Risk Management and Healthcare Policy Dovepress

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# Factors Influencing Nurses' Knowledge About Delirium in Acute Care Settings in Hail Region, Saudi Arabia: A Cross-Sectional Study

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**Background:** The factors influencing nurses' knowledge of delirium in acute care settings have not been fully investigated in Saudi Arabia. Therefore, this study aimed to investigate these factors among nurses in acute care settings in the northern region of Saudi Arabia.

**Methodology:** A cross-sectional study was conducted using a convenience sample of 234 acute care nurses at the main public hospitals in the Hail region of Saudi Arabia. Data were collected using a structured, self-administered questionnaire, from November 2023 to February 2024. Multiple linear regression was used to identify factors of knowledge about delirium.

**Results:** Of the acute care nurses, 7.3% had a good level of overall knowledge about delirium, while 66.1% and 26.6% showed poor and moderate levels, respectively. Most nurses (78.2%) had poor knowledge of delirium assessment. Significantly higher scores on delirium assessment were observed for nurses who reported receiving in-service training on delirium ($P = 0.006$) and when a clear job description was applied ($P = 0.031$), whereas significantly higher scores on knowledge about risk factors were observed for those who had previous experience in caring for delirious patients ($P < 0.001$), received educational sessions on delirium ($P = 0.001$), and participated in training on delirium care ($P < 0.001$). Lack of previous experience in caring for delirious patients and participation in delirium care training were significant factors for lower knowledge about delirium scores (CI=−5.750 –1.200, $P < 0.001$).

**Conclusion:** In-service training, daily clinical discussion, availability of instructional materials, and specific training on delirium significantly influence nurses' knowledge about delirium, particularly regarding delirium assessment and early recognition. Enhancing these factors could improve nurses' knowledge and the care and management of patients complaining of delirium in acute care settings.

**Keywords:** delirium, intensive care unit, knowledge, Saudi Arabia

## Introduction

Delirium is an acute cognitive syndrome characterized by disrupted attention, impaired consciousness, and altered psychomotor activity.[1] It often occurs in the context of prolonged care for acute and life-threatening illnesses, with a higher incidence in cases of severe infections, complicated fractures, major surgeries, and use of psychoactive drugs.[2] The cognitive abilities of delirious patients fluctuate between periods of inattention and awareness, leading to two distinct clinical presentations: hyperactive delirium, which mainly manifests as resistance to treatment rules, and hypoactive delirium, which may manifest as disengaged or depressed patients.[3–5]

The prevalence of delirium in acute care settings varies widely, ranging from 30% to 70%, and is increasing among highly dependent and mechanically ventilated patients.[3,5] Many risk factors are associated with delirium, such as elderly

Received: 8 October 2024
Accepted: 16 December 2024
Published: 21 December 2024

patients, particularly patients with cognitive alterations such as dementia, extreme acuity, invasive procedures, and reliance on supportive devices such as prolonged use of mechanical ventilators.[6] Prevalence is varied widely, a study conducted in China showed that 36.1% of patients admitted to the intensive care unit (ICU) or critical care unit (CCU) had experienced delirium,[7] while a study in the central region of Saudi Arabia found that the incidence of delirium was 14.5%.[8]

Delirium usually results in serious consequences in acute-care settings. It causes short-term effects such as prolonged mechanical ventilation,[9] care challenges, and extended hospitalization,[10] or long-term effects such as chronic cognitive decline[11] and increased 6-month mortality.[12] Delirium remains one of the most commonly overlooked syndromes in clinical practice.[13,14] Missed or underdiagnosed delirium is attributed to a lack of knowledge and underestimation of the problem as well as inadequate assessment methods.[15,16] Previous studies suggest that less than half of delirium cases are diagnosed, with nurses and healthcare providers (HCPs) knowledge about delirium being unsatisfactory, and only 14.2% of HCPs used a correct delirium scale.[1,17,18]

Comprehensive care is crucial for fulfilling various aspects of care and minimizing missed nursing care, particularly in patients with terminal illnesses.[19–21] The American Center for Disease Prevention has recommended the knowledge-attitude-practice (KAP) theory as one of the most influential interventions in health-seeking behavior research to collect information on the knowledge, beliefs, and actions related to a particular topic in a specific population.[22–24] Therefore, evaluating nurses' knowledge of delirium provides evidence for the development of appropriate interventions to reduce its prevalence and improve its care.[17]

