

## **Prevalence of Hepatitis B and C Viruses among Health Care Workers at Governmental Hemodialysis Units**

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### **Abstract**

Egypt has one of the highest prevalence rates of hepatitis C virus (HCV) in the world. Occupational exposure to HBV and HCV is a well-recognized risk for health care workers (HCWs). The current study conducted to determine the prevalence of HBV and HCV among HCWs in governmental hemodialysis units in Daqahlygovernance (DG). Cross-sectional design was utilized to carry out this study. This study was conducted at 33 governmental hemodialysis units. The total number of the study participants were 1043 HCWs. Structured interviews were run to assess socio-demographic, and occupational characteristic of HCWs; their health history, and laboratory investigations were carried out to estimate the prevalence of HBV and HCV among them which were firstly for HCV (hepatitis C virus antibody 3rd generation); secondly for HBV (HBsAg, and hepatitis B surface antigen). Results indicated that 46.8% of HCWs aged 30 to less than 40 years, 45.6% of HCWs were university education, 94.7% of HCWs received HBV vaccination, finally prevalence of HCV was 5.4%, while prevalence of HBV was 0.48%. The researcher could be concluded that: prevalence of both HBV and HCV among health care workers at governmental hemodialysis units in Dakahlia governorate is very low; with the highest one for HCV than HBV. Finally, this study recommended that: Regular screening for HBV and HCV infection status among HCWs specially in hemodialysis units should be performed.

**Key words:** Blood borne infection, Health care workers, Hepatitis B virus, Hepatitis C virus, Infection control

## **Introduction**

### **Prevalence of Hepatitis B and C Viruses among Health Care Workers at Governmental Hemodialysis Units**

Hepatitis B virus (HBV) and [hepatitis C virus](#) (HCV) are among the main causes of liver-associated diseases, including [liver cirrhosis](#) and hepatocellular carcinoma (Schillie, et al., 2018; Kapadia & Marks, 2018). Both [viruses](#) are major global public health problems warranting high

priority [efforts](#) for prevention, control and treatment. Approximately two billion individuals worldwide have been infected by HBV, and between 350 and 400 million individuals have chronic HBV [infection](#), while an estimated 200 million people (i.e., 3.3% of the world's population) are chronically infected by HCV worldwide (Elzouki et al., 2014).

A majority of countries in the Middle East show an intermediate or high [endemicity](#) of HBV infection, which clearly poses a serious public health problem in the region. Egypt has one of the highest prevalence rates of hepatitis C virus (HCV) in the world, mostly with genotype 4 that is highly associated with severe fibrosis (Raad, et al., 2018).

The World Health Organization (WHO) estimated that 1 in 3 people in the world have been infected by either HBV or HCV and 1.3 million people have died as a result of this disease in 2015. It has been reported that 2 billion people have been infected with HBV; approximately 185 million of those people are infected with HCV (Jefferies et al., 2018).

The modes of transmission of these two [blood-borne viruses](#) in developing countries include perinatal transmission or household contact,

sexual contact, shared needles in intravenous drug abusers and contaminated blood or [organ transplants](#) are responsible for their transmission in developed countries. But, [screening tests](#) as well as [vaccination](#) for HBV have dramatically reduced the risk of transmission worldwide (Yasin, et al., 2019).

[Occupational exposure](#) to HBV and HCV is a well-recognized risk for health care workers (HCWs). The assessment of the risk of transmission to HCWs requires information derived from various sources including the place of HCW hospital work, the working period, the type of occupation, and the rate of exposure to patients' blood and [blood products](#). The rates of transmission of HBV and HCV to HCWs are also influenced by the prevalence of HBV and HCV infection in the general population (Deuffic-Burban et al., 2011).

In developing countries, the prevalence of HBV and HCV among HCWs is high, while the vaccination status among HCWs and its relationship with occupational factors are not well documented (Gaziano, et al., 2015).

Many researches were conducted to estimate the prevalence of HBV and HCV infections among hemodialysis patients. The full extent of HCV transmission in dialysis units is unknown, outbreaks continue to occur. Full compliance to standard/specific infection control procedures and routine serologic screening for HCV antibody play a pivotal role for preventing the transmission of HCV within hemodialysis units (Fabrizi, &Messa, 2015).

Public health nurses have been working as community advocates,

educators, and providers of critical public health services. Public health nurses are the largest group of providers of public health services. They provide a variety of essential services to the communities in which they work. The primary role of the public health nurse is to work within the community to support population health and deliver preventive health care services (Kulbok & Thatcher, 2012 & Tanhope & Lancaster, 2011).

