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Prevalence of HCV among Financial Company Employees and Effectiveness of Educational Sessions on the Knowledge of HCV Positive Ones

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Abstract: **Hepatitis C virus diseases are a serious public health problem worldwide. Only a few studies were done with employees' related knowledge and awareness.** ***Aim of the study*****: The study was aimed at measuring the prevalence of HCV among financial company employees and the effectiveness of educational sessions on the knowledge of HCV positive ones.** ***Subjects and methods*****: The study was conducted at a financial company located at Kafr El Zayat city, Gharbia Governorate, Egypt using a descriptive cross-sectional design for the prevalence, and a one-group quasi-experimental design with pre-post assessment for the intervention. All 818 employees in the company were included in the prevalence study, and those testing HCV positive were included in the intervention. Data collection tools included an interview questionnaire for personal and medical history, a laboratory sheet for recording HCV and HBV tests results, and a knowledge test for the intervention. The intervention was carried out through assessment, planning, implementation, and evaluation phases. The fieldwork was from October 2017 to May 2018.** ***Results*****: The prevalence of HCV sero-positivity was 7.33% (95% Confidence Interval: 5.69-9.28). It was significantly related to low income, accidental wounds, bilharzia treatment, previous hospitalization, endoscopy, drug abuse, and multiple sex partners. The knowledge of HCV sero-positive employees was low before the intervention, but significantly improved after the intervention; thus satisfactory knowledge rose from 20.0% to 100.0% after the intervention (p<0.001).** ***Conclusion and recommendations*****: HCV sero-positivity is relatively high among employees in the setting, and their knowledge is amenable to improvement through educational sessions. Widespread educational programs targeting employees and workers in various work settings are recommended.**

Keywords: **HCV, Sero-positivity, Knowledge, Employees.**

1. INTRODUCTION

Hepatitis C Virus (HCV) diseases form a grave public health problem all over the world, with about 300 million people affected, of whom around one million die yearly. They constitute a major underlying cause of chronic liver diseases, with related high rates of mortality and morbidity ***(Indolfi et al., 2019)***. A number of factors have contributed to the high prevalence rates particularly in developing countries such as the lack of sound information of the disease, insufficient diagnostic facilities, the stigma of having HCV, and availability of treatment ***(Behzadifar et al., 2019)***. Laboratory diagnosis of HCV includes Enzyme Immunoassays (EIA) and Electro-Chemi-Luminescence Immunoassays (ECLIA) to detect specific viral hepatitis antigens or antibodies, and molecular assays such as polymerase chain reaction (PCR) to detect and quantify the viral genome ***(Villar et al., 2015)***.

The prevalence rates of HCV diseases vary across countries. The rates are lowest in developed countries such as the United States and Italy were 2-3% of the populations are chronically affected ***(Gentile et al., 2019)***. Higher rates were

reported in countries of Central Asia reaching a pooled mean prevalence as high as 13.5% ***(Botheju et al., 2019)***. The rates among immigrants from developing countries were high as well ***(Coppola et al., 2019)***.

Egypt is among the countries with the highest prevalence rates of HCV ***(Raad et al, 2018)***. The overall reported prevalence was as high as 14.7% ***(Abd-Elsalam et al., 2019)***. This was true until the start of the national treatment program aimed elimination of the disease ***(Omran et al., 2018)***. The program targets to treat 300,000 patients with HCV disease each year. Thus, marked declines in the risk of HCV infection were noticed during the last few years ***(Kouyoumjian et al., 2018)***. Nevertheless, in spite of the considerable efforts and the outcomes achieved, still more efforts and improvements are required to effect the actual elimination of the disease ***(Amin Elzorkany and Zahran 2017; El Kassas et al, 2018)***.

The transmission of HCV infection is through multiple routes and mechanisms, and the risk is increased among those in close contact with the patient ***(Bayomy et al., 2018)***. Thus, intra-familial transmission may constitute a major cause of the propagation of the infection, especially when the patients lack sound and complete information about the risks of exposure to HCV infection and the modes and routes of transmission ***(Sherief et al., 2019)***. However, there is poor knowledge about these infections in the general population, and even gaps of knowledge were reported among healthcare providers and students ***(Khalil et al., 2018)***. Moreover, most studies addressing HCV infection and related knowledge and awareness were carried out on healthcare providers, students, and general or high risk populations, with only few studies on employees ***(Oliveira et al., 2015; Sugiyama et al., 2018)***.

