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# Impact of Educational Program on Critical Care Nurses' Knowledge of ICU Delirium: A Quasi-Experimental Study

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## ABSTRACT

**Background:** Cat Intensive care unit (ICU) delirium is a significant complication that increases the mortality, morbidity, and length of stay for critically ill patient. **Objective:** The aim of this study was to assess the critical care nurse's knowledge of ICU delirium and the effectiveness of an educational program about the recognition and assessment of ICU delirium on critical care nurse's knowledge. **Methods:** A quasi-experimental single group pre-test-post-test design was conducted using delirium knowledge assessment questionnaires. **Results:** The median post test score of overall nurses' knowledge was 76.2 (range 19.1-95.2) compared to the median pre-test score of 38.1 (range 14.3 – 61.9) indicating a significant change in nurses' knowledge after conducting the educational program (p<0.001). **Conclusion:** Critical care nurses' knowledge of ICU delirium was low before the intervention and increased significantly after delivering an educational program..

**Keywords:** Axillary lymph node, Cat scratch disease, Lymphadenitis, Lymphoma.

## 1. BACKGROUND

Delirium is a common neurocognitive disorder, and it's a significant unwanted neurocognitive abnormality for the critically ill patient. According to the diagnostic and statistical manual of mental disorders 5th edition (DSM-5) delirium is the disturbance in attention, change in cognition that is developed over a short interval, with fluctuating course evidence by history, physical examination, and laboratory findings. The physiological disturbance often results from another conditions, such as substance intoxication or withdrawal (1).

There is a modifiable and non-modifiable risk factors for intensive care unit (ICU) delirium. The modifiable risk factors are treatment-related factors (e.g., the amount of sedation, type of sedation, number of infusions and use of restraints) and environmental risks (e.g., length of ICU stay, no visible daylight, lack of hearing and visual aid and sleep disturbances). The non-modifiable risk factor are patient-related factors (e.g., age, dementia, hypertension) and disease-related factors (e.g., mechanical ventilator, organ failure, metabolic acidosis, emergency surgery, and coma) (1). Delirium in ICU is caused by the alteration in cerebral blood flow, cerebral hypo-perfusion, degradation of the blood-brain barrier, endothelial dysfunction, acetylcholine depletion and monoamine (dopamine, norepinephrine, and serotonin) depletion (1).

Delirium is a common among ICU patients with an incidence of 45% to 87% (2). A significant mortality rate was found in ICU patients with delirium compared to patients who did not manifest delirium. Overall ICU delirium is a risk factor of critically ill patient morbidity and mortality (3). In a systematic review of 42 studies by Sulluh and colleagues (4), delirium was reported in one third (31.8%) of ICU patients.

In a prospective cohort study to determine if delirium predicts of clinical outcome the mortality rate within 6 months period and the length of stay on mechanical ventilator among ICU patients, the majority of patients (81.7%) develop delirium during their admission and had a higher mortality rate (34%) and spent additional ten days compared to those who did not develop delirium (5). The prolonged ICU stay can ultimately impact on the cost of

hospitalization. The United States the health care system estimated the cost of about 4 to 16 billion dollars annually (6).

Along with the high mortality and morbidity rates and the cost of ICU patients, it is critical to early identify and continuously assess patients with delirium in ICU. Up to date, there has been no golden standard blood test to diagnose ICU delirium; therefore, the identification of delirium cases is explicitly dependent on the recognition of the sudden onsets of decreased responsiveness, withdrawal, apathy, agitation, restlessness, and emotional lability (7).

It is difficult to assess ICU delirium because most of the patients are either sedated, on high levels of analgesics or intubated hindering verbal communication. The ICU nurses have an essential role in assessing and recognizing delirium through a valid objective screening tool. The most used tools for assessing delirium in the ICU patients are the Confusion Assessment Method (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC) (1,7).

The CAM-ICU is used when patients are unable to communicate (7). To assess delirium by CAM-ICU the first step is to evaluate Richmond Agitation Sedation Scale (RASS) then using either a picture recognition or random letter test, then a simple instruction is administered such as asking the patient to hold up some finger, scoring is not derived from CAM-ICU, delirium is either present or absent (7). The CAM-ICU has been translated into several languages including Arabic with acceptable reliability and validity<sup>8</sup> and has demonstrated an interrater reliability of ( $k=1.0$ ) (8).