Because the information regarding transmission of blood-borne viruses in HCWs is very limited in Egypt, the current study conducted to determine the prevalence of HBV and HCV among HCWs in Governmental Hemodialysis Units in Dakahlia governance. A further aim of this study was to analyze how the risk of these infections are affected by the type of occupation and the working period as well as the vaccination status among this high risk group.

**Aim of the Study:**

The aim of the study was to estimate the prevalence of hepatitis B and C viruses among health care workers in Dakahlia governmental hemodialysis units.

**Method**

**Study Design**

A cross sectional study design was used to carry out this research.

**Settings**

This study was conducted at 33 (All) governmental hemodialysis units, affiliated to Ministry of Health and Population in Dakahlia governorate.

**Participants**

The total numbers of the study participants were 1043 health care workers from total target of 1480, divided into 56 physicians, 454 diploma nurses, 376 high-qualified nurses, 17 lab

technicians, 79 machine technicians, and 66 housekeepers.

**Sampling**

**I. Sampling technique and sample size of Dakahlia governmental hemodialysis units**

The following steps were conducted to clarify distribution of Dakahlia governmental hemodialysis units:

- Dakahlia governmental hemodialysis units were 33, classified into; 30 governmental, two-health insurance, and one El Amana Specialized Hospitals.

**II. Sampling technique and sample size of health care workers (HCWs) providing health care at hemodialysis units**

Stratified random sample technique was used. The following steps were conducted to select the study sample:

- Average number of HCWs on duty during the study period in governmental hemodialysis units, affiliated to Ministry of Health and Population in DG was 1480.
- The calculated sample size of this study was 1043 HCWs, using the following formula.

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where

**Z** = 1.96 for 95% confidence level.

**p** = expected prevalence of satisfaction (0.50).

**d** = precision (Margin of error) = 0.05

- The sample size was increased to 1043 HCWs to compensate for drop outs or any failures with incomplete data.
- A simple random sampling technique, taking into consideration proportion allocation was used to select 1043 out of 1480 HCWs to estimate the prevalence of HBV and

HCV infection among them.

#### **Study tools**

After reviewing, the relevant literatures four tools were developed by the researcher used to collect data.

#### **First tool: Structured interview to assess socio-demographic characteristic**

The socio-demographic characteristic of health care workers, which were age, sex, residence, and marital status.

#### **Second tool: Structured interview to assess occupational characteristic**

It was concerned with assessment of occupational characteristic of health care workers including: level of education, occupation, years of experience at different departments, and, hemodialysis units, working shifts, training courses, and availability of disinfectants, personal protective equipment, and infection control policy at hemodialysis units.

#### **Third tool: Structured interview to assess health history**

The tool was constructed from three parts as the following:

##### **Part I: Previous health history**

This part concerned with history of chronic diseases, blood transfusion, surgeries, dental procedures, prodromal symptoms, liver diseases. Previous incidence of needle sticks injuries, and exposure to splash of blood or its derivatives.

##### **Part II: Family history**

This part concerned with presence of a relative having HBV and/or HCV infections, residence with those relatives at the same house hold, sharing the personal items with HBV/HCV relatives, and having HBV vaccination.

##### **Part III: Current health history:**

This part concerned with smoking habits among HCWs, last virology investigations of HBV/HCV performed to HCWs, Knowledge about source of infections, and state of vaccinations.

##### **Fourth tool: Laboratory investigations**

Laboratory investigations were carried out to detect old and new cases from health care workers with HCV and HBV through these types of tests for HCV (hepatitis C virus antibody 3<sup>rd</sup> generation) and for HBV (HBsAg, and hepatitis B surface antigen).

##### **Phases of the study**

###### **Phase I: Administrative process**

An official letter was issued from the Faculty of Nursing, Mansoura University to the director of Dakhllia Medical Affairs to permit the researcher to carry out the study.

###### **Phase II: Development of study tools**

- Tools were developed by the researcher after reviewing the related literature.
- **Face and content validity.** According to Litwin, (1995); Maruish, (2011); Miller, (2010); Polit and Beck, (2006) and Tavakol and Dennick, (2011) face validity is established when an individual (and or researcher) who is an expert on the research subject reviewing the questionnaire (instrument) concludes that it measures the characteristic or trait of interest. Content validity pertains to the degree to which the instrument fully assesses or measures the construct of interest. Study tools were tested for appropriateness and have relevant items, by five experts in department of Community Health Nursing, Faculty of Nursing, and Mansoura University.
- **A pilot study.** It was carried out on 10% (104) HCWs of the study

sample who assigned conveniently, and excluded from the main study sample accordingly.

