Advanced Medical Journal, Vol.10, No.1, P.149-156,2025 https://doi.org/10.56056/amj.2025.329

Training's Impact on Medical Staff's KAP in Infection Prevention for Nosocomial Viral Hepatitis B&C in Erbil Teaching Hospital's Hemodialysis Unit

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Abstract

Background & objectives: Hemodialysis patients are susceptible to various types of infections, such as exposure to blood borne pathogens. This study aims to identify the effects of training on the incidence of nosocomial viral hepatitis B & C infection and implement an interventional program to decrease the incidence of nosocomial infection.

Methods: A quasi-experimental study design was conducted from the 1st Nov 2021-30th Nov 2022 in the hemodialysis unit of Erbil Teaching Hospital employing a pre-and post-test design. All medical staff working in the unit (48), underwent an assessment of their knowledge, attitudes, and practices regarding infection control before and after the implementation of the training program.

Results: Out of 48 staff 25 (52.1%) of them were males. Before the implementation of the training program, the mean knowledge score calculated was 13.7 and the mean attitude score was 10.9 while the mean score of the practice was only 9.3. Eventually, after the implementation of the training program, the subtended scores were 23.0, 16.5, and 14.3 respectively. The highest incidence rate of Hepatitis B was reported in 2019 which was 3.4 whereas the lowest rate was reported in 2022 which was 0.5. There was a statistically significant variation between the incidence of HBV in 2021 and its incidence in 2022, p value < 0.05.

Conclusion: Implementation of an educational program led to a notable enhancement in the knowledge of infection prevention and control principles among medical staff.

Keywords: HBV, HCV, Hemodialysis, Infection prevention and control, Knowledge attitude and practice

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Introduction

Chronic renal failure is widely recognized as a global public health issue.[1] Over the past decade, there have been significant changes in the global end-stage renal disease (ESRD) population that undergoes maintenance dialysis.[2] Among patients undergoing hemodialysis, infection stands as the primary cause of hospitalization.[3] Hemodialysis patients are susceptible to various types of infections, such as exposure to bloodborne pathogens.[4] Risk factors associated with infections in hemodialysis (HD) patients encompass compromised immune status, exposure to invasive devices, contact with healthcare personnel, and notably, non-adherence to guidelines.[5] Also, understaffing, insufficient training of hemodialysis staff, lack of resources, and overcrowded units that lack proper spacing between patients. [6&7]Hepatitis is characterized by liver inflammation & and represents a significant public health issue, impacting nearly 10% of the global population.[8] The global impact of viral hepatitis is immense, affecting lives, communities, and healthcare systems. Each year, an estimated 1.4 million deaths occur due to acute infections, hepatitis-related liver cancer, and cirrhosis. Chronic HBV infection affects around 240 million individuals worldwide, while chronic hepatitis C virus (HCV) infection affects 130-150 million individuals.[9]Hepatitis B and Hepatitis C virus are highly contagious viruses that can be easily transmitted from one infected individual to another through various means mainly direct blood contact.[10], contact with contaminated blood or body fluids, Procedures such as dialysis also pose an increased risk of infection. Chronic liver disease resulting from HBV infection plays a significant role in the occurrence of HCC. Therefore, implementing preventive measures targeted at HBV is crucial in reducing the incidence of HCV. [11, 12]Hepatitis B infection often occurs as a result of gaps in instrument sterilization techniques or inadequate hospital waste management. Among healthcare personnel, HBV transmission commonly happens through accidental needlestick injuries with infected needles and syringes. Acquiring knowledge about the hepatitis B virus and implementing safety precautions is crucial in minimizing the risk of healthcare-associated infections among healthcare personnel.[13] Annual number of healthcare workers exposed to sharp injuries contaminated with HBV was projected to reach 2.1 million.[14,15] Given these circumstances, government policies related to dialysis programs may need to prioritize prevention.[16] This study is the first of its kind conducted in the Erbil hemodialysis unit at Erbil Teaching Hospital, marking a unique and motivating opportunity for the researcher. The aim and objectives of the study are to Investigate the incidence of nosocomial viral hepatitis B & C infection in the hemodialysis unit in 2022 and 2023 and also implement an appropriate interventional program to decrease the incidence of the nosocomial HBV & HCV infection and improve the Knowledge, attitude, and practice of medical staff.