Numerous studies have assessed knowledge about delirium among intensive care personnel, including nurses, and have often found a lack of knowledge about delirium as well as inadequate skills for early recognition and assessment tools.[1,25–28] A few studies in the Arabic regions showed a high prevalence of delirium and a low level of knowledge.[29] Study conducted in the central region of Saudi Arabia found that ICU nurses had an acceptable level of knowledge about delirium.[30] To the best of our knowledge, the factors influencing nurses' knowledge of delirium in acute care settings have not been fully investigated in Saudi Arabia, particularly in the northern region. Therefore, this study aimed to investigate such factors among nurses in acute care settings in the northern region of Saudi Arabia.

# Methods

## Study Design

A cross-sectional design was used, in accordance with the STORBE guidelines for observational studies.

## Study Participants

The target population for this study consisted of all nurses working in acute care settings (ICU, cardiac wards, and palliative care units) at the main public hospitals in the Hail region of Saudi Arabia. Out of 362 nurses working in these specific settings, a minimum sample size of 187 nurses was determined using the Epi Info software (Centers for Disease Prevention and Control, Atlanta, Georgia, US). This calculation was based on an expected frequency of 50% for nurses with adequate knowledge, confidence level of 95%, and accepted marginal error of 5%. However, 234 nurses were randomly selected using a simple random sample from nurse registries in the aforementioned settings. Nurses of both sexes were included if they were licensed by the Saudi Commission for Health Specialties (SCFHS).

## Data Collection Tool

A structured, self-administered questionnaire was developed to investigate the factors influencing nurses' knowledge of delirium based on validated instruments used in previous studies and relevant literature.[6,23,31,32] Researchers have expanded items to include more questions to ensure completeness of the instrument, for example, details on types of delirium, clinical characteristics, and more risk factors. The adapted instrument, which was named "Nurses' Knowledge about Delirium Questionnaire" comprised of two parts. The first part aimed to collect the nurses' sociodemographic and professional characteristics. The second part assessed nurses' knowledge about delirium through 42 items across three knowledge domains: delirium background (21 items), nurses' knowledge about delirium assessment (10 items), and

knowledge about associated risk factors (11 items). Responses to the items in this part were scored as follows: "0" for incorrect response, "1" for unsure response, and "2" for correct responses.

## Instrument Validity and Reliability

To ensure the validity of the study instrument, the questionnaire was reviewed by seven experts in the nursing field (three assistant professors from the College of Nursing, two senior nurses, and two MD physicians from King Salman Hospital in the Hail region). Based on their comments, two items regarding delirium assessment were modified, and items to assess knowledge about delirium-associated risk factors were rearranged. Moreover, a scoring system for the instrument was established, where achieving 75% or more of the total score indicated a good level of knowledge, 50–74% of the total score indicated a moderate level of knowledge, and scoring below 50% indicated a poor level of knowledge.[33]

The questionnaire was pilot tested on 25 nurses to assess its applicability, feasibility, and reliability. The findings demonstrate that the questionnaire was simple to complete. The scale was found to be reliable, with a Cronbach's alpha coefficient of 0.814. Nurses involved in the pilot study were excluded from final data analysis. Data were collected between November 2023 and February 2024.

## Data Analysis

Data were analyzed using IBM SPSS Statistics version 22 (IBM Corp., Armonk, NY, USA) under the guidance of a statistician. Given that the data were not normally distributed, the Mann–Whitney *U*-test or Kruskal–Wallis *H*-test, as appropriate, was used to compare the mean ranks of nurses' knowledge scores. Multiple linear regression was used to identify the factors of knowledge about delirium among nurses. Differences were considered statistically significant at *P*-values <0.05.