**Phase II: Operational phase**

**Stage 1: Data collection**

- Data collection for the first four months (from September to December) three times/week. The researcher visited governmental hemodialysis units during (Sunday, Monday and Tuesday); from 9 am to 12pm, each visit ranged between 60 to 120 minutes.
- Data collected by structured interview questionnaire to assess socio-demographic and occupational characteristic, health history, and laboratory investigations of HCWs.

**Stage 2: Blood sample collection and laboratory investigations**

A blood sample (5-10ml) was extracted by the researcher for each HCW, labeled and sent immediately to the local laboratory, in the same hospital in which the HCWs are working, where it was centrifuged and the sera were stored at -20° c until transported to the central laboratories at Dakahlia Medical Affairs. Samples were tested for (hepatitis C virus antibody 3<sup>rd</sup> generation) for HBV (HBsAg, and hepatitis B surface antigen).

**Stage 3: ethical consideration**

- An approval was obtained from Research Ethics Committee, Faculty of Nursing, and Mansoura University.
- An informed consent was obtained from the health care workers. The researcher introduces herself to HCWs and a simple explanation about the aim of the study.
- Health care workers informed that they have the right to withdraw at any time from the study without giving any reason.

- Health care workers informed that the researcher would cover all cost of laboratory investigations.
- They assured that their participation in the study was voluntary and that collected data treated confidentially and would be only used for the purpose of the study.

**Stage 4: Statistical analysis**

- Statistical analysis was performed with SPSS version 22 (SPSS Inc, Chicago, IL, USA) Chi-square was used to compare the differences between various categorical data frequencies and the student.

**Results**

Table (1): showed that 46.8% of HCWs aged 30 to less than 40 years. Related to sex, residence, and marital status 91.3%, 77.1%, and 91.7% of HCWs were males, resident at rural areas, and married respectively.

Table (2): illustrated that 45.6% of HCWs were university education. Technical nurses represented 43.3% of the studied health care workers. In relation to shift; 46.0%, 50.9%, 66.3%, and 71.1% of the studied health care workers; working at morning and evening shifts, for 1-2 shifts, for 2-8 hours, dealing with 1-9 cases respectively. Finally, 36.7% of HCWs had 5 to less than 10 years of experience in dialysis.

Table (3): displayed that 53.4% of HCWs started their work in dialysis units. Workers in Dialysis department represented 53.4% of HCWs. Regarding the periods of work, 71.5% of HCWs had < 5 years of experience, while 22.0% of them had experience from 5 to < 10 years. Finally, 68% of HCWs worked 2-8 hours per shift.

Table (4): reveals that 80.9% and 63.8% of HCWs had 1-5 training courses from less than 5 years.

Table (5):revealed that solutions of hand disinfection and choler for floor disinfection were available in 96.9% and 84.3% of hemodialysis units respectively. In terms of availability of personal protective equipment, gloves and masks were available by 96.9 % and 66.6% respectively. Finally, 90.9%, 78.7%,and 45.4% of hemodialysis units expendgloves, gowns, and masks respectively.

Table (6):showed that infection prevention, and control policy was present in90.9 % of hemodialysis units. Training on infection prevention, and control policy was carried out in 84.8 % of hemodialysis units. Compliance to infection prevention, and control policy was reported by66.6 % of hemodialysis units. In relation to reporting of needle stick injuries, 45.4% of hemodialysis units reported to infection prevention, and control team.

Table (7):illustrated that 28.5% of HCWs exposed to NSI, 73.06% of these NSI were superficial. In relation to number of NSI 69.36% of HCWs exposed to 2-5 times since a week. Cleaning site of NSI by chlorine, hand washing, and squeezing the site of NSI were performed by 53.2%, 50.1, and 38.0% of HCWs, respectively. Infection control team fulfill post exposure sheet and identified the vaccination status in 68.0% and 60.2% of HCWs

Table (8):indicatedthat 21.5% of HCWs exposed to blood splash with frequency of 1-5 times representing 17.8%, and since a week representing 16.3%. In relation to action performed, 13.8% of HCWs wash site exposed to

splashes, and 12.8% of them informed the infection control team. In relation to the amount and type of splashes, 19.3% of HCWs exposed to blood with little amount.

