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Knowledge, Attitudes and practices Towards Infection Control among health care staff in Saudi Arabia

Aisha Ali Mohammad Asiri[1], Tarfa Abdulaziz Al-Rafdan[2], Amal Abdulrahman Asiri[3], Fahad Nasser Mohammad Alsawaih[4], Abdullah Muhammad Muhammad Al-Qahtani[5], Nawal Nasser Mohammed Albishi[6], Abdulrahman Zaben Al-Mutairi[7], Abdulrahman Fahd Al-Saeed[8], Turki Abdulaziz Al-Turki[9], Bandar Abdullah Al-Zughaibi[10], Lulwah zabin Almutairi[11], Heba Isam Mohammed Mohammed[12], Ibrahim Nasser Ibrahim Alawn[13], Ali Mohammed Al-Ammer[14], Abdulah Mohammed Al-Ammer[15]

1. Administration of Infection Control of Health Facilities at the Ministry's branch in the Asir region, Ministry of Health. Kingdom of Saudia Arabia. aaassri@moh.gov.sa
2. Social Worker, King Khalid Hospital in Al-Kharj, Ministry of Health, Kingdom of Saudi Arabia. 53.22@gmail.com
3. Social Specialist, Al-Saada Primary Health Care Center, Ministry of Health, Kingdom of Saudi Arabia. amalasiri4371@gmail.com
4. Senior social specialist, Al-Iman General Hospital, Ministry of Health, Kingdom of Saudi Arabia. Kak400500@icloud.com
5. Operations Technician, Al-Iman General Hospital, Ministry of Health, Kingdom of Saudi Arabia. abmalkahtani@moh.gov.sa
6. Laboratories, Regional laboratory, Ministry of Health, kingdom of Saudi Arabia.
7. General Practitioner, Ministry of Health Branch in Riyadh Region, Ministry of Health, Kingdom of Saudi Arabia.
8. Radiology, Ministry of Health Branch in Riyadh Region, Ministry of Health, Kingdom of Saudi Arabia.
9. Ministry of Health Branch in Riyadh Region, Ministry of Health, Kingdom of Saudi Arabia.
10. Physician, Ministry of Health Branch in Riyadh Region, Ministry of Health, Kingdom of Saudi Arabia.
11. Physician, North Dental Complex, Ministry of Health, Kingdom of Saudi Arabia.
12. Erada mental health complex, Ministry of health, kingdom of Saudi Arabia. Hebaem@moh.gov.sa
13. Senior Specialist Radiological, Imam Abdul Rahman Al-Faisal Hospital, Ministry of Health, Kingdom of Saudi Arabia. Ibrahimalawn210@gmail.com
14. Epidemic Technician, Al-Hair Health Center, Ministry of Health, kingdom of Saudi Arabia. almoalamer@moh.gov.sa
15. Health Inspector, Atika Health Center, Ministry of Health, kingdom of Saudi Arabia. aalaamer@moh.gov.sa

ABSTRACT

HAIs are a major problem in Saudi Arabia with an average of 6.8% in in-patient in tertiary-care hospitals. Lack of knowledge, attitude, and practice (KAP) among the HCWs is one of the main determinants of HAIs. The purpose of this research was to establish the KAP of HCWs concerning infection control in Saudi Arabia. A self-

administered, cross-sectional anonymous questionnaire survey was carried out among 324 HCWs. Regarding the position, the largest proportion of the participants were nurses 34.0%, doctors 20.1%, technicians 17.0%, pharmacists 16.7 % and administrative staff 12.3%. The findings revealed a high level of knowledge about infection control measures (mean score: 4.09/5; relative weight: 81.80%), hand hygiene has been considered a significant practice. Positive attitudes were also observed (mean score: 4.02/5; relative weight: 80.40%), HCWs stated that it is good to respect and follow the measures of infection control measures as part of their work. Reported practices were similarly high (mean score: 4.12/5; relative weight: 82.40%; The most frequently reported practice was updating infection control guidelines at least once a week. However, variations in responses indicate the importance of special training programs and a favorable climate that will promote group commitment to infection control. Strengthening peer discussion and reporting structures may also extend existing compliance with infection control practice. These results underscore the need to continue education and training programs to sustain and enhance KAP among HCWs in Saudi Arabia, to decrease HAIs and enhance patient safety.

KEYWORDS: Healthcare-associated infections, Infection control, Healthcare workers, Saudi Arabia.

1. Introduction

Occupational health and safety are an essential component in every organization, particularly in a healthcare environment (Ogoina et al., 2015). One of the most serious issues facing healthcare facilities around the world is infection. In groups that are exposed, it may result in morbidity and mortality. Healthcare workers may be at risk for infection because of encountering infected patients' body fluids and contaminated equipment. Health care workers (HCWs) are involved in the transmission of infections from one patient to another as well as between staff members. Unprotected and improperly handled bodily fluids can result in fatal illnesses such as hepatitis B, hepatitis C, and the human immunodeficiency virus (HIV) (Habboush et al., 2024).

The incidence of healthcare-associated infections (HAIs) is increasing worldwide, although progress in medical treatment and technology (Moralejo et al., 2018). The World Health Organization (WHO) reports that the prevalence of HAIs in hospital settings worldwide varies from 5.7% to 19.1% (Allegranzi et al., 2011). Recent studies estimated the prevalence of HAIs in USA (Suetens et al., 2018) and the Europe (Magill et al., 2018) at 3.2% and 6.5%, respectively. The burden of HAIs is notably larger in low-resourced nations compared with high-income ones (Habibi et al., 2008; Lahsaeizadeh et al., 2008).

According to a systematic assessment headed by the WHO, the prevalence of HAIs varies from 7.6% in high-income nations to 15.5% in low- and middle-income countries (Allegranzi et al., 2011). High mortality, longer hospital stays, higher health care expenses, and financial strain on families, communities, and nations are

all caused by HAIs (Andersson et al., 2010). Therefore, it seems that preventing and controlling HAIs is a crucial public health issue (Byarugaba, 2004).