Patients and methods

A quasi-experimental study design was conducted employing a pre-and post-test design, both before and after implementing an interventional training program. The research took place in a hemodialysis unit of Erbil Teaching Hospital (tertiary health care facility), spanning a duration of two years. The timeline was divided as follows:1st Nov. to 31st Dec. 2021 was allocated for preparation, conducting the pre-intervention test, and analyzing any shortcomings then from 1st Jan. to 31st Mar. 2022 were dedicated to preparing materials and providing training based on evidence-based guidelines (the Iraqi guideline of infection control) regarding infection control in hemodialysis units. This was achieved

https://doi.org/10.56056/amj.2025.329

through scheduled training programs for each group of 8 groups of nurses. Followed by a post-intervention test and follow-up phase that lasted for 12 months, during which all HBV and HCV-positive cases were detected by viewing the patient's admission case sheet and the electronic registration book of the hemodialysis unit. All medical staff working in the unit, including 48 staff, underwent an assessment of their knowledge, attitudes, and practices regarding infection control. This assessment was conducted through a specialized researcher-filled questionnaire by direct interview using checklists derived from the WHO Guideline of Infection Control recommendations for preventing infections among chronic hemodialysis patients. [17] As well as the CDC checklists for infection control in the hemodialysis unit. The knowledge of the staff was evaluated by registering their response to 30 knowledge-related questions each with either a yes or no response, while both the attitude and practice questions consisted of 6 questions with a response varying from 1-5 using the Likert scale(is a unidimensional scale that researchers use to collect respondents' attitudes, practice and opinions)[18] "On a scale of 1 to 5, where 1 represents 'strongly disagree' and 5 represents strongly agree.Each of the Knowledge, attitude, and practice responses used to weight 1-30, and the obtained scores of each participant were classified into mild (those who obtain a score of 1-9), moderate (those who obtain a score of 10-19), and strong (those who obtain a score of 20-30). During a span of one month, a total of eight educational sessions were conducted, aimed at providing instruction and knowledge to participants. To ensure effective organization, the participants were divided into different groups. Some attended the morning sessions from 11:00 am to 01:00 pm, while others participated in the evening sessions from 4:00 pm to 6:00 pm.Various methods were employed in the intervention program, including lectures, posters, group discussions, videos, and scenario illustrations. The sessions covered a range of important topics related to the educational intervention program, such as proper hand hygiene, the correct usage of PPE, modes of transmission for bloodborne diseases, pathogenic bacteria, and other microorganisms, recommended infection control practices for hemodialysis units (in addition to standard precautions), appropriate handling and delivery of patient medications, safe injection practices, the rationale behind segregating HBsAg-positive patients with separate rooms, machines, instruments, supplies, medications, and staff members, bundles of care for vascular access, environmental cleaning and disinfection, disinfection of hemodialysis machines, routine serologic testing results for HBV and HCV, and the importance of hepatitis B vaccination for both patients and healthcare staff. The frequency of HBV and HCV was obtained by thorough revision of the registration book of the past 5 years before 2021 with that of 2021and 2022, thereafter the incidence of HBV and HCV infections were calculated, in addition, the median endemic index was calculated by dividing the sum of the means of 2016, 2017, 2018, 2019, and 2020 by 5 for comparison. A significance level of $p \leq 0.05$ and a 95% confidence interval (95% CI) were considered for the analysis. The statistical package for social sciences (SPSS, version 24) was employed for data analysis. The study protocol was approved by the Research Ethics Committee of the Kurdistan Higher Council of Medical Specialties (Protocol no. 1225, approval date: 26/6/2022).

Results

Out of 48 staff; 25 (52.1%) of them were males. The age of the participants ranged from 25-56 years with a mean age ± SD of 35.89 ±4.84 years. About 60% of participants were younger than 35 years. The most

https://doi.org/10.56056/amj.2025.329

frequent age group of the staff was 25-34 years constituting 45.8%. Around 96.0% of the cases were Kurds and the rest were Arabs. Muslims constituted 94.0% of the cases and 89.4% of the cases live in urban areas as shown in Table (1).

Table (1): Socio-demographic characteristics of medical staff.