# Results

## Knowledge of Nurses About Delirium

Figure 1 shows that only 7.3% of nurses in acute care settings in the Ha' il region had a good level of overall knowledge about delirium, while 66.1% and 26.6% of nurses showed poor and moderate levels, respectively. The majority of nurses

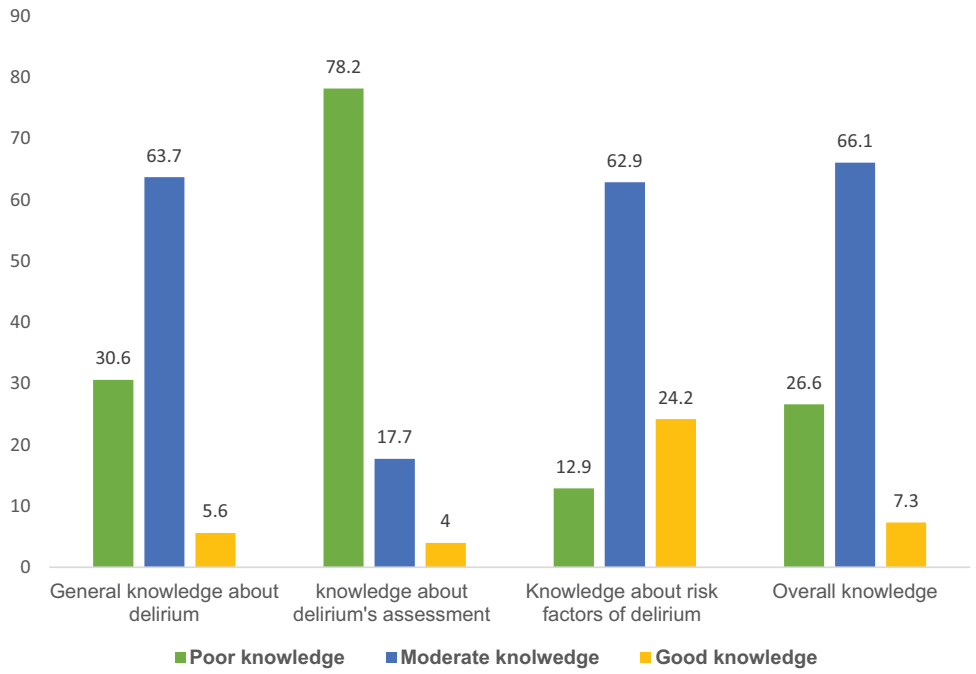


**Figure 1** Nurses' knowledge about delirium in acute care settings in Hail region, Saudi Arabia (2023–2024).

(78.2%) had a poor level of knowledge about delirium assessment, while 63.7% and 62.9% of nurses had a moderate level of knowledge about delirium background and its associated risk factors, respectively.

## Comparison of Delirium Knowledge Scores by Sociodemographic Characteristics

Table 1 shows that there were no significant differences in the mean scores of nurses' overall knowledge of delirium by gender, age, work unit, or years of experience. Regarding delirium knowledge domains, females scored significantly higher on delirium assessment ($P = 0.001$), while males scored significantly higher on knowledge of delirium background ($P = 0.018$) and risk factors ($P = 0.021$). In contrast, there were no significant differences in nurses' mean scores in any of the three knowledge domains by age, work unit, or years of experience.

## Comparison of Delirium Knowledge Scores by Profession-Related Characteristics

Table 2 shows that there were significant differences in the mean scores of nurses' overall knowledge about delirium based on profession-related characteristics of in-service training ($P = 0.029$), engagement in daily clinical discussions with the healthcare team ($P = 0.003$), previous experience in caring for delirious patients ($P < 0.001$), receiving

**Table 1** Comparison of Delirium Knowledge Scores Among Nurses in Acute Care Settings by Their Sociodemographic Characteristics