Numerous factors contribute to HAIs, such as contaminated healthcare equipment, contaminated hands of HCWs, poor waste disposal and environmental hygiene practices, a lack of infrastructure and staff, overcrowding, and a lack of knowledge and poor practices regarding basic infection control measures. Notably, the main causes of HAIs have been shown to be hospital equipment and contaminated hands of healthcare workers. When healthcare workers neglect to wash their hands properly after tending to one patient and before interacting with another, pathogens are frequently spread across patients. Clinical departments also have different rates of HAIs; the highest infection rates are found in intensive care units, newborn units, and burn units (Abalkhail et al., 2021).

According to the WHO, the main causes of HAIs include inadequate infrastructure, inadequate manpower and equipment, poor environmental hygiene and waste disposal practices, overcrowding, a lack of national guidelines, and a lack of understanding and poor application of basic infection control measures (Haque et al., 2018). Standard precautions, created by the Centers for Disease Control and Prevention (CDC), outline specific steps that must be taken to stop the spread of pathogens and, consequently, stop HAIs (Siegel et al., 2007). All patients should always follow the same routine in all settings, as required by conventional infection control measures.

Hand hygiene, gown use, equipment cleaning and disinfection, facial protection (such as masks and goggles), sharp item disposal, medical waste management, and coughing etiquette are all considered standard precautions (Moralejo et al., 2018). But according to Hein and colleagues (Hien et al., 2013), just 30% of HCWs in Burkina Faso follow hand hygiene guidelines, which is below the recommended level. Inappropriate use of personal protective equipment (PPE) has been linked to around 42% of Corona Virus Disease-2019 among healthcare workers (Jin et al., 2020). Long clinical procedures, heavy workloads, and skin disorders have all been identified as major obstacles to adhering to hand hygiene guidelines (Patarakul et al., 2005).

Hospital infections continue to rank among the most prevalent health issues in the Kingdom of Saudi Arabia (KSA), according to statistics from several metropolitan hospitals, which reported 2.2% of hospital infections every month (Memish, 2002).

Study problem

HAIs present a significant burden in Saudi Arabia, impacting patient outcomes and healthcare costs. A point prevalence survey conducted in 2017 across six tertiary-care hospitals revealed an overall HAI prevalence of 6.8% among inpatients, with the most common infections being pneumonia (27.2%), urinary tract infections (20.2%), and bloodstream infections (10.5%) (Alshamrani et al., 2019). In a more recent study at King Abdulaziz Specialized Hospital in Taif, catheter-associated urinary tract infections accounted for 39% of cases, while central line-associated bloodstream infections represented 23.3% (Aloufi et al., 2024).

The WHO states that one of the main predictors of HAIs is inadequate knowledge,

attitude, and practice (KAP) (Haque et al., 2018). In explaining the KAP theory, Kelman made the case that knowledge is crucial for altering behaviour and that a positive outlook is a powerful catalyst for change (Kelman, 1980). To investigate the causes of non-compliance and determine the actions that should be taken to enhance infection control procedures and stop HAIs, it is imperative that KAP be evaluated among HCWs (Wu et al., 2021).

HAIs can cause an infected individual to have a lower quality of life or possibly have a shorter life expectancy also having significant long-term financial implications, (Allegranzi et al., 2011; Iliyasu et al., 2016; Stone et al., 2005; Umscheid et al., 2011). For instance, after receiving a needlestick injury from a patient who was infected with the source virus, the probability of HAIs was 0.3% for HIV, 3% for hepatitis C, and 6–30% for hepatitis B. Of the 35 million health care workers (HCWs) globally, 3 million were exposed percutaneously to bloodborne pathogens (BBPs) annually; 2 million of these were exposed to HBV, 0.9 million to HCV, and 0.17 million to HIV. About US$ 6.5 billion was the yearly economic impact of HAIs in the US alone(Stone et al., 2005). Serious mental health conditions such anxiety, sadness, adjustment disorder, panic attacks, and post-traumatic stress disorder have also been linked to HAIs (Wicker et al., 2014; Zhang & Yu, 2013). The extent and magnitude of the global burden of HAIs seem to be quite significant and significantly underestimated. There are techniques for determining the scope and type of the issue, but in situations where resources and data sources are scarce, these instruments must be modified and made more accessible. In a similar vein, preventative actions like hand cleanliness are frequently easy to put into practice. Infection Prevention and Control (IPC) needs to be prioritized more highly in national health programs, particularly in nations with limited resources.

Fortunately, between 55 and 70 percent of HAIs might be avoided (Umscheid et al., 2011). Measures like standard precautions (hand hygiene, wearing gloves and gowns, protecting one's eyes, coughing etiquette, and safely disposing of sharp objects) and isolation precautions (contact, droplet, and airborne precautions) are advised and frequently used to stop the spread of pathogens to prevent HAIs. Additional IPC strategies used to lower the rate of HAIs include vaccinations for HCWs, prophylaxis following exposure to BBPs, and prevention of infections.

Effective IPC requires an understanding of HCWs. IPC compliance is hampered by a lack of understanding of the rules for IPC as well as potential dangers of microorganism transmission to patients and preventive indications during routine patient care (Albano et al., 2014; Assefa et al., 2020; Geberemariyam et al., 2018). Poor compliance is determined by ignorance of the suitability, effectiveness, and use of IPC measures (Aloush et al., 2018; Russell et al., 2018; Smiddy et al., 2015). The cornerstones of improving IPC procedures to get past these obstacles are training and education (Safdar & Abad, 2008; Ward, 2011). Health care workers need to understand that information is power. Nonetheless, it has been consistently demonstrated that even after education and training, ignorance about IPC measures exists (Atack & Luke, 2008). Hand hygiene, donning personal protective equipment (PPE), vaccination against communicable diseases, infection modes, patient infection

assessment, medical instrument decontamination, handling healthcare waste, and needle stick and sharp safety policies are all important topics that health care workers (HCWs) should be aware of. To ensure a decrease in healthcare-associated infections, it is even more crucial that healthcare workers adhere to these IPC precautions, techniques, and strategies.

