Knowledge, Attitudes, and Practice of Hand Hygiene among HCWs at KSAMC in Madinah City, Saudi Arabia

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Abstract

Maintaining great hand hygiene is the most efficient and straightforward way to reduce the likelihood of hospital-associated illnesses; nonetheless, improving hand hygiene is a crucial intervention to achieve one of the patient safety goals in a healthcare context. At King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah City, the study aims to examine the knowledge, attitudes, and practises of healthcare professionals (HCWs) on hand hygiene procedures. The study was conducted at King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah, a tertiary care hospital with over 1200 beds. All data items were entered in the Statistical Package for Social Sciences (IBM SPSS-ver22). Descriptive statistics (percent and number) and a p-value <0.05.

The study included 604 participants, 65.9% of them were females and 34.1% were males. 62.7% of the studied sample aged between 20- 30 years old. 63.4% of participants had good knowledge of hand hygiene, 32.5% had moderate knowledge and 4.1% had poor knowledge. Regarding attitude, 59.8% of participants had a positive attitude toward hand hygiene, 39.1% had a neutral attitude and 1.2% had a negative attitude. As for practice, only 7.5% of participants had good practice scores, 82.9% had neutral practice and 9.6% had poor practice. A significant association was found between knowledge, attitude, and practice scores with participants' age, job title, and years of experience (P <0.05). Saudi healthcare workers exhibited moderate knowledge and attitude toward hand hygiene.

Keywords: Hand hygiene, Knowledge, Attitudes, Practices, Health care worker

INTRODUCTION

Ignac Semmelweis, known as the "Father of Hand Hygiene," created hand hygiene for the first time in Europe in the nineteenth century to stop healthcare-associated infections (HAIs) [1]. Hand hygiene is a broad term that refers to washing hands with ordinary or antimicrobial soap and water or utilising alcohol-based hand rubs to get rid of dirt and other unwanted substances that have become attached to the hands as well as viruses, bacteria, and other microbes [2].

The World Health Organisation recommends doing hand hygiene five times during patient care: prior to contact with a patient, before administering an aseptic therapy, following contact with a patient, following contact with body fluids, and following contact with a patient's surroundings [2]. Since the implementation of the "5 Moments" programme, the compliance rate in some nations, including Saudi Arabia, has grown from 51% to 67% [3].

The most effective and easiest strategy to reduce the occurrence of healthcare-associated infections is to practise proper hand hygiene. Improving hand hygiene, on the other hand, is a critical intervention for achieving one of the patient safety goals in a healthcare setting. A very important issue when it comes to patients' health and safety is nosocomial

infections also known as hospital-acquired infections (HAIs) [4]. Nosocomial infection occurs when the infection is not manifested at the time of admission to the hospital but develops after 48 hours of hospitalization [5].

According to estimates, the prevalence of HAI in the United States is between 1.7 and 23.6 per 100 admitted patients, costing hospitals between 28.4 and 33.8 billion dollars annually in direct hospital expenses and causing around 80,000 fatalities [5].

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Nosocomial infections affect 5-10% of hospitalised patients in wealthy nations, but 20% of patients in impoverished countries [3]. HAIs are a huge illness burden that has a considerable cost impact on people and healthcare systems globally. Monitoring and preventing such infections should be a top priority of each hospital and every health care system [3].

In high-income countries, hand hygiene compliance rarely exceeds 70%, while in low-income countries, only around 9% of hand hygiene practices are followed when caring for critically ill patients, indicating that improvements are needed everywhere [6].

Hand hygiene compliance is estimated to be 40% and is lower in intensive care units compared to the other settings. Most nurses have better compliance compared to physicians. When compared to after handling a patient, less hand hygiene is performed beforehand. Workplace factors such as a heavy workload, the lack of alcohol-based hand rubs or sinks at the point of care, and a lack of organisational support all have an impact on how well people practise hand hygiene [7].

Many previous studies have reported several barriers to appropriate hand hygiene, there are many reasons healthcare workers fail to adhere to hand hygiene best practices. Among them are skin rashes, difficult access to supplies, disruptions in worker-patient relationships, the need to prioritise patients, forgetfulness, disregard for policies, a lack of time, a heavy workload, a lack of staff, and a dearth of data demonstrating the effect of better hand hygiene on hospital infection rates [7].

As stated by Wisniewski *et al.* the main reason why healthcare personnel don't comply with hand hygiene regulations, in addition to the obstacles previously discussed, is that they are unaware of the need for hand washing. Practises for hand hygiene among healthcare workers are significantly influenced by their level of knowledge, attitude, practise, and compliance. A cross-sectional study revealed that there are gaps in knowledge among healthcare workers in Saudi Arabia [3]. In the healthcare sector, healthcare providers are mostly responsible for spreading germs if they do not wash their hands properly. Especially Nurses and physicians have the greatest physical contact with patients; therefore, they are the primary vectors of transmission within hospitals [8].

HCWs regularly come into contact with sick patients and contaminated surfaces because they are on the front lines of the COVID-19 outbreak. During this crisis, hand hygiene has gotten a lot of attention, not just because it is important but also because healthcare workers are worried about their exposure. HCWs are also worried about bringing the virus back into their homes, where they have elderly family members and babies who are more susceptible to the illness. Hospitals had trouble with hand hygiene before the COVID-19 pandemic. According to research, in March and April 2020, during the COVID-19 crisis, the demand for and use of hand sanitizers among healthcare workers soared by four times. Infection preventionists' routine hand hygiene audits and covert observations made by undercover shoppers both revealed greater than 90% compliance with hand hygiene practises at the same time [9].