Aim of the study

The study was aimed at measuring the prevalence of HCV among financial company employees and the effectiveness of educational sessions on the knowledge of HCV positive ones. This was accomplished through the specific objectives:

1. Measure the prevalence of HCV among financial company employees
2. Investigate the risk factors for HCV infection among financial company employees
3. Plan, implement, and evaluate the effect of providing educational sessions on the knowledge of HCV positive ones.

Research hypothesis

The research hypothesis was that the knowledge scores will be improved significantly after implementation of the educational sessions.

2. SUBJECTS AND METHODS

Study setting and design: This study was conducted in a financial company located in Kafr El Zayat city, Gharbia Governorate, Egypt. The Egyptian Financial and Industrial Company was established as an Egyptian joint stock company to be the pioneer of the phosphate fertilizer industry in Egypt and the Middle East. In 1935 the first factory was established in Kafr El-Zayyat in 1961. A descriptive cross-sectional design was used to measure the prevalence of HCV and its risk factors, and a one-group quasi-experimental design with pre-post assessment for testing the research hypothesis.

Subjects: All the employees working in the aforementioned company composed the study population. The only inclusion criterion was being a full-time employee in the company. The total number of eligible was 818 employees.

This sample size was large enough to measure a prevalence of HCV infection of 5% or higher at 95% level of confidence and 1.5% absolute precision using the Open Epi statistical software package.

Data collection tools: Three tools were used to collect the necessary data, namely a survey interview questionnaire form, a laboratory sheet for HCV and HBV tests, and a pre-post knowledge test.

- *Survey interview questionnaire form*: This tool was developed by the researchers. It included a section for employee's personal data such as age, gender, marital status, residence, educational level, income, and absenteeism from work. The second section was for assessment of the employee's medical history and involved the history of chronic diseases such as

hypertension, diabetes, cardiac or respiratory diseases, and neoplasm. The third section was for assessing the risk factors for HCV infection such as previous surgery, blood transfusion, multiple injections, accidental wounds, bilharzial treatment, dental procedures, hospitalization, endoscopy, and suturing. The last section was for the risky behavioral factors such as sharing common nail trimming and shaving tools, drug abuse, and multiple sex partners.

- *Laboratory sheet*: This sheet was designed for recording the results of the HCV and HBV tests of the employees.
- *Knowledge test*: This tool was used to assess the effect of the educational sessions on employees' knowledge. It was applied to those testing positive for HCV before and after the intervention. The researchers developed it based on related literature ***(Mohamed and Wafa, 2011; Sypsa et al., 2002; Mesfin and Kibret, 2013; World Health Organization [WHO], 2017)***. It consisted of 15 True/false questions covering areas of HCV transmission such as hugging, sharing utensils, blood transfusion, sexual relationship, tooth brushes, etc., as well as prevention of HCV and HBV. For scoring, a correct answer was given one point, and the incorrect zero. The total score was computed by simple summation of the points gained for a maximum score 15. The employee gaining 60% of the total score, i.e. nine or more correct answers, was considered to have satisfactory knowledge, while a lower score was considered unsatisfactory.

The data collection tools in their preliminary forms were presented to five experts for face and content validation. These included two professors from the Community Health Nursing, Faculty of Nursing, Zagazig University, two professors in Gastroenterology and one professor of Community Health, from the Faculty of Medicine, Zagazig University. They assessed the tools for relevance, clarity, and applicability. Recommended modifications in the form of rephrasing some questions and addition of some risk factors were done. Reliability of the proposed tools was done by Cronbach's Alpha test; it was 0.875 for tool (I) and 0.932 for tool (II).

Then, a pilot study was carried out on 81 employees representing approximately 10% of the main study sample. The purpose of the pilot study was to test the questions for any ambiguity, and to assess the feasibility of the study. It also helped the researchers to estimate the time required to fill out the forms. Since no modifications were done, the pilot study subjects were included in the main study sample.

Fieldwork: The fieldwork lasted for eight months from October 2017 to the end of May 2018. The work was three days a week between 10.00 AM and 12.00 Noon. The study was carried out through initial survey and then intervention.

