

Original Research Article

Impact of pharmacist-led health education on Hepatitis C virus awareness in Saudi Arabia: A pre-post interventional study

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Abstract

Purpose: To evaluate the impact of pharmacist-led health education on public awareness of Hepatitis C virus (HCV) in Al-Madinah Al-Munawarah region in the Kingdom of Saudi Arabia (KSA).

Methods: A pre-post interventional assessment was conducted to assess the awareness of HCV among citizens of Al-Madinah, Al-Munawarah, KSA. A pretested, validated questionnaire was distributed to randomly selected participants who were 15 years or older. Health education sessions were conducted by pharmacists and 4 months later, participants were reassessed using the same questionnaire to measure the improvement of their awareness and understanding of the disease and to evaluate the pharmacist's role.

Results: Of the 159 randomly selected participants, 35 % were between 20 - 30 years and 58 % of participants had higher education. There was limited knowledge among participants, with only 43 % recognizing HCV as a contagious illness. Some behavioral risks included 13 % of individuals using razors that were not changed between uses by family members. Significant improvements were observed across all knowledge domains, with overall awareness increasing from 43 to 92 % ($p < 0.001$).

Conclusion: Health education interventions by pharmacists significantly enhance public knowledge of HCV, particularly in high-prevalence regions like Al-Madinah, Al-Munawarah. Enhanced community awareness will potentially reduce the burden of HCV and improve public health outcomes in Saudi Arabia.

Keywords: Hepatitis C virus, Health Education, Public Awareness, Pharmacist intervention, Saudi Arabia

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INTRODUCTION

Hepatitis C virus (HCV) presents a significant public health concern worldwide, affecting more than 71 million people. It's one of the leading

causes of liver-related morbidity and mortality [1]. The prevalence of HCV differs across the globe, with the highest burden presented in middle-income countries, mainly in regions such as Africa, and Central and East Asia [1,2].

Nevertheless, developed countries also face challenges with HCV. This is attributed to historical factors such as unsafe medical procedures, injection drug use, and lack of knowledge within the general population [1]. Even with advances in treatment, a large percentage of people remain undiagnosed and untreated. Thus, acquiring an ongoing risk of transmission and disease progression increases the occurrence of liver cirrhosis and cancer [2]. Addressing the global burden of HCV necessitates coordinated strategies between healthcare providers in different settings. Aiming for more prevention initiatives, early diagnosis, and treatment [1,2].

Hepatitis C virus poses a substantial public health concern in the Kingdom of Saudi Arabia, which drives a considerable burden on the healthcare system. According to recent literature, the prevalence of HCV in Saudi Arabia differs across different regions. The estimated prevalence of HCV ranges from 0.5 to 3.3 % among the general population [3,4]. The infection rate is particularly higher in specific populations, such as patients with thalassemia, a disease state that is very common in Saudi Arabia and raises the prevalence of HCV up to 24 % [5]. The burden of this infection intensifies the complications of liver-related mortality and morbidity, such as advanced liver fibrosis, cirrhosis, and hepatocellular carcinoma [3]. The western region of Saudi Arabia, particularly Makkah and Madinah, has been attracting millions of visitors from all over the world every year due to their significance as religious sanctuaries. This suggests that Makkah and Madinah may have a higher prevalence of HCV compared to other regions in Saudi Arabia [4]. Given the chronic and recurring nature of HCV infections and their expected complications, there is a compelling need for active prevention, screening, and treatment initiatives to relieve the burden of HCV in Saudi Arabia, particularly in Madinah [4].

Health education plays an essential role in identifying and treating individuals at high risk for HCV infection. Screening should target high-risk individuals identified through medical history and other relevant information [6]. The demand for information from the general public underscores the importance of education and counseling programs in both primary and tertiary settings [7].

Health literacy is an important factor that is defined as an individual's capacity to obtain, process, and understand health information. It is a crucial step for informed decision-making [7]. Limited health literacy is strongly associated with

worse health outcomes, inadequate knowledge of medical care, and reduced compliance with treatment [7]. Health education and health promotion programs can be effective cost-saving interventions for HCV prevention [7]. The objective of this study aligns with the Kingdom's vision for health promotion and disease prevention in Madinah, Saudi Arabia. The study aims to assess the issue of HCV by understanding potential behavioral and medical risk factors within the population of Madinah. Additionally, it seeks to evaluate the knowledge and awareness of the disease and determine correlations between these factors and variables such as age and educational level. Furthermore, the study aims to assess the impact of health education on the community's understanding of HCV and evaluate the pharmacist's role in raising awareness. Addressing these objectives aims to effectively combat the spread of HCV and reduce its burden on public health in Madinah, Saudi Arabia.