Due to a lack of observation and research in developing nations, the causes of low hand hygiene levels among healthcare workers have not yet been determined. In order to increase hand hygiene compliance and enhance patient quality of care by lowering hospital-acquired infections, the goal of this study is to evaluate the level of knowledge, attitudes, and practise of hand hygiene among HCWs (doctors and nurses) at King Salman Bin Abdul-Aziz Medical City (KSAMC) in Madinah City.

Research Question

- a. What are the levels of knowledge regarding hand hygiene among HCWs (physicians and nurses) at King Salman Bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA?
- b. What are the levels of attitudes regarding hand hygiene among HCWs (physicians and nurses) at King Salman Bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA?
- c. What are the levels of practices regarding hand hygiene among HCWs (physicians and nurses) in King Salman Bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA?

Hypothesis of Study

Null

There is no statistically significant association between healthcare workers' Knowledge, Attitudes, and Practices with hand hygiene compliance

Alternate Hypothesis

There is a statistically significant association between healthcare workers' Knowledge, Attitudes, and Practices with hand hygiene compliance.

Aim of Study

To assess the knowledge, attitudes, and practices of HCWs (physicians and nurses) on hand hygiene measures in KSAMC in Madinah City.

Objective of Study

- To assess the knowledge of hand hygiene among HCWs (physicians and nurses) in King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA.
- To assess the attitudes of HCWs (physicians and nurses) in King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA towards hand hygiene
- To assess the practices of hand hygiene among HCWs (physicians and nurses) in King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah City in KSA.

MATERIALS AND METHODS

Study Design

A descriptive, cross-sectional design was used to carry out this investigation. Using self-reported surveys, KSAMC in Madinah City HCWs (doctors and nurses) were asked about their knowledge, attitudes, and hand hygiene practises.

Study Setting

The study was conducted at King Salman bin Abdul-Aziz Medical City (KSAMC) in Madinah, a tertiary care hospital with over 1200 beds. In the medical city, there are three dedicated services: general health care, maternity and pediatric health care, and mental health care.

Study Population

In this study, the sample will only include physicians and nurses who provide direct patient care.

Sample Size

To choose the participants, a convenience sampling method was used. 1955 nurses and 550 doctors make up the whole staff of the KSAMC. To determine the sample size with a 95% confidence level, a response distribution of 50%, and a margin of error of 5% Using Raosoft Software's sample size calculator ("Sample Size Calculator by Raosoft, Inc.," 2019), the target sample size for doctors is 227 and for nurses is 322, based on the proportion of doctors and nurses in the population.

Inclusion Criteria

All physicians and nurses who provide direct contact with patients.

Exclusion Criteria

Physicians and nurses who do not provide direct contact with patients for example work in administrative positions.

Physicians and nurses who are on vacation at the time of study.

Other HCWs like lab technicians, radiologists, pharmacists, and IT.

Data Collection

Self-reported questionnaires were sent to physicians and nurses included in this study according to the inclusion criteria. The data was collected through an electronic survey created by Google Forms. The study questionnaire will upload to Google Forms once ethical approvals have been received. A questionnaire link was sent from the medical director and nursing education department to physicians and nurse managers, to be distributed to physicians and nurses to send their responses within the survey period. The questionnaire was distributed among physicians and nurses working at KSAMC, from November to February 2023. All collected data was securely stored and deidentified, with access only made available to the principal investigator.

Study Instrument

In this study, we used Self –reported questionnaires adopted from a previous Publication by Gupta (2020), with written permission from the author through personal communication via email. This questionnaire tool was designed to assess physicians' and nurses' knowledge, attitudes, and practices about hand hygiene. The questionnaire consists of four sections: demographics (7 questions), knowledge (8 questions), attitudes (11 questions), and practice (19 questions) with a total of 45 questions.

The Scoring System

The survey instrument for hand hygiene contained three scales: knowledge, attitude, and practise. The survey contained a demographic component to gather data on the respondents' age, gender, job title, years of experience, department of employment, and whether or not they had formal hand hygiene training. More than 75% were deemed good, 50-74% were deemed moderate, and less than 50% were deemed low.

Hand Hygiene Knowledge Scale

A scoring system was used, with one point given for each accurate response about knowledge and a score of 0 for each incorrect response, for the first scale, hand hygiene knowledge, which was examined using eight questions, comprising multiple choice and "yes" or "no" questions on general hygiene knowledge.

Hand Hygiene Attitude Scale

Attitudes were examined using 11 questions in which respondents were asked to choose between strongly agreeing and strongly disagreeing on a 1-to-5 scale. The score was calculated by aggregating the summed-up items; the higher the score, the better the attitudes towards hand cleanliness.

Hand Hygiene Practices Scale

A total of 19 questions with four response options—very low, low, high, or very high—were used to evaluate respondents' self-reported hand hygiene practises. For all questions, the "very high" response received three points, "high" received two points, "low" received one point, and "very low" received none.

Data Analysis

The questionnaires were reviewed for accuracy and completeness after they have been returned. For easy analysis, the questions were coded. Then, all data items were entered in the Statistical Package for Social Sciences (IBM SPSS-ver22). Descriptive statistics (percent and number) and a p-value <0.05.

Ethical Consideration

Ethical approval was obtained from physicians, nurses, and Al-Faisal University. Ethical approval from the Ministry of health hospitals was obtained. After approval from hospitals, we will obtain it. The nurses and physicians will declare that participation is voluntary. Participant names will not be written on the questionnaire. Also, confidentiality and privacy were maintained. Ethical approval and tool approval was obtained.