Initial survey: This phase consisted of the survey of the prevalence of HCV infection. The researchers first introduced themselves and explained the purpose of the research briefly to the manager of the company who appointed a supervisor to be a liaison with the workers to arrange for the interviews and ensure that the research does not interrupt normal company activities. The researchers met with the workers, explained the aim of the study and obtained their verbal consent to participate. The interviews were carried out individually using the designed form, and took 10-15 minutes for each worker.

At the end of the interview blood samples were obtained for HCV/ HBV serological testing. Samples were collected by venipuncture with strict infection control precautions. An enzyme immunoassay for the detection of antibodies to HCV/HBV in human serum was used. Samples were incubated in micro-wells coated with highly purified antigens.

Intervention: This was carried out through assessment, planning, implementation, and evaluation phases.

- Assessment phase: During this phase, the employees with HCV positive laboratory results were identified. They were informed about their HCV status and guided to appropriate management channels. Meanwhile, they were invited to participate in the educational sessions to improve their knowledge about HCV with the aim of preventing transmission to their families and surroundings. They all provided their consent, and were handed the knowledge questionnaire and instructed in how to fill it in. It took each employee 15-20 minutes to complete the test. This constituted the knowledge baseline or pre-test.
- Planning phase: Based on a review of the literature, characteristics of the sample of employees, and the results obtained from the pre-test, the researchers designed the educational sessions with a general objective of raising their knowledge of HCV infection. The sessions covered the definition of HCV infection and its causes, symptoms, mode of transmission, diagnosis, complications, the preventive measures, and treatment. An illustrated learning booklet prepared by the researchers was distributed to them to be used as a guide for self-learning.

- Implementation phase: The intervention was implemented in the form of sessions in the conference room in the company. Various teaching methods were used as mini-lectures, an group discussions. The sessions were supported by teaching aids as videos, posters, and data shows. The intervention was implemented in 3 sessions, 20-25 minutes each, in small groups of 10-15 employees. At the beginning of the first session an orientation was given about the purpose of the intervention, its contents, time and location in order to establish good communication. Then, each session was started by a summary of what was given in the previous one, followed by the objectives of the new one.

- Evaluation phase: An evaluation of the educational intervention was carried out immediately after the implementation of the sessions using the same tool of the pretest.

Administrative and ethical considerations: Permission to carry out the study was granted by submission of official letters from the Faculty of Nursing to the responsible authorities in the study setting to obtain their permission for data collection and implementation of the intervention. All ethical issues were taken into consideration according to Helsinki declaration.

Statistical analysis: Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables, and Fisher exact 95% confidence intervals were computed. Quantitative continuous data were compared using Student t-test in case of comparisons between two independent groups and paired t-test for dependent pre-post samples. When normal distribution of the data could not be assumed, the non-parametric Mann-Whitney test was used instead. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. McNemar chi-square test was used for the comparison of dependent pre-post samples. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. To identify the independent predictors of the risk of HCV infection, multiple logistic regression analysis was used. In order to identify the independent predictors of the knowledge score change, multiple linear regression analysis was used and analysis of variance for the full regression models was done. Statistical significance was considered at p-value <0.05.

3. RESULTS

Table 1 shows that the prevalence of HCV sero-positivity in the study sample was 7.33% (95% Confidence Interval: 5.69-9.28). The prevalence of HBV sero-positivity is much lower (0.73%).

Comparing the characteristics of the employees with and without HCV infection, Table 2 demonstrates that those HCV sero-positive had significantly older age ($p<0.001$). Moreover, significantly higher percentages of them were having insufficient income ($p=0.045$), and absenteeism from work ($p=0.01$).

Table 3 illustrates that that those HCV sero-positive employees had significantly higher percentages of respiratory diseases ($p<0.001$), and neoplasms ($p=0.03$), but significantly lower rate of hypertension ($p<0.001$). They had a higher median number of chronic diseases ($p<0.001$), and all the HBV sero-positive cases were among them ($p<0.001$). The prevalence of the various medical risk factors was significantly higher among them, with the exception of blood transfusion and dental procedures. In total, their median number of medical risk factors (4.0) were higher compared to 2.0 in those HCV sero-negative ($p<0.001$). This was also noticed regarding the median number of behavioral factors, and the percentage of those having multiple sexual partners was higher among them ($p=0.01$). Overall, the median number of total risk factors in HCV sero-positive employees (7.0) was higher compared to 3.0 in those HCV sero-negative, and the difference was statistically significant ($p<0.001$).

