



ORIGINAL RESEARCH ARTICLE

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# Effect of health education intervention on hepatocellular carcinoma risk factor prevention in Menoufia governorate, Egypt

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## Abstract

**Background:** Hepatocellular carcinoma is an important public health problem worldwide and in Egypt. It has a bad prognosis and few treatment options. HCV and HBV infection and exposure to pesticides and aflatoxins are major risk factors for its development, so paying more attention to prevention via raising population awareness about its risk factors may be useful in lowering HCC incidence. This study was implemented to study knowledge, attitude, and practice (KAP) of a rural community of Menoufia governorate, Egypt, pre- and post-health education intervention about HCC and prevention of its risk factors.

**Results:** Seroprevalence of HCV among study participants was 12.3%, and the health education intervention about HCC and the prevention of its risk factors was effective in increasing the percent of pre-intervention good knowledge score groups about HCC, HBV, and HCV, pesticides, aflatoxins, and total knowledge score from 66.5%, 88.8%, 83.8, 41.9%, and 73.7% respectively to 98.9%, 100%, 100%, and 98.9% post-intervention ( $p$  value = 0.000 for each) and was also effective in increasing the pre-intervention positive attitude score groups from 61.5 to 98.9% post-intervention. It was also effective in increasing the pre-intervention safe practice score groups of male and female study participants from 20% and 23% respectively to 94.3% and 93.1% post-intervention.

**Conclusions:** Health education intervention was effective in improving KAP about HCC and prevention of its risk factors and could be adopted by MOHP as a part of comprehensive program for HCC prevention in rural communities of Menoufia governorate.

**Keywords:** Health Education, Prevention, HCC, Risk factors, Rural, Pesticides, Aflatoxins

## Background

Hepatocellular carcinoma (HCC) arises from liver cells and constitutes about 90% of all primary liver cancer types [1]. HCC is an important public health problem worldwide especially in developing countries [2]. In Egypt, HCC is an increasing problem which is the most common cancer to occur in men and the second in women [3]. HCC has a bad prognosis and few treatment options so directing efforts to its prevention is a better choice [3].

Chronic hepatitis B and C are the most important risk factors for HCC development in Egypt in addition to widely used pesticides especially in agriculture [4] and

consumption of aflatoxins contaminated food commodities [3]. The incidence of HCC can be reduced largely if people became more aware about its risk factor prevention, and this can be done via health education intervention to increase community awareness and to encourage them adopt best practices.

Studies on HCC prevention are rare [5]. Up to our knowledge, there was no study assessing knowledge, attitude, and practice of rural community of Menoufia governorate about HCC and prevention of its risk factors.

## Methods

### Ethical considerations

The Institutional Review Boards of both National Liver Institute Menoufia University and Ministry of Health and Population approved the study procedures. Approaches to ensure ethics were considered in the

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study regarding confidentiality and the verbal consent. The researcher introduced herself to the participants in the sample and explained the objectives of the study, to obtain their acceptance to be recruited in the study as well as to gain their cooperation.

### The study tools establishment

Throughout the course of the present study, data were collected using a constructed questionnaire which was developed by the researcher based on literature review, revised by jury of professors, then tested for validity and reliability (Cronbach's alpha 0.85). It included four parts:

Part I: Including socio-demographic characteristics of the study participants such as age, sex, educational level, job, marital status, and their medical history.

Part II: Including questions to address participants' knowledge and attitude about hepatocellular carcinoma (HCC) and prevention of its risk factors especially viral hepatitis B and C, aflatoxins, and pesticides.

Part III: Including questions to address participants' practice about hepatocellular carcinoma and prevention of its risk factors (HBV and HCV, aflatoxins, and pesticides).

Part IV: Including HCV status laboratory results of the study participants.

A pilot study was done on 15 participants using the constructed questionnaire to evaluate the questionnaire for clarity, time to fill the questionnaire, and applicability. These 15 participants were not included in the full-scale study. Based on the results of the pilot study, the questionnaire was modified and made ready for use.

