SIERPIŃSKA, Lidia and WÓJCIK, Olga. Assessment of knowledge concerning prevention of infection with HCV among nurses employed in surgical wards. Journal of Education, Health and Sport. 2025;79:59542. eISSN 2391-8306.
https://doi.org/10.12775/JEHS.2025.79.59542
https://apcz.umk.pl/JEHS/article/view/59542

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).
The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 17.02.2025. Revised: 12.03.2025. Accepted: 21.03.2025. Published: 21.03.2025.

Assessment of knowledge concerning prevention of infection with HCV among nurses employed in surgical wards

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Abstract

Background and study aims. Infection with hepatitis C virus (HCV) may lead to acute or chronic hepatitis. About 3% of the world's population is infected, while in Poland approximately 2%. Occupational exposure among nurses is related with the provision of care to patients in surgical wards which are an important source of infection with HCV. The aim of the study was assessment of the level of knowledge concerning prevention of HCV infection among nurses employed in surgical wards.
Materials and Method. The study included 148 nurses working in surgical wards in Polish hospitals, and was conducted by the method of a diagnostic survey, using an author-

constructed questionnaire and a modified questionnaire designed by the Polish HCV Expert Group.
Results. The majority of nurses in the study had a mediocre level of knowledge concerning hospital-acquired infections transmitted through blood, methods of prevention of hospital-acquired infections with HCV, and methods of protection against occupational exposure to HCV infection. The majority of respondents provided correct answers regarding the risk of infection with HCV. The deficit of respondents' knowledge concerned the lack of vaccine against hepatitis C and the possibility of curing a person infected with HCV as long as the disease is diagnosed early.
Conclusions. Nurses employed in surgical wards should be motivated to expand their knowledge concerning prevention of HCV infections. Training courses should include the methods of prevention of infections with HCV, ways to protect against occupational exposure to HCV infection, and the possibilities of treatment of persons infected with HCV.

Key words: *hospital-acquired infections, hepatitis C, occupational exposure, HCV*

Introduction

Long-term infection with the hepatitis C virus (HCV) is an important problem in Poland (estimated around 700,000 people – 1.9% of the population), and globally (approximately 170 million – 3% of the world's population). The etiologic factor of hepatitis C is the hepatitis C virus (HCV) [1, 2, 3].

In 50% - 80% of patients infection with HCV leads to chronic hepatitis C. It has been confirmed that 20% of those infected develop cirrhosis of the liver which, in turn, may lead to primary liver cancer [4, 5].

A study carried out in Tunisia showed that employees working in surgical wards were most exposed to infection with HCV, compared to those in other wards (0.13% of positive results). Simultaneously, the researchers paid attention to the fact that despite the low scale of infections with HCV preventive actions should be undertaken in order to increase the safety of medical staff [6].

Researchers from Ethiopia confirmed a high incidence of occupational exposure to needle stick injuries among healthcare staff, especially among nurses. Therefore, according to their opinions it is necessary to improve work safety and hygiene in health care facilities [7, 8].

Chinese researchers emphasize that at the workplace of nurses there is a high exposure to blood-borne infections. For this reason it is necessary to observe the principles of prevention of infections, because among nurses the costs related with post-exposure care are high [9].

Researchers from Egypt confirmed that health education programmes in the area of control of hospital-acquired infections are necessary in order that nurses could enhance their level of knowledge on patients with hepatitis C [10].

The frequency of occurrence of anti-HCV antibodies among medical staff in Poland, including employees of surgical wards is estimated at 1.3 and 1.4%. Considering the problem of occupational exposure among nurses, especially regarding the provision of care of patients with hepatitis C internal trainings should be carried out concerning the risk of blood-borne infections.

Objective

The aim of the study was assessment of the level of knowledge concerning prevention of infections with HCV among nurses employed in surgical wards.

Materials and Method

Population and research project

The study included the total number of 148 nurses working in surgical wards in Polish hospitals, and conducted by means of an author-constructed questionnaire, and a modified questionnaire '*Evaluation questionnaire for students (pre- and post-)',* designed by the Polish HCV Expert Group. The research was conducted electronically using an on-line questionnaire. The research tools were made available on the Facebook platform associating male and female nurses employed in surgical wards in the whole of Poland. The results of the study were statistically analyzed using the statistical software StatSoft STATISTICA 13.1. PL, and the Microsoft Office package. The majority of respondents in the study group were females (86.5%), compared to males – 13.5%. The study was conducted from 1-31 May 2024. The research project was submitted to the Dean's Office at the University of Economics and Innovation Academy (AWSEI) in Lublin, Poland, by the co-author of the research project – member of Students' Scientific Circle at the AWSEI in Lublin (Catalogue No. 36146/2022). Consent for the study was obtained from the Dean of the AWSEI in Lublin after the research project had been considered by the Council of the Faculty of Health Sciences AWSEI in Lublin.

