Assessment of Knowledge, Attitude and Practice of Health Staff Toward Infection Control in Teaching Hospitals in Erbil City in Iraq

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ABSTRACT

Background: The objective of this study is to assess the knowledge, attitude, and practice of health staff in a teaching hospital in Erbil city in Iraq.

Methods: This cross-sectional study was carried out from 1st June 2021 through 31st December 2021, involving 1200 participants of health staff.

Results: A total of 1200 participants were included in the study. 631 (52.6%) were females (72.4%) was married, (51.9%) Physician, and (48.1%) nurses, the majority of health staff qualifications was having Bachelor's (40.1%), 934 (77.8%) of participants had been vaccinated against hepatitis B, 771 (64.3%) had a history of vaccination against covid 19 infection, half (57%) of participants had Medium knowledge about infection control while 38.8% had Good knowledge and 4.3% had poor knowledge. (78.3%) had a medium attitude about infection control while 20% had a poor attitude and 1.7% had a good attitude. More than half of the study participants (69.2%) had good practice in infection control while 26.9% had medium practice and 3.9% had poor practice. There was a significant statistical association between Knowledge level among health staff and their attitude level (P value < 0.001). A statistically significant variation between knowledge level and practice level (P value < 0.001). A statistically significant variation between attitude level and their practice level (P value < 0.001).

Conclusion: Results of our study showed (that 57%) of participants had Medium knowledge, (78.3%) had medium attitude, (and 69.2%) had a good practice, a significant statistical association between Knowledge level and their attitude level, and a significant variation between knowledge level and their practice level, a statistically significant variation between attitude level among health staffs and their practice level (P value < 0.001).

Keywords: Infection control, Knowledge, Attitude and Practice, Health staff, Erbil City

INTRODUCTION

Infections acquired during the delivery of health care, often known as health-care-associated infections (HAIs), are by far the most common healthcare-related adverse events. Infections linked to health care occur all around the world, affecting both developed and developing nations. In developed nations, about 5%-10% of patients admitted to acute care hospitals get health-care-associated infections at any one time, whereas in underdeveloped countries, the risk of infection is 2-20 times higher. The Eastern Mediterranean Region has one of the highest rates of healthcare-associated infections in the world (11.8%), indicating that this is a significant threat to the region's healthcare quality. The financial and opportunity costs of healthcare-associated infections are significant. According to some estimates, avoiding a case of healthcare-associated infections saves more than $10,000 on average and lowers the patient's chance of mortality from 7% to 1.6%. (WHO, 2010).

Healthcare-associated infections (HCAIs) are a serious medical and financial concern that affects people all over the world. The resources and efforts for infection surveillance and control are critical in reducing morbidity and death from nosocomial infections. It is vital to have appropriately educated employees, responsive infrastructure, and sufficient financial resources to prevent and manage infections in health care facilities. The availability of these resources, on the other hand, differs by country. As a result, attempts to address infection control and prevention difficulties in a specific circumstance must take into consideration each country's unique cultural, social, and economic factors. (WHO, 2009).

Infection control professionals (ICPs) are critical in preventing HCAI. They can prevent infections by intervening immediately, educating and raising awareness among healthcare workers, developing and recommending policies and procedures, and managing crucial data and information. Financial restrictions, sterilizing methods, and poor staff training all play a role in the execution of infection prevention and control programs in low-resource settings. (ICPs) can help in these situations by spotting shortcomings in infection control measures and suggesting and implementing efficient and cost-effective alternatives. Infection control measures refer to all activities or actions that are performed to reduce the risk of infection spreading. Standard, contact, droplet, and airborne precautions are all dependent on how an infectious agent is communicated[1].

Infection control measures can be grouped into two categories: Standard precautions and additional (transmission-based) precautions. The SPs policy is regarded as an effective means of protecting HCWs,

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patients, and the public, thus reducing hospital-acquired infections. Some HCWs believe that when they do not adhere to SPs, this would place the patient's life in danger. Others feel that there is no need for SPs in some circumstances, for example, one of the responses was that this person frequently recaps needles because he or she was pricked by a needle that was not covered. A previous study in Nigeria reported that most HCWs (90.8%) had a positive attitude about SPs and wanted to practice them, but inadequate funds and equipment hindered them from practicing them. The available data from developing countries show that adherence to the "standard precaution" and adequate documentation of occupational exposures is suboptimal. Lack of resources and a lack of appropriate legislation and control are the main barriers to infection control in developing countries. This study was done to assess the perception of HCWs toward infection control measures and to identify the major barriers that may hinder the proper infection control practice[2].

The World Health Organization (WHO) estimates that 3 million percutaneous exposures occur annually among 35 million HCWs globally, over 90% occurring in resource-constrained countries. Healthcare workers in Africa suffer two to four needle stick injuries per year on average[3,4] with Nigeria, Tanzania, and South Africa reporting 2.10 injuries per healthcare worker on average. Worldwide occupational exposure accounts for 2.5% of HIV cases and 40% of hepatitis B and C cases among HCWs. Each year as a consequence of occupational exposure, an estimated 66,000 hepatitis B, 16,000 hepatitis C, and up to 1,000 HIV infections occur among healthcare workers. These infections are preventable through infection prevention measures which significantly reduce the risk of HIV and hepatitis transmission among healthcare workers[5].

Justification: There is no published data about infection control in the region. This study will be done to provide policy-makers, health facility administrators, and infection personnel, as well as partner agencies in Erbil city with comprehensive, standardized data sets, by which to analyze policy gaps and options related to infection control measures, as well as to measure progress and outcomes achieved about addressing the multiple factors contributing to healthcare-associated infections risks. This study might also increase awareness of health care workers about infection control and prevention of hospital-acquired infections.

Aim of the study

To assess the infection prevention and control activities and resources in teaching hospitals of Erbil city and to study the knowledge and attitude of health care workers about infection control.

SUBJECTS AND METHODS

Research Design : A Quantitative cross-sectional design study was carried out to assess the knowledge, attitudes, and practices of health care staff in teaching hospitals. The setting of the study was teaching hospitals in Erbil City (Rizgary, Maternity, Raparin, Emergency, Surgical specialty Hospital Erbil Cardiac center, Psychiatric hospital, Roshhalt Hospital, Roshawa Hospital, Nanakali Hospital, Central emergence Erbil Hospital, and Jemhori teaching Hospital). This cross-sectional study was carried out from 1st June 2021 through 31st December 2021, involving 1200 participants of health staff. Inclusion criteria were health care staff which includes physicians and nurses in the study of assessment of knowledge, attitudes, and practices of an infection control program. Exclusion criteria were Non-teaching hospitals and health staff who refused to participate in the study. Sample size estimation was calculated by Epi info version 7; using a population size of 4865 with 95% confidence interval, 50% expected frequency, and an acceptable margin of error of 2.5, the estimated sample size was 1168; however, we choose 1200 samples.

Distribution of Samples by Hospitals

Table 1, showed the distribution of selected health staff (nurses and physicians) in teaching hospitals in Erbil city in our study.