The community-based intervention study was conducted from February 2017 till March 2019. The study was implemented in the family health unit (FHU), in a randomly selected village that was selected by a multi-stage random sampling technique with first stage of simple random selection of one district out of the ten districts of Menoufia governorate (Shebein El-Kom district). The second stage was simple random selection of one village out of all villages ( $N = 28$  villages), and it was Kafr Tanbedy village. The third stage was a systematic random sampling of the family records, included within the (FHU), and located in Kafr Tanbedy. An equal geographical region distribution of the rural participants' family records residing at the north, south, east, and west sites of the selected village was ensured. Out of the 200 study rural participants who were contacted for participation, only 188 subjects responded out of which 179 rural participants were evaluated pre- and post-health education intervention, with a response rate of 89.5%. The inclusion criteria were being a resident of Kafr Tanbedy for at least 10 years, adult with age  $\geq 18$  years old, and being able to participate in an educational intervention program.

### Methods

This study was done by development and implementation of health education-based intervention about HCC and prevention of its risk factors by the researcher.

#### *Development of a health education-based intervention*

The health education-based intervention was adopted from the most recent international HCC prevention guidelines and educational programs to improve participant's knowledge, attitude, and practice about HCC and its risk factors (HBV and HCV, aflatoxins, and pesticides), in which the researcher developed knowledge and practice modules regarding HCC, viral hepatitis B and C, and pesticide and aflatoxin prevention using two educational means—booklets and power point presentations.

#### *Implementation of a health education-based intervention through three phases*

1. Preparatory phase (pre-intervention family health unit visit) which included the following activities: participation agreement, discussing the objectives of the study, and collecting the selected participants' data (using the questionnaire with its four parts).
2. The implementation phase: *two parts* which started after 2 weeks from the pre-intervention family health unit visit in which the participants were divided into groups; ten rural participants' each group.

*Part one:* Health education intervention included three sessions/week. Each session is 2 h per day for 3 days per week for each group at the family health unit.

*Part two:* Serology; 3 ml of venous blood were withdrawn from each study participant and transferred slowly into a dry sterile centrifuge tube, and the whole blood was allowed to clot at 37° C, and then centrifuged for 10 min at 1500 rounds per minute; the clear supernatant serum was separated and stored in a freezer at -80°C till the time of testing. Each serum sample was tested for HCV antibodies by third-generation enzyme-linked immunosorbent assay (ELISA) using kits of MUREX-Diasorin. This was done in the National Liver Institute research laboratory at the Clinical Pathology Department.

3. The evaluation phase in which a follow-up visit was done for the study participants' at family health unit 3 months after the health education program for reassessment of HCC knowledge, attitude, and practices of these participants.

#### **Scoring system and data management**

##### *Scoring of knowledge*

A score for each answer on questions of knowledge was given as follows: correct answer (2), wrong answer (1),

and I do not know (0). HCC knowledge score ranged from 0 to 32, HBV and HCV knowledge score ranged from 0 to 18, pesticide knowledge score ranged from 0 to 18, aflatoxin knowledge score ranged from 0 to 26, and the total knowledge score ranged from 0 to 94 points. Good knowledge score was considered if the percentage was more than 50% and poor if the percentage was less than or equal 50%.

#### Scoring of attitude

A score for each answer on questions of attitude was given as follows: correct answer (2), wrong answer (1), and I do not feel that (0). Attitude scores ranged from 0 to 12 points. Positive attitude score was considered if the percentage was more than 50% and negative if the percentage was less than or equal 50%.

#### Scoring of practice

A score for each answer on questions of practice was given as follows: safe practice (2), sometimes safe practice (1), and risky practice (0). Practice score ranged from 0 to 38 and 0 to 36 points for males and females respectively. Good practice score was considered if the percentage was more than 50% and considered poor if less than or equal 50%.

#### Statistical analysis

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 20. Graphs were done using Excel program.

