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Infection prevention knowledge and practice among health care workers in Primary Health Care centers of Erbil city

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Abstract

Background and objective: Infection prevention is the practice of making barriers between susceptible microorganisms and hosts and is crucial for the supply of quality health services and safety at the level of facility. This study aimed to determine the knowledge on infection prevention and practices among health care workers working in primary health care centers in Erbil city.

Methods: A cross-sectional study carried out in 20 primary health care centers in Erbil city from 5th September 2023 to 4th October 2024. A convenience sampling method was used to recruit the sample of (291) health care workers. An electronic questionnaire form (Google form) used for data collection. SPSS version 25 was used for data entry and analysis. *P* value ≤ 0.05 was regarded as a statistically significant.

Results: A total of 291 health care staffs attended the selected primary health centers were involved in this study. About 35% of the participants were in the age group 41-50 years old. Most of health care workers 173 (59.5%) were females and 118 (40.5%) were males. More than one third (36.1%) of them joined in infection prevention and control training and majority (78%) of them has medium level of knowledge. A statistically significant highest percentage (82.4%) of nurses had medium knowledge about infection prevention control in comparison to other professions (Physicians, Biologist/chemist and radiologist (74.8%), (66.7%) and (80.0%) respectively, *P* value <0.001.

Conclusion: The knowledge about infection prevention and control among health care workers was medium. Nurses are more knowledgeable compare to other professions

Keywords: Infection prevention control; Primary health care center; health care worker; Erbil city.

Introduction

Infection prevention is the procedure of making barriers among susceptible microorganisms and hosts and is crucial for the supply of quality health services and safety at the level of facility. This also relates to all policies, and procedures measures aimed at preventing or minimizing the risk of spread of infectious diseases in the healthcare area.(1) Infection Control and prevention (IPC) has been considered as a vital organization of the health care system and thus the need to observe to the standard procedures to prevent and reduce the risk of transmission of infectious disease among staff patients and visitors at the health facilities.(2) Adequate knowledge of infection prevention is important to implement these infection prevention standards and to improve infection prevention practice.(3)

Appropriate knowledge of IPC with effective application of procedures is significant to attaining a quality healthcare delivery.(4) Also according to the WHO effective IPC programs can lower hospital acquired infection (HAI) rates by

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more than 30%; improving the practice of hand hygiene reduces the spread of pathogen in health care services by 50%. [5] The practice of safe infection prevention plays an inestimable role in saving the lives of healthcare staffs and patients and determining the quality of care. Infection prevention procedures are among the protective processes in the fight against COVID-19. Consequently, there is essential to assessment the recent status of health workers' infection prevention practices, recognize gaps and find solutions.

It is essential to observe the practice of infection prevention and the factors involved among health staffs in order to take the essential stages and methods to support and protect these health care staffs and patients.[1] The World Health Organization estimations that three million percutaneous contacts occur annually among 35 million HCWs worldwide, above 90% occurring in source reserved countries. In Africa healthcare staffs suffer 2 to 4 needle stick injuries each year on average.[6] Though, very little has been published on the level of infection prevention knowledge and practices among health care staffs in Erbil city. Further, the majority of prior studies have done at the hospital level which varies from the primary health care centers in concerning to staff profile, organization, teaching and commercial maintenance.

This study aimed to determine the knowledge on infection prevention and practices among health care workers working in primary health care centers in Erbil city.

Methods

Study design

A cross- sectional study

Setting of the study

This study was conducted in 20 primary health centers in Erbil city.

Duration of the study

5th September 2023 to 4th October 2024.

Study population

Consisting of all health care workers from 20 PHC centers; includes (nurses, midwives, laboratory staffs, physicians, and radiologist) in Erbil city.

Inclusion criteria

All health care workers who work in PHC centers in Erbil city include physicians, midwives, nurses, laboratory staff and radiologist

Exclusion criteria

Administrative and supportive workers were excluded.