Table (9):displayed that 3.0 % of HCWs had relatives infected with HBV, 64.5% of them were first-degree, and 1.3% of them had HBV vaccination. In relation to relatives with HCV infection, 14.5% of HCWs had relatives with HCV infection, 81.5% of them were first-degree relatives. Nobody of HCWs shared the personal items of the HBV/HCV infected relatives.

Table (10):revealed that 83.1% of HCWs did not perform HBV investigation. In relation of the results of the investigation, 99.4% of HCWs were negative HBV. The table showed that 83.1% of HCWs did not perform HCV investigation. In relation of the results of the investigation, 96.5% of HCWs were negative HBV. Regarding regularity of virology investigation in the hospital, 83.1% of HCWs reported that no regular analysis made in the hospital.

Table (11):showed that 57.5 %, 50.6%, and 41.8% of HCWs thought that viral infection occurs because of their exposing to infected patients, improper sterilization of instruments, and improper disinfection of surfaces, respectively. HBV vaccine was available in hemodialysis units, belonged to 91.8% of HCWs. Concerning with receiving HBV vaccination during work at DU 94.7% of HCWs received HBV vaccination. No one of HCWs investigated the response titer of the vaccination.

Table (12):indicated that prevalence of HCV was 5.4%, while prevalence of HBV was 0.48%.

**Prevalence of Hepatitis B and C Viruses etc...**

*Table 1. Socio-demographic characteristics of HCWs (n=1043)*

Items	No	%
<b>Age (years)</b>		
20-	436	41.8
30-	488	46.8
40-	85	8.1
50-60	34	3.3
Mean 31.79 ± (7.01)		
<b>Sex</b>		
Males	952	91.3
Females	91	8.7
<b>Residence</b>		
Rural	804	77.1
Urban	239	22.9
<b>Marital status</b>		
Married	956	91.7
Single	44	4.2
Divorced	31	3.0
Widow	12	1.2

*Table 2. Current occupational characteristics of HCWs (n=1043)*

Items	No	%
<b>Education</b>		
University	456	45.6
Technical school	333	31.9
Secondary	195	18.7
Preparatory	23	2.2
Primary	20	1.9
Read and write	16	1.5
<b>Occupation</b>		
Technical nurse	452	43.3
Nurse specialist	376	36.0
Maintenance technician	81	7.8
Workers	66	6.3
Physician	51	4.9
Lab technician	17	1.5
<b>Type of shift</b>		
Morning and evening	480	46.0
Morning	411	39.4
Evening	134	12.8
Night	12	1.2
24 hours	6	0.6
<b>Number of shifts per week</b>		
1-2	531	50.9
3-4	444	42.6
5-6	64	6.1
7-8	4	0.4
<b>Duration of shift</b>		
2-8 hours	691	66.3
9-12 hours	343	32.9
18-24 hours	9	0.9
<b>Number of cases per shift</b>		
None	138	13.2
1-	742	71.1
10-	124	11.9
20-	27	2.6
30+	12	1.2
<b>Years of experience in dialysis</b>		
< 5	354	33.9
5-	383	36.7
10-	204	19.6
15+	102	9.8

Table 3 .Previous occupational characteristics of HCWs (n=1043(

Items	No	%
<b>Place of work</b>		
Start in dialysis	557	53.4
Other departments	486	46.6
<b>Departments</b>		
Dialysis	557	53.4
Obstetric	26	2.5
Surgery	31	3.0
Neonatal ICU	63	6.0
Internal Medicine	59	5.7
ICUs	72	6.8
Emergency	130	12.5
Pediatrics	20	1.9
Operating room	33	3.2
Others*	52	4.9
<b>Periods of work</b>		
< 5 years	750	71.5
5-	230	22.0
10	54	5.2
15+	14	1.3
<b>Duration of shift</b>		
2-8 hours	712	68.2
9-12 hours	320	30.5
>12 hours	16	1.5

Table 4. Training courses for HCWs (n=1043)

Items	No	%
<b>Number of training courses</b>		
None	75	7.2
1-5	844	80.9
6-10	117	12.1
>10	7	0.7
<b>Duration since last training course (years)</b>		
None	75	7.2
>1	64	6.1
< 5	665	63.8
5-10	239	22.9

Table 5 .Availability of disinfectants and personal protective equipment at hemodialysis units (n =hemodialysis units(