Quantitative data were presented by mean ( $X$ ) and standard deviation (SD). Qualitative data were presented in the form of frequency distribution tables, number, and percentage. It was analyzed by chi-square ( $\chi^2$ ) test. However, if an expected value of any cell in the table was less than 5, Fisher's exact test was used (if the table was four cells) or likelihood ratio (LR) test (if the table was more than four cells). McNemar's test was used to measure association between paired qualitative data. Significance levels were considered at 5% level

#### Results

Results showed that 45.8% of study participants were aged 18–35 years and the majority of them were married (89.9%), and about 49.2% of them have reached the secondary education level with illiteracy of 21.8% and 55.3% (about half) of them did not work (Table 1).

The health education intervention about HCC and prevention of its risk factors was effective in decreasing the percent of poor knowledge about HCC from 33.5% pre-intervention to 1.1% post-intervention and in increasing the percent of good knowledge about HCC

**Table 1** Distribution of the study participants regarding their sociodemographic characteristics

Socio demographic characteristics	No	Percent
1. Age groups		
18–35 years	82	45.8
36–53 years	72	40.2
54–70 years	25	14
Mean + SD (years)	(38.74 + 11.746)	
2. Sex		
Female	144	80.4
Male	35	19.6
3. Marital status		
Married	161	89.9
Unmarried	18	10.1
4. Educational level		
Illiterate	39	21.8
Basic education	12	6.7
Secondary education	88	49.2
University and above	40	22.3
5. Occupation		
Governmental	39	21.8
Private	18	10.1
Farmer	10	5.5
Does not work	99	55.3
Others*	13	7.3
Total	179	100

\*As dealers and free lancers

from 66.5% pre-intervention to 98.9% post-intervention, and this effect was of high statistical significance ( $p$  value = 0.000). Health education was significantly effective in decreasing the percent of pre-intervention poor knowledge about HBV, HCV, pesticides, and aflatoxins and increasing the good knowledge about them post-intervention ( $p$  value = 0.000) (Table 2).

As regards attitude, health education intervention about HCC and its risk factor prevention was effective in decreasing percent of negative attitude from 38.5% pre-intervention to 1.1% post-intervention and in increasing percent of good attitude from 61.5% pre-intervention to 98.9% post-intervention, and this effect was statistically highly significant ( $p$  value = 0.000) (Table 3).

The health education intervention about HCC and prevention of its risk factors was effective in decreasing percent of risky practice of male study participants from 80% pre-intervention to 5.7% post-intervention and in increasing percent of safe practice from 20% pre-intervention to 94.3% post-intervention, and this effect was statistically highly significant ( $p$  value = 0.000). Also

**Table 2** Effect of health education intervention on participant's knowledge about HCC, HBV, and HCV, pesticides, aflatoxins, and total knowledge

Knowledge items	Pre-intervention		Post-intervention		McNemar's test	<i>p</i> value
	No	%	No	%		
1. HCC						
Poor (0–16)	60	33.5	2	1.1	56.017	0.000
Good (17–32)	119	66.5	177	98.9		
2. HBV and HCV						
Poor (0–9)	20	11.2	0	0	18.050	0.000
Good (10–18)	159	88.8	179	100		
3. Pesticides						
Poor (0–9)	29	16.2	0	0	27.034	0.000
Good (10–18)	150	83.8	179	100		
4. Aflatoxins						
Poor (0–13)	104	58.1	2	1.1	100.010	0.000
Good (14–26)	75	41.9	177	98.9		
5. Total knowledge						
Poor (0–47)	47	26.3	0	0	45.021	0.000
Good (48–94)	132	73.7	179	100		
Total	179	100	179	100		

,it was effective in decreasing percent of risky practice of female study participants from 84% pre-intervention to 6.9% post-intervention and in increasing percent of safe practice from 23% pre-intervention to 93.1% post-intervention, and this effect was statistically highly significant ( $p$  value = 0.000) (Table 4).