Tools, Instrument, and methods of data collection were by a modified questionnaire designed by the WHO Western Pacific Regional was adopted for data collection A questionnaire was developed after an extensive review of relevant literature, which consisted of:

Part one: Socio-demographic data

This part is concerned with socio-demographic characteristics of health staff which included items such as hospital name, age, sex, marital status, occupation, years of employment, qualification (graduation), setting of work in a hospital (department or unit), attended symposia regarding infection control, attending training courses about IC, received hepatitis B vaccine, covid19 vaccine, and influenzas vaccine in the last 2 years.

Part two: Knowledge questions

This part is composed of 21 questions related to knowledge questions about hospital-acquired infection, nosocomial infection, hand hygiene knowledge, antiseptic solution, using clean water, Standard precautions, and hospital-acquired infection guidelines. The health staff was asked to mark the correct answer for each question (yes, no). Each correct answer was given a score of 'one' and each wrong answer was given a score of 'zero'. The total scores for each participant, therefore, ranged from 0-21.

Table 1: Distribution of selected health staff in teaching hospitals in Erbil city

NO.	Hospitals	Total No.	No. of Physician	No. Physician selected	No. of Nursing staff	No. of Nurses selected	Total sample selected
1	Maternity	672	272	67	400	99	166
2	Riparian	268	137	34	131	32	66
3	Emergency	201	74	18	127	31	49
4	Cardiac center	344	148	37	196	48	85
5	Psychiatric	109	59	15	50	12	27
6	Erbil teaching	814	214	53	600	148	201
7	Central Emergency	127	67	16	60	15	31
8	Oshawa	483	182	45	301	74	119
9	Roshhalat	440	230	57	210	52	109
10	Rizgary	1281	1072	264	209	52	316
11	Nanakuli	126	67	16	59	14	31
	Total	4865	2522	622	2343	577	1200

The knowledge was categorized into; poor knowledge (0-9 correct answers), medium knowledge (10-15 correct answers), and good knowledge (16-21 correct answers).

Part three: Attitude questions

This part is concerned with attitude questions (26 questions) about the level of agreement of staff regarding attending in-service training/ workshop related to infection prevention and control regularly, Policies and procedures on infection control should be adhered to at all times, and hand hygiene attitude, workload affects and ability to apply infection prevention guidelines, availability and inconveniently located sinks of waters, believe that following the prevention guidelines will reduce rates of hospital-acquired infection, antiseptic solution, positive attitude regarding Standard precautions, and sharp and waste disposes management. The total scores for each participant, therefore, ranged from 0-26.

The attitudes were categorized into; poor attitude (0-12 correct answer), medium attitude (13-19 correct answer), and a good attitude (20-26 correct answer).

Part four: Practice questions

This part is concerned with practice questions about, hospital-acquired infection guidelines., hand hygiene practices, Standard precautions, sharp and waste disposal management, practice for preventing and controlling Hospital-acquired infection, and Screening of patients is being done to detect colonization even if no evidence of infection. The variable practice had questions from 4.1 to 4.21.

The total scores for each participant, therefore, ranged from 0-21.

The practices were categorized into; poor practice (0-9 correct answers), medium practice (13-19 correct answers), and good practice (20-26 correct answers).

Pilot study

A pilot study was conducted from 15th May 2021 to 25th May 2021 on 35 of the samples of the pilot study were excluded from the original study. The pretest and post-test method was used to determine the ratability of the questionnaire. The analysis of data was done using the correlation coefficient test this test revealed that there are no significant differences between both results (r = 0.88).

Validity

The questionnaire has been validated by a panel of[5] experts in the specialty of community health medicine to investigate the content of the questionnaire for clarity, relevancy, and adequacy. A copy of the questionnaire was referred to each expert. The result indicated that the common of the experts agreed upon the items of the study with few comments and suggestions which were all taken into attention. Modifications were employed and the final draft of the instrument was complete to be suitable for conducting the study.

Statistical data analysis

The data were coded, entered, and analyzed by using Statistical Package for Social Sciences (SPSS, version 21). After collecting data, the researcher would analyze using descriptive statistics like frequency, mean, and standard deviation and non-parametric tests like chi-square and parametric tests, and t-tests based on the, / objectives of the study. Other statistical test analyses would be used when they are applicable.

All data analyses were conducted by SPSS (version 24), and all participant's data were analyzed in baseline, 3-month, and 6-month measurements. The mean± SD or median and interquartile range or number and percentage are used for data description, independent t-test, Chi-square, and Fisher's exact test used to explore the difference between groups at baseline.

Method of data collection

The modified questionnaire used for this purpose was based on the world health organization Infection prevention and control: guidance to action tools[6]. And modified from three similar studies which were carried out in Nigeria, Ethiopia, and ZAMBIA[7-9] and on other literature to investigate their knowledge and attitudes about standard precaution and infection control.

Scope and limit to the research

Before designing a strategy for implementation of the IPC program, the opinions of the health care professionals are sightseen since these opinions influence the implementation of the IPC program either directly or indirectly by making the uncomplimentary environment of the nonexistence of support from peers and seniors.

Ethical consideration

Permission has been taken from the ethical committee of the medical college, permission was also taken from the general directorate of health -Erbil for including the health care workers staff to participate in the study

Administrative arrangement

For this study, written official permission was obtained from the scientific committee/College of Medicine /Hawler Medical University. The data collection and permission to conduct this study have been secured from the General Directorate of health -Erbil, June 2021.

RESULTS

Sample description

Concerning the hospitals, Figure 1 shows that the highest percentage of the study sample was from Rizgary teaching hospital (62.3%), and the lowest study sample was from Nanakali teaching hospital (2.6%).

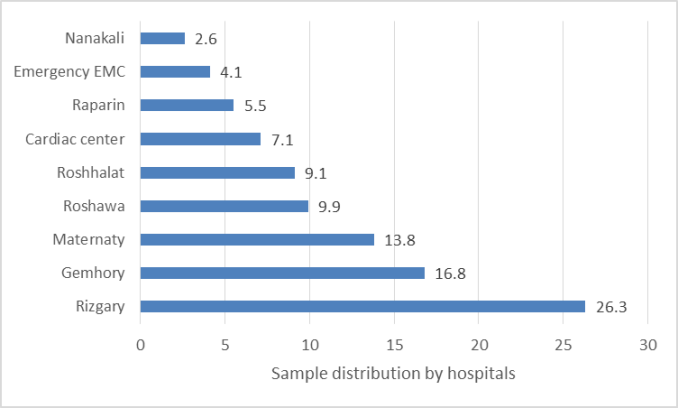

Figure 1: Sample distribution by hospitals

Out of the total sample of 1200 individuals, 569 (47.4%) were males, and 631 (52.6%) were females. The majority (72.4%) of the study sample were married, and more than half (51.9%) were Physicians

and nurses constitutes (48.1%). The highest percentage, 49.7% of the employment group, was >10 years, and the lowest percentage, 8.8% years of employment duration was <1 year. The majority of health staff qualifications was Bachelor 40.1%. The attendance rate to symposia regarding infection control among study participants was 42.3%. Regarding hepatitis B vaccinations, this study showed that 934 (77.8%) participants had been vaccinated. Out of the total vaccinated participants, 118 (9.8%) have received complete vaccination, 664 (55.3%) received two doses, and only 152 (12.7%) received a single dose of HBV vaccine. On the other hand, this study showed that 771 (64.3%) had a history of vaccination against covid19 infection. Among them, 771 vaccinated participants, 686 (57.2%) have received two vaccination doses, and only 85 (7.1%) received a single dose of covid 19 vaccine. 533 (44.4%) had a vaccination history against influenza infection in the last three years.