Sample size and sampling technique

A Convenient sampling technique was used for selecting 291 health care workers in the 20 primary health centers in Erbil city.

Data collection

Data were collected through Google form the link sent to the administrator of each health care centers via What's app and Viber. An electronic questionnaire was used for collection of information. The questionnaire consists of three parts. First part related to demographic characteristics of the HCW like age, sex, educational status, working experience, working unit, presence of IPC guideline and IPC training. The Second part related to the knowledge on infection prevention and control of the HCWs eleven questions were used to assess the knowledge score; less five correct answer regarded as poor knowledge, 5-8 correct answer regarded as medium knowledge, more than 8 correct answer regarded as knowledge.

Statistical analysis

The statistical package for social sciences (version 25) was used for data entry and analysis. Two methods were used; descriptive statistics for defining frequencies and percentages. In second analytic approach; Chi square association test and Fisher's Exact test were used for categorical variable. *P* value ≤0.05 was regarded as a statistically significant.

Ethical consideration

This study accepted by the ethics committee at the college of medicine,

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Hawler Medical University. Informed consent was attained from all administrator of each PHC after explaining the purpose of the study to them.

Results

Socio-demographic data characteristics of the HCWs

Out of total 291 health care workers who participated in this study, 102 (35.1%) of them were in the age group 41-50 years old and 173 (59.5%) of them were female and 118 (40.5%) were male. More than half of the participants (50.9%) were nurse. 258 (88.7%) of them have their working experiences above 10 years, as shown in Table 1.

Table 1 Socio demographic characteristics of the HCWs

Variables		No.	(%)
Age (years)			
20-30 years		18	(6.2)
31-40 years		86	(29.6)
41-50 years		102	(35.1)
50 years and above		85	(29.2)
Gender			
Male		118	(40.5)
Female		173	(59.5)
Educational level			
Medical high school		44	(15.1)
Medical institute		111	(38.1)
University degree		109	(37.5)
Postgraduate		27	(9.3)
Professions			
Nurse		148	(50.9)
Physician		111	(38.1)
Biologist/chemist		27	(9.3)
Radiologist		5	(1.7)
Working Experience			
<5 years		14	(4.8)
5-10 years		19	(6.5)
10 years and above		258	(88.7)
Working place			
Immunization unit		33	(11.3)
Maternity care unit		25	(8.6)
Dental unit		56	(19.2)
Pharmacy		42	(14.4)
Laboratory		26	(8.9)
Others		109	(37.5)
Presence infection control guideline?	Yes	153	(52.6%)
	No	138	(47.4%)
Have you participated any infection prevention and control training?	Yes	105	(36.1%)
	No	186	(63.9%)
Total		291	(100%)

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Among the respondents, 251 (86.3%) of them received information about IPC principles. Vast majority (96.2%) of them knew that wearing PPE reduce health care-acquired infection. More than half of the HCWs 163 (56.0%) informed that healthcare-associated pathogens can be found on normal and intact patient skin, and about 209 (71.8%) of the health care workers think that use of an alcohol-based disinfectant for hand hygiene is as effective as soap and water if hands are not visibly dirty. Majority, 234 (80.4%) of them knew that TB is carried in airborne particles that are generated from patients with active pulmonary TB. Only 141 (48.5%) of them knew to what level safety boxes should be filled before closing and sealing and just (29.2%) of respondents knew how to make a 0.5% chlorine solution as shown in Table 2.

