

Research Article

Delirium in Adult Critical Care Unit: Prevalence and Outcomes at Regional Hospital

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Abstract

Background: Delirium is an acute confusional state that affects 30-80% of admitted patients to intensive care units. According to the literature, delirium may worsen patients' and hospital outcomes. No research studies regarding delirium prevalence and outcomes were found in Oman. **Objective:** This study aims to determine the prevalence and outcomes of delirium in Adult patients admitted to the Intensive Care Unit (ICU) at a regional hospital. **Methodology:** This study followed an observational longitudinal design. A consecutive sampling method for six months was used for selecting Adult Intensive Care Unit (AICU) patients after 48 hours of ICU admission and a total of 76 patients aged 18 years and older were included. Confusion Assessment Method in Intensive Care Unit (CAM-ICU) instrument (CAM-ICU worksheet and Daily Assessment Checklist) was used for assessing patients' prevalence and outcomes of delirium. A training program was provided for adult intensive care doctors and nurses regarding using the CAM-ICU tool one month before the study. Social Packages for the Social Sciences Program (SPSS) version 20 was used for data analysis. **Results:** More than half of the participants were male (63%), while the age group above 65 years (42%) had more positive cases. Results indicated a high prevalence of delirium in AICU (77%) of admitted patients. Outcomes of delirium in AICU indicated two outcomes, duration in AICU and ventilation days. Duration in ICU ($M=15.53$, $SD=21.27$) while ventilation days indicated a ($M=13.30$, $SD=20.69$). The result indicated a significant positive relationship between age, duration days in ICU, and ventilation days to delirium ($p=0.001$). **Conclusion:** The results from this study indicated a high prevalence of delirium in AICU and delirium is associated with longer duration in AICU and longer ventilation days. Identifying delirium prevalence and outcomes can enhance the early management of delirium and improve patients' and hospital outcomes. In addition, results from this study can improve the knowledge and skills of healthcare providers in using the CAM-ICU assessment as a valid tool for assessing delirium in Intensive care unit (ICU) patients.

Keywords

Delirium, Adult Critical Care Unit, Prevalence, Outcomes, CAM-ICU

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1. Introduction

Delirium is a disorder characterized by acute mental deterioration, attentional deficit, altered level of arousal, and psychotic features. This condition leads to temporary memory loss, sleep disturbances, illusions, and restlessness [1]. Delirium is a common problem found with high incidence in critically ill patients. It is seen in 30-80% of patients admitted into the intensive care unit (ICU) [2]. Delirium is a common cause of disturbed behaviors in critically ill patients and often goes undetected and poorly managed. There is much interest and focus on detecting ICU delirium today because it was found to be associated with poor outcomes. Delirium was reported in 60–80% of mechanically ventilated patients and 20–50% of ICU patients with lower severity of illness [3].

Many studies have examined the incidence of delirium in the ICU. In a large study conducted by Brown et al. [4], 44% of their study population experienced delirium in an ICU. In an observational study by Gravante et al. delirium occurred in 55.8% of the study population. Delirium was found in 36.1% of the patients in the Affiliated Hospital of Zunyi Medical University in Chania [6], while in India around 24.4% of ICU had delirium [7]. As indicated by Sharma et al. the incidence was higher (64%) in mechanically ventilated patients [7]. Incidence of delirium in noninvasively ventilated patients showed that 18.1% of patients had delirium in the ICUs of a teaching hospital in Chania [8]. A systematic review and meta-analysis reported that the pooled incidence of delirium is 31.8% in critically ill patients; it is found much higher (reaching 80%) in mechanically ventilated patients [9]. Moreover, Khalighi et al. found that delirium was present in 24.7% of ICU patients [10]. During the COVID-19 pandemic, many patients were admitted to ICUs due to acute respiratory distress syndrome, and studies have shown that delirium was present in around 60% of subjects. Delirium is associated with many factors, the most common being higher age, severity of illness, use of respiratory support (invasive or noninvasive), use of sedative agents, and comorbidities with multisystem involvement [11].

The prevalence of delirium varies across care settings, with rates as high as 80% among patients admitted to ICUs [12]. Studies conducted in Saudi Arabia showed that the incidence of delirium was 14.5% among patients admitted to critical care units in the central region [13]. In Iran, the prevalence of delirium in hospitalized patients was 27.5%, of which 24.7% were admitted to the ICU [10]. The literature indicated that the prevalence of delirium among patients admitted to ICUs in Italy was 55.8% [5]. While in Canada the prevalence of delirium among patients admitted to ICUs was 44% [4].