RESULTS AND DISCUSSION

Among the 604 participants in the study, 65.9% were female and 34.1 percent were male. A total of 26.2% of the sample under study was between the ages of 31 and 40, making up 62.7% of the sample's age range. 39.4% of the group under study were doctors, compared to 60.6% of nurses. Less than one year of experience was held by 28.3% of participants, two years by 12.9%, and more than three years by 41.6% of participants. 60.4% of the studied sample were from Madinah general hospital, 30.1% from Maternity and children hospital, and 9.4% from Al- Amal Hospital. As for the department, 20.5% work in the emergency department, 12.7% in ICU, and 12.6% in the surgery department as in **Table 1**.

| | Parameter | No. | % |
|---|-----------------------------------|-----|------|
| | less than 20 | 18 | 3.0 |
| | 20 - 30 | 379 | 62.7 |
| A co | 31 - 40 | 158 | 26.2 |
| Age | 41 - 50 | 30 | 5.0 |
| | 51 - 60 | 16 | 2.6 |
| | more than 60 | 3 | .5 |
| Gender | Male | 206 | 34.1 |
| | Female | 398 | 65.9 |
| Job title | Nurse | 366 | 60.6 |
| | physician | 238 | 39.4 |
| | less than one year | 171 | 28.3 |
| | one year | 49 | 8.1 |
| Year of experience | two years | 78 | 12.9 |
| | three years | 55 | 9.1 |
| | more than three years | 251 | 41.6 |
| | Al- Amal Hospital | 57 | 9.4 |
| Hospital building work in | Madinah general hospital | 365 | 60.4 |
| | Maternity and Children's Hospital | 182 | 30.1 |
| | Emergency | 124 | 20.5 |
| | ICU | 77 | 12.7 |
| | Labor & Delivery ward | 26 | 4.3 |
| Age Gender Job title Year of experience spital building work in Department | Medical | 122 | 20.2 |
| | NICU | 22 | 3.6 |
| | Ob/GYN | 5 | .8 |
| | OB/GYN | 2 | .3 |
| Department | OPD | 49 | 8.1 |
| | OR | 19 | 3.1 |
| | Orthopedics | 7 | 1.2 |
| | pediatric | 1 | .2 |
| | PICU | 27 | 4.5 |
| | Psychiatric | 16 | 2.6 |
| | Surgical | 76 | 12.6 |
| | - | | |

Urology

5.1

Table 2 shows that 88.9% of individuals had formal training in hand hygiene within the previous three years. 89.7% of people regularly wash their hands with an alcohol-based hand rub. 11.3% of respondents identified hospital air circulation as the primary method of potentially harmful germs spreading between patients in a healthcare facility, while 57% pointed to healthcare workers' dirty hands, 17.5% to patients' contact with colonised surfaces, and 14.2% to sharing non-invasive objects.

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| Table 2. Previous training and knowledge among participants (n=604) | | | | | | |
|---|--|-----|------|--|--|--|
| Parameter | No. | % | | | | |
| Dessived formal training in hand busines in the last three years | Yes | 537 | 88.9 | | | |
| Received for man training in nand nygrene in the fast till ee years | No | 67 | 11.1 | | | |
| Routinely use an alcohol-based hand rub for hand hygiene | Yes | 542 | 89.7 | | | |
| | No | 62 | 10.3 | | | |
| | Air circulating in the hospital | 68 | 11.3 | | | |
| Main route of cross-transmission of potentially harmful germs | Health-care workers' hands when not clean | 344 | 57.0 | | | |
| between patients in a health-care facility | Patients' exposure to colonised surfaces | 106 | 17.5 | | | |
| | Sharing non-invasive objects | 86 | 14.2 | | | |
| | Germs already present on or within the patient | 165 | 27.3 | | | |
| Most frequent source of germs responsible for health care- | The hospital air | 54 | 8.9 | | | |
| associated infections | The hospital environment (surfaces) | 301 | 49.8 | | | |
| | The hospital's water system | 84 | 13.9 | | | |

As shown in **Table 3**, hand hygiene is practised by 90.4% of participants prior to patient contact, 80% immediately following the risk of body fluid exposure, 81.6% immediately following exposure to a patient's immediate surroundings,

84.8% prior to a clean/aseptic procedure, 90.2% following patient contact, 89.7% following the risk of body fluid exposure, 86.3% following patient exposure to immediate surroundings, and 73.5% prior to patient contact.

| Table 3. Knowledge of participants of hand hygiene (n=604) | | | | | | | |
|--|---|--------------|--------------|--|--|--|--|
| | Parameter | Yes | No | | | | |
| | Before touching a patient (Yes) | 546 90.4% | 58 9.6% | | | | |
| Hand hygiene actions prevent transmission of germs to the patient | Immediately after a risk of body fluid exposure (No) | 483 80.0% | 121 20.0% | | | | |
| | After exposure to the immediate surroundings of a patient (No) | 493 81.6% | 111 18.4% | | | | |
| | Immediately before a clean/aseptic procedure (Yes) | 512 84.8% | 92 15.2% | | | | |
| | After touching a patient (Yes) | 545 90.2% | 59 9.8% | | | | |
| Hand hygiene actions prevent | Immediately after a risk of body fluid exposure (Yes) | 542 89.7% | 62 10.3% | | | | |
| worker | After exposure to the immediate surroundings of a patient (Yes) | 521 86.3% | 83 13.7% | | | | |
| | Immediately before a clean/aseptic procedure (No) | 444 73.5% | 160 26.5% | | | | |