METHODS

Ethical consideration

Ensuring participant confidentiality throughout the research process, the study was carried out in accordance with ethical norms. Prior to the interview, participants received an explanation of the study's purpose and were made aware that answering the questionnaire would be interpreted as implicit consent. The Research Ethics Committee of Taibah University, Al-Madinah Al-Munawwarah, Kingdom of Saudi Arabia, granted ethical approval (approval no. COPTU-REC-20210106Elshafie).

Study design

A pre-post interventional study was conducted in community settings across Al-Madinah Al-Munawwarah, Saudi Arabia, including local pharmacies and public areas across different districts of Al-Madinah to ensure diversity of participants. The study involved residents of the city aged 15 years and above. To evaluate the respondents' medical and behavioral potential risk factors for HCV, as well as their understanding of hepatitis C, a multiple-choice validated, pretested questionnaire was given to them anonymously in person. A brief writing of their opinions was requested from the participants. Simple, unambiguous language was employed. Following the initial data collection, pharmacists performed health education programs using messages that were delivered in person, with the aid of some handout leaflets for demonstration. These messages contained the

correct responses to every question on the questionnaire. The same questionnaire was used for a follow-up interview four months later to gauge the participants' awareness and understanding of the illness and to evaluate the pharmacist's participation, which was calculated on a percentage scale. Participants received the questionnaire between November 2023 and February 2024 (4 months).

Sampling method

A total of 159 participants aged 15 years and above were recruited using snowball sampling through community pharmacists in Al-Madinah, Al-Munawwarah. The sample included people from different socioeconomic and educational backgrounds, such as students, teachers, housewives, and other residents. The sample was selected for diversity rather than statistical representativeness. Sample size was calculated using a 95 % confidence level and 5 % margin of error, assuming an anticipated awareness rate of 50 %. This yielded a minimum required sample of 150 participants; 159 were recruited to account for potential non-responses.

Study instrument

Based on a thorough analysis of the literature from Medline, PubMed, and earlier studies, a structured questionnaire was created in Arabic and English as the study tool. Three professors with expertise in questionnaire design from Taibah University's College of Pharmacy reviewed the first draft. The questionnaire was improved and finalized in response to their input.

The final questionnaire comprised four sections:

Section I: Demographic information (5 items).

Section II: Medical and behavioral risk factors for HCV (8 items).

Section III: Evaluation of Hepatitis C Knowledge (8 items).

Knowledge scores were assigned as follows: correct answer = 2 points, "I don't know" = 1 point, wrong answer = 0 points.

Section IV: Post-intervention evaluation of awareness and role of the pharmacist.

Data collection

Data was collected via face-to-face survey. Using a snowball sampling strategy, pharmacists were chosen to administer this questionnaire to the

participants. Although this approach facilitated recruitment, it may have introduced selection bias and limited the generalizability of the findings and should be interpreted cautiously. A minimum of 25 participants were requested to be invited by each pharmacist. To test the questionnaire and determine how long it would take to complete, a pilot study was carried out. Responses were anonymous, and participation was entirely voluntary. Participants were made aware that sharing their answers implied their agreement to take part.

Intervention

To guarantee uniformity throughout all sessions, all participating pharmacists underwent a one-hour standardized training session before implementation that covered HCV transmission, communication techniques, and the utilization of instructional resources.

The intervention consisted of face-to-face educational sessions provided by trained community pharmacists. Each session lasted approximately 10 – 15 minutes and was conducted either in local pharmacies or in public community areas.

Important topics of the sessions included: Basic information about the hepatitis C virus (HCV), how it spreads (e.g., unsafe injections, sharing razors, and unsterile medical procedures), common symptoms and potential complications of chronic HCV infection, how to prevent it (e.g., avoiding blood contact, not sharing personal items), the significance of early testing and treatment, and clearing up common misconceptions found in the pre-intervention questionnaire.