Delirium is an independent predictor of outcomes that matters, including increased healthcare costs, duration of ICU and hospital stay, mortality, and long-term cognitive impairment [3]. Brown et al. found that patients who ever had delirium in the ICU had 1.14 times the risk of developing a neuropsychiatric disorder and 2.14 times the risk of devel-

oping a neurocognitive disorder within one year compared to those who never had delirium in the ICU [4]. Patients with delirium stayed longer on mechanical ventilation [14]. As a result, the length of stay in the ICU and hospital was longer resulting in a higher cost of treatment [6]. Severely ill COVID-19 patients with delirium stay longer on mechanical ventilation and have higher rates of renal replacement therapy and extracorporeal membrane oxygenation [15]. ICU delirium resulted in worse functional outcomes at discharge, and those patients were less likely to be discharged. Delirium was linked to higher ICU and hospital mortality [11]. In a systematic review conducted by Rosgen et al. found that the severity of delirium was strongly associated with increased ICU length of stay and a smaller proportion of patients discharged [17].

Furthermore, the prevalence of delirium among patients is linked to overall patient outcomes and the cost of treatment [17]. The reported incidence rate of delirium in adult intensive care units (AICUs) varies, but there is limited data regarding its prevalence in Oman. Due to a lack of evidence, it is difficult to estimate the prevalence of delirium in Omani hospitals.

Delirium can lead to many serious outcomes, such as long duration of mechanical ventilation, prolonged ICU and hospital stay, increased hospital cost, and increased mortality rate [6]. Increasing levels of delirium severity and duration amplify these outcomes and are independently associated with worsening cognitive and functional outcomes post-discharge [16]. Delirium has a major economic impact on the healthcare system. According to previous studies, the total estimated expenditures caused by delirium in the United States of America range from US\$38 to US\$152 billion per year [18]. Based on the literature review, limited studies were found to examine delirium in ICU patients in the Arab countries in general and Oman in particular.

Delirium results in immediate adverse events on patients and hospitals, such as prolonged ICU hospitalization, increased medical costs, and long-term adverse effects on patients' health and quality of life [9]. Despite the increased prevalence of delirium worldwide and its severe adverse effect on patient health and care outcomes, Omani Hospital lacks such data.

Identifying the prevalence of delirium contributes to the early management of delirious patients in AICU. It is useful for critical care patients and hospital outcomes [18]. Managing critically ill patients will improve the cost-effectiveness of the hospital and the Ministry of Health. This, in turn, improves patients' quality of care and their life outcomes [3]. Therefore, this study was conducted to determine the prevalence of delirium and identify delirium outcomes among AICU patients admitted at a regional hospital.

2. Material and Methods

2.1. Study Design

This study applied an observational longitudinal design. Before the data collection, the primary investigator provided a training program for all nurses and doctors working in the AICU on using the data collection instrument. The training was conducted for one month before the data collection process. A full explanation of the tool and how to use it to obtain the needed data was provided. A trial for applying the tool and collecting sample data was conducted to ensure the staff's and doctor's ability to use the tool. Data was collected for six months, from May to November, 2023. This study was conducted in the AICU at a regional hospital. This unit cares for critically ill adult patients of both genders and has a capacity of 8 beds.

2.2. Participants

The target population of the present study was patients 48 hours after admission into the AICU at a regional hospital. The total occupancy rate of the AICU in a regional hospital for the last six months was 180 patients. All admitted adult patients who completed 48 hours in AICU were included in the study for six months. Patients under 18 years of age were excluded because the study aimed to determine the prevalence of delirium in adult patients only. In this study, the sample was drawn from the population of patients admitted into the AICU. A consecutive-sampling technique was used in this study. The principle investigator visited the AICU every two days to follow up on admitted patients 48 hours after AICU admission to include them in this study. A sample of 75-85 patients was considered for the study, taking into consideration possible withdrawals. The principle investigator and other team members conducted periodic visits during the data collection.

