



## Knowledge, attitudes, and practices of nurses towards hand washing in infection prevention and control at a psychiatric hospital

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### ABSTRACT

The study examined the knowledge, attitudes and practices of nurses towards compliance with hand washing in a selected psychiatric hospital. A descriptive survey design with self-administered questionnaire was used to collect data from 195 nurses. The study population comprised all categories of nurses (registered nurses, enrolled nurses, auxiliary nurses, enrolled nurse assistants) permanently employed at the selected psychiatric hospital. The results show a discrepant levels of knowledge, attitudes and hand washing practices between genders, with males having slightly more knowledge (mean score 92.5) than females (mean score 91.41); female nurses had a better attitude (mean score 96.06) than male nurses (mean score 95.09), and a higher level of hand washing practice (mean score 95.63) than male nurses (mean score 94.66). There was no statistically significant association between gender and attitudes of nurses towards hand washing ( $P = 0.42$ ). Registered nurses had slightly more knowledge and positive attitudes than the other categories of nurses. Educational level had an impact on knowledge of hand washing, but less impact on attitudes and practices. No statistically significant association was found between demographic variables and knowledge, attitudes and practices on hand hygiene. The study demonstrated knowledge gaps among respondents about various aspects of hand hygiene. Variations in attitude level were noted among nurses in terms of age, gender, rank, work experience and educational level. Moreover, it was noted that there was possible overestimation of hand hygiene practice and knowledge by the respondents. Continuous monitoring and evaluation should be put in place with the aim of translating knowledge into action, changing attitudes into positive behaviour, and promoting/maintaining correct hand washing techniques. This is crucial to maintain standards in level of knowledge and attitudes and consistent correct practices of hand washing procedures throughout nurses' professional lives in infection prevention and control at a psychiatric hospital.

### 1. Background to the study

Healthcare-related infections are primarily transmitted via contaminated hands in healthcare facilities. These hospital-acquired infections are caused by pathogens from infected or draining wounds, colonised areas of patients' skin, patients' gowns, bed linen, and bedside furniture, including other objects in the patient's immediate environment (Zakeri, Ahmadi, Rafeemanesh, & Saleh, 2017).

Hand hygiene is known to be the single most effective method of infection prevention and control in healthcare settings (Piai-Morais, Fortalez, & Figueiredo, 2015). The clients in mental health settings are vulnerable to healthcare-associated infection, particularly those who are physically compromised, receiving immunosuppressive therapy, or undergoing invasive procedures (Hsu et al., 2020). A study on psychiatric

healthcare facilities in Brazil discovered very low compliance with hand hygiene by the nurses before and after procedures, as well as non-adherence to other infection control standard protocols (Piai-Morais et al., 2015). Duedu, Peprah, Anim-Baidoo, and Ayeh-Kumi (2015) reported that the asymptomatic carriage of parasitic pathogens among patients increased with the duration of admission to a psychiatric institution in Ghana.

It appears that healthcare workers (HCWs) adhere to handwashing when the need and sense of self-protection arise, and often miss opportunities for hand washing out of limited knowledge or forgetfulness when they don't see or feel the need for it (Chuc et al., 2018). Nurses in psychiatric health settings may tend to perceive the healthcare environment as more therapeutic and free of risk of infectious diseases, as patients do not manifest clear symptoms of physical illness; however,

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physical comorbidities and infection outbreaks occur in psychiatric settings (Duedu et al., 2015; Croker et al., 2018; Mada, Saldana, Castano, Malus, & Adley, 2018).

Nurses' knowledge, perceptions, and attitudes about hand hygiene have been recognized as a significant influence on hand hygiene performance (Oh, 2019).

It is important to note that Middle East respiratory syndrome coronavirus (MERS-CoV) may be fatal, especially when patients have physical comorbidities (Alfahan, Alhabib, Abdulmajeed, Rahman, & Bamuhair, 2016). This stresses the need for effective measures for infection control in healthcare settings, and hand washing practices (Alfahan et al., 2016). Many studies have confirmed that non-compliance with hand washing practices in healthcare settings has negative outcomes (Fox et al., 2015; Sahile, Esseye, Beyene, & Ali, 2016; Diwan et al., 2016; Zil-E-Ali, Cheema, Ullah, Ghulam, & Tariq, 2017).