According to **Table 4**, the minimum amount of time needed for an alcohol-based hand rub to kill the majority of germs, according to 59.8% of participants, is 20 seconds. According to 64.9% of respondents, rubbing is necessary as a kind of hand hygiene before palpating the abdomen. Before administering an injection, 56.3% of respondents stated that rubbing as a form of hand cleaning approach is essential. After emptying a bedpan, 62.3% of people said they need to wash their hands. After removing examination gloves, 52.5% said that rubbing is required as a form of hand cleansing treatment. A healthcare-associated infection had a high impact on a patient's clinical outcome, according to 52% of participants. Hand hygiene was assessed to be extremely useful in preventing healthcare-associated infection by 45.5% of respondents. 49% of respondents said hand hygiene was extremely important at their workplace.

| Table 4. Knowledge of participan | | | |
|--|---|-----|------|
| | Parameter | No. | % |
| | Hand rubbing is more rapid for hand cleansing than handwashing (T) | 211 | 34.9 |
| Alcohol-based handrub and handwashing | Hand rubbing causes skin dryness more than handwashing (F) | 80 | 13.2 |
| with soap and water are true | Handrubbing is more effective against germs than handwashing (T) | 93 | 15.4 |
| | Handwashing and handrubbing are recommended to be performed in sequence (F) | 220 | 36.4 |
| | 1 minute | 82 | 13.6 |
| Minimal time needed for alcohol-based | 3 seconds | 69 | 11.4 |
| handrub to kill most germs | 10 seconds | 92 | 15.2 |
| | 20 seconds | 361 | 59.8 |
| | None | 89 | 14.7 |
| Fype of hand hygiene method is required before palpation of the abdomen | Rubbing | 392 | 64.9 |
| serere parparent of the appoint | Washing | 123 | 20.4 |
| | None | 35 | 5.8 |
| Type of hand hygiene method is required before giving an injection | Rubbing | 340 | 56.3 |
| before groung an injection | before giving an injection Washing None | | 37.9 |
| | None | 38 | 6.3 |
| Fype of hand hygiene method is required after emptying a bednan | Rubbing | 190 | 31.5 |
| arer emprynig a beapan | Washing | 376 | 62.3 |
| | None | 40 | 6.6 |
| Fype of hand hygiene method is required after removing examination gloves | Rubbing | 317 | 52.5 |
| arter removing examination groves | Washing | 247 | 40.9 |
| | None | 29 | 4.8 |
| Cype of hand hygiene method is required after making a natient's bed | Rubbing | 312 | 51.7 |
| uror manning a parton o sou | Washing | 263 | 43.5 |
| | None | 25 | 4.1 |
| Fype of hand hygiene method is required after visible exposure to blood | Rubbing | 211 | 34.9 |
| | Washing | 368 | 60.9 |
| | 0- 10 | 80 | 13.2 |
| | 11-20 | 47 | 7.8 |
| verage percentage of hospitalized patients | 21- 30 | 49 | 8.1 |
| who develop a health care associated | 31-40 | 30 | 5.0 |
| infection | 41- 50 | 79 | 13.1 |
| | 51-60 | 36 | 6.0 |
| | 61-70 | 55 | 91 |

| 71-806310.481-90978.191-1009716.1Don't know193.1Very low609.9Impact of a health care associated infection on a patient's clinical outcome10820.2Very ligh10817.9Very high10817.9Very low498.1Effectiveness of hand hygiene in preventing health care-associated infection10813.2Very low4945.0Very high19832.8Very high19832.8Importance of hand hygiene at institution19532.3Low important19532.3Low important19532.3Very low important10532.3Low important106.8 | | | | |
|---|---|--------------------|-----|------|
| 81-90498.191-1009716.1Don't know193.1Very low609.9Impact of a health care associated infection on a patient's clinical outcomeHigh31452.0Very high10817.9Very high10813.2Effectiveness of hand hygiene in preventing health care-associated infectionHigh19832.8Very high19832.8Very high19832.8Very high27745.9Importance of hand hygiene at institution19532.3Low important19532.3Low important1232.3Very low important146.8 | | 71-80 | 63 | 10.4 |
| 91-1009716.1Don't know193.1Very low609.9Impact of a health care associated infectionLow12220.2Mapping a patient's clinical outcomeHigh31452.0Very high10817.9Very high10817.9Effectiveness of hand hygiene in preventing health care-associated infectionLow8013.2Very low4948.1Very high19832.8Very high19832.8Very high27745.9Very important29649.0High important19532.3Low important7211.9Very low important7211.9Very low important416.8 | | 81-90 | 49 | 8.1 |
| Don't know193.1Very low609.9Impact of a health care associated infection on a patient's clinical outcomeLow12220.2High31452.0Very high10817.9Very high10813.2Effectiveness of hand hygiene in preventing health care-associated infectionLow8013.2Very high19832.832.8Very high27745.9Very high27645.9Very important29649.0High important19532.3Low important7211.9Very low important416.8 | | 91-100 | 97 | 16.1 |
| Very low609.9Impact of a health care associated infection on a patient's clinical outcomeLow12220.2High31452.0Very high10817.9Very high10813.2Infectiveness of hand hygiene in preventing health care-associated infectionLow8013.2Very high19832.8Very high27745.9Very high27745.9Importance of hand hygiene at institution19532.3Low important19532.3Low important7211.9Very low important416.8 | | Don't know | 19 | 3.1 |
| Impact of a health care associated infection on a patient's clinical outcome Low 122 20.2 High 314 52.0 Very high 108 17.9 Very high 49 8.1 Effectiveness of hand hygiene in preventing health care-associated infection 108 13.2 Very high 198 32.8 Very high 198 32.8 Very high 277 45.9 Very high 296 49.0 High important 195 32.3 Low important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | | Very low | 60 | 9.9 |
| on a patient's clinical outcome High 314 52.0 Very high 108 17.9 Very low 49 8.1 Effectiveness of hand hygiene in preventing health care-associated infection Low 80 13.2 Very high 198 32.8 Very high 277 45.9 Very high 296 49.0 High important 195 32.3 Low important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | Impact of a health care associated infection on a patient's clinical outcome | Low | 122 | 20.2 |
| Very high 108 17.9 Very low 49 8.1 Effectiveness of hand hygiene in preventing health care-associated infection 108 13.2 High 198 32.8 Very high 277 45.9 Very important 296 49.0 High important 195 32.3 Kery high 195 32.3 Very important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | | High | 314 | 52.0 |
| Very low 49 8.1 Effectiveness of hand hygiene in preventing health care-associated infection Low 80 13.2 High 198 32.8 Very high 277 45.9 Very important 296 490. High important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | | Very high | 108 | 17.9 |
| Effectiveness of hand hygiene in preventing health care-associated infection Low 80 13.2 High 198 32.8 Very high 277 45.9 Very important 296 49.0 High important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | | Very low | 49 | 8.1 |
| health care-associated infection High 198 32.8 Very high 277 45.9 Very important 296 49.0 High important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | Effectiveness of hand hygiene in preventing | Low | 80 | 13.2 |
| Very high 277 45.9 Very important 296 49.0 High important 195 32.3 Low important 72 11.9 Very low important 41 6.8 | health care-associated infection | High | 198 | 32.8 |
| Very important29649.0High important19532.3Low important7211.9Very low important416.8 | | Very high | 277 | 45.9 |
| High important19532.3Low important7211.9Very low important416.8 | | Very important | 296 | 49.0 |
| Importance of hand hygiene at institution Low important 72 11.9 Very low important 41 6.8 | I | High important | 195 | 32.3 |
| Very low important 41 6.8 | importance of nano hygiene at institution | Low important | 72 | 11.9 |
| | | Very low important | 41 | 6.8 |