Items	No	%
<b>Availability of disinfectants</b>		
Solutions of hand disinfection	32	96.9
Choler for floor disinfection	28	84.8
Soap for hand washing	18	54.5
Ethylene alcohol 60-90%	15	45.4
Betadine 10.0% for patients	1	3.0
<b>Availability of personal protective equipment</b>		
Gloves	32	96.9
Masks	22	66.6
Gwen	14	42.4
Face shield	8	24.2
Eye shield	5	15.1
Head protective	3	9.0
Nothings	1	3.0
<b>Personal protective equipment expendsduring work</b>		
Gloves	30	90.9
Gwen	26	78.7
Masks	15	45.4
Eye shield	3	9.0
Nothings	2	6.0
Head protective	1	3.0
Face shield	1	3.0



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**Table 6 .Infection prevention, and control policy in hemodialysis units (n=30)**

<b>Items</b>	<b>No</b>	<b>%</b>
Infection prevention, and control policy	30	90.9
Training on infection prevention, and control policy	28	84.8
Compliance to infection prevention, and control policy	22	66.6
Needle stick injuries policy	26	78.7
Training on reporting incidence of needle stick injuries	14	42.4
Policies of preventing blood borne diseases	24	72.7
Training on prevention from blood borne diseases	17	51.5
<b>Notification of NSI or exposure to blood or its derivatives</b>		
Infection prevention, and control team	15	45.4
Infection prevention, and control team and supervisors	7	21.2
Supervisors	5	15.1
Occupational safety personnel	4	12.1
Go to physician	3	6.0
Others*	1	3.0

Others\* Emergency services, Infection control and supervisor and occupational safety personnel, Do not know and No one

**Table 7 .Incidence of needle stick injuries among HCWs (n=1043)**

<b>Items</b>	<b>No</b>	<b>%</b>
<b>Depth of NSI in last year(297)</b>	<b>297</b>	<b>28.5</b>
Superficial	208	73.06
Penetrate the skin	81	22.90
Deep	3	3.70
Not sure	5	0.34
<b>Number of NSI (297)</b>		
Once	54	18.18
2 – 5	206	69.36
6 – 9	31	10.44
10+	6	2.02
<b>Duration since last NSI (297)</b>		
One week	217	73.06
2 weeks	68	22.90
15-30 days	11	3.70
More than one month	1	0.34
<b>Actions done just after NSI</b>		
Clean site Of NSI by chlorine	158	53.20
Hand washing	149	50.17
Squeeze the site of NSI	113	38.05
Apply alcohol after cleaning	82	27.61
Wash by betadine	20	6.73
Investigation for the source patients	26	8.75
Do Nothing	17	5.72
Wash by betadine and notify infection control	12	4.04
<b>Actions taken by infection control team</b>		
Fulfilling post exposure sheet	202	68.01
Find vaccination state and complete doses	179	60.27
Investigations for the injected persons	54	18.18
No thing	34	11.45
Investigations for the source	24	8.08

Table 8 .Exposure to splash of blood or its derivatives among HCWs (n=1043)

Items	No	%
<b>Exposure to blood splash</b>	224	21.5
<b>Frequency</b>		
1-5 times	186	17.8
6-10 times	38	3.6
<b>Duration since last exposure to blood splash</b>		
One week	170	16.3
2 weeks	52	5.0
15-30 days	2	0.2
<b>Actions done just after splash (224)</b>		
Washing site exposed to splashes	144	13.8
Notify infection control and safety team	134	12.8
Recognize source patient	43	4.1
No thing	12	1.2
<b>Substances were exposed to</b>		
Blood	201	19.3
Blood derivatives	17	1.6
Obvious bloody secretions	31	3.0
Water used to remove blood or its derivatives	8	0.8
Non obvious bloody secretions	2	0.2
<b>The amount</b>		
Little	198	19.0
Heavy	26	2.5

Table 9. Families' health history of HCWs (n=1043)

Items	No	%
<b>Presence of a relative having HBV infection</b>	31	3.0
First degree	20	64.5
Second or more	11	35.5
<b>Residence at the same house hold</b>	12	1.1
<b>Sharing the personal items with HBV relatives</b>	31	3.0
No participation	31	3.0
<b>Having HBV vaccination</b>	14	1.3
<b>Presence of a relative having HCV infection</b>	151	14.5
First degree	123	81.5
Second or more	28	18.5
<b>Residence at the same house</b>	64	42.4
<b>Residence at other house</b>	87	57.6
<b>Sharing personal items with HCV relatives</b>		
No participation	147	14.1