| Sociodemographic Characteristics | *n* | (%) | Delirium Knowledge Domains (Mean Rank) | | | |
|---|---|---|---|---|---|---|
| | | | Background | Assessment | Risk Factors | Overall |
| **Gender**[a] | | | | | | |
| Male | 100 | (42.7) | 129.60 | 101.13 | 129.25 | 126.61 |
| Female | 134 | (57.3) | 108.47 | 129.72 | 108.74 | 110.50 |
| P-value | | | 0.018* | 0.001* | 0.021* | 0.075 |
| **Age** (years)[b] | 27.44±4.065 | | | | | |
| <25 | 108 | (46.2) | 116.96 | 114.52 | 117.93 | 115.72 |
| 25–35 | 96 | (41.0) | 121.76 | 122.09 | 116.74 | 123.15 |
| >35 | 30 | (12.4) | 105.82 | 113.55 | 118.38 | 105.82 |
| P-value | | | 0.523 | 0.670 | 0.989 | 0.440 |
| **Work unit**[b] | | | | | | |
| ICU | 163 | (69.7) | 115.47 | 114.54 | 115.40 | 123.76 |
| CCU | 17 | (7.3) | 136.44 | 134.76 | 127.59 | 138.09 |
| PCU | 54 | (23.1) | 117.66 | 114.54 | 120.65 | 113.28 |
| P-value | | | 0.474 | 0.436 | 0.720 | 0.263 |
| **Years of experience in acute care settings**[b] | | | | | | |
| ≤3 | 166 | (70.9) | 120.62 | 118.74 | 111.48 | 116.30 |
| 4–6 | 47 | (20.1) | 106.05 | 114.14 | 134.64 | 121.66 |
| >6 | 21 | (9.0) | 119.74 | 115.29 | 125.84 | 117.26 |
| P-value | | | 0.407 | 0.900 | 0.091 | 0.888 |

**Notes**: The asterisk (*) indicates significant results; ([a]) signifies that the Mann–Whitney *U*-test was used; ([b]) signifies that the Kruskal–Wallis *H*-test was used.
**Abbreviations**: ICU, Intensive Care Unit; CCU, Cardiac Care Unit; PCU, Palliative Care Unit.

**Table 2** Comparison of Delirium Knowledge Scores Among Nurses in Acute Care Settings by Their Profession-Related Characteristics[a]

| Profession-Related Characteristics | *n* | (%) | Delirium Knowledge Domains (Mean Rank) | | | |
|---|---|---|---|---|---|---|
| | | | Background | Assessment | Risk Factors | Overall |
| **In-service training on delirium** | | | | | | |
| Yes | 174 | (74.4) | 121.04 | 122.67 | 119.93 | 121.76 |
| No | 60 | (25.6) | 99.22 | 90.82 | 104.95 | 95.54 |
| P-value | | | 0.067 | 0.006* | 0.210 | 0.029* |
| **Applying a clear job description** | | | | | | |
| Yes | 148 | (63.2) | 130.01 | 112.07 | 116.54 | 122.55 |
| No | 86 | (36.8) | 81.21 | 133.25 | 120.29 | 102.85 |
| P-value | | | <0.001* | 0.031* | 0.710 | 0.052 |
| **Engagement in daily clinical discussions with the healthcare team** | | | | | | |
| Yes | 163 | (69.7) | 128.76 | 117.98 | 119.75 | 126.25 |
| No | 71 | (30.3) | 91.65 | 116.41 | 112.34 | 97.42 |
| P-value | | | <0.001* | 0.867 | 0.439 | 0.003* |
| **Previous experience in caring for delirious patients** | | | | | | |
| Yes | 98 | (41.9) | 139.39 | 117.38 | 135.96 | 140.06 |
| No | 136 | (59.1) | 97.77 | 114.10 | 100.31 | 97.27 |
| P-value | | | <0.001* | 0.703 | <0.001* | <0.001* |
| **Availability of instruction materials regarding delirium** | | | | | | |
| Yes | 81 | (34.6) | 138.70 | 106.78 | 122.78 | 127.36 |
| No | 153 | (65.4) | 106.27 | 123.18 | 114.71 | 112.28 |
| P-value | | | <0.001* | 0.069 | 0.383 | 0.104 |
| **Receiving educational sessions on delirium** | | | | | | |
| Yes | 85 | (36.3) | 139.05 | 119.35 | 136.13 | 140.58 |
| No | 194 | (63.7) | 105.21 | 116.45 | 106.87 | 104.34 |
| P-value | | | <0.001* | 0.745 | 0.001* | <0.001* |
| **Participation in training on delirium care** | | | | | | |
| Yes | 57 | (24.4) | 148.91 | 121.54 | 153.55 | 155.79 |
| No | 177 | (75.6) | 107.38 | 116.20 | 105.89 | 105.17 |
| P-value | | | <0.001* | 0.593 | <0.001* | 0.001* |
| **Presence of routine daily assessment of delirium** | | | | | | |
| Yes | 43 | (18.4) | 155.48 | 124.31 | 125.00 | 141.64 |
| No | 191 | (81.6) | 108.95 | 115.97 | 115.81 | 112.07 |
| P-value | | | <0.001* | 0.451 | 0.419 | 0.010* |