Selection of the study group

Nurses for the study were selected at random. The criterion of selection was work of nurses in hospital surgical wards. Into the study were qualified exclusively nurses who worked in a section in direct contact with the patient. The criterion of exclusion was nursing management staff employed in surgical wards performing managerial functions. Apart from this, nurses employed in conservative wards and outpatient care were excluded from the study.

Method and research tool

The study was carried out by the method of a diagnostic survey using questionnaires. Two research tools were applied:

1. An author-constructed questionnaire consisting of closed questions systematized into IV domains entitled:

Domain I – Knowledge concerning hospital-acquired infections transmitted through contact with infected blood among the examined nurses in surgical wards. The questions were: What is your level of knowledge about hospital-acquired infections transmitted through contact with infected blood? Do you regularly update your knowledge concerning infection with HCV and prevention of infection with HCV virus? From where do you acquire knowledge about hospital-acquired infections and their prevention? What is your self-assessment of knowledge concerning hospital-acquired infections and their prevention?

Domain II – Knowledge concerning methods of prevention of hospital-acquired infections due to hepatitis C among the examined nurses in surgical wards. The questions were: What is your level of knowledge about methods of prevention of hospital-acquired infections due to hepatitis C? How often do you participate in trainings in the area of prevention of infections with HCV? How do you evaluate your knowledge concerning exposure to infectious material and post-exposure prophylaxis? In your opinion is there possibility of infection with HCV other than puncture or injury with a contaminated medical instrument?

Domain III – Knowledge concerning methods of prevention of occupational exposure to infection with hepatitis C virus among the examined nurses in surgical wards. Set of questions: What is your level of knowledge concerning methods and ways of protection against occupational exposure with HCV virus? Do you know what to do in the event of a confirmed infection with HCV among medical staff? Do you know and use safe procedural practices? Do you use personal protective equipment while performing activities with the patient?

Domain IV – Demographic and social data. The questions concerned independent variables: gender, age, place of residence, education, problem of infection with hepatitis C virus in the family of the examined nurses.

2. The second research tool was a modified questionnaire '*Evaluation questionnaire for students (pre- and post-)',* designed by the Polish HCV Expert Group. The original version of the questionnaire was available on web-site [11].

The questionnaire consisted of the following 8 closed questions:

What is the hepatitis C virus? In your opinion in what way can one become infected with HCV? In what situations can one become infected with HCV? How many people in Poland are infected with HCV? How can one check whether one is infected with HCV? Is there an effective vaccine against hepatitis C? Is it possible to cure a person infected with HCV? Who is exposed to infection with hepatitis C virus?

Statistical analysis

The collected research material was analyzed using the non-parametric Pearson's chi-square test. The p values $p<0.05$ were considered statistically significant. Statistical analysis was performed by means of:

- statistical software StatSoft STATISTICA 13.1. PL;
- Microsoft Office package.

The results of analyses are presented in tables.

Results

1. Characteristics of the study group

The study included 148 nurses, whose socio-demographic characteristics are presented in Table 1.

Table 1. Structure of nurses in the study according to gender, education, place of residence, and problem of infection with hepatitis C virus in the family.

Characteristics of the examined cohort	N	%
Gender		
females	128	86.5
males	20	13.5
Total	**148**	**100.0**
Education		
secondary school	6	4.0
Licentiate degree	116	78.4

Master's degree	26	17.6
Total	**148**	**100.0**
Place of residence		
rural area	68	45.9
urban area	80	54.1
Total	**148**	**100.0**
Problem of infection with hepatitis C in the family		
noone	119	80.4
I do not know	19	12.8
family member	10	6.8
Total	**148**	**100.0**

The majority of respondents were females - 128 (86.5%), compared to males – 20 (13.5%). The largest group were nurses had higher licentiatie degree education – 116 (78.4%), followed by those with higher Master's degree education - 26 (17.6%). The respondents were mainly urban inhabitants - 80 (54.1%), while a smaller number of nurses lived in rural areas – 68 (45.9%). It was found that in a large group of respondents the problem of infection with HCV in the family did not occur – 119 (80.4%), $^1/_5$ of the nurses in the study (12.8%) had no knowledge concerning the infected family members, whereas 6.8% of the examined nurses reported that in their family they had the problem of infection with hepatitis C virus.