2.3. Data Collection Instrument

The Confusion Assessment Method (CAM) is an assessment tool that Dr. Sharon Inouye designed and validated in 1990 for non-psychiatrists to assess bedside delirium [19]. The CAM-ICU is an adaptation of this tool used to detect delirium in ventilated and non-ventilated critically ill patients in an ICU setting. Due to the spread of delirium worldwide, it was translated into 20 languages and can be used in multiple countries [20]. According to the literature, the CAM-ICU appears rapid, valid, and reliable for clinical and research purposes [21]. The CAM-ICU had sensitivities of 100% and 93%, 98% and 100% specificities, and high interrater reliability

($n=0.96$; 95% confidence interval, 0.92-0.99) [22]. Permission was obtained via e-mail from Babar A. Khan, 2017.

The CAM-ICU adopts a staged approach during the assessment. The tool assesses four features divided into two major and two minor criteria. These major criteria include acute onset or fluctuating course of mental status and inattention. The minor criteria include an altered level of consciousness and disorganized thinking. The diagnosis of delirium is based on the presence of two major criteria (acute or fluctuating onset plus inattention) and at least one of the minor criteria (disorganized thinking or altered level of consciousness). In the first stage, the level of consciousness and any fluctuation in mental status is assessed using validated sedation or a level of consciousness scale, such as the Richmond Agitation-Sedation Scale. Based on the result of this stage, a decision is made as to whether the patient should be further assessed or can be reevaluated later. If the first feature is present, the examiner can move to the next step, which is the assessment of inattention using a different set of letters or photos.

The results of steps one and two inform the decision to move to steps three and four. Each criterion is documented as present or absent and is used to decide whether the patient is delirious [19]. Data was collected using a CAM-ICU worksheet. This study analyzed data using Social Packages for the Social Sciences (SPSS) version 20. Descriptive statistics, numbers, and percentages were used to analyze the demographic data. Numbers and percentages were used to calculate the prevalence and outcomes of delirium in AICU.

2.4. Ethical Consideration

In this study, the ethical approval and permission to conduct the study and access the Al-Shifa Plus System was obtained from the regional research committee and the Directorate of Nursing at Nizwa Hospital. Written informed consent was secured from adult patients admitted to the AICU and from patients' relatives for unconscious patients. Participants will be recruited voluntarily. No identification data of participants was collected.

3. Results

The data was collected over six months, from May 7, 2023, to November 14, 2023. The number of admitted patients during the data collection period was 180, whereas only 76 were included based on the calculated sample and the inclusion criteria. The sampling method and selection process Figure 1.

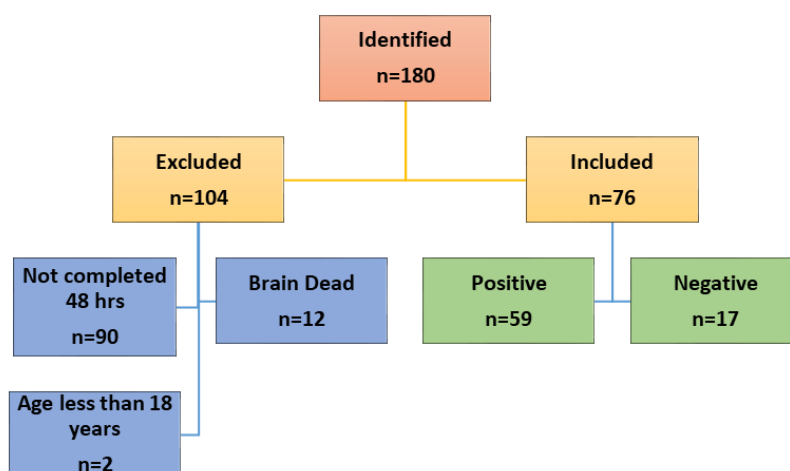


Figure 1. Sampling Method and Selection Process.

Only age and gender were included as demographic data for the participants. The sample included 48 (63.2%) male and 28 (36.8%) female. While the age of participants was in the ratio of 18-45, 46-65, and more than 65 (32.9%, 25% and 42.1% respectively). Results showed that more than half of the participants, 59 (77.6%), were positive for delirium based on the CAM-ICU used in this study [Table 1](#).

Table 1. Results of CAM-ICU Assessment (N=76).

CAM-ICU	Frequency	Percentage
Positive	59	77.6
Negative	17	22.4
Total	76	100.0

The results showed that the rate of delirium increases with age. The relationship between delirium and gender could not be identified because the majority of the included sample was female as shown in [Table 2](#).