Table 2: Sample distribution by socio-demographic characteristics

Sociodemographic data	**No.**	**(%)**
Gender		
Male	569	(47.4)
Female	631	(52.6)
Marital status		
Single	322	(26.8)
Married	869	(72.4)
Divorced	3	(0.30)
Widowed	6	(0.50)
Occupation		
Physician	623	(51.9)
Nurse	577	(48.1)
Years of employment		
<1 Year	105	(8.80)
1-5 Years	248	(20.7)
5-10 Years	251	(20.9)
>10 Years	596	(49.7)
Qualification		
High School	70	(5.80)
Diploma	386	(32.2)
Bachelor	481	(40.1)
MSc	106	(8.80)
Ph.D. Or Board Specialty	157	(13.1)
Attended symposia regarding infection control		
Yes	508	(42.3)
No	692	(57.7)
Attending training regarding infection control		
Yes	486	(40.5)
No	714	(59.5)
Received hepatitis vaccine		
Yes	934	(77.8)
No	266	(22.2)
Doses of hepatitis vaccine		
One	152	(12.7)
Two	664	(55.3)
Three	118	(9.8)
Received covid19 vaccine		
Yes	771	(64.3)
No	429	(35.8)
Doses covid19 vaccine		
One	85	(7.1)
Two	686	(57.2)
Received influenzas vaccine last three years		
Yes	533	(44.4)
No	667	(55.6)
Total	**1200**	**(100.0)**

Figure 2 show that most of the study sample worked in the patient department while the lowest percentage was equal in the dental clinic unit and minor operative unit 2% of the study sample.

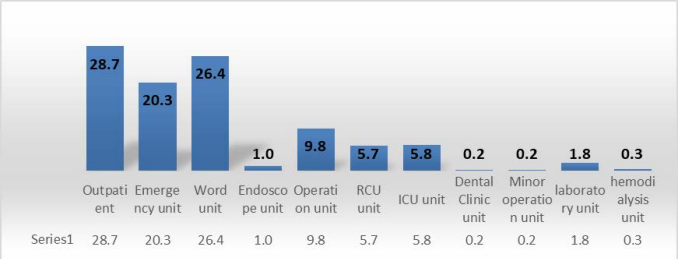

Figure 2: Sample distribution by the department in hospitals

Figure 3 show the distribution of study sample by the duration of attendance of symposium was the majority of time was 1-3 days (25.7%). The lowest percentage was 10-12 days and >10 days (0.8%).

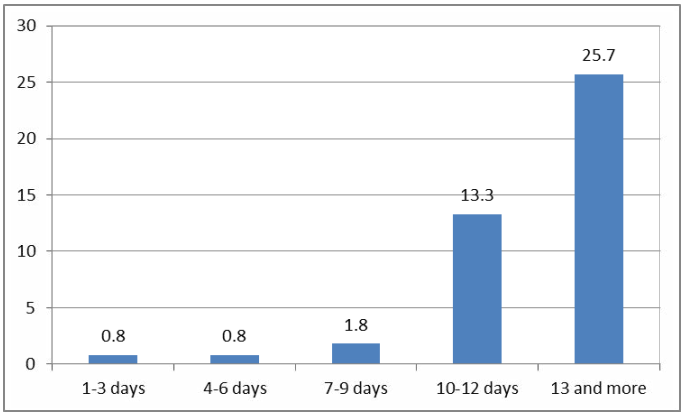

Figure 3: Sample distribution by the duration of attendance of symposium

More than half (59.5%) of participants attended a training course for (4-7) days- Figure 4.

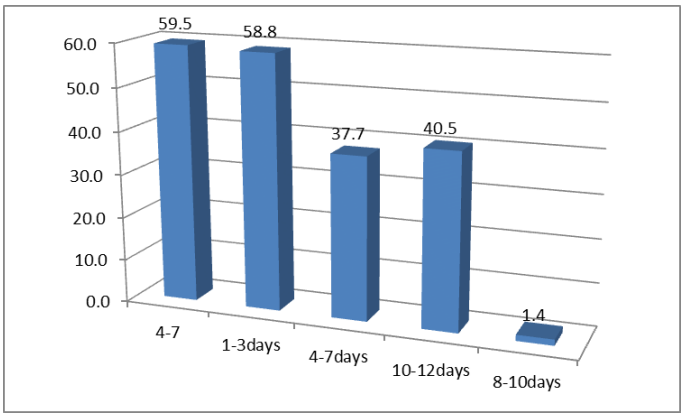

Figure 4: Sample distribution by the duration of attendance of training

Knowledge of infection prevention and control among health staff

According to Table 3, the majority of health staff knew the answer to statements that; (92.8%) hospital-acquired infections can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers, etc... More than three-quarters (78.5%) were aware of the world health Organization's "5 moments of hand hygiene". The majority (80.7%) knew the instruments can be stored in an antiseptic solution for up to 36 hours. More than one-third (76.1%) knew that standard precautions apply to all patients regardless of their diagnosis. The majority (91.7%) knew that Gloves should be worn if blood or body fluid exposure is anticipated while (23.9%) answered that they were can wear the same pair of gloves for multiple patients as long as there is no visible contamination on the gloves. The majority (87.5%) knew that washing hands with soap or an alcohol-based antiseptic decreases the risk of transmission of hospital-acquired pathogens. More than three-quarters (83.1%) knew that Healthcare-associated pathogens can be found on average, intact patient skin and that they were while working in the hospital.

On the other hand, more than half of health staff incorrectly answered the statements that; (61.7%) gloves provide complete protection against acquiring/transmitting infection, (53.1%) nosocomial infection is an infection that the patient comes with from home, (70.1%) micro-organisms are destroyed by clean water, (68.3%) we should be concerned and realize that all personnel and patients are possibly infectious and (87.9) that If my hands are not visibly dirty there is no need to wash my hands before the patient contact.

More than half of the participants correctly answered the statement that; (65.4%) bathing every day is a universal precaution, (78.3%) handled body fluids with bare hands if gloves were not available, (53.3%) used an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty, using alcohol-based antiseptics, (60.9%) I should keep rubbing my hands until dry, (67.3%) that they were familiar with hospital-acquired infection guidelines, and (69.2%) that they know how to prevent and control hospital-acquired infections.

Concerning the Knowledge Level Table 3 Showed more than half of the study participants (57%) had Medium knowledge about infection control while 38.8% had Good knowledge and 4.3% had poor knowledge.