Table 2: Knowledge of infection prevention and control

Statements	Yes No. (%)	No No. (%)
Have you received any information about infection prevention principles?	251 (86.3)	40 (13.7)
Do you know wearing PPE (mask, glove,etc) reduce health care- acquired infection	280 (96.2)	11 (3.8)
Do you think gloves cannot provide whole protection against transmitting infection	222 (76.3)	69 (23.7)
Do you think healthcare-associated pathogens can be found on normal and intact patient skin	163 (56.0)	128 (44.0)
Do you think use of an alcohol-based disinfectant for hand hygiene is as effective as soap and water if hands are not visibly dirty	209 (71.8)	82 (28.2)
Do you think no need to washing the hands before doing procedures that do not include bodily fluids	51 (17.5)	240 (82.5)
Do you think no need to wear the same pair of gloves for several patients as long as there is no observable contamination	62 (21.3)	229 (78.7)
Do you think TB is carried in airborne particles that are produced from patients with active pulmonary TB	234 (80.4)	57 (19.6)
Do you know to what level safety boxes should be filled before closing and sealing?	141 (48.5)	150 (51.5)
Do you know specific waste disposal buckets according to the level of their contamination?	184 (63.2)	107 (36.8)
Do you know how to make 0.5 chlorine solution?	85 (29.2)	206 (70.8)

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This study showed that majority (78%) of participants has medium level of knowledge, and only 14.1% has good knowledge, Figure 1.

Half of the respondents 147 (50.5%) reported all patients are cause of infections regardless of their diagnosis and more than half of the participant 168 (57.7%) correctly answered the question that all body fluids except sweat should be regarded as source of infection as shown in Table 3: A.

Table 3: Knowledge on various aspects of infection prevention and control
Part A: General concept of Infection Prevention and Control

Statement	True No. (%)	False No. (%)	Total
All patients are cause of infections regardless of their diagnosis (True)	144 (49.5)	147 (50.5)	291 (100%)
All body fluids except sweat should be regarded as source of infection (True)	168 (57.7)	123 (42.3)	291 (100%)

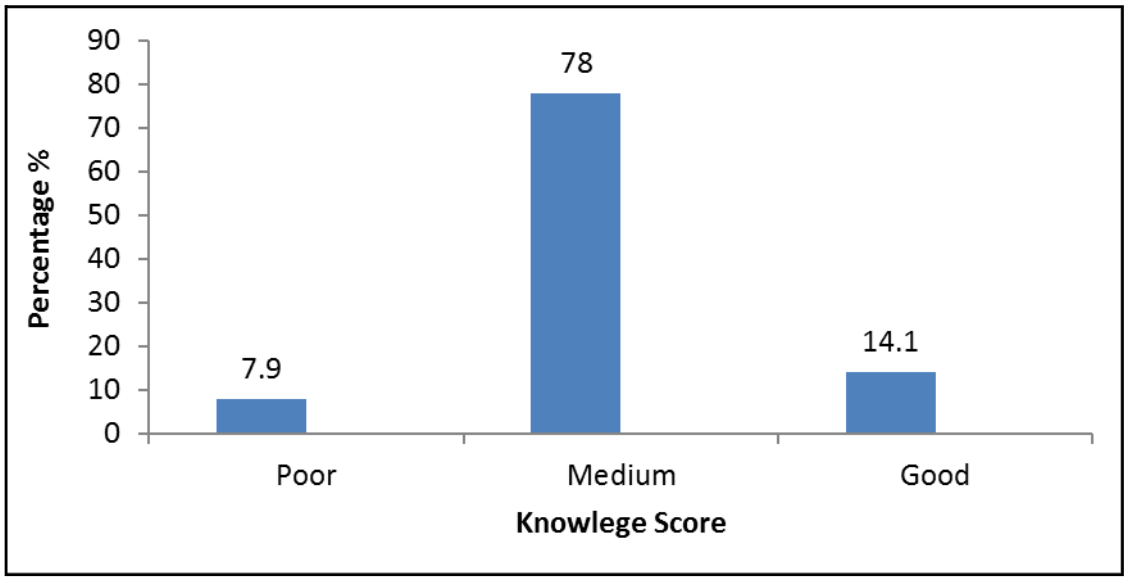

Figure 1 Knowledge score among participants

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Among the study participants, 231 (79.4%) of them reported that hand washing decreases microorganisms acquired on the hands if hands are soiled. Vast majority (97.3%) of the respondents knew hand washing decreases the incidence of healthcare-related infections and (90.7%) of them knew hand decontamination is washing the hands with antiseptic soap for 30 seconds while, (51.5%) of the study participant reported alcohol hand rub substitute hand washing even if the hands are soiled. On the other hand, the majority of them (84.5%) showed that hand washing is indicated between tasks and procedures on the same patient and only 177 (60.8%) of the respondents showed that the use of gloves not replaces the need for hand washing. About two third of the participants (87.6%) reported that hand washing is indicated after removal of gloves and vast majority of them (97.6%) indicated hand washing is required with patients with respiratory infections including COVID19 as shown in Table 3: B.