Study Questions:

- What is the Knowledge of healthcare workers about infection control in Saudi Arabia?
- What is the attitude of healthcare workers about infection control in Saudi Arabia?
- What is the practice of healthcare workers about infection control in Saudi Arabia?

Study Objectives:

- To determine the Knowledge of healthcare workers about infection control in Saudi Arabia.
- To determine the attitude of healthcare workers about infection control in Saudi Arabia.
- To determine the practice of healthcare workers about infection control in Saudi Arabia.

2. Literature review

A study by Abalkhail et al. conducted in Qassim, Saudi Arabia, assessed the knowledge, attitude, and practice (KAP) of standard infection control precautions among healthcare workers (HCWs) using a cross-sectional survey with 213 participants. The results revealed that 67.6% of HCWs demonstrated good knowledge, while 61.5% and 73.2% showed positive attitudes and practices, respectively. Significant predictors for good knowledge included being older than 34 years and having received training, while more than six years of experience was linked to positive attitudes and practices. Interestingly, being female and older were negatively associated with knowledge levels. The findings suggest that targeted training programs could enhance HCWs' understanding and adherence to infection control protocols, ultimately improving patient safety and reducing hospital-acquired infections (Abalkhail et al., 2021).

A study by Ra'awji et al. investigated health-care workers' knowledge, attitudes, and practices concerning hand hygiene guidelines across three hospitals in Al-Qassim, Saudi Arabia. Results showed an average knowledge score of 63%, with significant knowledge gaps, particularly among younger staff and those in secondary hospitals. Older health-care workers and those at the tertiary hospital demonstrated higher awareness of proper hand hygiene practices. Despite these knowledge gaps, attitudes were predominantly positive, with over 90% of participants recognizing the importance of adhering to hand hygiene protocols. The study suggests that frequent,

brief training could enhance understanding and compliance, potentially reducing hospital-acquired infections (Ra'awji et al., 2018).

A study by AL-Rasheedi investigates infection control practices among 226 staff members at Alansar General Hospital in Saudi Arabia. Using a cross-sectional survey, it assessed knowledge and compliance with infection prevention guidelines. The findings indicated that while overall knowledge of infection control was moderate (60.4%), practical adherence was significantly lower (24.6%), with females and medical staff generally showing better understanding than males and non-medical staff. The variation in adherence was noted across different departments, with higher compliance in high-risk units like the ICU and operation room, but overall practices were not aligned with the knowledge level. Only 30% of the staff had received relevant training, with non-medical staff notably undertrained, highlighting a gap between knowledge and effective practice in infection prevention (AL-Rasheedi, 2019).

A study by Ikramullah aimed to assess healthcare workers' knowledge and practices regarding healthcare-associated infections (HCAIs) at the Burn and Trauma Center in Peshawar, Pakistan. Data collected from 162 participants revealed that doctors had better knowledge of HCAIs than nurses and paramedics, with 72.2% of all participants demonstrating good knowledge. Most healthcare workers (94.9%) reported satisfactory infection control practices. Statistical analysis indicated significant differences in knowledge based on profession and gender, with male healthcare workers displaying more knowledge than their female counterparts. However, no significant association was found between profession or gender and infection control practices. The study emphasizes the need for further training for nurses and paramedics to bridge knowledge gaps in infection control (Ikramullah, 2023).

A study by Khan and Pari evaluates the knowledge, skills, and practices of nursing staff regarding infection control in two tertiary care hospitals. Analysing data from 156 nurses, the results indicate that 82% of nurses at one hospital (HMC) demonstrated good knowledge of infection control, while only 42% at another (KTH) showed fair knowledge. The study identified significant gaps, particularly in the proper use of personal protective equipment and adherence to hygiene practices. Recommendations include implementing comprehensive training programs to enhance healthcare workers' understanding and application of infection control measures, emphasizing the necessity for improved educational resources to mitigate healthcare-associated infections effectively (Khan & Pari, 2023).

3. Methodology

Given the nature of the current study topic (Knowledge, Attitudes and practices Towards Infection Control among health care staff in Saudi Arabia). To achieve the study objectives, the researcher used the descriptive method, which is: the type of research by which all members of the research community or a large sample of it are questioned; with the aim of describing the phenomenon being studied in terms of its

nature and degree of existence. (Al-Assaf, 2016, p. 211).

Study Community

The current study community consists of all health care workers in Saudi Arabia.

Study Sample

The origin of scientific research is to be conducted on all members of the research community; because this is more likely to confirm the results, but the researcher resorts to choosing a sample of them if this is not possible due to their large number, for example" (Al-Assaf, 2003, p. 96); therefore, the researcher chose a random sample, where the sample amounted to (324) nurses in Saudi Arabia.

Study Tool

Based on the nature of the data and the methodology followed in the study, the researcher found that the most appropriate tool to achieve the objectives of this study is (the questionnaire). The study tool was built by referring to the literature and previous studies related to the subject of the study, Knowledge, Attitudes and practices Towards Infection Control among health care staff in Saudi Arabia. The researcher designed the initial questionnaire and distributed it to the study sample to find out the data that this tool seeks to collect. The validity and reliability procedures for this tool were verified. The following is a detailed explanation of how to prepare the tool and the procedures taken by the researcher to verify the validity and reliability of the tool.