Table 2. Delirium Cases to Age and Sex (N=76).

Parameters	Gender/Age	CAM-ICU Positive	CAM-ICU Negative
Sex	Male	83.3%	16.7%
	Female	67.9%	32.1%
Age	18-45	60%	40%
	46-65	68.4%	31.6%
	>65	96.9%	3.1%

Delirium's outcomes in terms of length of stay and ventilation days indicating prolonged length of stay and ventilating days with positive delirium [Table 3](#).

Table 3. Length of Stay and Ventilation Days with Delirium (N=76).

Delirium	Parameters	ICU Stay Duration	Ventilation Days
Positive	Mean	15.5254	13.3051
	Median	7.0000	6.0000
	Std. Deviation	21.27517	20.69670
Negative	Mean	3.5882	.8235
	Median	3.0000	.0000
	Std. Deviation	1.50245	1.07444

4. Discussion

This observational study aimed to examine the prevalence and outcomes of delirium in adult patients admitted into the ICU at a regional hospital. In this study, the prevalence of delirium was 77.6%, which is consistent with the findings by Sharma et al. (53.6%) and Gravante et al. (55.8%) [\[7, 5\]](#). However, this study results are inconsistent with Khalighi prevalence was only 24.7% [\[10\]](#). Pan et al. found similar results to Khalighi's (36.1%) due to inadequate monitoring of delirium [\[6\]](#).

The current study suggested a higher prevalence of delirium among male patients (83.3%) than female patients (67.9%). The literature did not report any association between delirium and gender. The association between gender and delirium in this study can be explained by the fact that the majority of the included sample was male. On the other hand,

this study results considered new additions to the literature. The results of the current study suggest a chronicled association between age and the prevalence of delirium, for the results indicated that older patients had a higher chance of getting delirium than younger patients. This study's results were consistent with the findings by Zaai et al. and Mori et al. who found a positive relationship between age and delirium [11, 23].

Based on this study's results, the positive cases of delirium were associated with a longer mean duration in the AICU ($M=15.52$, 2-103 days, vs. $M=3.5882$, 2-8 days) and more ventilation days ($M=13.30$, 0-103 days, vs $M=.8235$, 0-3 days) compared to non-delirious patients. These findings suggested a positive relationship between delirium and ICU duration as well as ventilation days, which is consistent with the findings by Tilousche et al. and Sulluh et al. who studied the same factors in terms of the length of ICU stay and ventilation days [24, 9]. Sharma et al. found similar results, and the length of study of patients with delirium was 3.4 more than patients without delirium [7].

This study indicated that there is a high prevalence of delirium cases in the AICU in the regional hospital, and patients with delirium stay longer in the hospital and on mechanical ventilation. Therefore, the CAM-ICU should be adopted to assess delirium in Omani hospitals because it has proven valid tool. Based on this study it is widely used as an assessment tool in many countries and can help ICU health teams to detect delirium early ensuring early management [21]. Policy-makers in the Ministry of Health in Oman need to develop a policy regarding using CAM-ICUs in all hospitals. A policy should mandate that all hospitals to use CAM-ICU instead of invalid tools. It is beneficial for the country to detect delirium early and improve the cost-effectiveness of ICU care by shortening hospital stays and ventilation days. Furthermore, this study was the first in Oman about delirium, and data from this study considered a database for other studies in Oman using bigger samples with multicenter and other research designs, such as experimental studies.

Based on the study's results, it is recommended that the CAM-ICU be used for early detection of delirium and effective management of the outcomes. The assessment findings must be documented in the patient electronic system for easy access and follow-up. Moreover, more research is recommended as the literature review lacks studies conducted in Oman on the discussed topic. The small sample size in this study is one of the major limitations. In addition, more training is needed for nurses dealing with patients to follow up with the assessment plan.

5. Conclusions

Delirium is common in AICU and many studies discussed its increase in many countries, while the prevalence of delirium and its outcomes was not investigated in Omani hospitals. In Oman delirium is a common cause that disturbs

behaviors in critically ill patients. However, it often goes undetected and poorly managed because of poorly used evaluation tools. This study used the CAM-ICU assessment to identify the prevalence of delirium and its outcomes. The results from this study indicated that there is a high prevalence of delirium in AICU, and there is a significant association between delirium, length of hospital stay, and ventilation days. The results from this study indicated that CAM-ICU assessment is a valid tool for assessing delirium in the ICU and should be adopted in Omani hospitals to enhance the early management of delirium and improve patients' and hospital outcomes. The CAM-ICU should be used with all patients upon admission and subsequently. Furthermore, Training ICU staff on how to use the CAM-ICU is recommended before using the tool.