Table 3 Part B: Hand Hygiene

Statements	True No. (%)	False No. (%)
Hand washing decreases microorganisms acquired on the hands if hands are soiled	231 (79.4)	60 (20.6)
The incidence of healthcare-related infections can be decreases through hand washing	283 (97.3)	8 (2.7)
Hand decontamination is washing the hands with antiseptic soap for 30 seconds	264 (90.7)	27 (9.3)
Alcohol hand rub substitute hand washing even if the hands are soiled	141 (48.5)	150 (51.5)
Hand washing is indicated between tasks and procedures on the same patient	246 (84.5)	45 (15.5)
Washing the hands can be replaced by the use of gloves	114 (39.2)	177 (60.8)
Hand washing is indicated after removal of gloves	255 (87.6)	36 (12.4)
Hand washing is required with patients with respiratory infections including COVID19	284 (97.6)	7 (2.4)

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Among the respondents 274 (94.2%) stated that PPEs provide protective barriers against infection. However only (5.8%) of them incorrectly answered. About two third 227 (78.0%) of the HCWs showed PPEs are fully appropriate to laboratory and cleaning staff for their protection while more than half of them 64 (22.0%) correctly answered. The majority of the respondents 175 (60.1%) correctly replied that PPEs should not be used only when there is contact with blood regarding re using of gloves and mask after proper cleaning. On the other hand274 (94.2%) of the health care workers correctly answered that gloves and mask cannot be used after proper cleaning. However; 17 (5.8%) of them incorrectly replied. More than half of the participants incorrectly answered that mask made of cotton or gauze are most protective as shown in Table 3: C.

Table 3 Part C: Personal Protective Equipment (PPE)

Variables	True No. (%)	False No. (%)
PPEs such as masks and gloves provide protective barriers against infection (**True**)	274 (94.2)	17 (5.8)
PPEs are fully appropriate to laboratory and cleaning staff for their protection (**False**)	227 (78.0)	64 (22.0)
PPEs should be used only when there is contact with blood (**False**)	116 (39.9)	175 (60.1)
Masks and gloves can be re-used after proper cleaning (**False**)	17 (5.8)	274 (94.2)
Used PPEs are to be discarded through regular dust containers (**False**)	98 (33.7)	193 (66.3)
Gloves should be changed between different procedures on the same patient (**True**)	212 (72.9)	79 (27.1)
Mask made of gauze or cotton are most protective (**False**)	155 (53.3)	136 (46.7)

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The level of knowledge of health care workers concerning used needles 225 (87.6%) of the participants answered that used needle should be recapped after use to prevent injuries the others said should not be recapped after use. More than half of them 177 (60.8%) incorrectly answered that soiled sharps objects should not be shredded (cut into tiny pieces) before final disposal while (39.2%) of them truly answered should be shredded. The health care workers were asked post-exposure prophylaxis is used for managing Needle stick injuries from an HIV-infected patient 215 (73.9%) of them truly replied. While 76 (26.1%) of them said not need to post-exposure prophylaxis after needle stick injuries as shown in Table 3: D.

The majority of the study participants 281 (96.6%) truly answered Cough/sneeze on a disposable napkin and wash your hands whereas only 3.4% of them incorrectly answered. More than half 212 (72.9%) of them said Cough/sneeze over the shoulder if a napkin is not accessible. Majority (87.3%) of them truly reported keep a distance from others when coughing more than two third of the health care workers reported wipe your hand on the inside of your white coat after you cough or sneeze while 56 (19.2%) of them incorrectly replied as shown in Table 3: E.