The format was standardized and included a brief introduction and rapport-building (2 – 3 minutes), a discussion of questionnaire questions and misconceptions (5 minutes), and an educational explanation (5 – 7 minutes) using handouts and visual aids.

Printed educational handouts with important HCV facts, transmission route illustrations, and prevention advice were among the resources used. During the conversation, pharmacists also utilized a visual flip chart or poster to help with comprehension. To guarantee accuracy and cultural suitability, two faculty experts evaluated all instructional materials that were created in Arabic.

Four months later, the same questionnaire was given again to gauge impact, and responses

from before and after the intervention were compared to gauge changes in awareness and knowledge. The efficacy of the pharmacist-led sessions was assessed by calculating the improvement as a percentage change in knowledge scores.

Statistical analysis

IBM SPSS for Windows, version 28 (IBM Co., Armonk, NY, USA), was used to analyze the data. Means and standard deviations (SD) were used to summarize numerical data, and paired t-tests were used to examine the data over time. Frequencies and percentages were used to represent categorical data. Factors linked to knowledge scores were found using linear regression analysis. A two-tailed *p*-value less than 0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of participants

Table 1: Socio-demographic characteristics of participants (n = 159)

Variable	N	%
Age (years)		
<20	21	13.2
20 – 30	55	34.6
>30 – 40	20	12.6
>40 – 50	36	22.6
>50	27	17.0
Gender		
Male	71	44.7
Female	88	55.3
Education		
Illiterate	2	1.3
Read & write	31	19.5
Primary or preparatory	14	8.8
Secondary	20	12.6
University	92	57.9
Occupation		
Unemployed or student	92	57.9
Skilled worker	6	3.8
Retired	13	8.2
Housewife	48	30.2
Marital status		
Single	70	44.0
Married	76	47.8
Widowed	10	6.3
Divorced	3	1.9

The study included 159 participants in total, with the majority being either aged between 20 - 30 years (34.6 %) or over 40 - 50 years (22.6 %). There were slightly more female (55.3 %) than male (44.7 %) participants. Most participants were university-educated (57.9 %), followed by those who could read and write (19.5 %). Over

half of the participants were unemployed or students (57.9 %), while 30.2 % were housewives. Most participants were single (44.0 %). Table 1 provides additional information.

Behavioral risk factors of HCV among participants

A significant portion, 44 %, reported engaging in community barber shaves or pedicures with assured sterilization. In contrast, a smaller yet notable 13.2 % of individuals used razors that were not changed between uses by family members. Sharing toothbrushes within the family and undergoing tattooing or piercing with confirmed sterilization were both reported by 3.8 % of participants. Additionally, a substantial 40.9% of participants were exposed to dental procedures where sterilization was assured.

Medical and other risk factors of HCV among participants

Figure 1 presents the medical and other risk factors of HCV among the participants. A total of 10.7 % reported a history of blood transfusion, 8.8 % had undergone surgery, and 5.7 % received sutures. Only 1.3 % reported previous hemodialysis, and another 1.3 % had a history of endoscopy. The term “Absent” refers to participants who reported no identifiable medical risk factors for HCV infection (72.3 %). Some participants reported additional potential exposure risks beyond the medical risk factors depicted in Figure 1. Exactly 1.9 % of respondents reported a history of schistosomiasis. Of the 70 female participants, 27 % had given birth in a hospital setting with a doctor present, and 17 % had a traditional birth attendant assist them.

As shown in Table 2, the comparison between knowledge of participants pre and post education sessions by pharmacists revealed that knowledge scores regarding (hearing of hepatitis, hepatitis infectivity, modes of transmission, symptoms, curability, complications, prevention and presence of vaccine) with their total score were significantly increased post education than pre ($p < 0.001$).

Factors associated with pre-education knowledge score among participants

The univariate regression analysis indicated that the occupation and marital status of participants were notably linked to their HCV knowledge scores before attending educational sessions conducted by pharmacists.