Studies focused on the hand hygiene of nurses and nosocomial infections in general hospitals, but little is known about the hand hygiene knowledge, attitudes, and practices of nurses in psychiatric healthcare settings (Alfahan et al., 2016; Croker et al., 2018; Duedu et al., 2015). A recent study by Li, Wang, Tan, Lee, and Yang (2019) indicated that although nosocomial infections also occur in psychiatric hospitals, very few studies have addressed infection control and prevention at psychiatric institutions. Studies on infection outbreaks specifically in psychiatric facilities are limited globally (Pittet, Boyce, & Allegranzi, 2017).

Evidence from a selected psychiatric hospital raised concern about ineffective support from nurse leaders for infection prevention personnel regarding the hand hygiene campaign, thus highlighting a negative attitude of nurse leaders towards hand hygiene (Kingston, Slevin, O'Connell, & Dunne, 2017).

In addition, in psychiatric facilities there are inadequate resources, limited diagnostic measures, and personnel to deal with infection control, as well as inadequate support for infection prevention, indicating less attention to precautions for infection control (Kim & Lee, 2017; Li et al., 2019). In South Africa, Lowman (2016) reported that there might be either general negligence or poor resources for nosocomial infection surveillance. Furthermore, serious issues keep arising from the lack of data in South Africa, which is a major concern for infection prevention and control measures in the healthcare system (Lowman, 2016).

## 2. Aim

The study aimed to examine the knowledge, attitudes, and practices of nurses towards compliance with hand washing in a selected psychiatric hospital in the Western Cape, South Africa.

It was hypothesized that there is an association between hand hygiene practice and demographic variables.

## 3. Methods and materials

In this study, a descriptive survey design with a self-administered questionnaire was used to study nurses' knowledge, attitudes, and practices in one of the largest psychiatric hospitals in the Western Cape (Grove, Burns, & Gray, 2013; Polit & Beck, 2013). This psychiatric hospital accommodates 740 mentally ill patients and serves as a specialist psychiatric referral hospital. It consists of four departments which include a child and adolescent unit, a forensic unit, a general adult psychiatry unit, and an intellectual disability unit.

### 3.1. Study respondents and sampling

There were 381 permanent nurses working at the selected psychiatric hospital at the time of data collection. The sample size calculation,  $n = \frac{N}{1+N(e^2)}$ ,  $e = 0.05$  error, with 95% confidence interval (CI) was used. Using a random sampling technique, 195 study respondents were selected from the 381 nurses.

### 3.2. Data collection

A pilot test was conducted on ten respondents who were not part of the actual study, to determine the validity and reliability measures of the instrument. A self-administered questionnaire was adapted from CDC Guidelines for Infection Control in Health-Care Facilities (CDC, 2002). The questionnaire was designed to collect data on demographic information, and knowledge, attitudes, and practices of HCWs on hand hygiene. The Cronbach's alpha test of the instrument was 0.801. The instrument was reviewed by a subject expert and a statistician. The respondents were approached during their staff meetings. Different psychiatric wards and psychiatric units have staff meeting dates. Permission to meet the nurses during their meeting dates were obtained from the nurse managers. Informed consent was obtained from study respondents before they completed the questionnaire. Most of the respondents completed the questionnaire at the workplace on the same day, while some of the nurses preferred to complete it in their own time and to return the completed questionnaires in a week's time. A follow-up email and calls were made to those who were unable to return the completed questionnaire on the agreed date. Data were collected between November 2018 and February 2019, by the researchers and research assistant.

### 3.3. Statistical analysis

Data were categorized according to their domain, and each completed questionnaire was coded and prepared for analysis. The data were double-entered into an Excel spreadsheet to cross-check for the correctness of data entry and then imported into the Statistical Package for the Social Sciences (SPSS) version 25 program. Descriptive and inferential statistical data analysis techniques were used to summarize and present the findings (Polit & Beck, 2013). The frequencies, percentages, and mean values were used to describe categorical data.

Thirteen items assessed knowledge of the nurses regarding hand washing. The knowledge items were measured on a Likert scale and grouped into 'Disagree', with a score of 1, 'Not sure', with a score of 2, and 'Agree', with a score of 3. One was considered the minimum score and 39 the maximum score. Grouping of the score and the percentage of scores was calculated for each item; the higher the score the more knowledgeable, and the lower the score the less knowledgeable the respondents were on that item.