Regarding the factors associated with HCV infection, the logistic regression model in Table 4 shows that employees' low income, accidental wounds, bilharzial treatment, previous hospitalization, endoscopy, drug abuse, and multiple sex partners were statistically significant independent risk factors of sero-positivity for this disease. The multiple sex partners were the most risky with Odds Ratio (OR) 12.309. Meanwhile, younger age was a protective factor with OR 0.941.

As presented in Table 5, the knowledge of HCV sero-positive employees were generally low about HCV transmission before the educational intervention. This was most evident regarding the transmission through tooth brushes (5.0%), infected donors and sharing spoons (6.7%), as well as infected mother (10.0%). Moreover, their knowledge of the prevention of HCV was low (15.0%). After implementation of the intervention, statistically significant improvements

were revealed in all knowledge areas. In total, 20.0% of these employees had satisfactory knowledge at the pre-intervention phase in comparison with 100.0% at the post-intervention phase ($p<0.001$). Additionally, their corresponding mean scores rose from 5.7 to 14.5 from a maximum of 15 points.

Table 6 indicates that HCV sero-positive employees' pre-intervention knowledge scores had statistically significant small positive correlations with their educational level and income. Meanwhile, their pre-post score difference had a statistically significant small negative correlation with their educational level ($r=-0.284$).

The multivariate analysis in Table 7 indicates that the study intervention was the main statistically significant independent positive predictor of the employees' knowledge score, in addition to the educational level. The model explains 81% of the change in this score as indicated by the r-square value.

4. DISCUSSION

The study results point to a generally high prevalence of HCV sero-positivity among the employees in the study setting. Those testing positive had mostly unsatisfactory knowledge of this disease. However, the educational sessions showed success in improving their knowledge, which leads to acceptance of the set research hypothesis.

According to the current study findings, the prevalence of HCV sero-positivity was 7.33%. This is considerably higher in comparison with the prevalence of HBV sero-positivity, which was lower by ten-folds. This is undoubtedly due to the introduction of HBV vaccination in the compulsory immunization schedule in Egypt before almost three decades. Nonetheless, the prevalence of HCV sero-positivity is lower than the rates reported earlier in Egyptian studies. Thus, the 2009 Egyptian Demographic Health Survey (EDHS) reported an overall prevalence of 14.7% ***(Miller and Abu-Raddad, 2010)***. In another study in Egypt by ***Awadalla et al. (2011)***, the prevalence was 16.8%. Meanwhile, more recently, a study on Cairo University students reported a rate of 4.6% ***(Esmat et al, 2016)***, while the rate was 1.0% among Menoufyia University students ***(Abo-Amer et al., 2018)***. The decline in the prevalence rate in our study and these ones reflects the recent national endeavors to combat HCV infection ***(Doss et al, 2018; Omran et al, 2018)***.

The present study has demonstrated that all the cases having HBV sero-positive laboratory testing were among those testing sero-positive for HCV, i.e. double infection. This could be explained by that the modes of transmission of the two types are almost the same. In agreement with this, a study in Assiut, Egypt, revealed a high prevalence of HBV sero-positivity among chronic HCV patients ***(Thabit et al., 2017)***. On the same line, ***Choy et al. (2019)*** in a study in Singapore attributed the co-infection with HBV and HCV to the common risk factors associated with both types of infection.

Concerning the risk factors of HCV sero-positivity, the present study identified many medical as well as behavioral factors. The medical risk factors with the highest prevalence were previous hospitalized, dental procedures, surgical interventions, and bilharzial treatment. These were all significantly higher in univariate analyses, among the HCV sero-positive employees. The only exception was the dental procedures, which were very high in the whole sample. However, the multivariate analysis confirmed the effect of bilharzial treatment and previous hospitalization, in addition to accidental wounds and previous endoscopy. Similar risk factors were reported from previous studies in Korea ***(Nam et al, 2019)***, Ireland ***(Crowley et al., 2019)***, and the United States ***(Jadoul et al., 2019)***.