4.2. Opinions of nurses concerning infections with HCV virus

The examined nurses were asked, among others, the question: '*What is your level of knowledge about hospital-acquired infections transmitted through contact with infected blood?*, which was included in the author-constructed questionnaire (Tab. 2).

Table 2. Respondents' opinions concerning the level of knowledge about hospital-acquired infections transmitted through contact with infected blood, according to gender and education.

Self-assessed level of knowledge		Total	Gender		Education		
			female	male	secondary school	licentiate degree	Master's degree
High	N	52	45	7	3	34	15
	%	35.1%	35.0%	35.0%	50.0%	29.0%	42.0%
Mediocre	N	95	83	12	3	81	11
	%	64.2%	65.0%	60.0%	50.0%	70.0%	58.0%
Low	N	1	0	1	0	1	0
	%	0.7	0.0%	5.0%	0.0%	1.0%	0.0%
Total	N	148	128	20	6	116	28
Stat.: (Chi^2),'p"'		-	p=0.40645		p=0.36417		

Analysis of the research material demonstrated that more than a half of the nurses in the study evaluated their level of knowledge concerning hospital-acquired infections transmitted through contact with infected blood as mediocre (64.2%), followed by high

(35.1%), and low – 0.7% of respondents. Answers with consideration of independent variables: gender, education were insignificant, p>0.05.

In the presented study it was considered important to recognize whether the nurses had a high level of knowledge about methods of prevention of hospital-acquired infections due to hepatitis C (Tab. 3).

Table 3. Respondents' opinions concerning the level of knowledge about methods of prevention of hospital-acquired infections due to hepatitis C, according to gender and education.

Self-assessed level of knowledge		Total	Gender		Education		
			female	male	secondary school	licentiate degree	Master's degree
High	N	58	50	8	3	43	12
	%	39.2%	39.0%	40.0%	50.0%	37.0%	46.0%
Mediocre	N	87	77	10	3	71	13
	%	58.8%	60.0%	50.0%	50.0%	61.0%	50.0%
Low	N	3	1	2	0	2	1
	%	2.0%	1.0%	10.0%	0.0%	2.0%	4.0%
Total	N	148	128	20	6	116	26
Stat.: (Chi^2), 'p'		-	p=0.16498		p= 0.20888		

It was observed that the majority of nurses in the study (58.8%) evaluated the level of their knowledge concerning methods of prevention of hospital-acquired infections due to hepatitis C as mediocre, followed by high (39.2%), and low (2.0%). No significant differences in respondents' answers were observed according to the analyzed variables; p>0.05.

The subsequent question included in the questionnaire concerned the level of knowledge concerning methods and ways of protection against occupational exposure to infection with HCV (Tab. 4).

Table 4. Respondents' opinions concerning the level of knowledge about methods and ways of protection against occupational exposure to infection with HCV virus, according to gender and education.

Self-assessed level of knowledge		Total	Gender		Education		
			female	male	secon-dary school	licentiate degree	Master's degree
High	N	54	45	9	3	39	12
	%	36.5%	83.0%	17.0%	6.0%	72.0%	22.0%
Mediocre	N	86	77	9	3	70	13
	%	58.1%	90.0%	10.0%	4.0%	81.0%	15.0%
Low	N	8	6	2	0	7	1
	%	5.4%	75.0%	25.0%	0.0%	13.0%	87.0%
Total	N	148	128	20	6	116	26
Stat.: (Chi^2), 'p'		-	p= 0.18142		p= 0.50070		

It was confirmed that the majority of respondents – 58.1% reported that they had a mediocre level of knowledge concerning methods and ways of prevention against occupational exposure to infection with hepatitis C virus. Approximately $^1/_3$ of respondents (36.5%) admitted that their level of knowledge was high, whereas 5.4% of the examined nurses evaluated their knowledge as low; the results were insignificant; $p>0.05$.

The nurses in the study were also asked the question: '*What is HCV?',* which is the first question in the modified questionnaire '*Evaluation questionnaire for students (pre- and post)',* designed by the Polish HCV Expert Group.

The majority of the examined nurses (99.3%) provided the correct answer and reported that HCV is 'hepatitis C virus', while 0.7% of respondents provided an incorrect answer and mentioned that this is 'a flu virus'. None of the respondents provided the answer that HCV virus is 'a virus causing vision disorders'. It was found that respondents' gender, education, place of residence, and their possible contact with persons infected with hepatitis C virus (family members) were statistically insignificant ($p>0.05$).