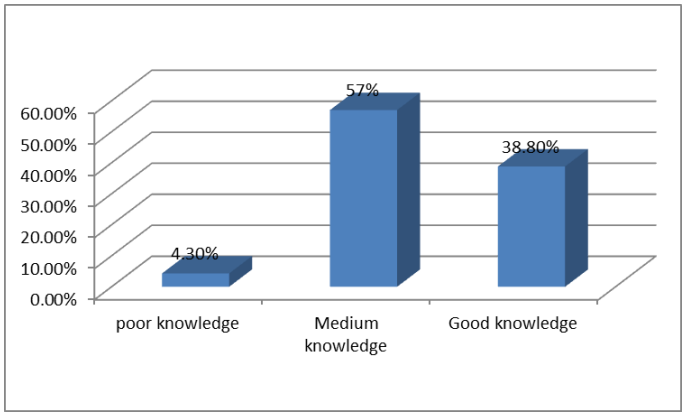

Figure 5: Sample distribution by knowledge level

Attitude toward infection prevention and control among study participants

Table 2 shows that more than half of health staff had an agreement with statements that; (68.3%) they should adhere to policies and procedures on infection control at all times, (67.8%) they should attend in-service training/workshops related to infection prevention and control regularly, (66.1%) Sinks are inconveniently located, they were if perform hand hygiene. Nearly three-quarters of health staff had an agreement with the statement that; (77.2%) that I am less likely to transmit infections to my patients Hand hygiene interferes with healthcare worker-patient interactions, (76.7%) prevention of hospital-acquired infections is a valuable part of healthcare workers role, (80.1%) infection prevention guidelines are essential to their hospital, (76.8%) they believed that following the infection prevention guidelines will reduce the rates of hospital-acquired infection, (73%) they should follow the guidelines of the unit, (73%) and the statement that needles should be recapped after use and before disposal.

On the other hand, this study showed that nearly more than half of participants disagreed with the statement that; (59.1%) do not have to wash their hands after using gloves, and they often forget to perform hand hygiene, (52.2%) Hand hygiene interferes with healthcare worker-patient interactions, (58.4%) they had a shallow risk of acquiring infections from my patients, (53.8%) it is not their responsibility to comply with the hospital-acquired infection guidelines, and less than half (47.3%) of study participant disagreed with the statement; they were have received training about the importance of hand hygiene.

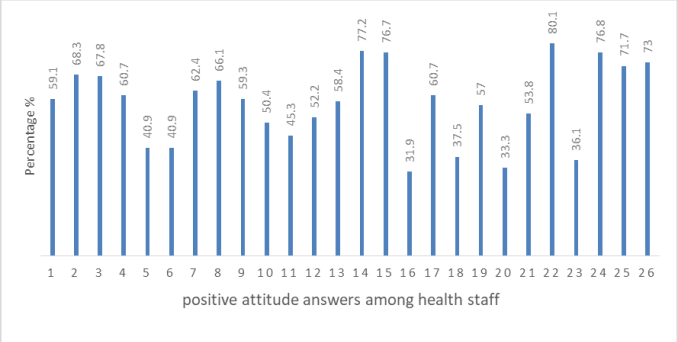

Figure 6: Sample distribution by positive attitude answers

Table 4 show more than three-quarters of participants of the study samples (78.3%) had a medium attitude toward infection control while 20% had a poor attitude and 1.7% had a good attitude.

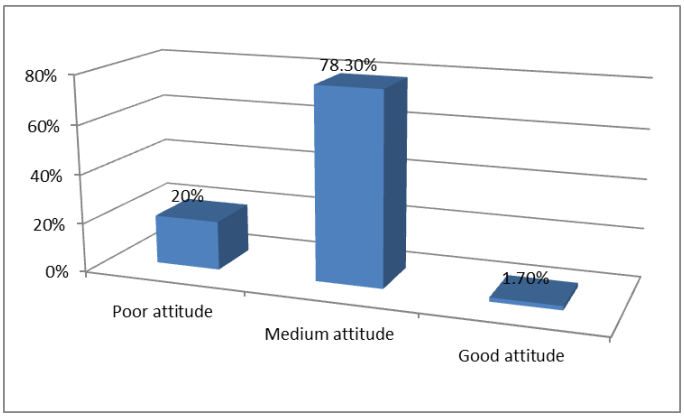

Figure 7: Sample distribution by attitude levels

Practice of infection prevention and control among health staff

As revealed in Table 4, the majority of health staff responded correctly to the hand hygiene practice items, which include, (81.5%) that they

Table 3: Sample distribution by knowledge regarding infection control

Knowledge		No.	(%)
Hospital-acquired infection can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers, etc.(yes)	Yes	1114	(92.8)
	No	86	(7.20)
Nosocomial infection is the patient's infection from home. (no)	Yes	637	(53.1)
	No	563	(46.9)
I know the world's health organization's '5 moments of hand hygiene. (yes)	Yes	942	(78.5)
	No	258	(21.5)
Some instruments can be stored in an antiseptic solution for up to36 hours. (yes)	Yes	968	(80.7)
	No	232	(19.3)
Microorganisms are destroyed by using clean water. (no)	Yes	359	(29.9)
	No	841	(70.1)
Bathing every day is a universal precaution. (yes)	Yes	785	(65.4)
	No	415	(34.6)
Standard precautions apply to all patients regardless of their diagnosis. (yes)	Yes	913	(76.1)
	No	287	(23.9)
Gloves provide complete protection against acquiring/transmitting infection. (no)	Yes	740	(61.7)
	No	460	(38.3)
Healthcare-associated pathogens can be found on the normal, intact patient skin. (yes)	Yes	997	(83.1)
	No	203	(16.9)
Washing your hands with soap or an alcohol-based antiseptic decreases the risk of transmission of hospital-acquired pathogens. (yes)	Yes	1050	(87.5)
	No	150	(12.5)
If my hands are not visibly dirty, there is no need to wash my hands before patient contact. (no)	Yes	145	(12.1)
	No	1055	(87.9)
The use of an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty. (yes)	Yes	639	(53.3)
	No	561	(46.8)
Gloves should be worn if blood or body fluid exposure is anticipated. (yes)	Yes	1100	(91.7)
	No	100	(8.3)
When using alcohol-based antiseptics, I should keep rubbing my hands until dry. (yes)	Yes	731	(60.9)
	No	469	(39.1)
There is no need to wash hands before doing procedures that do not involve bodily fluids. (no)	Yes	205	(17.1)
	No	995	(82.9)
Hand hygiene should be performed before and after direct patient contact. (yes)	Yes	1125	(93.8)
	No	75	(6.3)
I can wear the same pair of gloves for multiple patients as long as there is no visible contamination on the gloves. (no)	Yes	287	(23.9)
	No	913	(76.1)
I am familiar with hospital-acquired infection guidelines. (yes)	Yes	808	(67.3)
	No	392	(32.7)
While working in the hospital, we should be concerned and realize that all personnel and patients are possibly infectious. (yes)	Yes	819	(68.3)
	No	381	(31.8)
You can handle body fluids with bare hands if gloves are not available. (no)	Yes	261	(21.8)
	No	939	(78.3)
I know how to prevent and control hospital-acquired infections. (yes)	Yes	830	(69.2)
	No	370	(30.8)
Total		1200	(100)