Six items were used to assess nurses' attitudes towards handwashing, which were grouped into the scale categories. After grouping them, the score for each item was calculated. One (1) was considered the minimum and 18 was considered the maximum score. The percentage of the score for each item was calculated; a higher percentage meant a more positive attitude, while a lower percentage indicated a negative attitude.

Eighteen items were used to assess nurses' hand washing practices. When the answer was 'No' a score of 1 was given, and when the answer was 'Yes' a score of 2 was given; then the total score was calculated for each item. A higher percentage indicated a greater practice of hand washing and a lower percentage less practice of handwashing.

The Chi-square test was used to determine the association between independent variables (gender, age, educational level, work experience, qualification) and dependent variables (nurses' knowledge, attitudes, and practices of handwashing). The level of significance was  $P < 0.05$ .

### 3.4. Ethical considerations

Ethics approval was obtained from the Biomedical Research Ethics Committee of the university, with ethics reference number MB17/2/8. Permission to use the health facilities for the study was obtained from the management of the selected hospital and the Department of Health. The researchers ensured that participation was voluntary, that information provided was treated confidentially, and respondents had the right to withdraw at any stage of the study without any consequences.

The researchers assured the respondents that their identity and any information provided would remain anonymous throughout the study period and during dissemination of the results.

#### 4. Results

The majority of respondents in the study (60%,  $n = 117$ ) were female. Among the categories of nurses, 40.5% ( $n = 79$ ) were registered nurses, 24.6% ( $n = 48$ ) were enrolled nurses, 22.1% ( $n = 43$ ) were enrolled nurse assistants, and 12.8% ( $n = 25$ ) were auxiliary nurses. Nurses older than 40 years were 80 (41%), and aged 30–40 years were 70 (35.9%).

Duration of work experience ranged from <1 year to more than 30 years. About 33.3% ( $n = 65$ ) had been in their current position for 1–5 years, followed by 29.2% ( $n = 57$ ) who had been in their current position for 6–10 years. Traditionally nurses work by rotating between different departments/wards, or between healthcare facilities, which could be the reason that the majority of nurses had <10 years of experience in their current position.

##### 4.1. Knowledge of the nurses on hand washing

As it shows in Table 1 below the knowledge of the nurses on handwashing was assessed with 13 items. The findings varied between 58.5% and 99% for various knowledge items. The majority of respondents (186, 95.4%) agreed with the statement that hand hygiene should be performed before having direct contact with a patient. Almost all respondents (193, 99%) reported washing their hands before an invasive procedure was performed. About 189 (96.9%) agreed that hand hygiene should be performed when moving from a contaminated body site to a clean body site during an episode of patient care.

Of the nurses, 144 (73.8%) agreed with that pathogens could be

**Table 1**  
Nurses' knowledge of hand washing.

| Knowledge questions  | Agree            |
|--|------------------|
| Hand hygiene should be performed before having direct contact with a patient   | N 186<br>% 95.4% |
| Hand hygiene should be performed before inserting an invasive device (e.g. intravascular catheter, Foley catheter)   | n 193<br>% 99.0% |
| Hand hygiene should be performed when moving from a contaminated body site to a clean body site during an episode of patient care  | n 189<br>% 96.9% |
| Hand hygiene should be performed after having direct contact with a patient or with items near the patient   | n 182<br>% 93.3% |
| Hand hygiene should be performed after removing gloves   | n 176<br>% 90.3% |
| If hands are not visibly soiled/contaminated the most effective regime to reduce pathogens is to apply 1.5 ml to 3 ml of alcohol-based hand rub to the hands and rubbing hands together until they dry | n 144<br>% 73.8% |
| Antibiotic-resistant pathogens most frequently spread from one patient to another in healthcare settings via the contaminated hands of clinical staff  | n 154<br>% 79.0% |
| If appropriate hand hygiene is not performed herpes simplex virus infection can be potentially transmitted from patients to clinical staff   | n 154<br>% 79.0% |
| If appropriate hand hygiene is not performed colonization or infection with methicillin-resistant <i>S. aureus</i> can potentially be transmitted from patients to clinical staff                      | n 160<br>% 82.1% |
| If appropriate hand hygiene is not performed respiratory syncytial virus infection can potentially be transmitted from patients to clinical staff  | n 147<br>% 75.4% |
| If appropriate hand hygiene is not performed hepatitis B virus infection can potentially be transmitted from patients to clinical staff  | n 159<br>% 81.5% |
| Alcohol-based hand hygiene products cause stinging of the hands in some providers due to pre-existing skin irritation  | n 142<br>% 72.8% |
| <i>C. difficile</i> , methicillin-resistant <i>S. aureus</i> , and vancomycin-resistant enterococcus already in the environment of the patient can survive for days to weeks                           | n 114<br>% 58.5% |