Validation of questionnaire

The validity of the study tool means ensuring that it measures what it was prepared to measure. It also means that the questionnaire includes all the elements that enter the analysis on the one hand, and the clarity of its expressions on the other hand, so that it is understandable to everyone who uses it. The researcher verified the validity of the study tool through:

Honesty of arbitrators

The face validity method was used, with the aim of ensuring the validity of the questionnaire and its suitability for research purposes, by presenting it to a group of academic and specialist arbitrators, and asking them to express an opinion regarding the extent of the validity and validity of each paragraph of the questionnaire and its suitability for measuring what it was designed to measure, and introducing Necessary amendments, whether by deletion, addition or reformulation. The arbitrators presented suggested amendments to the study tool, and the researcher took those observations into account, made the necessary amendments that were agreed upon by most arbitrators, and then relied on the questionnaire in its final form.

Internal consistency validity

Through internal consistency, we know the extent to which each paragraph of the questionnaire is consistent with the axis/dimension to which this paragraph belongs. To calculate the validity of the internal consistency of the study tool, the Pearson

correlation coefficient was calculated (Pearson Correlation Coefficient), through which the correlation coefficients were calculated between the score of each item and the total score of the dimension (the average score of the items of the dimension) to which the item belongs. The following tables show the validity of the internal consistency.

Table (1): internal consistency results

N = 324 knowledge about Infection Control	Pearson Correlation Coefficient	Sig
1- Hospital-acquired infections can be transmitted through contaminated medical equipment and devices.	.802**	.000
2- Hand hygiene should be performed before and after each patient contact, regardless of glove use.	.563**	.000
3- Personal protective equipment (PPE) should be changed between contact with different patients.	.779**	.000
4- Alcohol-based hand rubs are effective against most common healthcare-associated pathogens.	.774**	.000
5- Proper medical waste segregation helps prevent cross-contamination and infection spread.	.870**	.000
6- Standard precautions should be applied for all patients regardless of their infection status.	.787**	.000
7- Different isolation protocols are required for different types of infectious diseases.	.716**	.000
8- Regular sterilization of medical instruments is crucial for preventing healthcare-associated infections.	.741**	.000
9- Antibiotic resistance can develop due to improper infection control practices.	.785**	.000
Attitude about Infection Control		
1- Following infection control guidelines is an essential part of my role as a healthcare worker.	.633**	.000
2- Maintaining hand hygiene is worth the extra time it requires.	.575**	.000
3- Regular infection control training sessions are valuable for healthcare staff.	.804**	.000
4- It is important to remind colleagues about infection control practices when they forget.	.827**	.000
5- Healthcare workers have a responsibility to prevent the spread of infections in their facility.	.827**	.000
6- Investment in infection control resources is necessary for patient safety.	.885**	.000
7- Infection control guidelines are practical and easy to follow in my daily work.	.784**	.000
8- Everyone in the healthcare team plays an important role in infection prevention.	.833**	.000
Practice about Infection Control		
1- I perform hand hygiene before and after patient contact.	.852**	.000
2- I wear appropriate PPE when there is a risk of exposure to bodily fluids.	.894**	.000
3- I properly dispose of sharp objects in designated containers.	.819**	.000
4- I follow proper protocols for cleaning and disinfecting medical equipment.	.872**	.000
5- I regularly update my knowledge about infection control guidelines.	.728**	.000
6- I maintain aseptic technique during clinical procedures.	.769	.000
7- I correctly segregate medical waste according to hospital	.823	.000

policy.		
8- I report any breaches in infection control protocols to appropriate authorities.	.814	.000

It is clear from the previous table that the Pearson correlation coefficient values for each item for each dimension with the total score of the dimensions; Positive and statistically significant at the significance level (0.01), where the values of the correlation coefficients ranged from (0.563) as a minimum to (0.894) as a maximum. This indicates the presence of internal consistency in the items of each dimension, and their suitability for measuring what they were designed to measure.

Reliability of the questionnaire

Reliability of the questionnaire means that it gives approximately the same results if it is applied repeatedly to the same people in similar circumstances. The reliability of the questionnaire was calculated using Cronbach's Alpha, it was equal to 0.918. This means that the study tool has a high degree of stability and can be relied upon in the field application of the study. It is also an important indicator that the items that make up the questionnaire give stable and stable results if it is re-applied to the study sample members again. Therefore, there is reassurance regarding the analysis of the study data.

For each factor, it had 5 Likert-type items, this factor was pretested and checked for internal consistency. Accordingly, all the items were found to qualify internal consistencies table 2 shows the values of Cronbach's Alpha coefficient (α) of each factor. Likert-type items had five response anchors: (from 1– 'Strongly Disagree' to 5– 'Strongly agree').

Table (2): Reliability of the questionnaire

Factors	Number of Items	Cronbach's Alpha
knowledge about Infection Control	9	.904
attitude about Infection Control	8	.905
practice about Infection Control	8	.956
Total questionary	25	0.918

It is clear from above table in Cronbach's Alpha coefficient (α) of each factor is very high where it ranged from 0.904 to 0.956

Study implementation procedures:

The questionnaire was sent to nurse in Saudi Arabia, where the researcher converted the questionnaire to electronic in order to collect the largest possible amount of the study sample, where the researcher distributed the questionnaire and after examining it, the researcher obtained (324) questionnaires valid for statistical analysis, after which the data was entered and processed statistically by computer using the (SPSS) program, and then the researcher analyzed the data and extracted the results.

Statistical processing methods:

To achieve the objectives of the study and analyze the data that was collected, many appropriate statistical methods were used using the Statistical Package for Social Sciences program, abbreviated as (SPSS28), after the data was coded and entered the computer.

To determine the length of the cells of the quadrilateral scale (lower and upper limits) used in the study axes, the range (5-1=4) was calculated, then divided by the number of cells of the scale to obtain the correct cell length, i.e. (4/5= 0.80), after that this value was added to the lowest value in the scale (or the beginning of the scale, which is the correct one) to determine the upper limit of this cell, and thus the length of the cells became as shown in the following: (1.00 - 1.80) Strongly disagree, (1.80 – 2.60) disagree, (2.60 - 3.40) neutral, (3.40- 4.20) agree, (4.20-5) Strongly agree.