**Notes**: The asterisk (*) indicates significant results. ([a]) indicates that the Mann–Whitney *U*-test was used.

educational sessions on delirium ($P$ <0.001), participation in training on care for delirious patients ($P$ = 0.001), and presence of routine daily assessment of delirium ($P$ = 0.010). Regarding delirium knowledge domains, significantly higher scores on delirium background ($P$ <0.001) were observed for nurses who applied a clear job description, engaged in daily clinical discussions with the healthcare team, had previous experience in caring for delirious patients, reported availability of instruction materials on delirium, received education on delirium, participated in training on delirium care, and reported the presence of routine daily assessment of delirium. On the other hand, significantly higher scores on delirium assessment were observed for nurses who reported receiving in-service training on delirium ($P$ = 0.006) and applied a clear job description ($P$ = 0.031), while significantly higher scores on knowledge about delirium-associated risk factors were observed for those who had previous experience in caring for delirious patients ($P$ <0.001), received educational sessions on delirium ($P$ = 0.001), and participated in training on delirium care ($P$ <0.001).

## Factors of Knowledge About Delirium

Table 3 shows that the multiple linear regression model of delirium knowledge factors was found to be statistically significant ($P$ = < 0.001) and accounted for 18.8% of the variance in nurses' knowledge ($R^2$ = 0.433, adjusted $R^2$ = 0.188).

**Table 3** Multiple Linear Regression of Factors Affecting Nurses' Knowledge About Delirium

| Factors | Mean Rank | β | t-Test | P-Value | 95% CI of β |
|---|---|---|---|---|---|
| **In-service training on delirium** | | | | | |
| **Yes** | 121.76 | Reference | | | |
| **No** | 95.54 | −1.83 | 0.175 | 0.141 | (−4.350, 0.705) |
| **Engagement in daily clinical discussions with the healthcare team** | | | | | |
| **Yes** | 126.25 | Reference | | | |
| **No** | 97.42 | −2.06 | −1.98 | 0.055 | (−0.411, −0.013) |
| **Previous experience in caring for delirious patients** | | | | | |
| **Yes** | 140.6 | Reference | | | |
| **No** | 97.27 | −3.48 | −3.08 | 0.001* | (−5.750, −1.200) |
| **Availability of instruction materials regarding delirium** | | | | | |
| **Yes** | 127.36 | Reference | | | |
| **No** | 112.28 | −0.18 | −0.141 | 0.080 | (−2.670, 2.314) |
| **Receiving educational sessions on delirium** | | | | | |
| **Yes** | 140.58 | Reference | | | |
| **No** | 104.34 | −4.364 | −4359 | 0.684 | (−0.034, −0.408) |
| **Participation in training on delirium care** | | | | | |
| **Yes** | **155.79** | Reference | | | |
| **No** | **105.17** | −2.58 | −1.768 | 0.048 | (−5.460, 0.290) |
| **Presence of routine daily assessment of delirium** | | | | | |
| **Yes** | 141.64 | Reference | | | |
| **No** | 112.07 | −1.15 | −0.898 | 0.255 | (−3.670, 1.370) |

**Notes**: The star sign (*) indicates significant results.
**Abbreviations**: B, coefficient of predictor variables; CI, confidence interval; S.E, standard error.

Specifically, the absence of previous experience in caring for delirious patients was identified as a significant factors of lower scores of knowledge about delirium among nurses when compared to those with previous experience. Likewise, the lack of participation in delirium care training was a significant factor of lower scores of knowledge about delirium among nurses when compared to those who had participated in such training.