reduced by applying 1.5–3 ml of alcohol-based hand rub to the hands and rubbing until the hands are dry, and 142 (72.8%) reported that hand hygiene products cause stinging of hands where there is pre-existing skin irritation. It was identified that 114 (58.5%) of nurses had lower knowledge on the ability of *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus*, and vancomycin-resistant enterococcus to survive in the environment of the patient for weeks.

##### 4.2. Attitudes of nurses towards hand washing

Six items were used to assess nurses' attitudes towards handwashing (see Table 2 below). Almost all of the respondents (194, 99.5%) had a positive attitude that hand washing is protective to nurses, while 176 (90.3%) of the respondents reported that the rate of handwashing can be improved by administrative orders. Most of the respondents (169, 86.7%) agreed that hand washing lowers hospital infections more than any other method of infection control, and 148 (75.9%) indicated that hand washing practices can be improved by role models.

##### 4.3. Hand washing practices of nurses

Table 3 below lists 18 items that measured the nurses' hand washing practices at the psychiatric hospital. The results indicate that 194 (99.5%) of the nurses reported conducting hand washing before carrying out an invasive procedure/action. The majority (178, 91.3%) reported practicing hand washing before non-invasive procedures; 156 (80%) practiced hand washing before personal contact, while 39 (20%) did not.

About 161 (82.6%) reported practicing hand washing before contact with body fluid, 167 (85.6%) before handling contaminated inanimate objects, and 136 (69.7%) before handling waste materials, while 59 (30.3%) did not carry out handwashing before handling waste materials.

##### 4.4. Association between demographic variables and nurses' knowledge, attitudes, and practices of hand washing

Table 4 below shows that male nurses had slightly more knowledge ( $M = 92.5$ ,  $SD = 7.28$ ) than females ( $M = 91.41$ ,  $SD = 10.03$ ;  $p = 0.41$ ), this difference not being significant. The statistical tests indicated that female nurses had better attitudes towards handwashing ( $M = 96.06$ ) than male nurses ( $M = 95.09$ ). Nurses older than 40 years had a slightly better attitude ( $M = 95.76$ ) than those younger than 40 years ( $M = 95.56$ ) of age. Registered nurses had a better attitude ( $M = 97.33$ ) than the enrolled nurses ( $M = 94.56$ ) or auxiliary nurses (95.33). Educational level and work experience have an impact on the knowledge of nurses about hand washing practices. Those nurses who had been in their current position for 21–30 years had better hand washing practices ( $M = 95.99$ ) than those who had been in their position for 1–5 years ( $M = 95.85$ ). There was no statistically significant association found between demographic variables and nurses' knowledge, attitudes, and practice of handwashing.

**Table 2**  
Nurses' attitudes towards hand washing.

| Summary of attitudes   | Agree            |
|--|------------------|
| Hand washing is protective to the nurses   | N 194<br>% 99.5% |
| Hand washing can be improved by administrative orders and continuous observation           | N 176<br>% 90.3% |
| Hand washing lowers nosocomial infections more than any other methods of infection control | N 169<br>% 86.7% |
| Hand washing can be improved by role models  | N 148<br>% 75.9% |
| It is important to assist or encourage patients to do hand washing after use of bathroom   | N 193<br>% 99.0% |
| It is important to assist or encourage patients to do hand washing before and after eating | N 191<br>% 97.9% |