Seroprevalence of HCV among study participants was 12.3% (Fig. 1). Pre-intervention, there was a statistically significant difference in HCV status of study participants in relation to their age groups ( $p$  value = 0.001), educational level ( $p$  value = 0.009), and occupation ( $p$  value = 0.022) where HCV seropositivity was more common in the age group of 36 to 53 years (45.5%), illiterate (45.5%), and unemployed (31.8%). However, there were no statistically significant difference in HCV status of study participants in relation to their sex ( $p$  value = 0.33) and marital status ( $p$  value = 0.094) (Table 5).

## Discussion

HCC prevention studies are rare despite the fact that HCC incidence can be largely decreased by increasing

population awareness about its known risk factors that will encourage them to adopt safer practices that may protect them from HCC [5].

This study was conducted on 179 rural participants to assess knowledge, attitude, and practice of the study participants pre-and post-implementation of health education intervention about hepatocellular carcinoma (HCC) and prevention of its risk factors (HBV and HCV, aflatoxins, and pesticides) and to assess the current prevalence of HCV among study rural participants.

In our study seroprevalence of HCV among study participants was 12.3%. This was in agreement with Shiha [6] who found that (13%) of study rural participants of El Othmaniya village in Northern Egypt were HCV seropositive. However, this was higher than Kandeel [7] who studied the data obtained from EDHS 2015 and found that the seroprevalence of HCV in Egypt as a whole was only 10%. This can be explained by our study that was implemented in a rural area of Menoufia governorate where rural residents may have increased exposure to HCV infection.

**Table 3** Effect of health education intervention on study participants total score of attitude towards HCC and its risk factor prevention

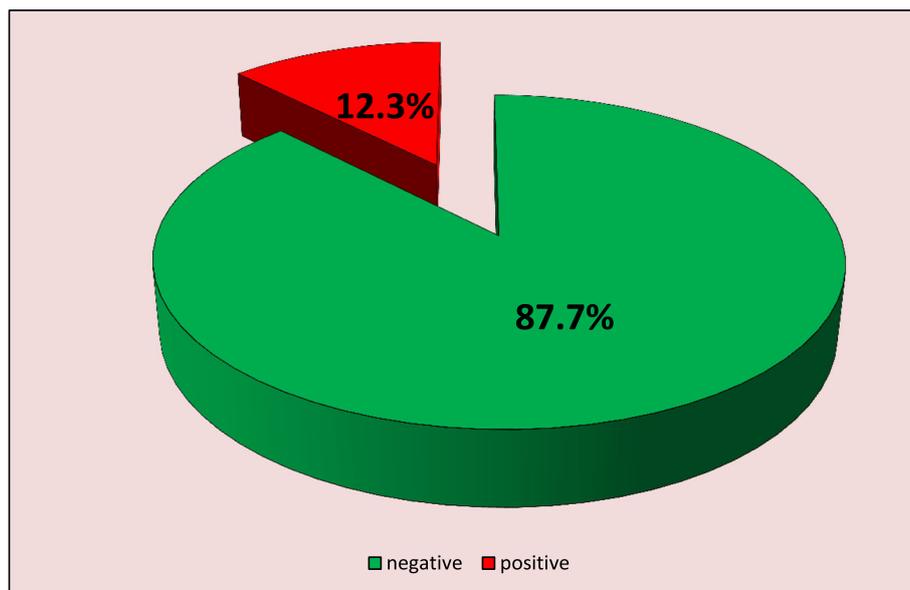
Attitude score groups	Pre-intervention		Post-intervention		McNemar's test	<i>p</i> value
	No	%	No	%		
1. Negative (0–6)	69	38.5	2	1.1	65.015	0.000
2. Positive (7–12)	110	61.5	177	98.9		
Total	179	100	179	100		

**Table 4** Effect of health education intervention on study male and female participant’s total score of practice about HCC and its risk factor prevention