## Discussion

Delirium syndrome is a common complication in acute care settings that negatively affects patient outcome. The high prevalence and consequences of delirium are usually associated with a lack of knowledge and skills to diagnose and treat delirium in a timely manner.[34] Therefore, determining the level of knowledge about delirium helps identify gaps and establish plans to improve the quality of its care.[35]

The present study revealed a lack of knowledge about delirium among nurses in acute care settings in the Ha' il region, with a small proportion (7.3%) showing a good level of knowledge compared to the vast majority (92.7%) with poor or moderate levels of knowledge. The knowledge gap was most pronounced in the domain of delirium assessment, with more than three-quarters of the nurses exhibiting poor knowledge about how to recognize delirium and its assessment tools. On the other hand, about one-third of the nurses had poor knowledge of the background of delirium. Poor knowledge about delirium in acute care settings could arise from the underestimation of its prevalence, absence of standardized care guidelines, and inadequate medical diagnosis. Consistent with this study, Zhou et al[6] have recently revealed inadequate awareness of delirium and its subcategories among Chinese nurses, particularly regarding assessment methods and identification of associated risk factors.

Education and training serve as cornerstones for improving nurses' knowledge and skills in delirium care. In line with the present study, previous studies have found that approximately half of ICU nurses lack education on delirium, resulting in poor knowledge and inappropriate treatment practices.[36,37] On the other hand, targeted educational programs have been shown to be effective in enhancing nurses' understanding of and clinical procedures related to delirium.[36,37] Furthermore, a recent study in Jordan showed that ongoing education was successful in improving knowledge and therapeutic outcomes of delirium.[38] Accordingly, an insufficient understanding of delirium among nurses is a common problem that necessitates ongoing education to improve the quality of care for patients at risk of or currently suffering from delirium.

The present study revealed a significant sex difference in knowledge about delirium. Specifically, female nurses were more aware of the assessment methods and early signs of delirium, while male nurses had a higher level of knowledge about the background and risk factors associated with delirium. In line with this observation, Zhou et al[6] found that female Chinese nurses had greater knowledge and skills in delirium care and higher competence in delirium assessment than their male counterparts.[6] Furthermore, a study conducted in Germany by Baessler et al[39] showed that male medical students tended to overestimate their knowledge of delirium, whereas female students were generally more accurate in their self-assessment and more proficient in practical applications.

In terms of profession-related attributes, the present study revealed higher levels of knowledge about delirium among nurses who received in-service training, engaged in daily clinical discussions, and had previous experience caring for delirious patients. This finding underscores the importance of in-service training and educational sessions to enhance nurses' understanding of delirium. Rowley-Conwy[1] suggested that education on delirium can greatly improve knowledge and practice among critical care nurses. Similarly, Alharbi[30] observed better assessment practices among Saudi nurses who received specific training on delirium. On the contrary, years of experience and the unit of work did not significantly affect the level of knowledge, which may be related to the fact that the majority of nurses in the present study had less than three years of experience, and the majority of them were working in ICUs.

Similarly, the present study found significantly higher levels of knowledge about delirium among nurses who participated in clinical discussions. Pan et al[7] observed that regular patient status assessments and discussions, including delirium, are vital for maintaining a high standard of care. The care experience of patients with delirium enhances nurses' knowledge and assessment skills. Abazid et al[8] found that Saudi nurses who had been exposed to delirious patients were better at recognizing and managing delirium, thereby emphasizing the importance of hands-on practices in improving delirium management skills.

For HCPs to develop a clear understanding of and familiarity with delirium, appropriate educational resources are needed. Advances in educational materials have helped enhance such knowledge. Mitchell et al[40] found a two-hour workshop significantly improved nursing students' knowledge and confidence in handling delirium in Northern Ireland. Another study reported considerable improvement in medical students' knowledge through the application of a video-based approach.[39] Regarding delirium assessment methods, the present study revealed a deficient level of knowledge regarding these methods, which may be related to the underestimation and underdiagnosis of delirium. In contrast, Pan et al[7] found that ICU staff in a Chinese hospital were familiar with the Confusion Assessment Method for the ICU (CAM-ICU), and that knowledge across different domains of delirium was evenly distributed. Rowley-Conwy[15] identified barriers to delirium assessment, including the complexity of assessment tools and challenges in assessing intubated patients, and emphasized the need for specific training and frequent clinical discussions to increase familiarity and confidence with these tools. Moreover, according to Kristiansen et al,[34] nurses often work without structured documentation and consistent knowledge about delirium, which compromises their ability to provide timely and effective care. This suggests that even as knowledge improves through targeted education, the implementation and consistency of such training is critical for sustained improvements in clinical practice.