**Table 3**  
Nurse's handwashing practices.

| Summary of hand washing practice                                  | No              | Yes           |
|---|-----------------|---------------|
| Do you wash hands before an invasive procedure?                   | N 1<br>% 0.5%   | 194<br>99.5%  |
| Do you wash hands after an invasive procedure?                    | N 0<br>% 0.0%   | 195<br>100.0% |
| Do you wash hands before a non-invasive procedure?                | N 17<br>% 8.7%  | 178<br>91.3%  |
| Do you wash hands after a non-invasive procedure?                 | N 19<br>% 9.7%  | 176<br>90.3%  |
| Do you wash hands before personal contact?                        | N 39<br>% 20.0% | 156<br>80.0%  |
| Do you wash hands after personal contact?                         | N 29<br>% 14.9% | 166<br>85.1%  |
| Do you wash hands before body fluids contact?                     | N 34<br>% 17.4% | 161<br>82.6%  |
| Do you wash hands after body fluids contact?                      | N 1<br>% 0.5%   | 194<br>99.5%  |
| Do you wash hands before touching contaminated inanimate objects? | N 28<br>% 14.4% | 167<br>85.6%  |
| Do you wash hands after touching contaminated inanimate objects?  | N 4<br>% 2.1%   | 191<br>97.9%  |
| Do you wash your hands before handling waste?                     | N 59<br>% 30.3% | 136<br>69.7%  |
| Do you wash your hands after handling waste?                      | N 2<br>% 1.0%   | 193<br>99.0%  |
| Do you wash your hands before using gloves?                       | N 59<br>% 30.3% | 136<br>69.7%  |
| Do you wash hands after using gloves?                             | N 11<br>% 5.6%  | 184<br>94.4%  |
| Do you wash your hands before administering medications?          | N 10<br>% 5.1%  | 185<br>94.9%  |
| Do you wash hands after administering medications?                | N 15<br>% 7.7%  | 180<br>92.3%  |
| Do you wash your hands before food handling?                      | N 1<br>% 0.5%   | 194<br>99.5%  |
| Do you wash hands after food handling?                            | N 5<br>% 2.6%   | 190<br>97.4%  |

**5. Discussion of results**

*5.1. Demographic information*

In the current study, 117 (60%) of the respondents were female nurses, while 78 (40%) were male nurses. This result is consistent with

**Table 4**  
Association between demographic variables, and nurses' knowledge, attitudes, and practice of handwashing.

| Knowledge             |                          | Knowledge |       |         | Attitudes |       |         | Practice |      |         |
|-----------------------|--------------------------|-----------|-------|---------|-----------|-------|---------|----------|------|---------|
|                       |                          | Mean      | SD    | P-value | Mean      | SD    | P-value | Mean     | SD   | P-value |
| Gender                | Female                   | 91.41     | 10.03 | 0.41    | 96.06     | 8.76  | 0.42    | 95.63    | 6.43 | 0.29    |
|                       | Male                     | 92.50     | 7.28  |         | 95.09     | 7.49  |         | 94.66    | 6.07 |         |
| Age (yrs)             | 20–30                    | 91.28     | 8.26  | 0.88    | 95.68     | 6.37  | 0.98    | 96.11    | 6.71 | 0.47    |
|                       | 30–40                    | 92.09     | 8.33  |         | 95.56     | 7.30  |         | 94.64    | 5.95 |         |
|                       | >40                      | 91.96     | 10.07 |         | 95.76     | 9.93  |         | 95.28    | 6.35 |         |
| Rank                  | Registered nurse         | 92.66     | 7.97  | 0.69    | 97.33     | 5.96  | 0.13    | 95.29    | 6.53 | 0.73    |
|                       | Enrolled nurse           | 91.88     | 8.35  |         | 94.56     | 7.29  |         | 94.62    | 6.89 |         |
|                       | Enrolled nurse assistant | 90.94     | 11.85 |         | 94.06     | 12.50 |         | 96.06    | 5.08 |         |
|                       | Auxiliary nurse          | 90.77     | 8.07  |         | 95.33     | 6.55  |         | 94.89    | 6.40 |         |
| Work experience (yrs) | <1                       | 89.74     | 13.24 | 0.18    | 98.41     | 2.71  | 0.49    | 95.24    | 9.17 | 0.51    |
|                       | 1–5                      | 90.69     | 11.02 |         | 94.19     | 10.64 |         | 95.85    | 5.98 |         |
|                       | 6–10                     | 90.91     | 8.35  |         | 95.81     | 6.32  |         | 93.81    | 6.72 |         |
|                       | 11–20                    | 96.58     | 6.59  |         | 95.83     | 8.58  |         | 95.60    | 5.36 |         |
|                       | 21–30                    | 92.81     | 6.25  |         | 96.45     | 7.87  |         | 95.99    | 5.57 |         |
|                       | >30                      | 94.73     | 6.00  |         | 97.84     | 5.09  |         | 95.83    | 6.75 |         |
| Education-al level    | Certificate              | 91.82     | 9.57  | 0.79    | 94.66     | 9.56  | 0.06    | 95.08    | 6.29 | 0.39    |
|                       | Diploma                  | 90.30     | 8.99  |         | 94.10     | 8.81  |         | 96.87    | 4.22 |         |
|                       | Advanced diploma         | 92.22     | 8.29  |         | 98.66     | 3.20  |         | 93.68    | 7.08 |         |
|                       | Degree                   | 93.35     | 7.80  |         | 98.15     | 4.08  |         | 95.58    | 7.36 |         |
|                       | Master's                 | 92.31     | 10.88 |         | 97.22     | 3.93  |         | 95.83    | 5.89 |         |