Table 3 Part D: Sharp discarding and Sharp Injuries

Statement	True No. (%)	False No. (%)
To prevent from injuries used needles should be recapped after use (**False**)	255 (87.6)	36 (12.4)
Used needles should be bent after use to prevent injuries (**False**)	143 (49.1)	148 (50.9)
Soiled sharps objects should be shredded (cut into tiny pieces) before final disposal (**True**)	114 (39.2)	177 (60.8)
Needle-stick injuries are the least commonly faced in general practices (**False**)	178 (61.2)	113 (38.8)
Post-exposure prophylaxis is used for treatment Needle stick injuries from an HIV-infected patient (**True**)	215 (73.9)	76 (26.1)
Total	291	(100%)

Table 3 Part E: Respiratory hygiene and cough etiquette

Statement	True No. (%)	False No. (%)
Cough/sneeze on a disposable napkin and wash your hands (**True**)	281 (96.6)	10 (3.4)
Cough/sneeze over the shoulder if a napkin is not accessible (**True**)	212 (72.9)	79 (27.1)
Keep a distance of 3 feet from others when coughing (**True**)	254 (87.3)	37 (12.7)
Wipe your hands on the inside of your white coat after you cough or sneeze (**False**)	56 (19.2)	235 (80.8)

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Of the total of study 281 (96.6%) of them said immunization history of HCWs should be achieved before recruitment only 3.4% of the study participants disagreed In the part related to care for healthcare providers, the least correctly answered statement was post-exposure immunization prevents the risk of hepatitis B infection following exposure with 56.7% (165 out of 290) of the responses correct. Table 3: F.

In regards of the sex of the health care workers, the highest proportion of the good knowledge (15.3%) about infection prevention and practices was seen among male group than female group which represent (13.3%), but the association was found to be not statistically significant (*P* = 0.775).The high percentage (82.4%) of the HCWs which has a medium knowledge was found among Nurses compare to other professions (Physicians, Biologist/chemist and radiologist (74.8%), (66.7%) and (80.0%) respectively with highly statistically significant association (*P* = 0.001). In relation to working experience those who worked 10 years and more have a greatest percentage of medium knowledge which represents (77.5%) compare to others but there was no significant association (*P* = 0.648).

Table 3 Part F: Care for Healthcare Workers

Statements	True No. (%)	False No. (%)
Immunization history of health care workers should be achieved before recruitment (**True**)	281 (96.6)	10 (3.4)
Post-exposure immunization prevents the risk of hepatitis B infection following exposure (**True**)	165 (56.7)	126 (43.3)
Immunizations are recommended for all healthcare workers to prevent from hepatitis B (**True**)	282 (96.9)	9 (3.1)
Following exposure to a patient with influenza, antibiotics are essential for the prevention of infection (**False**)	108 (37.1)	183 (62.9)
Health workers with the highest risk of exposure to tuberculosis include radiologist (**True**)	142 (48.8)	149 (51.2)

Table 4 Association between certain socio demographic and knowledge score about infection prevention control

Variables	Knowledge score			*P*-value
	Poor No. (%)	Medium No. (%)	Good No. (%)	
Gender				0.775
Male	8 (6.8%)	92 (78.0%)	18 (15.3%)	
Female	15 (8.7%)	135 (78.0%)	23 (13.3%)	
Profession				
Nurse	14 (9.5)	122 (82.4)	12 (8.1)	<0.001*
Physician	2 (1.8)	83 (74.8)	26 (23.4)	
Biologist/Chemist	6 (22.2)	18 (66.7)	3 (11.1)	
Radiologist	1 (20.0)	4 (80.0)	0 (0.0)	
Working Experience				
<5 years	1 (7.1)	10 (71.4)	3 (21.4)	0.648
5-10 years	0 (0.0)	17 (89.5)	2 (10.5)	
10 years and above	22 (8.5)	200 (77.5)	36 (14.0)	