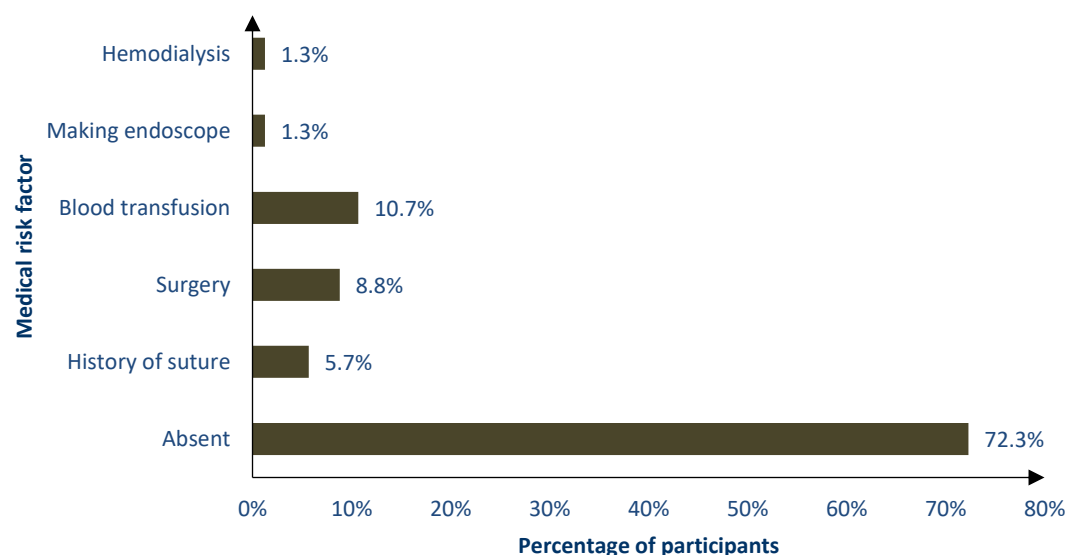


Figure 1: Distribution of medical risk factors for hepatitis C virus (HCV) among study participants. “Absent” indicates participants with no reported medical risk factors

Comparison between pre- and post-education knowledge scores among participants

Specifically, skilled workers had significantly higher scores compared to unemployed individuals or students (coefficient = 1.82, 95 % CI: 0.15 to 3.49, $p = 0.033$). Additionally, married participants scored significantly higher than those who were single (coefficient = 0.73, 95 % CI: 0.07 to 1.39, $p = 0.031$).

Table 2: Comparison between pre- and post-education knowledge scores among participants

Variable	Pre-education	Post-education	P-value
Hearing about hepatitis	1.54±0.79	1.92±0.27	<0.001
Hepatitis infectivity	1.33±0.65	1.84±0.48	<0.001
Modes of transmission	0.96±0.81	1.89±0.39	<0.001
Symptoms	0.71±0.74	1.82±0.5	<0.001
Curability	0.95±0.7	1.35±0.89	<0.001
Complications	0.73±0.71	1.86±0.4	<0.001
Prevention	0.79±0.75	1.8±0.45	<0.001
The presence of the vaccine	1.07±0.69	1.9±0.38	<0.001
Total score	8.08±2.04	14.38±1.38	<0.001

Data are presented as mean ± SD. Statistical significance at $P < 0.05$

In the multiple regression analysis, occupation, marital status, and history of hospital deliveries were identified as significant predictors of HCV knowledge scores. Skilled workers again scored significantly higher than unemployed individuals

or students (coefficient = 2.14, 95 % CI: 0.24 to 4.04, $p = 0.028$). Married individuals also showed a significantly higher score compared to single individuals (coefficient = 0.84, 95 % CI: 0.14 to 1.53, $p = 0.019$). Additionally, women who had deliveries conducted by doctors in hospitals had significantly higher knowledge scores compared to men and women without such a history (coefficient = 1.002, 95 % CI: 0.21 to 1.8, $p = 0.014$), as shown in Table 3.

Factors associated with post-education knowledge score among participants

Univariate regression and multiple regression analysis methods were applied to explore the relationship between various factors and the knowledge scores of participants after educational sessions. The analyses revealed no statistically significant associations between these factors and post-education knowledge scores.

DISCUSSION

About 71 million people worldwide are afflicted by hepatitis C, which still contributes to 9.7 million disability-adjusted life years annually [1,8]. HCV continues to be a leading cause of chronic liver disease and causes close to 700,000 deaths per year, despite improvements in prevention and treatment [9]. Non-specific symptoms that delay diagnosis draw attention to ongoing knowledge and awareness gaps in many areas [8].