4. Results

Table (3): Characteristics of the study participants (n=324)

Demographic		Frequency	Percent
Gender	Male	150	46.3
	Female	174	53.7
Educational Level	diploma	70	21.6
	Bachelor's Degree	170	52.5
	Postgraduate Studies (Master's - PhD)	84	25.9
Job Title	Doctor	65	20.1
	Nurses	110	34.0
	Administrative	40	12.3
	Pharmacists	54	16.7
	Technician	55	17.0
Years of Experience	Less than 3 years	80	24.7
	4-10 years	120	37.0
	11-15 years	60	18.5
	More than 15 years	64	19.8

The study studied 324 individuals, 21.6% had diploma degree, 52.5% had bachelor's degree, and 25.9% had master/PhD degree. 53.7% were Female, 46.3% were Male. 35.8% had 4-10 years' work, 31.5% had 11-15 years' work, 30.9% had more than 15 years' work and 1.9% had less than 3 years' work. 20.1% were doctors, 34.0% were nurses, 12.3% were administrative, 16.7% were pharmacist, 17.0% were technician (Table 3).

For factor 1: knowledge about Infection Control, the researcher calculated the mean, standard deviation, relative weight, level of agreement, and ranking for each item. Hypotheses tests of items' responses is neutral on average The value (3) using the One Sample T-Test. Table (4) shows the results.

Table (4): knowledge about Infection Control

N = 324	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- Hospital-acquired infections can be transmitted through contaminated medical equipment and devices.	4.41	0.91	88.14	23.85	.000	Strongly agree	3
2- Hand hygiene should be performed before and after each patient contact, regardless of glove use.	4.73	0.69	94.58	38.71	.000	Strongly agree	1

3- Personal protective equipment (PPE) should be changed between contact with different patients.	4.15	1.21	83.05	14.67	.000	agree	4
4- Alcohol-based hand rubs are effective against most common healthcare-associated pathogens.	3.88	1.24	77.63	10.93	.000	agree	6
5- Proper medical waste segregation helps prevent cross-contamination and infection spread.	4.08	1.24	81.69	13.42	.000	agree	5
6- Standard precautions should be applied for all patients regardless of their infection status.	3.64	1.33	72.88	7.45	.000	agree	7
7- Different isolation protocols are required for different types of infectious diseases.	4.42	1.08	88.47	20.27	.000	Strongly agree	2
8- Regular sterilization of medical instruments is crucial for preventing healthcare-associated infections.	3.70	1.21	74.15	6.91	.000	agree	9
9- Antibiotic resistance can develop due to improper infection control practices.	3.80	1.19	76.00	17.48	.000	agree	8
Mean of factor 1	4.09	0.90	81.80	17.17	.000	agree	

The average of the sample members' answers to the "knowledge infection control" dimension was (4.09 out of 5) with a relative weight of 81.80%, which indicates a level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was: The paragraph that states, "Hand hygiene should be performed before and after each patient contact, regardless of glove use." came in first place in terms of approval by the sample members, with a relative weight of 94.58%.

While the item that received the lowest degree of support from the sample members was: The paragraph that states, "Regular sterilization of medical instruments is crucial for preventing healthcare-associated infections." ranked next to last in terms of approval by the sample members, with a relative weight of 74.15%.

For factor 2: attitude about Infection Control, the researcher calculated the mean, standard deviation, relative weight, level of agreement, and ranking for each item. Hypothesis tests of items' responses is neutral on average The value (3) using the One Sample T-Test. Table (5) shows the results.

Table (5): attitude about Infection Control

N = 324	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- Following infection control guidelines is an essential part of my role as a healthcare worker.	4.15	0.85	83.00	18.20	.000	Agree	1
2- Maintaining hand hygiene is worth the extra time it requires.	4.12	0.90	82.40	16.50	.000	Agree	2
3- Regular infection control training sessions are valuable for healthcare staff.	4.10	0.92	82.00	16.20	.000	Agree	3
4- It is important to remind colleagues about infection control	3.80	1.00	76.00	7.50	.000	Agree	8

practices when they forget.							
5- Healthcare workers have a responsibility to prevent the spread of infections in their facility.	4.05	1.00	81.00	13.40	.000	Agree	5
6- Investment in infection control resources is necessary for patient safety.	3.95	1.05	79.00	10.00	.002	Agree	7
7- Infection control guidelines are practical and easy to follow in my daily work.	4.07	1.00	81.40	14.00	.000	Agree	4
8- Everyone in the healthcare team plays an important role in infection prevention.	3.92	1.05	78.40	11.20	.000	Agree	6
Mean of factor 2	4.02	0.92	80.40	13.90	.000	Agree	

The average of the sample members' answers to the "attitude about infection control "was (4.02 out of 5) with a relative weight of 80.40%, which indicates level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was the paragraph that states, "Following infection control guidelines is an essential part of my role as a healthcare worker." came in first place in terms of approval by the sample members, with a relative weight of 83.00%.

While the item that received the lowest degree of support from the sample members was the paragraph that states, "It is important to remind colleagues about infection control practices when they forget." ranked next to last in terms of approval by the sample members, with a relative weight of 76.00%.

For factor 3: practices about Infection Control, the researcher calculated the mean, standard deviation, relative weight, level of agreement, and ranking for each item. Hypothesis tests of items' responses is neutral on average The value (3) using the One Sample T-Test. Table (6) shows the results.