According to **Table 5**, 6.6% of the respondents strongly concur that there are times when they have more important tasks to complete than practising good hand hygiene. 7.8%

firmly concur that using gloves lessens the requirement for hand hygiene. 4.6% firmly concur that they are reluctant to request that others adopt good hand hygiene.

Table 5. Attitude of participants towards hand hygiene (n=604)

| | Agree | Disagree | Neutral | Strongly agree | Strongly disagree |
|--|-------|----------|---------|----------------|----------------------|
| | 176 | 23 | 85 | 315 | 5 |
| I always adhere to correct hand hygiene practices | 29.1% | 3.8% | 14.1% | 52.2% | .8% |
| | | 10 | 50 | 207 | 6 |
| sufficient knowledge about hand hygiene practices is necessary to improve correct hand hygiene practice | 36.8% | 1.7% | 9.8% | 50.8% | 1.0% |
| -7 9 1 | | | | | |
| Sometimes I have more important things to do than hand hygiene | | 96 | 138 | 161 | 40 |
| | | 15.9% | 22.8% | 26.7% | 6.6% |
| | 194 | 79 | 130 | 182 | 19 |
| Emergencies and other priorities make hand hygiene more difficult at times | 32.1% | 13.1% | 21.5% | 30.1% | 3.1% |
| | 141 | 115 | 126 | 175 | 17 |
| Wearing gloves reduce the need for hand hygiene | 23.3% | 113 | 20.9% | 29.0% | 7.8% |
| | | | | | |
| I feel frustrated when others emit hand hygiane | 200 | 59 | 127 | 201 | 17 |
| Thee in ustrated when others onlit hand hygiene | 33.1% | 9.8% | 21.0% | 33.3% | 2.8% |
| | 182 | 61 | 168 | 165 | 28 |
| I am reluctant to ask others to engage in hand hygiene | 30.1% | 10.1% | 27.8% | 27.3% | 4.6% |
| | | | | | |
| The newly qualified staff has not been properly instructed in hand hygiene in their | 174 | 89 | 178 | 141 | 22 |
| training | 28.8% | 14.7% | 29.5% | 23.3% | 3.6% |
| | 194 | 40 | 127 | 224 | 19 |
| I feel guilty if I omit hand hygiene | 32.1% | 6.6% | 21.0% | 37.1% | 3.1% |
| | | | | | |

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| Adhering to hand hygiene practices is easy in the current setup | 246 | 23 | 114 | 210 | 11 |
|---|-------|------|-------|-------|------|
| | 40.7% | 3.8% | 18.9% | 34.8% | 1.8% |
| Healthcare personnel should act as a role models for others | 170 | 17 | 119 | 291 | 7 |
| | 28.1% | 2.8% | 19.7% | 48.2% | 1.2% |

In **Table 6**, 42.5% strongly agree that the importance of performing appropriate hand hygiene is highly valued by the head department. 44.7% strongly agree that performing proper hand hygiene is important to colleagues. 52% strongly

agree that using an alcohol-based hand massage makes practising hand hygiene easier in the workplace. Knowing the findings of hand hygiene observation inward helps to enhance hand hygiene practises, according to 51.5% of respondents.