(*) Fisher's exact test was used

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Discussion

Infection prevention is crucial for ensuring quality healthcare and protecting staffs, patients, and communities from infectious agents. This study assessed the knowledge and practices of healthcare workers in Erbil city regarding infection prevention. In the current study 102 (35.1%) of the respondents were in the age group 41-50 years old, This finding agree with study done in Iraq in which most (64.3%) of healthcare workers at age 20-39 years old.[7] This study found that only 105 (36.1%) of HCWs had participated in infection prevention and control (IPC) training. Comparatively, a study in Ethiopia reported that only 17.8% of healthcare providers had received such training.[8] While a study in Nepal indicated that 88.8% of respondents had not received any IPC training, with only 11.2% having received training.[9]

Also our finding is nearly similar to finding observed in a study done among hospital staffs in Erbil city showed that less than half of the study participants had attended training regarding infection control (40.5%).[10] A similar study done in Karbala city (Iraq) among health care workers in primary health centers presented that most participants (75.7%) don't have training related IPC.[7] Also a result of the study done in Palestinian Hospitals showed that approximately two thirds of the study group hadn't had previous courses on infection control.[11] A study done at Shar teaching hospital in Sulaimani city among nurses revealed that (69.8%) have not participated in an infection control training course.[12] Regarding awareness of IPC principles, this study showed that 251 (86.3%) of respondents were familiar with them, compared to 96.16% in an Ethiopian study in Southeast Ethiopia, 53.7% of HCWs were knowledgeable about infection prevention.[13]

This study also showed that 280 (96.2%) of participants stated that wearing personal protective equipment (PPE) reduces healthcare-acquired infections. This is higher than (64.9%) that reported in a study in Western Cape, South Africa.[14] Additionally, 82.5% of HCWs in Erbil considered hand washing necessary before procedures that do not involve body fluids, and 96.2% believed in the efficacy of PPE. A study at King Saudi University supported this finding most nurses knowledgeable about hand washing and other infection control measures.[15] On the other hand in Egypt a study observed that wearing protective gloves during dealing with patients was practiced by 94.3% of the nurses, compared with 90.9% of the physician's.[16]

The current study found that 78% of respondents had a medium level of knowledge about infection prevention practices, while only 14.1% had good knowledge. This finding is higher than (51%) reported in Mogadishu,[1] but lower than (99.3%) with good knowledge found in a study among Ethiopian nurses.[17] Another study in Northern Ethiopia reported that 70.8% of healthcare workers had adequate knowledge and 55.0% practiced safe infection prevention.[18] Furthermore, a study among 236 Ethiopian HCWs showed that 90.2% had good knowledge.[19] These discrepancies could be due to variations in awareness, sample sizes, study settings, participant characteristics, and training availability. More than half of the respondents 168, (57.7%) in Erbil believed all body fluids, except sweat, are sources of infection, aligning with a Ugandan study where 202 (31.7%) of respondents shared this view.[2]

Regarding to the attitude of hand washing only 150 (51.5%) of the HCWs of this study participant believed that alcohol hand rub substitute hand washing even if the hands are soiled also the preferred method of hand hygiene by a Netherlands study was soap and water (56%) versus ABHR (44%).[20] The current study showed that 177 (60.8%) of the participants disagreed the use of gloves replaces the need for hand washing this finding supported by

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finding of the study done in Ghana (97.4%), which agreed to wash their hands even if they used gloves.[21] Most of the HCWs 283 (97.3%) in this study knew that hand washing reduces the incidence of healthcare-related infections. This finding is in agreement with a study done in China (98%).[22] According to findings of this study 255 (87.6%) of the HCWs knew that hand washing is indicated after removal of gloves and this result support by another study which reported 134 (32.4%) of the study participants always wash hands directly after removal of gloves this inconsistency could be due to different in sample size.[23]