Table 4: Sample distribution by attitude regarding infection control

Attitude		No.	(%)
I do not have to wash my hands if I used gloves.	Disagree	709	(59.1)
	Neutral	342	(28.5)
	Agree	149	(12.4)
Policies and procedures on infection control should be adhered to at all times	Disagree	81	(6.8)
	Neutral	299	(24.9)
	Agree	820	(68.3)
I should attend in-service training/workshops related to infection prevention and control regularly.	Disagree	56	(4.70)
	Neutral	331	(27.6)
	Agree	813	(67.8)
The workload affects my ability to apply infection prevention guidelines	Disagree	162	(13.5)
	Neutral	310	(25.8)
	Agree	728	(60.7)

Hand hygiene agents are not always available	Disagree	363	(30.3)
	Neutral	346	(28.8)
	Agree	491	(40.9)
Clean towels to dry my hands after washing are not always available	Disagree	235	(19.6)
	Neutral	385	(32.1)
	Agree	580	(48.3)
Gloves are always available when needed	Disagree	206	(17.2)
	Neutral	245	(20.4)
	Agree	749	(62.4)
Sinks are inconveniently located	Disagree	157	(13.1)
	Neutral	250	(20.8)
	Agree	793	(66.1)
Sinks are not available	Disagree	711	(59.3)
	Neutral	306	(25.5)
	Agree	183	(15.3)
Hand hygiene agents cause irritation and dryness	Disagree	184	(15.3)
	Neutral	411	(34.3)
	Agree	605	(50.4)
Hand hygiene interferes with healthcare worker-patient interactions	Disagree	340	(28.3)
	Neutral	317	(26.4)
	Agree	543	(45.3)
I often forget to perform hand hygiene	Disagree	626	(52.2)
	Neutral	419	(34.9)
	Agree	155	(12.9)
I have a very low risk of acquiring infections from my patients	Disagree	701	(58.4)
	Neutral	284	(23.7)
	Agree	215	(17.9)
If I perform hand hygiene, I am less likely to transmit infections to my patients	Disagree	122	(10.2)
	Neutral	152	(12.7)
	Agree	926	(77.2)
Prevention of hospital-acquired infections is a valuable part of healthcare workers' role	Disagree	91	(7.6)
	Neutral	189	(15.8)
	Agree	920	(76.7)
I have received training about the importance of hand hygiene	Disagree	567	(47.3)
	Neutral	250	(20.8)
	Agree	383	(31.9)
The importance of hand hygiene is emphasized by my clinical supervisors	Disagree	148	(12.3)
	Neutral	324	(27.0)
	Agree	728	(60.7)
I would feel uncomfortable reminding an HCW to perform hand hygiene	Disagree	450	(37.5)
	Neutral	336	(28.0)
	Agree	414	(34.5)
I am aware that patients expect me to wash my hands before touching them and after touching them.	Disagree	208	(17.3)
	Neutral	308	(25.7)
	Agree	684	(57.0)
I feel that infection control policies and guidelines are enough in the hospital	Disagree	446	(37.2)
	Neutral	355	(29.6)
	Agree	399	(33.3)
It is not my responsibility to comply with hospital-acquired infection guidelines.	Disagree	645	(53.8)
	Neutral	259	(21.6)
	Agree	296	(24.7)
Infection prevention guidelines are important to this hospital.	Disagree	73	(6.10)
	Neutral	166	(13.8)
	Agree	961	(80.1)
I have enough time to comply with infection prevention guidelines	Disagree	355	(29.6)
	Neutral	412	(34.3)
	Agree	433	(36.1)
I believe that following the prevention guidelines will reduce rates of hospital-acquired infection.	Disagree	60	(5.00)
	Neutral	219	(18.3)
	Agree	921	(76.8)
I should follow the procedure guidelines of the unit.	Disagree	39	(3.30)
	Neutral	301	(25.1)
	Agree	860	(71.7)
I feel that needles should be recapped after use and before disposal	Disagree	96	(8.00)
	Neutral	228	(19.0)
	Agree	876	(73.0)
Total		1200	(100.0)

Table 5: Sample distribution by practice regarding infection control

Practice		No.	(%)
Always wash hands before and after direct contact with the patients	Yes	978	(81.5)
	No	222	(18.5)
I always put on a mask and glasses when performing invasive and body fluid procedures	Yes	826	(68.8)
	No	374	(31.2)
Knowledge of infection prevention and control are being monitored in the hospital	Yes	788	(65.7)
	No	412	(34.3)
Surgical operation sites are shaved with razors	Yes	989	(82.4)
	No	211	(17.6)
Vaccination is provided to all staff	Yes	713	(59.4)
	No	487	(40.6)
Screening of patients is being done to detect colonization even if no evidence of infection	Yes	745	(62.1)
	No	455	(37.9)
Washing hands before patient contact	Yes	1003	(83.6)
	No	197	(16.4)
Washing hands after Patient Contact	Yes	1091	(90.9)
	No	109	(9.1)
Washing hands if they look or feel dirty	Yes	1094	(91.2)
	No	106	(8.8)
Washing hands after going to the toilet	Yes	1179	(98.3)
	No	21	(1.8)
Washing hands after contact with blood or bodily fluids	Yes	1176	(98)
	No	24	(2)
Washing hands before caring for a wound	Yes	1117	(93.1)
	No	83	(6.9)
Washing hands after caring for a wound	Yes	1159	(96.6)
	No	41	(3.4)
Washing hands after removing gloves	Yes	1069	(89.1)
	No	131	(10.9)
Injection safety (recap of needle and presence of waste container)	Yes	1050	(87.5)
	No	150	(12.5)
The hospital provides fiscal and human resource support for maintaining the infection prevention and control program	Yes	818	(68.2)
	No	382	(31.8)
The infection prevention and control program provides infection prevention education to patients, family members, and other caregivers	Yes	770	(64.2)
	No	430	(35.8)
Supplies necessary for adherence to hand hygiene (e.g., soap, water, paper towels, alcohol-based hand rub) are readily accessible in patient care areas	Yes	832	(69.3)
	No	368	(30.7)
Adherence to infection prevention guidelines	Yes	988	(82.3)
	No	212	(17.7)
Personal protective equipment is always accessible	Yes	863	(71.9)
	No	337	(28.1)
Screening of patients is being done to detect colonization even if no evidence of infection	Yes	716	(59.7)
	No	484	(40.3)
Total		**1200**	**(100)**

always wash hands before and after direct contact with the patients, (83.6%) that they were washing hands before patient contact, (83.6%) that they were washing hands after patient contact, 1094 (91.2%) that they were washing hands if they look or feel dirty, (98.3%) that they were washing hands after going to the toilet, (98%) that they were washing hands after contact with blood or bodily fluids, (93.1%) that they were washing hands before caring for a wound, (96.6%) that they were washing hands after caring for a wound, and 1069 (89.1%) that they were washing hands after removing gloves.