| Table 6. Practice of participants towards hand hygiene (n=604) | | | | | | | |
|--|-------|-------|-------|-------|--|--|--|
| Parameter | 1 | 2 | 3 | 4 | | | |
| The importance does the head of your department attach to the fact that you perform optimal hand | 63 | 90 | 194 | 257 | | | |
| hygiene | 10.4% | 14.9% | 32.1% | 42.5% | | | |
| What importance do your colleagues attach to the fact that you perform optimal hand hygiene | 55 | 116 | 163 | 270 | | | |
| what importance do your concegues attach to the fact that you perform optimal hand hygene | 9.1% | 19.2 | 27.0% | 44.7% | | | |
| | | 89 | 190 | 257 | | | |
| The importance do patients attach to the fact that you perform optimal hand hygiene | 11.3% | 14.7% | 31.5% | 42.5% | | | |
| | | 93 | 177 | 280 | | | |
| Consider the effort required by you to perform good hand hygiene when caring for patients | | | 29.3 | 46.4% | | | |
| Has the improvement of the safety climate helped you personally to improve your hand hygiene practices | | 81 | 220 | 266 | | | |
| | | 13.4% | 36.4% | 44.0% | | | |
| | 44 | 75 | 171 | 314 | | | |
| Has the use of an alcohol-based hand scrub made hand hygiene easier to practice in your daily work? | 7.3% | 12.4% | 28.3% | 52.0% | | | |
| Has your awareness of your role in preventing health-care-associated infection by improving your hand | 38 | 80 | 189 | 297 | | | |
| hygiene practices increased during the current hand hygiene promotional campaign | 6.3% | 13.2% | 31.3% | 49.2% | | | |
| Is the use of alcohol-based hand rubs well tolerated by your hands | 59 | 98 | 215 | 232 | | | |
| | 9.8% | 16.2% | 35.6% | 38.4% | | | |
| Knowing the results of hand hygiene observation in your ward helps you and your colleagues to improve | 43 | 72 | 178 | 311 | | | |
| your hand hygiene practices | 7.1% | 11.9% | 29.5% | 51.5% | | | |
| | 48 | 96 | 208 | 252 | | | |
| The fact of being observed made you pay more attention to your hand hygiene practices | 7.9% | 15.9% | 34.4% | 41.7% | | | |
| | 33 | 90 | 184 | 297 | | | |
| Educational activities that you participated in are important to improve your hand hygiene practices | 5.5% | 14.9% | 30.5% | 49.2% | | | |
| | 51 | 82 | 205 | 266 | | | |
| Do you consider that the administrators in your institution are supporting hand hygiene improvement | 8.4% | 13.6% | 33.9% | 44.0% | | | |

In **Table 6**, 63.4% of participants had good knowledge of hand hygiene, 32.5% had moderate knowledge and 4.1% had poor knowledge. Regarding attitude, 59.8% of participants had a positive attitude toward hand hygiene, 39.1% had a neutral attitude and 1.2% had a negative attitude. As for practice, only 7.5% of participants had good practice scores, 82.9% had neutral practice and 9.6% had poor practice.

Overall KAP score was found to be 1.8% poor, 33.3% moderate and 64.9% good.

As illustrated in **Table 7**, a significant association was found between knowledge, attitude, and practice scores with participants' age, job title, and years of experience (P < 0.05). **Figures 4-7** shows Pearson correlation for KAP scores.

| Table 7. Association between KAP scores with sociodemographic characteristics of participants (n=604) | | | | | | | | | |
|---|--------------|----------------|------------------------|-----------------------|---------------|---------|--|--|--|
| | | Knowledge, att | itude, and practice so | core for hand hygiene | Total (N=604) | P value | | | |
| | | Poor | Moderate | Good | | i value | | | |
| Gender | less than 20 | 2 | 64 | 140 | 206 | 0.341 | | | |

| | | 0.3% | 10.6% | 23.2% | 34.1% | |
|--------------------|---------------------|------|-------|-------|-------|-------|
| | 20.20 | 9 | 137 | 252 | 398 | |
| | 20- 30 | 1.5% | 22.7% | 41.7% | 65.9% | |
| | 1 (1 20 | 0 | 1 | 17 | 18 | |
| | less than 20 | 0.0% | 0.2% | 2.8% | 3.0% | |
| | 20 - 30 | 10 | 142 | 227 | 379 | |
| | 20 30 | 1.7% | 23.5% | 37.6% | 62.7% | |
| | 31 -40 | 1 | 50 | 107 | 158 | |
| A == | | 0.2% | 8.3% | 17.7% | 26.2% | 0.019 |
| Age | 41 -50 | 0 | 5 | 25 | 30 | 0.018 |
| | 41 50 | 0.0% | 0.8% | 4.1% | 5.0% | |
| | 51 60 | 0 | 3 | 13 | 16 | |
| | 51 - 00 | 0.0% | 0.5% | 2.2% | 2.6% | |
| | man than (0 | 0 | 0 | 3 | 3 | |
| | more than 60 | 0.0% | 0.0% | 0.5% | 0.5% | |
| Job title | Nurse | 7 | 136 | 223 | 366 | |
| | | 1.2% | 22.5% | 36.9% | 60.6% | 0.020 |
| | , | 4 | 65 | 169 | 238 | 0.039 |
| | physician | 0.7% | 10.8% | 28.0% | 39.4% | |
| | 1 4 | 7 | 47 | 117 | 171 | |
| | less than one year | 1.2% | 7.8% | 19.4% | 28.3% | |
| | | 2 | 19 | 28 | 49 | |
| | one year | 0.3% | 3.1% | 4.6% | 8.1% | |
| | | 1 | 33 | 44 | 78 | |
| Year of experience | two years | 0.2% | 5.5% | 7.3% | 12.9% | 0.020 |
| | | 0 | 23 | 32 | 55 | |
| | three years | 0.0% | 3.8% | 5.3% | 9.1% | |
| | more than three | 1 | 79 | 171 | 251 | |
| | years less than one | 0.2% | 13.1% | 28.3% | 41.6% | |
| | year | 3 | 18 | 36 | 57 | |
| | Al- Amal hospital | 0.5% | 3.0% | 6.0% | 9.4% | |
| Type of hospital | Madinah general | 4 | 114 | 247 | 365 | |
| building | hospital | 0.7% | 18.9% | 40.9% | 60.4% | 0.101 |
| | maternity and | 4 | 69 | 109 | 182 | |
| | children hospital | 0.7% | 11.4% | 18.0% | 30.1% | |
| | | | | | | |