As regards the risk behavioral factors, the univariate analysis showed higher percentages of employees with multiple sexual partners or drug abusers among HCV sero-positive employees. This was confirmed in the multivariate analysis, which identified that multiple risk partners independently increased the risk by more than twelve folds and the drug abuse by more than five folds. In agreement with this, a study in Egypt found that 47.5% of drug abusers were HCV sero-positive ***(Awadalla et al., 2011)***. More recently, a study of HCV sero-positivity in the Middle East and North Africa showed that the risk ratio was 6.8 among illicit drug users, which is very close to our figure ***(Chemaitelly et al., 2019)***.

The multivariate analysis of the present study has also identified two personal characteristics having independent and significant influence on the risk of HCV sero-positivity, namely age and income. Thus, increasing age seems to be a protective factor, which might be explained by the lower likelihood of risky behaviors in older age. On the other hand, a lower income is risky and increases the likelihood of HCV sero-positivity by more than one and a half folds. The finding might be explained by the lower health literacy and higher exposure to medical risk factors in low-income persons. In support of this explanation, a positive significant correlation was revealed between employees' pretest knowledge and

their income. In agreement with this, a study in Italy demonstrated a significant association between low income and low socioeconomic level and HCV infection ***(Morisco et al, 2017)***.

The present study results additionally demonstrated that the HCV sero-positive status is associated with more physical morbidities as shown by the significantly higher median of the numbers of chronic diseases. This consequently leads to lower productivity as evidenced by the high rates of absenteeism from work among them. In line with this, a multi-center study in Brazil revealed significantly lower productivity and higher rates of absenteeism among employees with chronic HCV disease ***(Castelo et al., 2018)***. Similar findings were also demonstrated in a systematic review on the burden and non-medical costs of HCV disease ***(Pascual-Argente et al, 2018)***.

A main objective of the present study was to improve the knowledge of HCV sero-positive employees about this illness. This was of major importance since the pretest results demonstrated major deficiencies and gaps in their knowledge. This was particularly evident regarding the methods of transmission of the disease, which were not correctly known by the majority of them. Thus, they needed to correct any related misinformation and misconceptions in order to be able to protect their families and prevent the transmission of the disease to them without having a negative impact or major restrictions on their daily life activities. The finding is in agreement with ***Sultan et al. (2018)*** who reported low levels of knowledge of HCV among Egyptian HCV-infected patients. Similar deficient knowledge about HCV and its transmission and management have been reported in studies from Australia ***(Doab et al., 2018***) and Brazil ***(Cruz et al., 2018)***.

The implementation of the educational sessions in the current study intervention proved to be effective in improving these HCV sero-positive employees. The positive effect of the intervention was re-affirmed in the multivariate analysis, which identified it as the major positive independent predictor of the knowledge score. This was quite expected as the researchers noticed the active participation and the eagerness of the participants during the educational sessions to know and acquire sound information that would help them protect their families. On the other hand, the program content responded to their unmet needs and filled their knowledge gaps. The effectiveness of the educational sessions in improving attendants' knowledge is in congruence with the findings reported in similar studies in Mansoura, Egypt ***(Mohamed and Wafa, 2011)***, and in Nigeria ***(Okwara et al., 2012)***. On the same line, studies in Malaysia ***(Mukherjee et al., 2017)*** and in the United States ***(Ochalek et al., 2018)*** demonstrated the effectiveness of educational interventions in improving the knowledge of HCV among high risk subjects.

Lastly, the educational level of HCV sero-positive employees showed important influences on their knowledge. Thus, in the pretest results, the knowledge scores had a significant positive correlation with the level of education, which is quite expected. On the other hand, the extent of improvement in the knowledge score after the intervention, i.e. the pre-post score difference, correlated negatively with the educational level. This implies that the educational sessions were more beneficial to those having lower educational levels compared with those more highly educated. This is also expected given the very low pretest scores of the former ones. Nonetheless, the educational level was a significant independent positive predictor of the knowledge score in multivariate analysis, indicating the positive impact of education on health literacy. In congruence with this, a study in the United States revealed a similar positive association between participants' educational level and their knowledge and awareness of HCV infection ***(Kim et al., 2019)***.