The current study showed that most participants responded correctly to the items of infection prevention program guideline statements which included, (65.7%) that knowledge of infection prevention and control are being monitored in the hospital, (59.4%) that vaccination is provided to all staff, (62.1%) that screening of patients is being done to detect colonization even if no evidence of infection, (68.2%) that Hospital provides fiscal and human resource support for maintaining the infection prevention and control program. Nearly more than three-quarters of study participants agreed with the statements; (87.5%) accepted that Injection safety (recap of needle and presence of waste container), (82.3%) that the statement Adherence to infection prevention guideline, (71.9%) that the statement Adherence to infection prevention guideline.

Table 5 showed more than half of the study participants (69.2%) had Good practice in infection control while 26.9% had medium practice and 3.9% had poor practice.

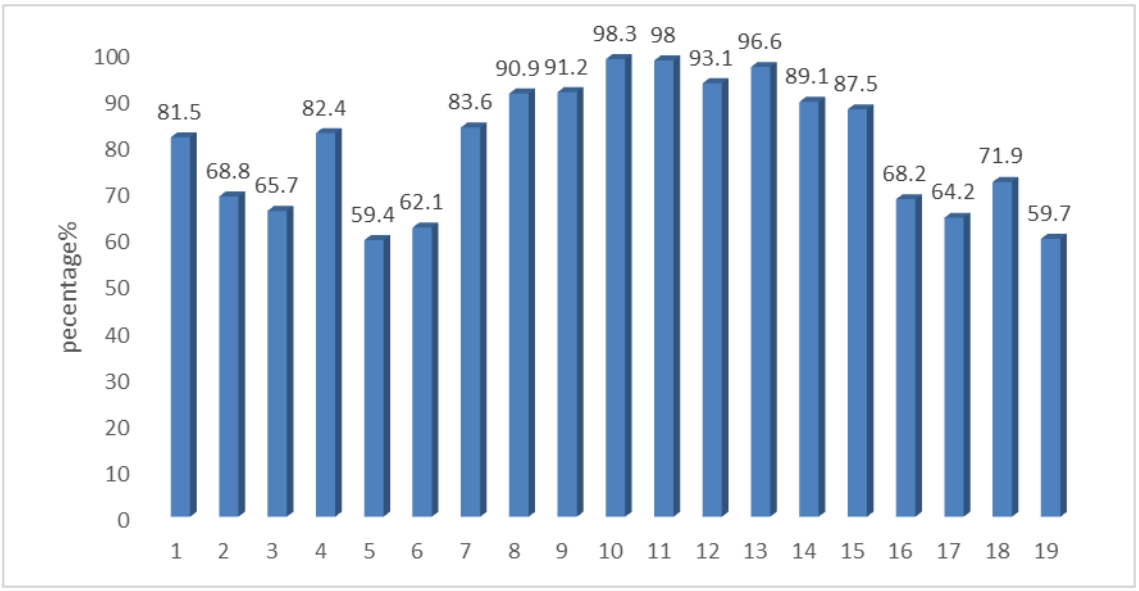

Figure 8: Sample distribution by positive practice answers

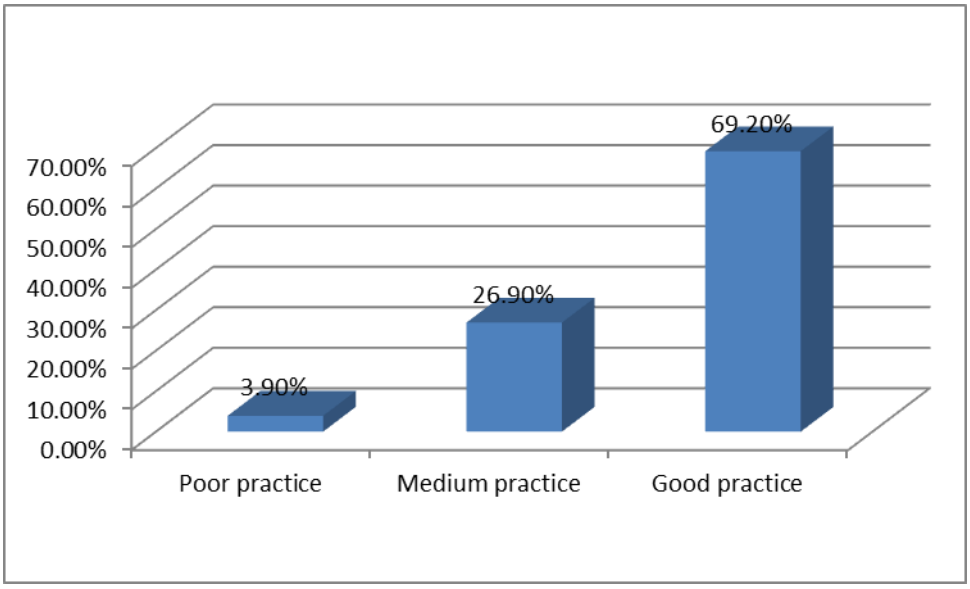

Figure 9: Sample distribution by practice levels

Table 6: Association between knowledge level among health staff and their attitude level

Knowledge level	Attitude level						Total		P Value
	Poor attitude		Medium attitude		Good attitude				
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	< 0.001
Poor knowledge	23	(45.1)	28	(54.9)	0	(0.0)	51	(100.0)	< 0.001
Medium knowledge	137	(20.0)	536	(78.4)	11	(1.6)	684	(100.0)	< 0.001
Good knowledge	80	(17.2)	376	(80.9)	9	(1.9)	465	(100.0)	< 0.001
Total	240	(20.0)	940	(78.3)	20	(1.7)	1200	(100.0)	

Table 7: Association between knowledge level among health staff and their practice level

Knowledge level	Practice level						Total		P Value
	Poor practice		Medium practice		Good practice				
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
Poor knowledge	9	(17.6)	19	(37.3)	23	(45.1)	51	(100.0)	< 0.001
Knowledge level Medium knowledge	27	(3.9)	178	(26.0)	479	(70.0)	684	(100.0)	< 0.001
Good knowledge	11	(2.4)	126	(27.1)	328	(70.5)	465	(100.0)	< 0.001
Total	47	(3.9)	323	(26.9)	830	(69.2)	1200	(100.0)	

Table 8: Association between attitude level among health staff and their practice level

Attitude level	Practice level						Total		P Value
	Poor practice		Medium practice		Good practice				
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
Poor attitude	13	(5.4)	67	(27.9)	160	(66.7)	240	(100.0)	< 0.001
Medium attitude	33	(3.5)	255	(27.1)	652	(69.4)	940	(100.0)	< 0.001
Good attitude	1	(5.0)	1	(5.0)	18	(90.0)	20	(100.0)	< 0.001
Total	47	(3.9)	323	(26.9)	830	(69.2)	1200	(100.0)	

The current study showed a statistically significant association between Knowledge level among health staff and their attitude level (P value < 0.001), (Table 6).

The current study showed a statistically significant variation between knowledge level among health staff and their practice level (P value < 0.001), This finding is shown in table 7.

The present study indicated that there was a statistically significant variation between attitude levels among health staff and their practice level (P value < 0.001), This finding is shown in Table 8.