Practice score groups	Pre-intervention		Post-intervention		McNemar’s test	p value
	No	%	No	%		
<b>1-Males</b>						
Risky (0–19)	28	80	2	5.7	24.038	0.000
Safe (20–38)	7	20	33	94.3		
<b>2. Females</b>						
Risky (0–18)	121	84	10	6.9	109.009	0.000
Safe (19–36)	23	16	134	93.1		
<b>Total</b>	<b>179</b>	<b>100</b>	<b>179</b>	<b>100</b>		

In our study pre-intervention, there was a statistically highly significant difference in HCV status of study participants in relation to their age groups and about 45.5% of positive cases lie in the age group (36–53 years) while 36.4% of positive cases lie in the age group (54–70 years). Also, there was a statistically significant difference in HCV infection status of study participants in relation to their educational level and occupation where 45.5% of positive cases were illiterate and 31.8% of positive cases were unemployed. There were no statistically significant difference in HCV infection status of study participants in relation to their sex and marital status. This was in accordance with Edris [8] who studied prevalence and risk factors of HCV in Demiatte governorate, Egypt, and found no statistically significant difference between males and females regarding their HCV status and that unemployment, rural residence, and low educational level are risk factors for HCV infection. Also, Kandeel

[9] studied the risk factors of HCV infection in Egypt and found that HCV infection is more common among illiterate than those of higher educational levels. In addition, a study of El-Sayed was done in Suez Canal region in Egypt [10] and found that HCV infection is more common in unemployed and lower educational levels study participants. In addition to that, a study of Gomaa [11] found that HCV infection in Egypt is more common in older age groups than younger ones. A study of Mohlman [12] found that HCV positivity prevalence was the highest among birth cohorts before 1960 and decreased thereafter in younger age groups. Our study findings were in contrast to el-Sadawy [13] who studied HCV seroprevalence in Sharkia governorate and found that males have higher HCV seroprevalence than females. This difference can be attributed to the limitation of our study that the number of male study participants was relatively low when compared to females.



**Fig. 1** Seroprevalence of HCV among study rural participants

**Table 5** The relation of study participants HCV status and their sociodemographic characteristics pre-intervention

Sociodemographic characteristics	HCV status				Test of significance	p value
	Negative		Positive			
	No	%	No	%		
1. Age groups						
18–35 years	78	49.7	4	18.1	LR = 13.359	0.001
36–53 years	62	39.5	10	45.5		
54–70 years	17	10.8	8	36.4		
2. Sex					Fisher's exact	0.33 (NS)
Female	128	81.5	16	72.7		
Male	29	18.5	6	27.3		
3. Marital status					Fisher's exact	0.094 (NS)
Married	139	88.5	22	100		
Unmarried	18	11.5	0	0.0		
4. Educational level					LR = 11.543	0.009
Illiterate	29	18.5	10	45.5		
Basic	9	5.7	3	13.6		
Secondary	82	52.2	6	27.3		
University and postgraduate	37	23.6	3	13.6		
5. Occupation					LR = 11.398	0.022
Governmental	34	21.7	5	22.7		
Private	14	8.9	4	18.2		
Farmer	6	3.8	4	18.2		
Does not work	92	58.6	7	31.8		
Others	11	7	2	9.1		
Total	157	100	22	100		

NS non-significant, LR likelihood ratio

The health education intervention about HCC and its risk factors prevention was effective in decreasing percent of poor knowledge about HCC from 33.5% pre-intervention to 1.1% post-intervention and in increasing percent of good knowledge about HCC from 66.5% pre-intervention to 98.9% post-intervention, and this effect was statistically highly significant. Also, health education intervention was effective in decreasing percent of poor knowledge about HBV and HCV from 11.2% pre-intervention to 0% post-intervention and in increasing percent of good knowledge about HBV and HCV from 88.8% pre-intervention to 100% post-intervention, and this effect was statistically highly significant. It also was effective in decreasing percent of poor knowledge about pesticides from 16.2% pre-intervention to 0% post-intervention and in increasing percent of good knowledge about pesticides from 83.8% pre-intervention to 100% post-intervention, and this effect was statistically highly significant. It also was effective in decreasing percent of poor knowledge about aflatoxins from 58.1% pre-intervention to 1.1% post-intervention and in increasing percent of good knowledge score groups about