Table 3: Linear regression analysis for factors associated with pre-education knowledge score among participants

Parameter	Univariate analysis			Multivariable analysis		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Age (years)						
<20	Ref			Ref		
20 – 30	-0.71	-1.72 to 0.3	0.165	-0.83	-1.88 to 0.23	0.123
>30 – 40	0.86	-0.37 to 2.09	0.167	0.38	-0.9 to 1.67	0.557
>40 – 50	0.26	-0.82 to 1.34	0.632	-0.22	-1.36 to 0.91	0.7
<50	-0.46	-1.6 to 0.68	0.427	0.66	-0.79 to 2.11	0.372
Gender						
Male	Ref			Ref		
Female	0.2	-0.44 to 0.84	0.543	-0.39	-1.33 to 0.56	0.419
Education						
Illiterate	Ref			Ref		
Read & Write	-0.39	-3.32 to 2.55	0.795	0.64	-2.46 to 3.74	0.682
Primary or preparatory	-0.57	-3.61 to 2.47	0.711	0.67	-2.54 to 3.89	0.679
Secondary	-0.95	-3.93 to 2.03	0.53	0.23	-2.9 to 3.36	0.886
University	-1.16	-4.04 to 1.71	0.425	-0.17	-3.2 to 2.86	0.912
Occupation						
Unemployed or student	Ref			Ref		
Skilled worker	1.82	0.15 to 3.49	0.033	2.14	0.24 to 4.04	0.028
Retired	-0.39	-1.56 to 0.79	0.516	-0.7	-2.17 to 0.77	0.349
Housewife	0.65	-0.05 to 1.36	0.069	0.91	-0.12 to 1.94	0.083
Marital status						
Single	Ref			Ref		
Married	0.73	0.07 to 1.39	0.031	0.84	0.14 to 1.53	0.019
Widowed	-0.14	-1.49 to 1.21	0.835	-0.22	-1.65 to 1.2	0.756
Divorced	-0.08	-2.43 to 2.28	0.949	-0.77	-3.17 to 1.64	0.53
Shaving at community barber/ pedicure while being sure of sterilization	0.11	-0.54 to 0.75	0.739	0.21	-0.45 to 0.88	0.527
Shaving with unchanged razors used by other family members	0.56	-0.38 to 1.51	0.238	0.9	-0.09 to 1.88	0.075
Sharing toothbrush within family	0.43	-1.24 to 2.11	0.61	0.45	-1.29 to 2.2	0.609
Tattooing/piercing with being sure of sterilization	-0.6	-2.28 to 1.07	0.478	-0.76	-2.53 to 1.01	0.397
Dental exposure with being sure of sterilization	0.36	-0.29 to 1	0.28	0.04	-0.7 to 0.77	0.922
Medical Risk Factors						
Absent	Ref			Ref		
History of suture	-0.49	-1.89 to 0.92	0.493	-1.24	-2.75 to 0.28	0.108
Surgery	0.17	-0.98 to 1.32	0.769	0.81	-0.36 to 1.98	0.175
Blood transfusion	0.25	-0.8 to 1.3	0.639	0.82	-0.24 to 1.87	0.128
Making endoscope	-0.04	-2.94 to 2.85	0.976	0.87	-2.06 to 3.81	0.556
Hemodialysis	1.96	-0.94 to 4.85	0.183	1.57	-1.33 to 4.46	0.286
History of Schistosomiasis	0.6	-1.76 to 2.95	0.617	0.5	-1.92 to 2.93	0.682
Delivery						
No	Ref			Ref		
By doctor in hospitals	0.56	-0.18 to 1.3	0.136	1.002	0.21 to 1.8	0.014
By traditional birth attendants	0.84	-0.03 to 1.72	0.059	0.83	-0.09 to 1.75	0.076

CI: Confidence interval, Statistical significance at $p < 0.05$

Table 4: Linear regression analysis for factors associated with post-education knowledge score among participants