Figure 1. Total KAP scores among study participants



Figure 2. Knowledge scores among study participants



Figure 3. Attitude scores among study participants



Figure 4. Practice scores among study participants



Figure 5. Scatter of knowledge score by attitude score (Pearson correlation coefficient: 0.936, P: 0.000)



Figure 6. Scatter of knowledge score by practice score (Pearson correlation coefficient: 0.847, P: 0.000)



Figure 7. Scatter of attitude score by practice score (Pearson correlation coefficient: 0.958, P: 0.000)

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| Table 8. Prediction analysis for predicting practice score using knowledge and attitude scores | | | | | | | | |
|--|--------------|-----------------|---------------------------|---------|------|--|--|--|
| ltem – | Unstandardiz | ed Coefficients | Standardized Coefficients | | Sia | | | |
| | В | Std. Error | Beta | L | Sig. | | | |
| (Constant) | 14.733 | .312 | | 47.193 | .000 | | | |
| Knowledge score | -1.610 | .115 | 404 | -14.059 | .000 | | | |
| Attitude score | 1.064 | .023 | 1.336 | 46.532 | .000 | | | |

Table 9. Non-parametric analysis of the association between knowledge, attitude, and practice scores with characters of participants.

| | Parameter | Knowledge score | Statistic | P- value | Attitude score | Statistic | P- value | Practice score | Statistic | P- value | | | |
|-------------------------|------------------------------------|--------------------|-----------|-------------|-------------------|-----------|-------------|-------------------|-----------|-------------|------|--|--|
| | 20 30 | 7+2 | | | 37+8 | | | 43+6 | | | | | |
| | 31 40 | 7+2 | | | 39+8 | | | 45+7 | | | | | |
| ge, y* | 41 50 | 7+1 | 22.4 | 0.000 | 43+7 | 27.0 | 0.000 | 49+6 | 20.0 | 0.000 | | | |
| Age | 51 60 | 7+1 | 22.4 | 0.000 | 40+6 | 21.9 | 0.000 | 46+6 | 29.9 | 0.000 | | | |
| | less than 20 | 8+1 | | | 38+3 | | | 43+2 | | | | | |
| | more than 60 | 8+0 | | | 43+2 | | | 47+2 | | | | | |
| ler. | Female | 7+2 | | | 38+9 | | | 44+7 | | | | | |
| Gend ** | Male | 7+1 | 39957.5 | 0.577 | 37+7 | 36802.0 | 0.039 | 43+5 | 36871.0 | 0.042 | | | |
| • * | Nurse | 7+2 | | | 38+8 | | | 44+7 | | | | | |
| Job title* | physician 7+2 | 7+2 | 38723.0 | 0.012 | 38+7 | 42545.0 | 0.630 | 44+6 | 42523.0 | 0.622 | | | |
| Years of experience* | less than one year | 7+2 | | | 37+8 | | | 43+6 | | | | | |
| | more than three year | 7+2 | | | 39+8 | | | 45+7 | | | | | |
| | one year | 6+2 | 10.7 | 0.030 | 35+9 | 16.7 | 0.002 | 42+6 | 19.1 | 0.001 | | | |
| | three year | 6+1 | | | 37+7 | | | 43+6 | | | | | |
| | two year | 7+1 | | | 37+7 | | | 43+6 | | | | | |
| f | Al- Amal hospital | 7+2 | | | 35+9 | | | 42+6 | | | | | |
| spital (vork* | Madinah general hospital | 7+2 | 4.5 | 0.105 | 38+8 | 8.3 | 0.016 | 45+6 | 8.2 | 0.017 | | | |
| μ | maternity and children hospital | 7+2 | | | 37+8 | | | 43+6 | | | | | |
| | Emergency | 6+2 | | | 36+8 | | | 42+6 | | | | | |
| | ICU | 7+1 | | | 41+7 | | | 47+7 | | | | | |
| | Labor & Delivery ward | 7+2 | | | 37+11 | | | 43+9 | | | | | |
| | Medical | 7+2 | | | 38+8 | | | 44+6 | | | | | |
| | NICU | 7+2 | | | 39+7 | | | 45+7 | | | | | |
| int* | Ob/Gyn | 8+0 | | | 44+5 | | | 50+6 | | | | | |
| rtme | OB/Gyn | 6+3 | 36.0 | 0.001 | 33+10 | 57.1 | 0.000 | 40+6 | 58.3 | 0.000 | | | |
| epaı | OPD | 6+2 | | | 36+8 | | | 42+6 | | | | | |
| D | OR | 6+2 | | | 33+8 | | | 40+5 | | | | | |
| | Orthopedics | 6+2 | | | 34+14 | | | 42+10 | | | | | |
| | pediatric | 8+. | | | 41+. | | | 45+. | | | | | |
| | PICU | 8+1 | | | 44+6 | | | 50+6 | | | | | |
| | Psychiatric | 7+1 | | | | | | 38+6 | | | 43+5 | | |
| | Surgical | 7+1 | | | 37+7 | | | 44+6 | | | | | |