Most 284 (97.6%) of the study participants knew hand washing is required with patients with respiratory infections including COVID19 on the other hand according to the national web based survey in Qatar on effectiveness of IPC measures among HCWs during COVID-19 pandemic most of HCWs (86.1%) reported the need to practice hand hygiene even when wearing gloves, and 87.3% considered hand washing using water and soap as effective as using alcohol-based hand rub for preventing transmission of COVID-19.[24] The World Health Organization (WHO) recommends HCWs practicing regular hand hygiene while caring for suspected or confirmed COVID-19 patients and airborne precautions[25] (WHO). This study showed that in spite good knowledge of participants about importance of hand hygiene, but there is poor adherence for practicing hand washing.

Regarding PPEs, this study declared that of HCWs who believed PPE provide protective barriers against infection was 274 (94.2%) and HCWs, while who believe PPEs are not fully appropriate to cleaning staff and laboratory for their protection were 227 (78.0%), only 116 (39.9%) Of HCWs believe PPEs should be only used when they contact patients' blood. These findings were consistent with study conducted in Hawassa university comprehensive, specialized hospital in southern Ethiopia in which showed HCWs continuously wear a waterproof apron whenever there is a probability of body fluid splashing in their body was only 30.5%, always wear boots.

whenever there is the potential of the legs coming in to contact with blood body fluids and other contaminated materials was only 26.9%.[23] Also according to another study among nurses in Jeddah (Saudi Arabia) reported majority of the study sample (91%) they stated the importance of standard precaution is to protect themselves.[26] This study also found that physicians were less knowledgeable about infection prevention than nurses, which is consistent with another Ethiopian study.[1] This indicates a gap in practical knowledge application, this might be due to various factors including careless attitudes, ineffective policies, lack of time, insufficient oversight, resource limitations, and cost. No significant difference was found between years of experience and knowledge levels among HCWs in Erbil. This contrasts with a study on nurses' knowledge about surgical site infection prevention, which found that years of service significantly influenced knowledge.[27]

A study done in China found that participants who had working experience of 16-25 years had significantly lower knowledge scores than those with working experience of 6-15 years. It might be due to the fact that nurses who have long working experience might take less time to request about latest evidence of surgical site infection prevention compare to our study this dissimilarity might be due to most of the HCWs in Erbil city who work in PHC centers have working experiences above 10 years.[28] Also the present study found that there was no significant difference between gender and knowledge score this finding is similar to the other study in Iran which reported that there were no significant differences among participants' knowledge score and their sex.[29] On the other hand the present study

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also found significant difference between profession and knowledge score (P <0.001) another finding in China supported our finding which reported Significant differences were found in the knowledge through job titles (P = 0.012).[22] Regarding post-exposure injury knowledge, 73.9% of participants knew about post-exposure prophylaxis for HIV from needle stick injuries, lower than the 91.2% reported in a study at a Dubai referral hospital from Ethiopia. Additionally, 87.6% of HCWs in Erbil stated that used needles should be recapped to prevent injury, higher than the 67.03% found in another study.[30] The current study also showed that 148 (50.9%) of participants disagreed that sharp needle should be bent after use to prevent injuries according to a study done in Saudi Arabia revealed practicing infection control precaution was about 34% of HCWs recap needles immediately after using and most participants, (65%) of participants disagreed that sharp needles can be bent or broken after use.[31] On the other hand (84.4%) of HCWs among HCWs in Healthcare Centers Sana'a, Yemen Sharp management practice by as recapping after using. This inconsistency could be due to sample size.[32]

Limitation of the study

We cannot generalize the findings of this study on all health care workers in Erbil city as we used a non-probability sampling method.

Conclusion

The knowledge about infection prevention and control among health care workers was medium. Nurses are more knowledgeable compare to other professions. Decision makers in the Ministry of Health will develop effective infection prevention and intervention programs for implementation in all health care centers in Erbil city. Preparing health education programs for infection prevention among health staffs at the level of health care centers is crucial.

Competing interests

The authors declare that they have no competing interests.

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