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*Table 10. Virological investigations carried out by hemodialysis units to HCWs (Tamin Sandob, Al frdos, Mniet Elnasr, Tlkha, Btra, Atmeda) (n=176)*

<b>Items</b>	<b>No</b>	<b>%</b>
<b>Duration since last HBV investigations (1043)</b>		
Not done	867	83.1
10-	61	5.8
5-	51	4.8
15+	47	4.5
< 5	17	1.6
<b>Results of HBV (176)</b>		
Negative	175	99.4
Positive	1	0.5
<b>Duration since last HCV investigations (1043)</b>		
< 5	17	1.6
5-	51	4.8
10-	61	5.8
15+	47	4.5
Not done	867	83,1
<b>Results of HCV(176)</b>		
Negative	170	96.5
Positive	6	3.4
<b>Regularity of virology investigation in hospitals (1043)</b>		
No regular virology investigation	867	83,1
Every 6 months	176	16,8

*Table 11 .Knowledge about source of infections and state of vaccinations among HCWs (n=1043)*

<i>Items</i>	<i>No</i>	<i>%</i>
<b>Source of infections</b>		
Infected patients	600	57.5
Improper sterilization of instruments	528	50.6
Improper disinfection of surfaces	436	41.8
Do not know	110	10.5
<b>Availability of HBV vaccination at hemodialysis units</b>	957	91.8
<b>Receiving HBV vaccination during work at DU</b>	988	94.7
<b>Total HCWs received first dose</b>	990	94,9
None	53	5.1
<b>Total HCWs received second dose</b>	973	93,3
None	70	6.7
<b>Total HCWs received third dose</b>	953	91,4
None	90	8.6
<b>Measuring antibody titer to know vaccine response</b>	0	0.0

*Table 12. Prevalence of HCV and HBV among HCWs (n=1043)*

Items	No	%
HCV	56	5.4
HBV	5	0.48

**Discussion**

Blood-borne infections have been recognized as an occupational hazard for nearly 50 years. Current treatment for hepatitis B virus (HBV) and hepatitis C virus (HCV) is very expensive for individuals in developing countries and cannot clear infection after it progresses to the chronic stage. Thus, early screenings of people who are at higher risk like healthcare workers and vaccination and awareness creation on standard precautions (SP) to prevent transmission are mandatory (Hebo et al., 2019).

There are about 130 million persons having hepatitis C infection worldwide. Its prevalence varies from region to region. The highest prevalence (15–20%) has been found in Egypt. Hepatitis B on the other hand, has been found to infect about 350 million people globally. Like hepatitis C, the prevalence of hepatitis B also varies from low to high in different parts of the world (Sani et al., 2018).

Concerning educational level of studied HCWs, results show that almost half of HCWs are university educated; one third of them graduated from technical schools, and almost one quarter of them has lower degrees of education. The obtained results come in agreement with Aldohyan et al., (2019) in Saudi Arabia who find that almost half of respondent healthcare workers has college degree or higher while the remaining has lower educational degrees. In contrast, Awimero et al., (2017) in Nigeria find that more than two thirds of HCWs are highly educated, and one

quarter of them has middle level of education.

Regarding occupation of enrolled HCWs, majority of them are nurses, while remaining of them are physicians, lab technicians, maintenance technician, this result supported by Aldohyan et al., (2019) in KSA who report that three quarters of HCWs are nurses.

In terms of studied HCWs' experience, results indicate that almost one third of HCWs in the hemodialysis units has <5 years of experience, second one third has 5-10 years of experience, while the remaining has > 10 years of experience. In the same line with a study conducted about Needle-stick injury among health care workers in hemodialysis units in Nigeria by, Amira and Awobusuyi, (2014) report that almost half of HCWs has 1-5 years of experience in hemodialysis units, more than one-fifth has 6-10 years of experience, and 22.5% of them have > 10 years of experience. While Shahdadi and Rahnama, (2018) report that HCWs have 4.7 years average experience in hemodialysis department

The current results indicate that most of studied HCWs attend at least 1-5 training courses since less than 5 years. This result is in the line with Iliyasu et al., (2016) who report the hospital hold regular infection control training in a Tertiary Referral Center in North-Western Nigeria. Alrubaiee et al., (2017) in private hospitals in Sana'a City, Yemen, find that less than 5 years (64.7%) of employment in the hospitals of HCWs attain high training course about nosocomial infections and 78.8% of them attain training on infection

control. In addition, Chuc et al., (2018) report that Ministry of Health popularizes and updates documents for continued training in hospital infection control. In contrast, Desta et al., (2018) report that three quarters of HCWs in Debre Markos referral hospital, Northwest Ethiopia, have not taken any training about infection prevention.