Devlin and colleagues conducted a study to identify current practices and perceptions of intensive care nurses regarding delirium assessment, 98% of the nurses were assessing sedation score routinely wherein only half of the nurses (47%) were assessing for delirium (9). Since ICU delirium is a serious problem affecting critically ill patients and can be associated with increased mortality, morbidity, length of stay in ICU, and cost, it is significantly important for ICU nurses to have knowledge about delirium and be able to identify and assess delirium cases regularly (10).

Early identification of ICU delirium allows for rapid management of the causes and implementation of pharmacological or non-pharmacological managements. Undetected ICU delirium cases might be due to several factors such as the lack of knowledge and skills on how to identify and assess delirium. A study of 232 participants revealed that 59.9% of the participants answer that head trauma is the cause of delirium and 60.3 with an answer of brain anoxia is the major cause of delirium (11). A similar study conducted on 331 participants only 3% of them rank delirium as the most important condition to be evaluate in ICU (9). In a recent study assessing the knowledge of health care providers, the majority (83%) of them identified delirium as a major problem in the ICU calming that the absence of knowledge to recognize and prevent delirium might be a significant factor (12).

After introducing the CAM-ICU in 2012 almost all participants agree that delirium assessment and treatment was an important part of ICU care. Eighty-one percent of the participants answered yes to keep using the CAM-ICU (13). The main barriers to assess and identify delirium in the intensive care unit are tight to the need for greater education (14).

In an intervention study examining the effectiveness of delivering an educational program to improve the nurses' knowledge and screening of delirium, a significant correlation was found between the nurses' acquired knowledge and the number of screened ICU patients with delirium (9,14,15).

In Saudi Arabia, the healthcare system is rapidly advancing, where all the operations are being digitized as a part of the Vision 2030 programme, and the Saudi nurse working force is being increased as a part of Saudization process (16). Given these circumstances, it is essential to determine the knowledge and awareness of the nurses towards various uncommon healthcare conditions and healthcare services. Accordingly, the purpose of this study was to measure the effectiveness of an educational program about delirium on the knowledge of ICU nurses and their ability to identify and assess cases of ICU delirium.

## 2. OBJECTIVE

The purpose was to determine the effectiveness of an educational program about delirium on the knowledge of ICU nurses and their ability to identify and assess cases of ICU delirium.

## 3. MATERIAL AND METHODS

A quasi-experimental pretest-posttest design was used to determine the critical care nurses' knowledge of ICU delirium and to measure the effectiveness of the educational program on critical care nurse's knowledge of ICU delirium.

### Ethical Approval

The ethical approval was taking from ethical committee in the Standing Committee for Research Ethics on Living Creatures (SCRELC) – Imam Abdulrahman bin Faisal University, IRB number IRB-PGS-2019-04-093, Ethical approval to conduct the study was obtained from General Directorate of Health Affairs, Eastern province. Permission was taken from Dammam Medical Complex after explanation of the proposal aim and methodology. Informed consent was obtained from the critical care nurses who volunteer to participate in the study. Nurses informed that they have the right to accept or refuse or withdraw from the study at any time with no impact on their work evaluation. All the study data kept confidentially at the college of nursing at Imam Abdulrahman bin Faisal University.

### Participants

Sample size was determined using G-power version 3.1. (17) statistical test of paired sample t-test with an effect size of 0.5 and alpha error probability of 0.05 and 1-beta probability of 0.95, the calculated sample size was 45 critical care nurses. After calculating the attrition

rate of 15% the adjusting sample size will be 57. Only registered nurses working in medical intensive care unit (MICU), surgical intensive care unit (SICU) and coronary care unit (CCU) for more than six months were included in the study.