Parameter	Univariate analysis			Multivariable analysis		
	Coefficient	95%CI	P-value	Coefficient	95%CI	P-value
Age (years)						
<20	Ref			Ref		
20 – 30	-0.46	-1.15 to 0.24	0.195	-0.54	-1.3 to 0.22	0.164
>30 – 40	-0.42	-1.26 to 0.42	0.327	-0.43	-1.36 to 0.49	0.356
>40 – 50	-0.37	-1.11 to 0.37	0.326	-0.49	-1.31 to 0.33	0.243
<50	0.31	-0.48 to 1.09	0.44	-0.14	-1.19 to 0.91	0.794
Gender						
Male	Ref			Ref		
Female	0.4	-0.03 to 0.83	0.067	0.30	-0.38 to 0.98	0.379
Education						
Illiterate	Ref			Ref		
Read & Write	0.02	-1.98 to 2.02	0.987	-0.15	-2.39 to 2.09	0.894
Primary or preparatory	0	-2.07 to 2.07	>0.999	-0.05	-2.38 to 2.27	0.963
Secondary	0.1	-1.93 to 2.13	0.923	-0.18	-2.45 to 2.08	0.872
University	-0.24	-2.2 to 1.72	0.81	-0.37	-2.57 to 1.82	0.736
Occupation						
Unemployed or student	Ref			Ref		
Skilled worker	-0.17	-1.32 to 0.98	0.77	-0.23	-1.61 to 1.14	0.738
Retired	0.59	-0.22 to 1.39	0.154	0.21	-0.85 to 1.28	0.692
Housewife	0	-0.49 to 0.48	0.988	-0.13	-0.88 to 0.61	0.724
Marital status						
Single	Ref			Ref		
Married	0.2	-0.25 to 0.65	0.381	0.20	-0.3 to 0.71	0.423
Widowed	0.1	-0.82 to 1.02	0.83	0.02	-1.01 to 1.05	0.966
Divorced	-1.3	-2.9 to 0.3	0.11	-1.52	-3.25 to 0.22	0.087
Shaving at community barber/ pedicure while being sure of sterilization	0.17	-0.27 to 0.6	0.446	0.28	-0.21 to 0.76	0.26
Shaving with unchanged razors used by other family members	0.28	-0.36 to 0.92	0.389	0.27	-0.44 to 0.99	0.448
Sharing toothbrush within family	-0.22	-1.35 to 0.92	0.704	0.19	-1.08 to 1.45	0.77
Tattooing/piercing with being sure of sterilization	-0.22	-1.35 to 0.92	0.704	-0.57	-1.85 to 0.71	0.384
Dental exposure with being sure of sterilization	-0.35	-0.79 to 0.08	0.113	-0.18	-0.71 to 0.35	0.503
Medical Risk Factors						
Absent	Ref			Ref		
History of suture	0.92	-0.02 to 1.86	0.056	0.86	-0.24 to 1.95	0.123
Surgery	0.2	-0.57 to 0.96	0.616	0.33	-0.52 to 1.18	0.441
Blood transfusion	-0.07	-0.77 to 0.64	0.847	0.21	-0.55 to 0.97	0.585
Making endoscope	-0.3	-2.24 to 1.63	0.757	0.03	-2.09 to 2.16	0.974
Hemodialysis	1.2	-0.74 to 3.13	0.224	1.17	-0.92 to 3.26	0.269
History of Schistosomiasis	-0.72	-2.31 to 0.86	0.368	-0.82	-2.57 to 0.93	0.353
Delivery						
No	Ref			Ref		
By doctor in hospitals	0.01	-0.49 to 0.52	0.956	0.22	-0.35 to 0.8	0.444
By traditional birth attendants	-0.18	-0.78 to 0.42	0.55	-0.05	-0.71 to 0.62	0.886

CI: Confidence interval, Statistical significance at $p < 0.05$

The purpose of the current study is to evaluate the HCV burden in Al-Madinah Al-Munawarah, Saudi Arabia, by identifying behavioral and medical risk factors, evaluating community knowledge and awareness, and exploring the role of pharmacists in promoting HCV education.