that of a study conducted in a psychiatric facility in Finland, where 62.4% of respondents were female nurses and 37.6% were male nurses (Kurjenluoma et al., 2017). This indicates that although nursing is a predominantly female profession, there are relatively more male nurses in the psychiatric nursing field.

*5.2. Knowledge of nurses on hand washing*

The findings indicate that nurses' knowledge of hand washing varied between 58.5% and 99% for the various items. Almost all of the nurses 193 (99%) agreed that hand washing should be performed before inserting invasive devices. Diwan et al. (2016) identified that HCWs' knowledge on hand hygiene varied between 77% and 98%, where 95% of respondents acknowledged the performance of hand hygiene practices before invasive procedures at all times.

Statistical tests have shown no significant association between demographic variables and knowledge of hand washing; the range of the overall mean score was between 89.74 and 96.58, which indicates adequate knowledge on hand hygiene. Dreidi, Alrimawi, Saifan, and Batiha (2016) identified similar results, with no significant association between the demographic variables and knowledge level of the respondents. In contrast, Zakeri et al. (2017) found a significant association between average work experience and inadequate knowledge about hand washing.

The majority (159, 81.5%) of nurses had knowledge on the potential risk of infection transmission due to missed opportunities for hand hygiene. Derhun, de Souza, Costa, Inoue, and Matsuda (2016) indicated that a high percentage of professional nurses had knowledge about hand hygiene. In another study, although there were high hand hygiene knowledge scores (Nematian, Palenik, Mirmasoudi, Hatam, & Askarian, 2017), these were not reflected in actual observed hand hygiene performance. Similarly, Corace et al. (2017) reported that hand hygiene compliance was above 90%, but the use of an anonymous observer for five months revealed actual hand hygiene performance rates of 13–33%. In addition, Kelcikova, Mazuchova, Bielenka, and Filova (2019) stated that where faulty self-assessment by HCWs was identified, this was possibly due to inability to self-assess rather than dishonesty. It was therefore assumed that flawed self-assessment could also be an issue in the context of this study.

It was observed that there was a decline in the level of hand hygiene knowledge on pathogen-related aspects. Despite 58.5% of nurses



reporting having knowledge, 41% had limited or no knowledge about the prevention of pathogens such as *C. difficile*, methicillin-resistant *S. aureus*, and vancomycin-resistant enterococcus in the patients' immediate environment. This could have a serious impact on the safety of patients, including COVID-19 transmission.

Consistent with this finding, [Yadav and Giri \(2018\)](#) also found gaps in hand hygiene knowledge, while [Clack, Passerini, Manser, and Sax \(2018\)](#) highlighted the importance of knowing about the patients, themselves as HCWs, and the hospital environment that forms part of the pathogen reservoir in the clinical setting. Cross-contamination of pathogens, including multidrug-resistant strains, can occur through being carried on the hands of those in the healthcare environment ([Apisarntharak & Weber, 2018](#)). Nurses have a moral, ethical and professional responsibility to use the standard guidelines for optimal hand washing practice during delivery of care ([Kingston et al., 2017](#)). Most importantly, nurses should at least know that both their hands and patients' hands can be directly or indirectly contaminated from the hospital environment ([Apisarntharak & Weber, 2018](#)). Defeating multidrug-resistant organisms primarily relies on improved compliance with proper hand hygiene by HCWs ([Grayson et al., 2018](#)).