The subsequent item in the questionnaire concerned the sources of infection with HCV: *'In your opinion in what way can one become infected with HCV?* It was confirmed that the largest number of respondents (97.3%) reported that the source of infection with hepatitis C virus may be 'contact with infected blood'. Three respondents indicated 'an alimentary route' (2.0%), while 0.7% of nurses in the study as a source of infection with HCV mentioned 'sharing cutlery with an infected person'. None of the respondents reported the risk of acquiring infection with HCV 'by shaking hands, hugging'. Statistical analysis did not show any significant relationships according to independent variables; $p>0.05$.

In the questionnaire the examined nurses indicated situations which, in their opinions, create the risk of infection with hepatitis C virus (Tab. 5).

Table 5. Respondents' opinions concerning their level of knowledge about situations in which it is possible to become infected with HCV virus, according to gender and education.

Risky situations for infection with HCV:		Total	Gender		Education		
			female	male	Secon-dary school	licentiate degree	Master's degree
using the same bathroom as an infected person	N	3	1	2	1	1	1
	%	2.0%	1.0%	10.0%	17.0%	1.0%	4.0%
by eating meals prepared by an infected person	N	2	1	1	0	2	0
	%	1.4%	1.0%	5.0%	0.0%	2.0%	0.0%
during a visit to the hairdresser and beautician, when skin disruption occurs	N	143	126	17	5	123	25
	%	96.6%	98.0%	85.0%	83.0%	97.0%	96.0%
Total		148	128	20	6	116	26
Stat.: (Chi^2), „p"		-	p= 0.21341		p= 0.43202		

It was found that the largest number of nurses (96.6%) reported that infection with hepatitis C virus may occur, for example, 'during a visit to the hairdresser and beautician, when skin disruption occurs'. The differences resulting from gender and education were statistically insignificant (p>0.05).

The nurses in the study were asked who in their opinions is exposed to contracting hepatitis C. It was found that a vast majority of respondents (97.3%) reported that 'everyone' is exposed to infection with hepatitis C virus. A small group of respondents (2.0%) considered that infection with HCV concerns only the persons undergoing blood transfusion procedures, and one nurse considered that exclusively 'drug addicts and the staff of medical services' may become infected with HCV. The respondents' answers did not significantly differ according to gender, education, place of residence, and the problem of infection with HCV in the family (p>0.05).

The nurses in the study were asked about their opinions concerning the number of people infected with HCV in Poland (they indicated one answer). The largest number of respondents (56.0%) provided the correct answer, i.e. approximately 700,000, whereas 29.8% of the examined nurses indicated the answer about 7,000, and 14.2% of respondents mentioned slightly over 2,500 people; according to independent variables the answers were statistically insignificant; p>0,05.

The respondents reported various ways by which it is possible to verify the presence of infection with hepatitis C virus. The largest number of nurses in the study (97.4%) mentioned that the best diagnostic method is ' performing anti-HCV antibody test to detect the presence of antibodies to the virus', while 2.7% of respondents incorrectly replied that

infection with hepatitis C virus may be detected using a quick test available at the pharmacy to perform at home. None of the respondents stated that infection with HCV may be detected by 'being vaccinated against hepatitis C'. The respondents' answers did not significantly differ statistically according to independent variables; $p>0.05$.

The respondents answered questions concerning prevention, and vaccination against hepatitis C. More than a half of the examined nurses (52.7%) considered that there is no vaccine against hepatitis C virus, because it failed to be developed due to the high diversity of the virus. It was found that 23.6% of nurses in the study indicated the answer that there is no vaccine against hepatitis C; however, the existing vaccines against hepatitis A and hepatitis B protect also against hepatitis C. A similar group of respondents (23.6%) incorrectly replied that vaccine against hepatitis C 'has been available in pharmacies since several years'. The answers did not significantly differ statistically according to gender, education, place of residence, and the fact of the presence of persons infected with HCV in the family; $p>0.05$.

One of the questions addressed to the nurses employed in surgical wards pertained to their knowledge on the possibilities of treatment of persons infected with HCV. The nurses most frequently replied that it is possible to cure a person infected with hepatitis C virus as long as the disease is diagnosed early (50.0%). A group of 43.9% of nurses in the study considered that there is no effective medicine for hepatitis C, and some respondents (6.1%) reported that the only treatment is liver transplantation. The respondents' answers did not significantly differ statistically according to gender, education, place of residence, and the presence of a person infected with HCV in the family; $p>0,05$.