aflatoxins from 41.9% pre-intervention to 98.9% post-intervention, and this effect was statistically highly significant and was effective in decreasing percent of poor total knowledge about HCC and its risk factor prevention from 26.3% pre-intervention to 0% post-intervention and in increasing percent of good total knowledge about HCC and prevention of its risk factors from 73.7% pre-intervention to 100% post-intervention, and this effect was statistically highly significant. This was in agreement with Saleh [14] who studied the effect of a pilot health education intervention about HCC prevention in Egypt and found that study participants had poor knowledge about HCC and its risk factors, and the health education intervention raised the knowledge of study participants on HCC and prevention of its risk factors.

This was also in agreement with Robotin [15] who studied the effect of community intervention for prevention of liver cancer in Australia which found that study participants have poor knowledge about HCC pre-intervention, that health education intervention was effective in increasing their knowledge about HCC, and

that it is a step in the way of decreasing HCC incidence by increasing awareness about its risk factors such as hepatitis B. Our study finding was also in agreement with Juon [16] who studied the effect of health education about HCC among Asian Americans in Baltimore and found that health education was effective in raising awareness about HCC and recommend integrating health education intervention as a basic part of a comprehensive program to increase knowledge and change social norms and beliefs to promote safer practices for prevention of HCC risk factors. In addition, Shiha [6] studied the community-based intervention for HCV elimination in a village in Northern Egypt and found that educational intervention significantly increased knowledge and adoption of safer practices to prevent HCV transmission among study rural participants. Moreover, a study of Joun [17] found that culturally integrated liver cancer health education intervention was effective in increasing knowledge about HBV among Asian Americans. Also, a study of Farahata [18] found that knowledge, attitude, and practice of study participants in a rural community of Manshat Sultan, Menoufia governorate, regarding pesticides were improved after health education intervention.

The main limitations of our study were lack of confirmation of HCV status by PCR to study participants proven to be HCV seropositive by ELISA and also a relatively small number of male study participants when compared to females.

## Conclusion

In conclusion, we found that health education intervention about HCC and prevention of its risk factors was feasible and is an effective way for raising awareness and improvement of practices of rural community in Menoufia governorate, Egypt. So, we recommend the adoption of a culturally integrated hepatocellular carcinoma risk factor prevention health education program by the Ministry of Health and Population (MOHP) and its implementation in primary health care units serving rural areas in Menoufia governorate to increase awareness about the disease and to promote safer practices to protect themselves and their families from HCC.

## Abbreviations

EDHS: Egypt Demographic Health Survey; ELISA: Enzyme-linked immunosorbent assay; FHU: Family health unit; HBV: Hepatitis B virus; HCC: Hepatocellular carcinoma; HCV: Hepatitis C virus; KAP: Knowledge, attitude, and practice; MOHP: Ministry of Health and Population; PCR: Polymerase chain reaction

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## Authors' contributions

SA collected, analyzed, and interpreted the study data and contributed in the manuscript writing. WM contributed in the manuscript writing. OH

contributed in the manuscript writing and supervision of the laboratory work. LD was a major contributor to the manuscript writing and revising. All authors read and approved the final manuscript.

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## Availability of data and materials

The data set of the current study is available from the corresponding author on reasonable request.

## Ethics approval and consent to participate

The Institutional Review Boards of both National Liver Institute Menoufia University (IRB00003413) and Ministry of Health and Population (IRB0000687) approved the study procedures. Approaches to ensure ethics were considered in the study regarding confidentiality and the verbal consent. The researcher introduced herself to the participants in the sample and explained the objectives of the study, to obtain their acceptance to be recruited in the study as well as to gain their cooperation.

## Consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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