communication between patients and the researchers had raised patients' awareness about correct self-care practices

This finding is corresponding to the results of **El Lassy, & Moustafa, (2019)**, who studied "Impact of Interactive Digital-Based Hepatitis C Education on Self-Management and Quality of Life of Damanhur University Students Having Hepatitis C" and stated that a remarkable improvement of the total scores of hepatitis C self-management was noticed among the intervention group through the stages of the study, and study sample who had a good level self-management were increased from preprogram to post-program.

Concerning to **relation between patients' total knowledge scores and their total self-care practices scores post program**, the present study results found that, there was highly statistical significant relation between total knowledge scores and total practices' scores of hepatitis C patients. From the researchers' point of view the gaining of patients to satisfactory knowledge about

hepatitis C reflect on their good self-care practices positively.

These part results answer to the research hypothesis of the study that, application of the smartphone-based educational program had an improvement in knowledge level, and self-care practices of hepatitis C patients among study group than control group.

Considering **relation between demographic characteristics and satisfactory level of knowledge**, this study finding indicated that there was no statistically significant relation between demographic characteristics of the studied patients and satisfactory level of knowledge post-program implementation except for age, educational level and family income. This finding is dissimilar to the results of **Atya, et al. (2016)**, in a study about "Suggested Nursing Guidelines for Patients with Hepatitis C Virus to live Healthy", and showed that there was no statistically significant relation were documented between patient's demographic characteristics and their total knowledge

Conclusion

It could be concluded that, there were highly significant improvements in total knowledge scores, reported self-care practices post smart phone educational program among study group than control group. There was a statistically significant relation between total knowledge scores and total self-care practices scores post smart phone educational program implementation among the study and control groups.

Recommendations:

- Illustrated booklet should be available at all inpatient departments, outpatient hospital clinics and health centers for all hepatitis C patients.

- Updated counseling regarding self-care strategies for hepatitis C patients must be included in the hepatitis C management standardized protocols.

- Replicate this study with a larger probability sample size in a different geographic location to confirm the findings for generalization of the results.

- Further research studies are needed to develop systemically continuous self-care programs for patients with hepatitis C to help to improve the health status of those patients.

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