Although the fact that 81 (41.5%) of the nurses had limited knowledge is less than those who were knowledgeable (114, 58.5%), it is vital to note that an adequate or high knowledge level of hand hygiene alone does not necessarily imply an acceptable level of hand hygiene practice. The key factor is to ensure that the nurses have sufficient knowledge of the role that their hands play in the transmission of infections during various patient care activities.

More than two-thirds (78.8%) of nurses use alcohol-based hand rub when their hands are not visibly soiled. Alcohol-based hand rub is effective during care and recommended for hand disinfection, as it eliminates a broad spectrum of microbes. However, 72.8% of nurses reported possible skin damage caused by alcohol-based hand rub. [Loyland, Wilmont, Hessels, and Larson \(2016\)](#) reported strong feelings of dislike towards hand sanitizers due to skin damage. This result highlights the possible reluctance of nurses to comply with hand hygiene, which poses a potential health risk.

The results revealed no statistically significant association between hand hygiene knowledge and demographic variables; however, those with more than 20 years of work experience in the field had less hand hygiene knowledge than those with fewer years of work experience. This could be because as the length of work experience increases, the less that hand hygiene knowledge is promoted among more experienced nurses. [Zakeri et al. \(2017\)](#) and [Al Ra'awji et al. \(2018\)](#) reported similar findings that the more the years of employment, the less the hand hygiene knowledge level of HCWs. Those with degrees (mean score 93.35%) had more knowledge than those with lower qualifications, which indicates that education has a positive impact on hand hygiene knowledge.

### 5.3. Attitudes of nurses towards handwashing

The overall results for attitude scores indicate a positive attitude towards handwashing. Almost all respondents (99.5%) reported that handwashing is protective to both nurses and patients. This finding is consistent with [Kelcikova et al. \(2019\)](#) findings, where HCWs demonstrated a positive attitude overall towards hand hygiene. [Piras, Lauderdale, and Minnick \(2017\)](#) reported that nurses perceived hand hygiene as protective behavior, and [Kelcikova et al. \(2019\)](#) reported that the majority of HCWs considered non-compliance with hand hygiene as a significant risk for infection transmission. In this study, most nurses (90.3%) indicated that there is a need for continuous monitoring to improve handwashing attitudes. Hand hygiene improvement included strict measures at the organizational level, regular observation and education ([Loyland et al., 2016](#)).

About 75.9% of the nurses in this study agreed that role models are influential when it comes to handwashing and lowering nosocomial infections. Role models could include nurse leaders, nurses in charge,

and doctors. [Winship and McClunie-Trust \(2016\)](#) and [Kingston et al. \(2017\)](#) reported role models as predictors of hand hygiene improvement. However, if role models display negative behavior, this will negatively impact junior nurses' behavior ([Kingston et al., 2017](#)).

Taking into consideration specific characteristics of psychiatric patients, such as limitations in cognitive ability, most nurses agreed on the importance of assisting patients with hand hygiene after using the bathroom and supporting patients with hand hygiene before and after eating. In this study, the findings showed that female nurses had a slightly better attitude (mean score 96.06) than male nurses (mean score 95.09). [Bakarman et al. \(2019\)](#) reported that female medical students had significantly better knowledge than males regarding the type of hand hygiene technique needed before palpation of the abdomen (177 (54%) vs 151 (46%);  $P < 0.002$ ). Females also had a significantly better attitude towards the importance of hand hygiene than males 240 (62.5%) vs 144 (37.5%);  $P < 0.001$ ) ([Bakarman et al., 2019](#)). The mean score for attitude was higher in registered nurses ( $6.9 \pm 1.17$ ) than in nursing assistants ( $6.2 \pm 0.56$ ) ([Aledeilah, 2018](#)). The authors suggested the significance of the multimodal hand hygiene training program and strategies for emotional and behavioral approaches for patient engagement in hand-hygiene practice interventions ([Aledeilah, 2018](#)). Interestingly, those with less than one year of work experience had better attitudes than those who had been in the field for longer. Therefore, implementing regular educational programs to boost nurses' motivation to maintain their routine standards from the beginning of their career is ideal ([Kingston et al., 2017](#)).