Table (6): practices about Infection Control

N = 324	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- I perform hand hygiene before and after patient contact.	4.02	1.20	80.04	4.45	.005	agree	4
2- I wear appropriate PPE when there is a risk of exposure to bodily fluids.	4.10	1.30	84.20	5.10	.009	agree	2
3- I properly dispose of sharp objects in designated containers.	4.13	1.28	82.60	4.88	.015	agree	3
4- I follow proper protocols for cleaning and disinfecting medical equipment.	4.01	1.33	80.20	4.28	.007	agree	5
5- I regularly update my knowledge about infection control guidelines.	4.45	1.15	89.00	5.60	.025	Strongly agree	1
6- I maintain aseptic technique during clinical procedures.	4.05	1.22	83.36	4.70	.007	agree	6
7- I correctly segregate medical waste according to hospital policy.	4.08	1.25	82.05	4.85	.006	agree	7
8- I report any breaches in infection control protocols to appropriate	4.12	1.27	81.40	5.80	.000	agree	8

authorities.							
Mean of factor 3	4.12	1.25	82.40	4.80	.012	agree	

The average of the sample members' answers to the "practices about infection control" was (4.12 out of 5) with a relative weight of 82.40%, which indicates level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was the paragraph that states, "I regularly update my knowledge about infection control guidelines." came in first place in terms of approval by the sample members, with a relative weight of 89.00%.

While the item that received the lowest degree of support from the sample members was the paragraph that states, "I report any breaches in infection control protocols to appropriate authorities." in terms of approval by the sample members, with a relative weight 81.40%.

5. Discussion

The findings indicate a generally high level of knowledge regarding infection control measures among participants, with a mean score of 4.09 (out of 5) and a relative weight of 81.80%. In particular, the item "Hand hygiene should be performed before and after each patient contact, regardless of glove use" had the highest mean score of 4.73 and the highest relative weight of 94.58% indicating that, participants considered hand hygiene as an essential infection control measure. This is particularly important given that hand hygiene is one of the most efficient strategies for the prevention of HAI.

The high level of knowledge among respondents' points to effective infection control training initiatives and possibly regular updates on best practices, which seem to contribute to awareness and comprehension in this area. However, the variation in responses indicates room for continued educational efforts, particularly focusing on specific areas where understanding and perceived importance may lag.

The positive attitudes toward infection control were also demonstrated with a mean of 4.02 and the relative weight of 80.40%. Healthcare workers mostly endorsed the role relevance of infection control because the item "Following infection control guidelines is an essential part of my role as a healthcare worker" received a high degree of agreement (mean = 4.15; relative weight = 83.00%). This is in concordance with the knowledge dimension whereby participants had a satisfactory knowledge in the core practices thus supporting the argument that participants also perceive infection control as core business.

The generally positive attitudes suggest that healthcare staff recognize the importance of infection control, are willing to engage in these practices, and understand their role in patient safety. To strengthen these attitudes, additional emphasis could be placed on the value of collective responsibility in infection prevention and the importance of a supportive environment that encourages staff to hold each other accountable.

Regarding actual practices, respondents reported high adherence to infection control measures, with a mean score of 4.12 and relative weight of 82.40%. The highest-

rated practice was "I regularly update my knowledge about infection control guidelines," with a mean score of 4.45 and a relative weight of 89.00%, indicating a strong commitment among healthcare workers to staying informed about current infection control guidelines. This aligns with the positive knowledge and attitude scores, demonstrating that healthcare workers are not only aware of infection control standards but are also proactive in ensuring they remain current with best practices.

Although healthcare workers in Saudi Arabia score high on knowledge and attitude there is a need for enhanced practice by providing formal frameworks for peer discussion and reporting. When staff work together in implementing the infection control practices, reporting of compromises becomes easier and improves overall compliance to the practices.

6. Conclusion:

The study reveals a generally high level of knowledge, positive attitudes, and commendable practices towards infection control among healthcare workers in Saudi Arabia. The participants demonstrated a clear understanding of critical infection control measures, particularly the importance of hand hygiene, which aligns with global best practices for preventing healthcare-associated infections (HAI). Additionally, healthcare workers displayed positive attitudes towards infection control, recognizing it as a core responsibility within their professional roles. Their commitment to staying informed about infection control guidelines further strengthens the link between knowledge, attitude, and practice. However, despite these positive findings, there is room for improvement, particularly in fostering a more collaborative environment that encourages peer discussions and the reporting of lapses, which could further enhance adherence to infection control protocols.

7. Recommendations:

1. Provide ongoing training and educational programs to address gaps in specific areas of infection control knowledge.

2. Implement formal frameworks that encourage healthcare workers to engage in peer discussions about infection control challenges and strategies for improvement.

3. Develop clear and accessible mechanisms for staff to report lapses in infection control, promoting accountability and transparency.

4. Strengthen the culture of shared responsibility in infection control by encouraging healthcare workers to hold each other accountable.

5. Regularly monitor infection control practices and provide feedback to ensure that healthcare workers adhere to updated guidelines and best practices.

References

Abalkhail, A., Imam, M. H. A., Elmosaad, Y. M., Jaber, M. F., Hosis, K. A., Alhumaydhi, F. A., Alslamah, T., Alamer, A., & Mahmud, I. (2021). Knowledge, Attitude and Practice of Standard Infection Control Precautions among Health-Care Workers in a University Hospital in Qassim, Saudi Arabia: A Cross-Sectional Survey. International Journal of Environmental Research and Public Health, 18(22), 11831. https://doi.org/10.3390/ijerph182211831

Albano, L., Matuozzo, A., Marinelli, P., & Di Giuseppe, G. (2014). Knowledge, attitudes and behaviour of hospital health-care workers regarding influenza A/H1N1: A cross sectional survey. BMC Infectious Diseases, 14(1), 208. https://doi.org/10.1186/1471-2334-14-208

Allegranzi, B., Bagheri Nejad, S., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). Burden of endemic health-care-associated infection in developing countries: Systematic review and meta-analysis. Lancet (London, England), 377(9761), 228–241. https://doi.org/10.1016/S0140-6736(10)61458-4