Socio-demographic characteristics		No. (%)
Gender (n=48)	Male	25 (52.1)
	female	23 (47.9)
Age group (years)	25-34	29 (60.4)
	35-44	9 (18.7)
	45-54	8 (1.7)
	≥ 55	2 (4.2)
Ethnicity (n=48)	Kurd	46 (95.8)
	Arab	2 (4.2)
Religion (n=48)	Muslim	46 (95.8)
	Christian	2 (4.2)
Marital status (n=48)	Married	38 (79.2)
	single	9 (20.8)
Residency (n=48)	Urban	45 (93.7)
	Rural	3 (6.3)

The highest incidence rate of Hepatitis B was reported in 2019 which was 3.4 whereas the lowest rate was reported in 2022 which was 0.5. On the other hand, the highest and the lowest incidence rates of Hepatitis C were reported in 2019 and 2022 respectively. There was a statistically significant variation between the incidence of HBV in 2021 (pre-interventional phase) and its incidence in 2022 (postinterventional phase) in addition there was also a statistically significant variation between the incidence of HCV in 2021, and its incidence in 2022, p value < 0.05. The details are shown in Table (2).

Table (2): Trend of incidences of HBV and HCV in the hemodialysis unit of Erbil Teaching Hospital in Erbil Governorate

variable	2016	2017	2018	2019	2020	MEI	2021	2022
HBV incidence(n)	2.4 (15/612)	2.2 (13/588)	2.1 (13/620)	3.4 (20/590)	0.8 (5/599)	2.2	0.9 (6/655)	0.5 (3/622)
HCV incidence(n)	1.0 (6/612)	0.9 (5/588)	0.6 (4/620)	1.4 (8/590)	0.5 (3/599)	0.9	0.6 (4/655)	0.3 (2/622)

There was a strong negative correlation between the incidence of HBV infection in 2022 and the median endemic index* correlation coefficient of -0.88 was obtained, as well as there was a strong negative correlation between the incidence of HBV infection in 2022 and 2021 correlation coefficient of -0.74. On the other hand, there was a strong negative correlation between the incidence of HCV infection in 2022 and the median endemic index* correlation coefficient -0.81, moreover, there was a negative strong correlation between the incidence of HCV infection in 2022 and 2021 correlation coefficient -0.8 as shown in Table (3).

https://doi.org/10.56056/amj.2025.329

Table (3): Correlation of incidences of HBV and HCV in 2022 with the incidences in 2021 and MEI

Variable	MEI	2021	2022	MEI/2022 p. (C.C**)	2021/2022 p. (C.C)
HBV incidence(n)	2.2	0.9	0.5	0.0001(-0.88)	0.0031(-0.74)
HCV incidence(n)	0.9	0.6	0.3	0.0006 (-0.81)	0.0022 (-0.80)

* Median endemic index=the mean of the past 5 years.
** Correlation coefficient.

Before the implementation of the training program, the mean knowledge score calculated was 13.7 and the mean attitude score was 10.9 while the mean score of the practice was only 9.3. Eventually, after the implementation of the training program, the subtended scores were 23.0, 16.5 & and 14.3 respectively. More than half of the participants reported a medium knowledge of infection prevention and control programs, similarly about 60% of them also reported a medium attitude and not much better than these nearly 54 % of them reported fair practicing of the PC program before the implementation of the training program which in turn improved all categories of knowledge score from 4.2% to 68.8 for the high knowledge category, also increased the proportion from 60.2% to 81.2% for the medium category attitude and finally raise the percentage from 45.8% to 83.4% for the medium category of practicing the IPC program in the hemodialysis unit. The details are shown in Table (4).

Table (4): The Knowledge, attitude, and practice scores of medical staffs before and after the implementation of the training program

Parameter	Score category	No (%) Before	Mean score ± SD Before	No (%) After	Mean score ± SD After
Knowledge score n=48	Fair 0-9	16(33.3)	13.7±5.32	6 (12.5)	23.0 ±7.09
	Medium 10-19	30(62.5)		9 (18.7)	
	High 20-30	2(4.2)		33 (68.8)	
Attitude score n=48	Fair 0-9	19(39.6)	10.9±2.83	2 (4.2)	16.5±3.63
	Medium 10-19	29(60.24)		39 (81.2)	
	High 20-30	0(0.0)		7 (14.6)	
Practice score n=48	Fair 0-9 fair	26(54.2)	9.3±2.23	3 (6.2)	14.3±4.05
	Medium 10-19	22(45.8)		40 (83.4)	
	High 20-30	0(0.0)		5 (10.4)	