Abbreviations

AICU	Adult Intensive Care Unit
CAM-ICU	Confusion Assessment Method for Intensive Care Unit
SPSS	Social Packages for the Social Sciences Program
ICU	Intensive Care Unit

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Author Contributions

Basma Al Mahrouqi: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Resources, Software, Writing Original Draft, Supervision, Writing and editing the Final Manuscript.

Huda Al Namani: Methodology, Investigation, Data Curation, Writing Original Draft, Reviewing Final Manuscript.

Zaina Al Harmali: Methodology, Resources, Validation, Supervision, Reviewing Final Manuscript.

Fadi Al Sulaimi: Investigation, Visualization, Writing Original Draft, and Reviewing Final Manuscript.

Aliya Al Shibani: Investigation, Writing Original Draft, and Reviewing Final Manuscript.

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Data Availability Statement

Data is available from the corresponding author upon reasonable request.

Conflicts of Interest

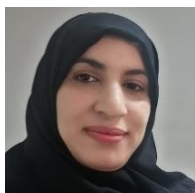
The authors declare no conflicts of interest.

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Biography



Basma Al Mahrouqi is a Science Tutor at Oman College of Health Science Al Dakhiliya Branch, Nursing program, Oman. She completed her Specialty diploma in adult critical care in 2017 and her Bachelor's in Nursing from Sultan Qaboos University in 2011. She participated in different workshops and conferences to present this research. She presented as a speaker at the International Nursing Research Congress and on Patient Safety Day as a poster presentation. She published one research and now working on another one. She is a member of the Quality committee and an external reviewer for the Oman Qualification Framework. She is a certified trainer from the Ministry of Higher Education, Innovation and Scientific research. She had worked as a staff nurse at a regional hospital in the adult intensive care unit for 15 years. Currently, she is working as a science tutor in the academic field facilitating nursing students in nursing subjects and supervising them in the clinical rotations.



Huda Al Namani is an assisted nursing tutor. Graduated from Nursing Institute with diploma certificate in 2009. BSN in general Nursing in 2015. Worked in the hospital in the Intensive care unit as a staff nurse from 2009 to 2021. At the current time working in the academic field at Oman College of Health Sciences as an academic nursing tutor teaching nursing students in major nursing subjects and supervising them in the clinical area.



Zaina Al Harmali has been an Associate Dean at the Oman College of Health Science Al Dakhiliya branch since August 2020. She has 26 years of experience, 3 of them in nursing services and 23 in nursing education. She is a member of the curriculum review committee in the college, the research committee, and the QA steering committee. She is a reviewer for several international journals such as *Heliyon*, *Nursing Education Today*, and *Journal of Patient Safety*. She is also an external reviewer for the Ministry of Health Research Committee. She has three publications and currently working on several research. She participated in three International Conferences and conducted several workshops for research methodology. She is also a member of Sigma Theta Tau International Honor Society of Nursing. Recently she got a research grant of 15,000 OR.



Fadi Al-Sulaimi is a consultant doctor in internal medicine and critical care at Nizwa Hospital, Nizwa, Oman. Graduated from the College of Medicine and Health Sciences at Sultan Qaboos University, Muscat, Oman in 2011. He completed the internal medicine residency program from the Oman Medical Specialty Board (OMSB), Muscat, Oman in 2016. Completed critical care medicine fellowship program from Queen's University, Kingston, Ontario, Canada in 2019.



Aliya Al Shibani is an adult critical care nurse who worked as a staff nurse in a secondary hospital in the adult intensive care unit for 10 years. She completed her specialty in adult critical care in nursing in 2024 from Oman Specialized Nursing Institute. She had her bachelor from Nizwa University in 2022. Currently, working as a critical care nurse caring for all ventilated and non-ventilated critically ill patients.

Research Field

Basma AL Mahrouqi: Medical, community, quality, education.

Huda Al Namani: Medical, maternity, education.

Zaina Al Harmali: Medical, education, quality, management, nursing education

Fadi Al Sulaimi: Medical, critical care.

Aliya Al Shibani: Nursing, critical care.