DISCUSSION

This is the first study on infection prevention programs in teaching hospitals which includes the level of knowledge, attitude, and practice of health staff and on the other hand stockholder of the infection control program for example managers, assistant managers, and head of infection control department in teaching hospitals in Erbil city in Kurdistan/ Iraq. A large health staff (1200) participants were randomly obtained among all teaching on other hand[10] stockholders hospitals in Erbil city/ Kurdistan region to develop, implement, and assess a health education program in improving infection control knowledge among health workers and to develop infection control program strategy through developing standard guideline which supporting by international references and then will provide to the ministry of health Kurdistan region/ Iraqi government.

Out of the total sample of 1200 individuals; 631 (52.6%) were females this finding agrees with the study in Palestinian Hospitals (56.1%)[3], and the study done in Bahir Dar city (60.2%), (1). New Delhi, India (69.25)[4].

More than half of the study sample was married 72.4%, agree with the study in Palestinian Hospitals (70.5%)[3], in tertiary hospitals in Zambia (49.5%)[9].

More than half of the occupation of the study sample was Physician 51.9% and nurses 48.1%. disagree with a cross-sectional survey of the HCP including doctors and nurses involved with direct patient care which showed that the majority of participants were nurses (82.25%)[4], and disagree with the cross-sectional done by Melaku Desta et al which showed that (14%) was Physician[11].

The highest percentage (49.7%) of experiences in the employment group was >10 years this finding disagrees cross-sectional done by Melaku Desta et al which showed that (6.7%) was >10 years. And disagree with a cross-sectional study done in Palestinian Hospitals which showed that 5 years or less (43.9%)[3]. And disagree with the study in Debre Markos referral hospital health care workers in Debre Markos which was a majority of participants experiences were < 5 years 74%[11].

The majority of health staff qualifications was Bachelor's 40.1% this finding is in agreement with several worldwide studies carried out (55.4%) in Palestinian[3], 40% in Northwest Ethiopia[11], (and 66.21) in Egypt[12].

In this study, the rate of attendance to symposia regarding infection control among study participants was (42.3%). While another study showed a significant improvement in compliance with the standard precautions from 48% to 74% after an educational symposium[13].

Less than half of the study participants had attended training regarding infection control among study participants (40.5%) is nearly similar to that study in Palestinian Hospitals (36.2%)[3]. and agree with the cross-sectional done by Melaku Desta et al which showed that (35.33% %) of health staff had training regarding IC[11].

Regarding hepatitis B vaccinations this study showed that 934 (77.8%) had of participants had been vaccinated this finding disagrees with the study done in Egypt where 38% of health staff had hepatitis B vaccinations[14], (12.3%) in Cameroon[15].

On the other hand, this study showed that 771 (64.3%) had a history of vaccination against covid 19 infection This finding is in agreement with the article review of the nature and extent of covid-19 vaccination hesitancy in healthcare workers which is represented that (72%) of health staffs had covid19 vaccinated[16], 89% in England[17].

The current study showed that 533 (44.4%) participants had a history of vaccination against influenza infection in the last 3 years. This finding is in disagreement with a study of Increasing influenza vaccination coverage in healthcare workers: a review on campaign strategies and their effect Which showed that 90% of health staff were influenza vaccinated[18].

According to Table 1, the majority of health staff 1114 (92.8%) accepted that hospital-acquired infections can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers, etc. Literature has shown that hospital-acquired infection can be transmitted through contaminated equipment. In agreement, the Center for Disease Control and Prevention[19] indicated that Pseudomonas Aeruginosa could be spread by equipment that gets contaminated and not properly cleaned. this finding is in agreement with several worldwide studies.

However, the study has shown that 637 (53.1%) of the health staff who participated in the study know that nosocomial infection is acquired at home. This indicates that these health staff did not know how hospital-acquired infections were acquired hence posing a risk of transmitting nosocomial infection[20].

(21.5%) of health staff who participated in the study did not know WHO (2009) 5 moments of hand hygiene hence posing a risk of transmitting infection[21].

According to the current study (19.3%) lack knowledge of instrument decontamination and therefore position a risk of hospital-acquired

infection. Environmental screening confirms repeated contamination of items, equipment, and general sites in bed spaces and rooms of colonized or infected patients and often throughout multiple clinical areas in a health care institution[22].

The current study showed less than half of the participants disagreed with the statement that bathing every day is a universal precaution indicating that is an indication of a knowledge gap.

The current study shows that (23.9%) indicated that standard precautions do not apply to all patients regardless of their diagnosis. These health staff position a risk of transmission of infection[23] that standard precautions are basic effective practices designed to protect health-care workers (HCWs) and prevent HCWs from spreading infections among patients. These safety measures apply to all hospitalized patients, regardless of the disease the patient is suffering from[23].

Infection control guidelines are important because they guide healthcare workers in the prevention of hospital-acquired infection WHO disagree that Gloves provide complete protection against acquiring/transmitting infection[24]. However, the present study indicated that 740 (61.7%) were not familiar with hospital-acquired infection guidelines. However, the present study indicated that 203(16.9%) were not familiar with hospital-acquired infection guidelines. The majority of participants 1050 (87.5%) agreed that washing your hands with soap or an alcohol-based antiseptic decreases the risk of transmission of hospital-acquired pathogens. 145 (12.1) agreed that If my hands are not visibly dirty, there is no need to wash my hands before patient contact. The majority of participants 1125 (93.8%) agreed that Gloves provide complete protection against acquiring/transmitting infection, whereas some participants 75 (6.3%) disagreed.

Infection control guidelines are important because they guide healthcare workers in the prevention of hospital-acquired infection WHO disagree that Hand hygiene should be performed before and after direct patient contact[24]. However, the present study indicated that 75 (6.3%) were not familiar with hospital-acquired infection guidelines.

More than half of the participants 808 (67.3%) agreed that they were familiar with hospital-acquired infection guidelines, and the majority of participants 819 (68.3%) agreed that they were While working in the hospital.

More than three-quarters of participants 939 (78.3%) disagreed that they handled body fluids with bare hands if gloves are not available. However, the present study indicated that 261 (21.8%) were not familiar with hospital-acquired infection guidelines.

More than half numbers of the participants 830 (69.2%) agreed that they know how to prevent and control hospital-acquired infections whereas 370 (30.8%) disagreed and did not understand the meaning of universal precautions and did not know how to prevent and control hospital-acquired infections. This indicates that there is still a gap in the level of knowledge on how to prevent hospital-acquired infections[25].

Concerning the knowledge level present study showed more than half of the study participants (57%) had Medium knowledge about infection control while 38.8% had Good knowledge and 4.3% had poor knowledge. This finding agrees with a cross-sectional study done by Hailemariam Gezie in Northeast Ethiopia[26] and is consistent with the studies done in North-Western Nigeria[27] in Karnataka, India[28], Pakistan[29], Ethiopia[30], in Iran[31] and Bangladesh[32]. Disagree with a study done in Nigeria[33].