Discussion

A study conducted in India among students of nursing demonstrated that 94.1% of respondents were aware of the risk of infection with blood-borne diseases. For this group of the examined students (46.7%) training courses were the main source of information concerning the risk of occupational exposure [12]. The presented study showed that more than a half of the examined nurses evaluated their level of knowledge about hospital-acquired infections transmitted through blood as mediocre (64.2%). Also, more than a half of respondents (58.8%) assessed their knowledge about the methods of prevention of hospital-acquired infections due to hepatitis C as mediocre.

A study carried out in Poland by Czapla among occupationally active nurses showed that 95% of respondents knew how to report accidental exposure to blood-derived products [13]. Based on the presented study it was confirmed that more than a half of the examined nurses– 58.1% had a mediocre level of knowledge concerning methods and ways of

protection against occupational exposure to hepatitis C virus. Approximately $^1/_3$ of respondents considered their knowledge in this area as high.

Based on a study conducted among nurses in three hospitals in Baghdad it was found that they presented a sufficient level of knowledge (66.66%) about HCV. The lowest results concerned transmission of the virus (69.0%), and prevention (48.3%) [14]. The results of the presented study confirmed that 99.3% of the examined nurses knew that HCV is 'heptitis C virus'. The vast majority of respondents (97.3%) reported that the source of infection with HCV may be 'contact with infected blood'. A large group of nurses in the study (96.6%) knew that it is posibnle to become infected with hepatitis C virus during a visit to the hairdresser and beautician, when skin disruption occurs.

Researchers confirmed that there are many routes of infection with HCV virus, e.g. during hospitalization, transfusion of blood or blood-derived products, haemodialysis, organ transplantation, occupational exposure, sexual contacts, vertical transmission, and in beauty parlours [15, 16]. According to the majority of the examined nurses (97.3%) 'everyone' is exposed to infection with HCV. Few respondents mentioned that infection with HCV concerns exclusively persons undergoing blood transfusions, 'drug addicts and employees of health services'. More than a half of respondents (56.0%) provided the correct answer that in Poland approximately 700,000 population are infected with hepatitis C virus, whereas the remaining answers were incorrect.

In their study Li et al. emphasize that the first step to examination of persons infected with HCV is anti-HCV test to detect the presence of antibodies against HCV [17]. It was found that the majority of nurses working in surgical wards (97.4%) knew that the best method of diagnosing infection with HCV is 'blood test for the presence of antibodies against HCV'.

According to researchers the development of a vaccine against HCV is hindered due to a high genetic diversity of the HCV virus [18]. The presented study demonstrated that more than a half of the examined nurses (52.7%) considered that there is no vaccine against hepatitis C virus, because it failed to be developed due to the high diversity of the virus, while the remaining respondents provided an incorrect answer.

Relevant literature shows that increasingly more often treatment of patients infected with HCV is undertaken using anti-viral drugs to achieve global elimination of the virus [19, 20, 21, 22]. The presented study demonstrated that 50.0% of the examined nurses knew about the possibility to cure a person infected with HCV, as long as the disease is diagnosed early. A large group of nurses in the study (43.9%) considered that there is no effective medicine for

hepatitis C, and some respondents (6.1%) mentioned that liver transplant is an effective treatment.

Conclusions

1. Nurses in surgical wards should be motivated to expand their knowledge in the area of prevention of hospital-acquired infections transmitted through blood, considering a mediocre level of knowledge of this problem.
2. Internal training courses for nurses should include the scope of problems concerning methods of prevention of hospital-acquired infections due to hepatitis C virus, and the ways of protection against occupational exposure to infection with HCV.
3. Post-graduate improvement courses for nurses working in surgical wards should include the scope of problems concerning the possibilities of treatment of persons infected with HCV virus, because a half of respondents had a deficit of knowledge in this area.

Human Subjects Approval Statement

The study was conducted according to the guidelines of the Declaration of Helsinki. All participants provided informed consent for the study. Before the study the co-author of the research work – member of the Student's Scientific Circle at the WSEI in Lublin obtained the consent for the study from the Dean of the University of Economic and Innovation in Lublin (Catalogue No. 38 249/2020).

Conflict of Interest Disclosure Statement

The authors have no conflicts of interest to report.

Author Contributions:

Lidia Sierpińska: conceptualization, analysis data, literature analysis, manuscript proofreading, formal analysis, corresponding author (50%)

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Olga Wójcik: data collection and analysis, literature analysis, preparation of the publication (30%)

0009-0006-4041-0727

Financing:

No external funding has been received

Institutional Review Board Statement:
Does not apply

Statement of informed consent:
Does not apply

Data Availability Statement
Does not apply

Conflict of interests:
The authors report no conflict of interest

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