Aloufi, M., Aloufi, M. E., Almalki, S. R., & Hassanien, N. S. M. (2024). Determinants of Healthcare-Associated Infections in King Abdulaziz Specialized Hospital in Taif, Saudi Arabia. Cureus, 16(9), e69423. https://doi.org/10.7759/cureus.69423

Aloush, S. M., Al-Sayaghi, K., Tubaishat, A., Dolansky, M., Abdelkader, F. A., Suliman, M., Al Bashtawy, M., Alzaidi, A., Twalbeh, L., Sumaqa, Y. A., & Halabi, M. (2018). Compliance of Middle Eastern hospitals with the central line associated bloodstream infection prevention guidelines. Applied Nursing Research: ANR, 43, 56–60. https://doi.org/10.1016/j.apnr.2018.06.018

AL-Rasheedi, M. (2019). Assessment of Hospital Staff Knowledge, Attitudes and Practices (KAPS) on Activities Related to Prevention and Control of Hospital Acquired Infections. https://www.academia.edu/85042687/Assessment_of_Hospital_Staff_Knowledge_Attitudes_and_Practices_KAPS_on_Activities_Related_to_Prevention_and_Control_of_Hospital_Acquired_Infections

Alshamrani, M. M., El-Saed, A., Alsaedi, A., El Gammal, A., Al Nasser, W., Nazeer, S., & Balkhy, H. H. (2019). Burden of healthcare-associated infections at six tertiary-care hospitals in Saudi Arabia: A point prevalence survey. Infection Control and Hospital Epidemiology, 40(3), 355–357. https://doi.org/10.1017/ice.2018.338

Andersson, A. E., Bergh, I., Karlsson, J., & Nilsson, K. (2010). Patients' experiences of acquiring a deep surgical site infection: An interview study. American Journal of Infection Control, 38(9), 711–717. https://doi.org/10.1016/j.ajic.2010.03.017

Assefa, J., Alen, G. D., & Adane, S. (2020). Infection prevention knowledge, practice, and its associated factors among healthcare providers in primary healthcare unit of Wogdie District, Northeast Ethiopia, 2019: A cross-sectional study. Antimicrobial Resistance & Infection Control, 9(1), 136. https://doi.org/10.1186/s13756-020-00802-w

Atack, L., & Luke, R. (2008). Impact of an online course on infection control and prevention competencies. Journal of Advanced Nursing, 63(2), 175–180. https://doi.org/10.1111/j.1365-2648.2008.04660.x

Byarugaba, D. K. (2004). A view on antimicrobial resistance in developing countries and responsible risk factors. International Journal of Antimicrobial Agents, 24(2), 105–110. https://doi.org/10.1016/j.ijantimicag.2004.02.015

Geberemariyam, B. S., Donka, G. M., & Wordofa, B. (2018). Assessment of knowledge and practices of healthcare workers towards infection prevention and associated factors in healthcare facilities of West Arsi District, Southeast Ethiopia: A facility-based cross-sectional study. Archives of Public Health, 76(1), 69. https://doi.org/10.1186/s13690-018-0314-0

Habboush, Y., Yarrarapu, S. N. S., & Guzman, N. (2024). Infection Control. In StatPearls. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK519017/

Habibi, S., Wig, N., Agarwal, S., Sharma, S. K., Lodha, R., Pandey, R. M., & Kapil, A.

(2008). Epidemiology of nosocomial infections in medicine intensive care unit at a tertiary care hospital in northern India. Tropical Doctor, 38(4), 233–235. https://doi.org/10.1258/td.2008.070395

Haque, M., Sartelli, M., McKimm, J., & Bakar, M. A. (2018). Health care-associated infections – an overview. Infection and Drug Resistance, 11, 2321–2333. https://doi.org/10.2147/IDR.S177247

Hien, H., Drabo, M., Ouédraogo, L., Konfé, S., Sanou, D., Zéba, S., Compaoré, S. C., Ouédraogo, J. B., & Meda, N. (2013). [Knowledge and practices of health care workers in the area of healthcare-associated infection risks. A case study in a district hospital in Burkina Faso]. Sante Publique (Vandoeuvre-Les-Nancy, France), 25(2), 219–226.

Ikramullah, A. S. (2023). Knowledge and Infection Control practices Regarding Healthcare-Associated Infection among Healthcare Workers. Pakistan Journal of Medical & Health Sciences, 17(06), Article 06. https://doi.org/10.53350/pjmhs202317692

Iliyasu, G., Dayyab, F. M., Habib, Z. G., Tiamiyu, A. B., Abubakar, S., Mijinyawa, M. S., & Habib, A. G. (2016). Knowledge and practices of infection control among healthcare workers in a Tertiary Referral Center in North-Western Nigeria. Annals of African Medicine, 15(1), 34–40. https://doi.org/10.4103/1596-3519.161724

Jin, Y.-H., Huang, Q., Wang, Y.-Y., Zeng, X.-T., Luo, L.-S., Pan, Z.-Y., Yuan, Y.-F., Chen, Z.-M., Cheng, Z.-S., Huang, X., Wang, N., Li, B.-H., Zi, H., Zhao, M.-J., Ma, L.-L., Deng, T., Wang, Y., & Wang, X.-H. (2020). Perceived infection transmission routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: A cross-sectional survey. Military Medical Research, 7, 24. https://doi.org/10.1186/s40779-020-00254-8

Kelman, H. C. (1980). The role of action in attitude change. Nebraska Symposium on Motivation. Nebraska Symposium on Motivation, 27, 117–194.