Present study indicated most of health staffs were had positive attitude regarding hand hygiene questions attitude, 709 (59.1%) disagreed with the statement that they do not have to wash hands after using gloves, 580 (48.3%) agreed that clean towels to dry my hands after washing are not always available, 793 (66.1%) were agreed that Sinks are inconveniently located, 605 (50.4%) agreed that Hand hygiene agents cause irritation and dryness, 543 (45.3%) agreed that Hand hygiene interferes with healthcare worker -patient interactions, 626 (52.2%) disagreed that they were often forget to perform hand hygiene Hand hygiene interferes with healthcare worker -patient interactions, 926 (77.2%) agreed that they were if perform hand hygiene, I am less likely to transmit infections to my patients Hand hygiene interferes with healthcare worker -patient interactions, 567 (47.3%) disagreed that they were have received training about the importance of hand hygiene, 684 (57%) agreed that they are aware that patients expect them to wash their hands before and after touching them while some health staffs 208 (17.3%). This finding is similar to many types of research worldwide in India[34], Iran[35], Saudi Arabic[35], Egypt[12], Ethiopia[1], in Zambia[1]. On the other hand, good knowledge and positive attitude of the physicians were not translated into good hand hygiene compliance. As described previously in a British study[36].

Most of the health staff had a positive attitude regarding infection control guidelines, 820 (68.3%) agreed that they should adhere to policies and procedures on infection control at all times, and 446 (37.2%) disagree and feels that infection control policies and guidelines are not enough in the hospital, 645 (53.8%) disagreed with the statement that it is not their responsibility to comply with the hospital-acquired infection guidelines, 961 (80.1%) agreed that infection prevention guidelines are important to their hospital. 921 (76.8%) agreed that they believed that following the infection prevention guidelines will reduce the rates of hospital-acquired infection, and 860 (73%) agreed that they should follow the guidelines of the unit. This finding agrees with studies done, in Karnataka, India[28], Zambia[1], Bangladesh[32], in Iran[32].

More than half of health staff were had a positive attitude regarding hospital-acquired infection management statements, 701 (58.4%) disagreed that they have a very low risk of acquiring infections from my patients, 920 (76.7%) agreed that prevention of hospital-acquired infections is a valuable part of healthcare workers role, 876(73%) agreed with the statement that needles should be recapped after use and before disposal this finding in collaborating with the finding of studies done in china[37], in South Africa[38], in Uganda[39], in UK[36].

Three-quarters of participants of the study samples (78.3%) had a medium attitude about infection control while 20% had a poor attitude and 1.7% had a good attitude this result agrees with studies done in Iran[35], in Saudi Arabic[35], in china[37], in a British study[36]. in Uganda[39] and Iran[31]. Disagree with a study done in Nigeria[33].

The current study revealed a large group of participants' health staff had correctly answered the items related to the practical hand wishing, 978 (81.5%) accepted that they always wash hands before and after direct contact with the patients, 1003 (83.6%) accepted that they were washing hands before patient contact, 1091 (83.6%) accepted that they were washing hands after patient contact, 1094 (91.2%) accepted that they were washing hands if they look or feel dirty, 1179 (98.3%) accepted that they were washing hands after going to the toilet, 1176 (98%) accepted that they were washing hands after contact with blood or bodily fluids, 1117 (93.1%) accepted that they were washing hands before caring for a wound, 1159 (96.6%) accepted that they were washing hands after caring for a wound, 1069 (89.1%) accepted that they were washing hands after removing gloves, This finding is nearly

similar to that reported in the UK[36], in Malaysia[40], in North-Western Nigeria[27], in Egypt[41].

On another hand this study showed most of health staffs were answered positively for items related to practical infection prevention and control program statements, 826 (68.8%) agreed that they always put on a mask and glasses when performing invasive and body fluid procedures, 788 (65.7%) agreed that knowledge of infection prevention and control are being monitored in the hospital, 989 (82.4%) agreed that Surgical operation sites are shaved with razors, 713 (59.4%) agreed that vaccination is provided to all staffs, 745 (62.1%) accepted that screening of patients is being done to detect colonization even if no evidence of infection, 1050 (87.5%) accepted that Injection safety (recap of needle and presence of waste container), 818 (68.2%) accepted that Hospital provides fiscal and human resource support for maintaining the infection prevention and control program, 770 (64.2%) accepted that Infection prevention and control program provides infection prevention education to patients, family members, and other caregivers, 988 (82.3%) accepted that the statement Adherence to infection prevention guideline, 716 (59.7%) accepted that the statement screening of patients is being done to detect colonization even if no evidence of infection. This is further corroborated by the many studies worldwide, in Brazil[42], Egypt[41], Karnataka, India[28], in Zambia[1].

The current study showed more than half of the study participants (69.2%) had good practice in infection control while 26.9% had medium practice and 3.9% had poor practice. This finding is in agreement with different studies in the world in the UK (40), Malaysia[40], Egypt[41], Iran[35], and Iran[31]. Disagree with a study done in Nigeria[33].

Finding of the study show that was a significant statistical association between Knowledge level among health staff and their attitude level (P value < 0.001), This finding is in agreement with different studies in the world in Karnataka, India[28], in Pakistan[29], in Egypt[41], in Ethiopia[30], in Ethiopia[11], in UK[36] in Iran[31], in Ethiopia[43].

The current study showed a statistically significant variation between knowledge level among health staff and their practice level (P value < 0.001), This finding is similar to different studies in the world-wide Karnataka, India[28], Pakistan[29], the UK[36], in Ethiopia[30], in Egypt[41] and in Ethiopia[43].

The present study indicated that there was a statistically significant variation between attitude levels among health staff and their practice level (P value < 0.001), This finding is similar to different studies in the world wide Karnataka, Ethiopia[30], Ethiopia[11], in India[28], in Pakistan[29], in UK[36], in Ethiopia[43] and Egypt[41].

CONCLUSIONS

Results of our study showed that approximately less than half attended symposia and training regarding infection control among study participants. Education is a critical element in the training of all HCWs. Concerning the knowledge level present study showed more than half of the study participants (57%) had Medium knowledge about infection control while 38.8% had Good knowledge and 4.3% had poor knowledge. Three-quarters of participants of the study samples (78.3%) had a medium attitude toward infection control while 20% had a poor attitude and 1.7% had a good attitude. The current study showed more than half of the study participants (69.2%) had good practice in infection control while 26.9% had medium practice and 3.9% had poor practice. The finding of the study shows that was a significant statistical association between Knowledge level among health staff and their attitude level (P value < 0.001). The current study showed a statistically significant variation between knowledge level among health staff and their practice level (P value < 0.001). The present study indicated that there was a statistically significant variation between attitude levels among health staff and their practice level (P value < 0.001). Decision makers and road map plans in the Ministry of Health shall develop effective infection prevention and intervention programs for implementation in all teaching hospitals in Erbil city. Prepare health education programs for infection prevention and health promotion among health staff and all individuals in teaching hospitals depending on the mass media and other methods of health education. Educate clients and individuals regarding infection control in all hospitals in Erbil City regarding health problems. More support is needed for conducting scientific research to improve surveillance of knowledge, practice, and attitude of health staff regarding infection control problems in teaching hospitals in Erbil city.

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Potential Conflict of Interest: None

Competing Interest: None

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