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| Urology | 7+1 | 37+6 | 44+5 | |
|---|-----|------|------|--|
| *Kruskal-Wallis test was used. **Mann-Whitney test was used. | | | | |

The study aims to analyse HCWs' knowledge, attitudes, and practises on hand hygiene procedures at KSAMC in Madinah City. According to the survey, respondents had a moderate degree of understanding about hand hygiene, with 63.4% having a good knowledge score, 32.5% having moderate knowledge, and 4.1% having poor knowledge. Previous Saudi studies indicated low knowledge levels are in line with other studies in Saudi Arabia [10-12] as well as internationally [13, 14].

Only 15.5% of the HCWs evaluated in Egyptian research had a reasonable level of knowledge (score > 75%), whereas 28% had a bad level (score > 50%), for a mean score of 59% [11]. The vast majority of nurses had little or insufficient knowledge, as evidenced by the fact that previous studies to evaluate the KAP of nurses regarding HH rarely surpassed 65%. In a study conducted in 2013 at a specific Egyptian cancer hospital, critical care nurses were found to have insufficient knowledge levels, with two-thirds (63.6%) of the tested sample having knowledge levels below 75% [15]. A knowledge score of more than 75% was only achieved by 9% of participants in various studies on nursing and medical students at a tertiary care centre in India [16]. 21% of HCWs in the Armed Forces Military Hospitals in Taif, Saudi Arabia, have insufficient knowledge of hand hygiene [17].

In our study, 11.3% of the respondents indicated air circulating in the hospital as the primary route of crosstransmission of potentially infectious germs between patients in a medical centre, 57% reported healthcare workers' dirty hands, 17.5% reported patients' exposure to colonised surfaces, and 14.2% reported sharing non-invasive objects. In a recent study, it was found that more than half of the workers were ignorant of the most frequent sources of bacteria that cause HCAI and the shortest amount of time an alcohol-based hand rub needs to be applied to hands to kill the majority of germs [11]. Only 27.5% of nurses and 27.5% of the patients at the tertiary healthcare institution in Bhopal City were aware of the most common source of the bacteria that cause HCAIs, according to a study conducted there [18]. Fewer than half (47.1%) of nurses in a dialysis unit at Alexandria University Hospital in Egypt were aware that they needed to wash their hands before and after care for a patient, per several studies [19].

Regarding attitude, 59.8% of participants had a positive attitude toward hand hygiene, 39.1% had a neutral attitude and 1.2% had a negative attitude. In a Saudi study, healthcare professionals were supportive of recommended hand cleanliness practices. They acknowledge their significance and state that they consistently make an effort to abide by them [10]. This result is consistent with research that examined attitudes toward hand hygiene in healthcare

environments [11, 20]. Overall, there is a high level of understanding of the significance of proper hand cleanliness, especially among advanced medical students and aspiring healthcare professionals. Only one-third of the HCWs in an Egyptian study who were polled thought that administrative directives and continual supervision could boost HH compliance, despite the fact that most of them had favourable sentiments towards HH. The majority also agreed that it is not always possible to practise hand hygiene in crisis situations. Since time spent on patient care activities coincides with that needed for hand washing, hand hygiene compliance is often poor in hospitals with low nurse staffing levels and patient crowding in emergency departments and critical care units (ICUs). HCWs believed that getting their patient's care done swiftly was more important than taking their time to wash their hands [11]. In the current research, nurses' attitudes toward the significance of instruction, supervision, and reminders in enhancing HH compliance were significantly better than those of young doctors. The difference in working expertise between the two study groups' durations may help to explain this discrepancy [11].

Only 7.5% of participants received high marks for practise, 82.9% received indifferent marks, and 9.6% received low marks. In a prior Saudi Arabian study, hand hygiene compliance was seen in 70% of medical students, 18.8% of nurses, and 9.1% of senior medical professionals. However, none of these groups adhered to the procedure to the highest standard. According to our study, less than half of HCWs consistently practise hand hygiene, which reflects the findings of the great majority of previous studies [9]. Only 5% of the nurses in a tertiary care facility had exceptional HH practises, according to a study done in India to look at the KAP of nursing students [13]. 57% of nurses used subpar HH procedures. According to the findings of numerous investigations carried out in an Alexandria dialysis unit, none of the nurses washed their hands prior to or during the execution of the different tasks that required hand washing [19]. In a follow-up study conducted in Ethiopia in 2014 [1, 21, 22], only 16.5% of participants received a score of greater than 50% on the observation checklist for HH compliance. The participant-cited obstacles, which are mostly caused by the hospital's dearth of adequate facilities and resources, may be partially to blame for this low compliance.

To improve infection control procedures, it's important to regularly challenge presumptions, assess behaviour changes, apply interventions with the appropriate process of change, and promote individual and group innovation. A multimodal, interdisciplinary approach is required due to the complexity of the transformation process [23, 24].

CONCLUSION

Saudi healthcare workers exhibited moderate knowledge and attitude toward hand hygiene. However, poor practice was found among the studied sample. Several tactics must be used to successfully promote hand hygiene. Healthcare providers will make system changes, train staff members, monitor compliance, solicit feedback, instill hand hygiene practices in the institution's safety culture, and implement these strategies.

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