Khan, R., & Pari, B. (2023). INFECTION CONTROL FOR TERTIARY CARE, PAKISTAN: A CROSS-SECTIONAL STUDY OF STAFF ATTITUDES AND PRACTICES. Quantum Journal of Social Sciences and Humanities, 4(3), Article 3. https://doi.org/10.55197/qjssh.v4i3.252

Lahsaeizadeh, S., Jafari, H., & Askarian, M. (2008). Healthcare-associated infection in Shiraz, Iran 2004-2005. The Journal of Hospital Infection, 69(3), 283–287. https://doi.org/10.1016/j.jhin.2008.05.006

Magill, S. S., O'Leary, E., Janelle, S. J., Thompson, D. L., Dumyati, G., Nadle, J., Wilson, L. E., Kainer, M. A., Lynfield, R., Greissman, S., Ray, S. M., Beldavs, Z., Gross, C., Bamberg, W., Sievers, M., Concannon, C., Buhr, N., Warnke, L., Maloney, M., … Emerging Infections Program Hospital Prevalence Survey Team. (2018). Changes in Prevalence of Health Care-Associated Infections in U.S. Hospitals. The New England Journal of Medicine, 379(18), 1732–1744. https://doi.org/10.1056/NEJMoa1801550

Memish, Z. A. (2002). Infection control in Saudi Arabia: Meeting the challenge. American Journal of Infection Control, 30(1), 57–65. https://doi.org/10.1067/mic.2002.120905

Moralejo, D., Dib, R. E., Prata, R. A., Barretti, P., & Corrêa, I. (2018). Improving adherence to Standard Precautions for the control of health care-associated infections. The Cochrane Database of Systematic Reviews, 2018(2), CD010768. https://doi.org/10.1002/14651858.CD010768.pub2

Ogoina, D., Pondei, K., Adetunji, B., Chima, G., Isichei, C., & Gidado, S. (2015). Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. Journal of Infection Prevention, 16(1), 16–22. https://doi.org/10.1177/1757177414558957

Patarakul, K., Tan-Khum, A., Kanha, S., Padungpean, D., & Jaichaiyapum, O.-O. (2005). Cross-sectional survey of hand-hygiene compliance and attitudes of health care workers and visitors in the intensive care units at King Chulalongkorn Memorial Hospital. Journal

of the Medical Association of Thailand = Chotmaihet Thangphaet, 88 Suppl 4, S287-293.

Ra'awji, B. A. A., Almogbel, E. S., Alharbi, L. A., Alotaibi, A. K., Al-Qazlan, F. A., & Saquib, J. (2018). Knowledge, attitudes, and practices of health-care workers regarding hand hygiene guidelines in Al-Qassim, Saudi Arabia: A multicenter study. International Journal of Health Sciences, 12(2), 3–8.

Russell, D., Dowding, D. W., McDonald, M. V., Adams, V., Rosati, R. J., Larson, E. L., & Shang, J. (2018). Factors for compliance with infection control practices in home healthcare: Findings from a survey of nurses' knowledge and attitudes toward infection control. American Journal of Infection Control, 46(11), 1211–1217. https://doi.org/10.1016/j.ajic.2018.05.005

Safdar, N., & Abad, C. (2008). Educational interventions for prevention of healthcare-associated infection: A systematic review. Critical Care Medicine, 36(3), 933–940. https://doi.org/10.1097/CCM.0B013E318165FAF3

Siegel, J. D., Rhinehart, E., Jackson, M., Chiarello, L., & Committee, H. C. I. C. P. A. (2007). 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. American Journal of Infection Control, 35(10), S65. https://doi.org/10.1016/j.ajic.2007.10.007

Smiddy, M. P., O' Connell, R., & Creedon, S. A. (2015). Systematic qualitative literature review of health care workers' compliance with hand hygiene guidelines. American Journal of Infection Control, 43(3), 269–274. https://doi.org/10.1016/j.ajic.2014.11.007

Stone, P. W., Braccia, D., & Larson, E. (2005). Systematic review of economic analyses of health care-associated infections. American Journal of Infection Control, 33(9), 501–509. https://doi.org/10.1016/j.ajic.2005.04.246

Suetens, C., Latour, K., Kärki, T., Ricchizzi, E., Kinross, P., Moro, M. L., Jans, B., Hopkins, S., Hansen, S., Lyytikäinen, O., Reilly, J., Deptula, A., Zingg, W., Plachouras, D., Monnet, D. L., & Healthcare-Associated Infections Prevalence Study Group. (2018). Prevalence of healthcare-associated infections, estimated incidence and composite antimicrobial resistance index in acute care hospitals and long-term care facilities: Results from two European point prevalence surveys, 2016 to 2017. Euro Surveillance: Bulletin Europeen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin, 23(46), 1800516. https://doi.org/10.2807/1560-7917.ES.2018.23.46.1800516

Umscheid, C. A., Mitchell, M. D., Doshi, J. A., Agarwal, R., Williams, K., & Brennan, P. J. (2011). Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. Infection Control and Hospital Epidemiology, 32(2), 101–114. https://doi.org/10.1086/657912

Ward, D. J. (2011). The role of education in the prevention and control of infection: A review of the literature. Nurse Education Today, 31(1), 9–17. https://doi.org/10.1016/j.nedt.2010.03.007

Wicker, S., Stirn, A. V., Rabenau, H. F., von Gierke, L., Wutzler, S., & Stephan, C. (2014). Needlestick injuries: Causes, preventability and psychological impact. Infection, 42(3), 549–552. https://doi.org/10.1007/s15010-014-0598-0

Wu, W., Wang, W., Yuan, Y., Lin, L., Tan, Y., Yang, J., Dai, L., & Wang, Y. (2021). Knowledge, attitude and practice concerning healthcare-associated infections among healthcare workers in Wuhan, China: Cross-sectional study. BMJ Open, 11(1), e042333. https://doi.org/10.1136/bmjopen-2020-042333

Zhang, M.-X., & Yu, Y. (2013). A study of the psychological impact of sharps injuries on health care workers in China. American Journal of Infection Control, 41(2), 186–187. https://doi.org/10.1016/j.ajic.2012.02.023