Concerning the presence of disinfectants and personal protective equipment at hemodialysis units, current study's results show that they are available, and expend. These results agree with Khamis et al., (2018 b), who find that availability of antiseptic supplies is good in the majority of all hemodialysis units in Menoufia. On the other hand, these findings contradict with a study of Khamis et al., (2018) aim to assess safety measures in hemodialysis (HD) units in Dakhliya Governorate; the researchers find that the medical team does not commit enough to wash hands despite the availability of disinfectants. Moreover, there is no commitment with regard to the use of personal protective equipment.

As well in contrast to our findings Le et al., (2019) conduct a study in a large central hospital in Vietnam, as the researchers report that HCWs find barriers within the hospital made it difficult for them to adhere to the hand hygiene guidelines, which include a lack of hand hygiene supplies, inconvenient placement of the supplies, patient overcrowding, work overload and pressure, skin reactions to hand sanitizers, lack of awareness, old habits of not washing hands, and forgetfulness.

Regarding infection prevention, and control policy and its application in studied hemodialysis units, the results displayed that majority of hemodialysis units have policy of infection prevention,

and control, and they mostly applied the adopted policy. In the same line of our findings Mahfouz et al., (2014), in Southwestern Saudi Arabia, indicate that compliance of infection control policy among WHCs, in all departments in the hospital, particularly hand hygiene is significantly increased after a training course. In a recent study for Brooks et al., (2020) the authors suggest that research from previous infectious diseases suggests a major cause of nosocomial transmission is healthcare professionals' poor compliance with recommended personal protective behaviors.

In contrast, Yassin et al., (2018) reported that in HD units in Kasr Al-Ainy Hospitals, no document infection control policies and procedures are present, both units didn't follow any immunization policy for HBV and isolation precautions weren't implement properly. No Focus Group Discussion (FGD) is conducted with the nursing staff in HD units; it is found that the main obstacle in compliance with infection control practices is absence of well-defined infection control team.

In relation to notification of needle stick injuries, almost half of the studied hemodialysis units notify the infection prevention, and control team, which come in agreement with Ottino et al., (2019) who find that half of the total NSI in Italy occur in the patient's room, and nurses are involved in most of the cases, and half of NSI occur during the disposal of the venous sampling device. Also, Mahajan and Gupta, (2019) indicate that disadvantage with the current reporting system is that it most often records only cases with an important exposure, thus leading to under-reporting of sharp injury cases with wide variation in the prevalence of

NSI among HCWs world widely, HCWs need to be familiar with immediate management both for themselves if they become injured and for assisting injured colleagues.

Çiçek-Şentürk et al., (2019), in Ankara-Turkey, indicated that NSIs are more commonly report by trainee nurses (44.5%), followed by nurses (22.2%), cleaning staff (19.8%), and doctors (9%). The rate of post exposure interventions is 92.6% NSI rates also show that the number of applications with NSIs increased over the years.

Regarding performing cleaning site of NSI and hand washing, in the current study, almost half of studied HCWs perform cleaning site of NSI and hand washing, less than three quarters of them exposed to NSI during last week and more than two thirds of them perform incidence notification (report sheet). Performing investigation for injured person or for patient, who is the source of injuring, represents one tenth total of NSI incidences. These results come in consistent with Voideet al., (2012) who find that 9.7% of HCWs in a Swiss University Hospital have sustained at least one NSSI during the preceding twelve months. In a study in a German Tertiary Care Hospital, Himmelreich et al., (2013) find that per 100 patient bed 29.2% of HCWs expose to NSI with almost one NSI per working day.

In contrast to our findings study of Foda et al., (2018) that conduct in Alexandria University Faculty of Medicine, report that majority of NSIs occur because of non-effective or successful practices of disposable injection equipment, and waste containers. High prevalence of NSSIs is report (61.3%), mostly during handling suture needles (50.8%).

In relation to exposure to blood splash, the current findings indicate that almost one quarter of the studied HCWs expose to blood splash with frequency of 1-5 times since a week, in the consistent with Butsashvili et al., (2012) who find that almost half of HCWs from seven medical institutions in five cities in Georgia as they report exposing to nosocomial risk events, including accidental needle stick injury (45%), cuts with contaminated instruments (38%) and blood splashes (46%). Also, in a study of Samargandy et al., (2016) which carry out in King Abdulaziz University Hospital, Jeddah, Kingdom of Saudi Arabia, majority (78.5%) of HCWs expose to blood or blood products spills during their morning shifts.