The present study concluded that previous experience in caring for delirious patients and specific training on delirium are factors affecting acute care nurses' knowledge levels. This finding could guide educational strategies to establish criteria for participation in educational sessions or assignment of nurses to care for patients with delirium. A systematic review by Thomas et al[5] revealed knowledge gaps regarding delirium care among nurses and highlighted the need for continuing education to address these gaps. Similarly, in a study on critical care nurses' readiness to recognize ICU delirium, Ho et al[41] suggested using a valid delirium assessment tool to improve nurses' skills. In contrast, Mansutti et al[42] reported that Italian nurses did not apply their clinical knowledge of poststroke delirium in their practice.[42] Several factors, including hospital environment and nursing workload, can influence the application of knowledge in clinical practice. In another context, urinary catheters at the site, days spent in the ICU, and use of sedative medications were identified as significant contributors to ICU patient delirium.[43,44] Therefore, further studies are needed to investigate the factors that affect the recognition and diagnosis of delirium. Additionally, it is crucial to implement clinical policies and guidelines for the care of patients with delirium.

## Study Limitations

The time constraints presented a challenge for this study, preventing its extension to other regions within the country. In addition, a cross-sectional design was adopted with a convenience sample of nurses solely from acute care units in public hospitals, potentially limiting the generalizability of the findings to a broader population of acute care nurses in other regions or healthcare settings. Moreover, this study may not have thoroughly explored the factors that influence nurses' knowledge of delirium. To address these limitations, large-scale studies spanning various regions of the country and diverse acute care settings using a multistage cluster sampling approach are recommended. Longitudinal and interventional studies are also needed for more comprehensive insight into the factors influencing nurses' knowledge of delirium. Finally, the possibility of introducing self-reported bias into the study should be acknowledged because the data collection relied on a self-administered questionnaire. Accordingly, nurses may have provided responses that they perceived as more socially desirable or that did not accurately reflect their actual knowledge of delirium.

### Implication for Practices and Future Research

Identifying the nurses' knowledge about delirium highlights a specific knowledge gap among nurses and it will pay the institution attention to developing an evidence-based plan of continuous education and training. Further research with longitudinal and multicenter is also needed for a more comprehensive insight into the factors influencing nurses' knowledge about delirium and to investigate those factors independently.

## Conclusion

The majority of acute care nurses in the Hail region exhibited poor to moderate overall knowledge about delirium, particularly regarding its assessment and recognition. Discrepancies in knowledge based on gender and professional characteristics regarding various aspects of delirium underscore the importance of targeted interventions to enhance such knowledge. Lack of prior experience in caring for delirious patients and lack of participation in delirium care training were significantly

correlated with low levels of knowledge, emphasizing the importance of practical experience in improving knowledge levels both in the workplace and through in-service training.

## Ethical Approval and Informed Consents

All procedures were performed in accordance with the relevant standards and laws, including the Helsinki Declaration. The University of Hail Research Ethics Committee approved this study (Ethical Approval No: H-2023-389). Before data collection, written informed consent was given to nurses, and they were advised that their contributions were voluntary, and that they might withdraw at any moment without reason. Only aggregated data were shared, and the participants' code numbers were used throughout the data collection and analysis to ensure their privacy and confidentiality.

## Acknowledgments

The authors are indebted to the Deanship of Scientific Research and Hail University for their support and cooperation during this study. The researcher would also like to thank all staff nurses and supervisors in the related settings who participated in this study.

## Funding

This research was funded by the Scientific Research Deanship at the University of Ha'il, Saudi Arabia (project number [RG-23071]).

## Disclosure

The authors declare no competing financial or nonfinancial interests associated with this work.

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