### 5.4. Hand washing practices of nurses

The current study shows that more than 90% of all respondents practiced hand washing before and after invasive and non-invasive procedures, and 99.5% has good hand washing practices after exposure to body fluids. [Khanal and Thapa \(2017\)](#) and [Garba and Uche \(2019\)](#) reported similar findings, where almost all respondents performed hand hygiene practices before and after invasive or non-invasive procedures. The majority (85.6%) of nurses reported practicing hand hygiene before working with contaminated inanimate objects, and 69.7% before handling waste.

The current study has shown no statistically significant association between demographic variables and hand hygiene practices. [Nematian et al. \(2017\)](#) and [Alfahan et al. \(2016\)](#) reported similar results, with no significant difference in hand hygiene compliance in terms of gender, educational level, and work experience.

Female nurses had better hand hygiene practices (mean score 95.63) compared to male nurses (mean score 94.66). [Laskar et al. \(2018\)](#) reported that females had a higher rate of complete adherence to hand hygiene post-intervention. This study has shown that younger nurses (20–30 years) had better practices than those who were older than 30 years. The assumption is that the younger professional nurses may have fresh knowledge about hand hygiene from their training, and at the same time they could be scared of the consequences of not performing hand hygiene. In contrast, the experienced professional nurses may tend not to update their knowledge and skills and experience a gradual decline in hand hygiene practices and/or developed negligence of hand hygiene practices through time. This implies the need for continuous monitoring and training on hand hygiene practices. A similar finding was reported in an observational study by [Tschudin-Sutter, Sepulcri, Dangel, Schuhmacher, and Widmer \(2015\)](#), where those aged below or equal to 25 years had better hand hygiene practices than those over 25 years of age. Findings from [Zakeri et al. \(2017\)](#) and [Al Ra'awji et al. \(2018\)](#) were that the more years of working experience, the less the hand hygiene knowledge level of HCWs.

The current study examined the compliance level of the nurses with hand hygiene practices; however, the extent of the use of correct techniques for these practices remains unknown. As this was a self-reported study, there could be over-reporting of their performance. Previous

studies have reported evidence of possible overestimation of hand hygiene performance by respondents (Piras, Minnick, Lauderdale, Dietrich, & Vogus, 2018; Kelcikova et al., 2019).

### 5.5. Limitations of the study

The study used self-administered questionnaires to assess the knowledge, attitudes, and practices of the nurses; it did not employ an observational tool to compare self-reported and actual practices. This might have impacted the outcomes of the study. The use of random sampling also could have an impact on the proportions in terms of work level within the representative sample; for instance, there were more registered nurses (79) than enrolled nurses (48), which could have an impact on the credibility of the results. Also, small sample size could limit the generalizability of findings to the wider population.

## 6. Conclusion and recommendation

This study demonstrated that females had better attitudes to hand washing (mean score 96.06) and a higher level of practice (mean score 95.63) than males (mean scores 95.09 and 94.66, respectively), but less hand hygiene knowledge than male nurses. There were discrepant levels of knowledge, attitudes, and practices of hand hygiene among nurses. There is a possibility of self-assessed overreporting in terms of knowledge, attitudes, and practices regarding handwashing. No association was found between demographic variables and knowledge, attitudes, and practice.

To improve adherence to hand hygiene practices, systematic organizational monitoring systems, such as a valid trained observation, and feedback for continuous professional development and training, as an incentive for performance improvement is recommended. Future research on this topic should focus on both self-reported responses and direct observation to address the actual practice of correct hand hygiene techniques. This will reveal whether there is a gap between reported and observed practices.

The findings of this study raise concerns, as they indicate the possibility of failure to reach the goal of reducing the burden of hospital-based infections in psychiatric health facilities, since the levels of knowledge, attitudes, and practice of handwashing by nurses are not consistent throughout their professional lives. Other hand hygiene-predicting factors, such as attitude towards practices, and perceptions of hand hygiene, need to be examined to address obstacles to optimal hand hygiene procedures holistically, since hand hygiene is the single most effective weapon against hospital infections.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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