5. CONCLUSION AND RECOMMENDATIONS

The study findings lead to the conclusion that HCV sero-positivity is relatively high among the employees in the study setting, and are associated with multiple medical risk factors and risky behaviors. The affected employees lack correct information about the transmission of the disease, but their knowledge is amenable to improvement through educational sessions. The study recommends widespread educational programs targeting employees and workers in various work settings to complement the endeavors of the national program.

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APPENDIX – A

List of tables:

Table 1: Prevalence of Hepatitis C Virus (HCV) and Hepatitis B virus (HBV) infections among employees in the study sample (n=818)

Variable	Prevalence (n=818)		Fisher exact 95% Confidence Interval (CI)	
	Frequency	Percent	Upper limit	Lower limit
HCV	60	7.33	9.28	5.69
HBV	6	0.73	1.59	0.27

Table 2: Demographic and work characteristics of employees in the study sample according to their HCV infection status

Variable	HCV				X^2 test	p-value
	- ve (n=758)		+ ve (n=60)			
	No.	%	No.	%		
Age:						
<40	135	17.8	5	8.3		
40-	287	37.9	14	23.3	13.06	0.001*
50+	336	44.3	41	68.3		
Range	22-59		36-59			
Mean ±SD	48.0±8.0		51.7±7.3		t=12.99	<0.001*
Median	48.0		53.5			
Gender:						
Male	692	91.3	58	96.7		
Female	66	8.7	2	3.3	Fisher	0.22
Residence:						
Rural	599	79.0	47	78.3		
Urban	159	21.0	13	21.7	0.02	0.90
Marital status:						
Unmarried	24	3.2	2	3.3		
Married	734	96.8	58	96.7	Fisher	1.00
Educational level:						
Illiterate	164	21.6	13	21.7		
Basic	165	21.8	19	31.7	3.72	0.29
Secondary	314	41.4	19	31.7		
University	115	15.2	9	15.0		
Income:						
Saving	7	11.7	90	11.9		
Sufficient	38	63.3	361	47.6	6.21	0.045*
Insufficient	15	25.0	307	40.5		
Previous absenteeism:						
No	389	51.3	21	35.0		
Yes	369	48.7	39	65.0	5.92	0.01*

(*) Statistically significant at p<0.05 *(t) Student t-test*

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Table 3: Medical history and HCV risk factors among employees in the study sample according to their HCV infection status

Variable	HCV				X^2 test	p-value
	-ve (n=758)		+ve (n=60)			
	No.	%	No.	%		
Chronic diseases:						
Hypertension	272	64.1	14	23.3	38.92	<0.001*
Diabetes	118	15.6	6	10.0	1.34	0.25
Cardiac	77	10.2	8	13.3	0.60	0.44
Respiratory	100	13.2	34	56.7	76.71	<0.001*
Neoplasm	2	0.3	2	3.3	Fisher	0.03*
No. of chronic diseases:						
Range	0-5		0-4			
Mean± SD	0.9±1.1		1.9±1.0		U=45.30	<0.001*
Median	1.0		2.0			
HBV infection	0	0.0	6	10.0	Fisher	<0.001*
Medical risk factors: previous:						
Surgery	365	48.2	456	76.7	18.08	<0.001*
Blood transfusion	85	11.2	7	11.7	0.01	0.91
Multiple injections	224	29.6	33	55.0	16.71	<0.001*
Accidental wounds	173	22.8	32	53.3	27.56	<0.001*
Bilharzial treatment	340	44.9	40	66.7	10.63	0.001*
Dental procedure	687	90.6	53	88.3	0.34	0.56
Hospitalization	575	75.9	54	90.0	6.26	0.01*
Endoscopy	58	7.7	12	20.0	10.83	0.001*
Suturing	96	12.7	19	31.7	16.62	<0.001*
No. of risks:						
Range	0-6		0-6			
Mean± SD	2.5±1.1		3.5±1.3		U=35.44	<0.001*
Median	2.0		4.0			
Behavioral factors:						
Common nail trimming	102	13.5	8	13.3	0.00	0.98
Common shavers	234	30.9	23	38.3	1.44	0.23
Drug abuse	10	1.3	3	5.0	Fisher	0.06
Multiple sex partners	9	1.2	4	6.7	Fisher	0.01*
No. of factors:						
Range	0-2		0-2			
Mean± SD	0.5±0.6		0.6±0.6		U=4.37	0.04*
Median	0.0		1.0			
Total No. of risks and factors:						
Range	0-8		3-10			
Mean± SD	3.0±1.3		6.4±1.6		U=136.63	<0.001*
Median	3.0		7.0			