There is a significant difference between the mean scores of all three parameters (knowledge, attitude, and practice) before and after the implementation of the training program. The 2-tailed significance level (p value) of knowledge, attitude, and practice was 0.008, 0.005 & 0.001 in sequence all of them less than 0.05. The 95-confidence interval of the mean score differences for the knowledge was -10.97 - -7.69, for attitude was -6.28 – -4.88, and for the practice was -5.43 -3.81. All of these statistical tests

https://doi.org/10.56056/amj.2025.329

indicate the positive role of the training program in improving the knowledge, attitude, and practice of the medical staff concerning the IPC program in the hemodialysis unit and rolling out the chance possibility of the differences. The details are shown in Table (5).

Table (5): Correlation between the mean scores of Knowledges, attitude, and practice before and after the implementation of the interventional training program

	Mean	Standard deviation	95% confidence interval		Sig.2-tail
			Lower	Upper	
Knowledge B - Knowledge A	-9.333	5.651	-10.974	-7.693	<0.001
Attitude B - Attitude A	-5.583	2.404	-6.281	-4.885	<0.001
Practice A - Practice B	-4.625	2.788	-5.434	-3.816	<0.001

Discussion

Recently the topic of infection prevention and control become one of the hottest topics, particularly after the emergence of the novel COVID-19 pandemic, moreover the continuous increase of reported cases of HBV and HCV all over the world especially the undeveloped countries and developing countries. On the other hand, increased number of chronic renal failure patients who need hemodialysis. For these reasons, the assessment of the Knowledge, attitude, and practice of medical staff about IPC measures, determining the incidence of nosocomial HBV and HCV infection, and implementation of a proper interventional program for these issues, become critical subjects of public health concern and importance. In terms of healthcare workers' understanding of the specific unit being examined, there was a notable lack of knowledge regarding the modes of transmission for blood borne infections before the intervention. Only a mere 20.8% of the participants correctly acknowledged that contact between contaminated blood and intact skin does not lead to blood borne infection transmission, this is in agreement with another study carried out in Egypt which reports an 11.9% correct answer. [19] In addition there were low correct responses concerning the needle stick injury and the way of managing such condition (22.9%) which was similar to a study carried out in Vietnam.[20] which reported 30.1%, highlighting a poor understanding of this particular issue. Conversely, there was a commendable level of 58.35 of knowledge regarding other modes of transmission, such as the contact of body fluid sprays with mucous membranes which was in agreement with a study carried out in Egypt 81.4%.[19] Overall mean knowledge, attitude, and practice before the implementation of the training program were 24.4, 22.2, and 20.7 respectively while another study.[21] showed different values 84.5, 55.6, and 54.2, and also different from a study carried out in Nigeria which reported over 90 for knowledge and attitude and about 60 for practice,[22] and much more different from a study carried out in Ethiopia.[23] which reported 81.6, 64.2, and 57.4, this large difference is more probably due to the difference in the number of training courses carried out in this study group and the other studies for instance in all three studies more than half of the participants underwent training while in this study no single participant entered a training course. Similarly, Gaikwad, [24] reported a similar low Knowledge of 19.7.The training program has been shown a positive effect in improving the

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Knowledge mean from 24.4 to 49.0, Gaikwad reported a similar improvement in Knowledge 19.7- 76.7,[24] while Jalal reported an increase in mean knowledge from 76.8 to 94.4,[25] also the attitude means of the participant had improved from 22.2 to 31.4, but to a lesser extent the mean practice increased slightly from 20.7 to 26.9 and this is quite different from the results of this study which reported an improvement of attitude and practice mean from 42.2 to 71.4 and from 36.7 to 76.9 respectively and this might be because of the different study sample and variant interventional training program.

Conclusion

The implementation of an educational intervention program led to a notable enhancement in the understanding (knowledge), attitude, and practice of infection prevention and control principles among medical staff in the hemodialysis unit being examined. Additionally, the incidence of nosocomial viral hepatitis B&C infection in the hemodialysis unit of Erbil Teaching Hospital in 2022 is markedly decreased in comparison to the previous five years.

Conflicts of Interest

None.

Acknowledgment:

Acknowledgment to the supervisors of this study Dr.Maaroof Tahseen Hassan, Dr.Sherzad Ali Ismael, and all people who participate in this article.

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