In relation to action done, more than half of HCWs wash the exposed site, and half of them inform the infection prevention, and control team. According to Samargandy et al., (2016), which is conducted in KSA, majority of HCWs expose to blood and blood splashes, wash the site of spilling and investigating the viral status of patient source of contamination, while only of them perform complete follow-up of viral status, Thirty four individuals receive a dose of HBV vaccine empirically as a primary or a booster dose after exposure.

Results obtained in the current study show that one and six out of 129 of studied HCWs have positive laboratory results of HBV, and HCV respectively, most of them report no regular virology investigation, and HBV vaccination is present in HD units and most of studied HCWs are vaccinated in their units, these results come in agreement with Tufon et al., (2019) who find that All HCWs, in the Southwest Region of Cameroon, knew about HBV infection and half of

them have taken the vaccine. Probable evidence of past infection (positive for anti-HBc only) is recorded in few (7.1%) of HCWs.

Yuan et al., (2019) report that majority of HCWs in China receive at least one dose of the hepatitis B vaccination and 60% complete  $\geq 3$  doses of the hepatitis B vaccination.

While El-Melligy et al., (2016) conduct a study in the HCWs at Ahmed Maher Teaching Hospital, one of the hospitals of the General Organization of Teaching Hospitals and Institutes in Cairo, Egypt. The authors report that majority of the HCWs receive full HBV vaccination; 73.6% of them are vaccinated in the last 5 years. Lack of protective hepatitis B surface antibody (HBs-Ab) titer is found in 27.2% of the participants. HCV-Ab is positive in 6.14% HCWs. In the study of De Schryver et al., (2020) report that HBV vaccination is mandatory for medical and nursing staff in 10 European countries.

Our results indicate that prevalence of HCV is identified in few numbers of studied HCWs, which come in agreement with Bernieh, (2015) who report the prevalence of HCV infection is 4.1%, also, Westermann et al., (2015) who find that prevalence of HCV infection among HCWs is 3.8 -6.0 %. As well as, Tavošchi et al., (2019) find that prevalence of HBV in European Union/European Economic Area (EU/EEA) country 0.6-2.2% , and For HCV the prevalence is 0.8-6.4.

Sani et al., (2018) report that The prevalence of HBV among HCWs in Dutse Metropolis Jigawa State, Nigeria, is 19 out of 100 and that of HCV is 5 out of 100 where in both cases, higher prevalence is observed among female nurses. The study reveal that nurses are at greater risk of contracting

HBV and HCV due to their frequent contact with patients.

While Shao et al., (2018) find that prevalence of HBV among health care workers in northern Tanzania is 5.7% which is similar to their national prevalence. Also, AbdAlla et al., (2017) find that the overall prevalence of HCV infection in study populations is 21.34%. On the other hand, Talebi et al., (2016) find that none of HCWs in Iran participants the HCV antibody is detected.

This can be attributed to that most of HCWs in the current study have received training courses in infection prevention and control, availability of disinfectants, personal protective equipment, infection prevention and control policy, and HBV vaccination at governmental hemodialysis units, and receiving HCWs HBV vaccination during work.

#### Conclusion

The results of the current study concluded that prevalence of both HBV and HCV among health care workers at governmental hemodialysis units in Dakahlyagovernorate was very low; with the highest one for HCV than HBV. Most of health care workers exposed to needle stick injuries, splashes of blood or its derivatives and they done the proper actions toward them. Health care workers did not perform regular virology investigations of HBV and HCV, while they regularly take complete vaccinations against HBV.

Most of at governmental hemodialysis units in Dakahlyagovernorate had a policy for infection prevention, and control concerning reporting incidence of needle stick injuries, splashes of biological fluids, and actions performed when those happened. Disinfectants and personal

protective equipment were available for health care workers. Finally most of health care workers took training on infection control policies.

#### **Recommendations**

**On the light of the current study, the following recommendations are suggested:**

- Regular screening for HBV and HCV infection status among HCWs especially in hemodialysis units should be performed.
- Continues and periodic training of healthcare workers on infection prevention, and control policies should be carried out.
- Provide HBV vaccine to HCWs especially newly hired; in addition to annual measuring antibody titer to know vaccine response to determine the need for booster dose.

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