(*) Statistically significant at p<0.05 *(U) Mann-Whitney test*

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Table 4: Best fitting multiple logistic regression model for HCV infection

Variable	Wald	Df	P	OR	95.0% CI for OR	
					Upper	Lower
Constant	11.761	1	.001	.000		
Age	8.107	1	.004	.941	.903	.981
Low income	5.263	1	.022	1.616	1.072	2.435
Accidental wounds	6.984	1	.008	2.294	1.239	4.246
Bilharzial treatment	4.431	2	.035	1.966	1.048	3.690
Previous hospitalization	9.615	1	.002	4.551	1.746	11.861
Endoscopy	6.588	1	.010	2.762	1.271	5.998
Drug abuse	5.324	1	.021	5.547	1.294	23.770
Multiple sex partners	11.478	1	.001	12.309	2.881	52.597
Nagelkerke R Square: 0.19						
Hosmer and Lemeshow test p=0.05), Omnibus Tests of Model Coefficients: p<0.001						
Variables entered and excluded: gender, residence, marital status, education, income, other diseases and risk factors						

Table 5: Pre-post intervention knowledge of HCV among employees with HCV infection

Variable	Time				McNemar test	p-value
	Pre (n=60)		Post (n=60)			
	No.	%	No.	%		
Transmission:						
Hugging	46	76.7	58	96.7	7.56	0.004*
Kissing	22	36.7	55	91.7	29.56	<0.001*
Sharing utensils	46	76.7	60	100.0	12.07	<0.001*
Blood transfusion	8	13.3	54	90.0	44.02	<0.001*
Ear piercing	21	35.0	60	100.0	37.03	<0.001*
Infected donors	4	6.7	52	86.7	42.48	<0.001*
Sexual relationship	50	83.3	58	96.7	4.08	0.04*
Tooth brushes	3	5.0	58	96.7	52.02	<0.001*
Infected mother	6	10.0	60	100.0	52.01	<0.001*
Shaking hands	9	15.0	59	98.3	46.17	<0.001*
Sharing spoons	4	6.7	59	98.3	51.16	<0.001*
Tattooing	8	13.3	59	98.3	47.17	<0.001*
Prevention:						
Vaccine for HCV	51	85.0	60	100.0	7.11	0.004*
Vaccine for HBV	52	86.7	60	100.0	6.13	0.008*
Prevention of HCV	9	15.0	58	96.7	45.18	<0.001*
Total knowledge:						
Satisfactory	12	20.0	60	100.0		
Unsatisfactory	48	80.0	0	0.0	80.00	<0.001*
Score (max=15)						
Range	0-15		14-15			
Mean± SD	5.7±3.0		14.5±0.9		Paired t=20.59	<0.001*
Median	5.0		15.0			

(*) Statistically significant at p<0.05

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Table 6: Correlation between HCV positive employees' scores of knowledge and their characteristics (n=60)

Variable	Spearman's rank correlation coefficient (r)		
	Knowledge scores		
	Pre	Post	Pre-post difference
Age	0.043	0.013	-0.014
Education level	0.308*	-0.019	-0.284*
Income	0.258*	0.005	-0.206
Work years	0.118	0.076	-0.052
No. of chronic diseases	0.191	0.224	-0.072

(*) Statistically significant at p<0.05

Table 7: Best fitting multiple linear regression model for the knowledge score

Variable	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	-4.67	0.79		-5.905	<0.001	-6.23	-3.10
Intervention	8.85	0.40	0.89	22.337	<0.001	8.07	9.63
Educational level	0.61	0.20	0.12	3.044	0.003	0.21	1.01

r- square=0.81

Model ANOVA: F=254.10, p<0.001

Variables entered and excluded: age, gender, marital status, income, work years, residence, numbers of chronic diseases and risk factors