Designing successful preventive methods requires an understanding of the dangers related to HCV transmission. While sexual and vertical

transmission are still less prevalent, HCV infection is frequently associated with limited access to sterile medical treatments, including surgery, dialysis, and dental care in low- and middle-income countries [10–13]. Our analysis found that sharing razors, dental exposures, and communal barbering practices were common behavioral risk factors, which are consistent with these studies. Additionally documented were medical risk factors, including history of

schistosomiasis (1.9 %), sutures (5.7 %), surgery (8.8 %), and blood transfusions (10.7 %). These results support the continuation of risky community and healthcare behaviors as possible transmission pathways, and they are consistent with previous research carried out in comparable geographical contexts [10–13].

The effectiveness of pharmacist-led community education in filling in HCV awareness gaps was demonstrated by the considerable improvement in participants' knowledge levels ($p < 0.001$) following the pharmacist-led educational intervention. These findings are in line with other research from Saudi Arabia and Nigeria that showed significant gains in health and knowledge after pharmacist-led programs [14–16]. Similarly, school-based programs in Pakistan and community-based programs in Egypt have shown significant gains in HCV-related knowledge and awareness [17,18]. The individualized, in-person format of the pharmacist-led sessions, which gave participants the chance to get tailored clarification and direction, may be responsible for the significant improvement seen in our study.

The current findings are also consistent with a wealth of research showing the benefits of pharmacist-led education in enhancing adherence and health outcomes for chronic conditions such as HIV, diabetes, and high blood pressure [14–16]. Pharmacists are excellent sources of health information and guidance on preventing disease because of their accessibility and frequent interactions with the general public. Because pharmacists may dispel myths, support early testing, and urge safe practices, this position is especially pertinent in the context of HCV. In the US, pharmacist-led educational initiatives improved patient comprehension, raised screening rates, and decreased HCV-related comorbidities, according to similar studies [16].

Our study's regression analysis showed that baseline knowledge scores were higher for younger and more educated participants, which is in accordance with results from another regional research [14,15]. Nevertheless, following the intervention, these demographic differences ceased to be substantial, indicating that pharmacist-led education was successful in reducing knowledge gaps across groups.

Findings from this study confirm that pharmacist-led health education can substantially raise public awareness about HCV and address behavioral and medical risk factors that contribute to transmission. Similar educational

initiatives have shown comparable results in enhancing understanding, decreasing harmful behaviors, and boosting testing and preventative initiatives in Australia, Egypt, Pakistan, and Spain [16–18]. The significance of ongoing, community-based educational interventions as a component of national HCV prevention efforts is reaffirmed by these combined findings.

Limitations of this study

Snowball sampling could have decreased generalizability and added selection bias. Self-reported knowledge was evaluated during a brief follow-up period, which could have missed behavioral shifts or long-term retention. Furthermore, the influence on testing and treatment uptake, as well as clinical outcomes, was not evaluated in this study. Considering the effectiveness of this intervention, increasing pharmacist-led educational initiatives in Saudi Arabia may be essential to raising awareness of HCV, especially among high-risk groups. Future research should assess long-term knowledge retention, include behavioral and clinical outcomes, and use bigger, more representative samples. Providing pharmacists with ongoing professional training and incorporating HCV education into national public health campaigns would enhance community-wide prevention and early detection initiatives.

CONCLUSION

Unlocking the challenges posed by HCV requires a multifaceted approach that includes raising awareness, promoting knowledge dissemination, and enhancing access to testing and treatment services. Pharmacists are uniquely positioned to contribute to these efforts through their roles as educators, advocates, and healthcare providers. By leveraging their expertise and engaging with patients and communities, pharmacists can play a pivotal role in addressing the burden of HCV infection and improving public health outcomes.

DECLARATIONS

Acknowledgement/Funding

None.

Ethical approval

The Research Ethics Committee of Taibah University, Al-Madinah, Al-Munawarah, Kingdom of Saudi Arabia, granted ethical approval (approval no. COPTU-REC-20210106Elshafie).

Use of Artificial intelligence/Large language models

We also declare that we did not use Generative artificial intelligence (AI) and AI-assisted technologies in writing the manuscript.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the author(s) named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Conceptualization, Riham Elshafie; Data analysis, Haifaa A. Fadel; Methodology, Riham Elshafie; Writing – original draft, Hanaa Wanas, Fahad Alkenani¹, Ehsan Hadeeb. All authors reviewed the results and approved the final version of the manuscript.

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