The educational program implemented at the intensive care unit in Dammam Medical Complex (DMC) with a total of 28 ICU bed capacity. Accordingly, all ICU nurses aged above 20 years are included in the study. The education program was delivered through power-point presentation by authors in association with the physicians at the hospital. A printed handout of the educational material (Appendix A) was handed over to the nurses after the session. The educational program was attended by all the participants in the seminar hall available at the hospital. Any doubts among the nurses were cleared at the end of session.

**Data collection**

To measure the effectiveness of the delirium educational program, a modified version of the delirium knowledge assessment scale adopted in prior studies (13,14) was used in this study. The instrument consists of demographic data: gender, age, and educational level. Followed by 21 multiple choice questions about ICU delirium knowledge and four questions about delirium assessment using CAM-ICU. Initially, a pilot study was conducted to test the reliability of the selected tool.

Informed consents were obtained from the critical care nurses who volunteered to participate in the study. A paper and pencil knowledge survey were distributed to critical care nurses as a pretest. Followed by a focused short educational program for about 45 minutes consists of an introduction about delirium significance, definition, pathophysiology, risk factors, types of delirium. In addition to explanation about the impact of delirium in ICU patients and discussion about delirium assessment tools and management. The post-test knowledge survey was distributed 2 weeks after the educational session. The time to answer the pre-and post-test was approximately 20 minutes.

The tool demonstrated adequate internal consistency reliability of 0.80 for the 25 items combined.

**Statistical Analysis**

Data was coded, enter and analysis on SPSS version 25, normality test Kolmogorov Smirnov was run, data were not normally distributed. Descriptive data was analysis using chi-square test median and range. Comparison for overall knowledge score for pre and posttest was analyzed using Mann Whitney U test.

**4. RESULTS**

The study included 57 intensive care unit nurses. The majority of the nurses were between 30-39 years old (54.4%), females (94.7%) and bachelor prepared (74 %) (Table 1). The result showed a significant change in nurses' knowledge post teaching session test score compared with pre- teaching test score (p <0.001). The median post-test knowledge score of overall knowledge was 76.2 (range 19.1-95.2) compared to the pre-test score of 38.1 (range 14.3 – 61.9) (Table 2).

Demographics	n	Percentage
<b>Age in years</b>		
20- 29	22	38.6%
30-39	31	54.4%
40-49	4	7.0%
50-59	0	0
<b>Gender</b>		
Male	3	5.3%
Female	54	94.7%
<b>Education</b>		
Diploma	13	22.8%
Bachelor	42	73.7%
Master	2	3.5%

**Table 1. Demographic Characteristics of Participants**

Test	Median	Range	P value*
Pre	38.1	14.3 – 61.9	Mann-Whitney U 296.0 P <0.001

**Table 2. Pre and Post comparison for overall knowledge score**

The post-test knowledge score increased significantly for most of the questions (Table 3). About 92.4% of nurses answered the questions about feedback regarding assessment for the altered level of patient consciousness compare to (68.4%) in pre-test (p <0.001). As 90.5% correctly answered the question related to the feedback on the occurrence of delirium compared to (22.8) in pre-test (p<0.001). Only three questions were identified in relation to which lower scores are recorded post-test. These included understanding mixed delirium, risk factors of developing delirium, and modifiable risk factors. These findings indicate that the nurses' knowledge related to risk factors has not been effectively developed even after the educational program.

Four questions related to Characteristics of delirium include, Medications associated as risk factors for delirium include, Characteristics of delirium include, and how Hypoactive delirium is characterized, reflected a high knowledge score ranging from 81.1% to 88.6%. All the four questions were statistically significant, nevertheless among these two items, the characteristics of delirium was correctly answered by 83% nurses with high significance (p=0.026\*) and feedback of hypoactive delirium was correctly answered by 81.1% with low significance (p = 0.019). Participants exhibited good knowledge score about Delirium symptoms in post-test (76%) compared to (56.1%) in pre-test (p=0.067). In addition, knowledge related to increased cost and mortality for patients associated with delirium, delirium effects after hospital discharge, and mixed delirium were observed to be statistically insignificant with low knowledge score.

There was no statistical significance difference between knowledge and nurses' demographic (table 4). Nurses' perception about the important of delirium assessment tool (table 5 and 6). About 51 % of nurses think

## Impact of Educational Program on Critical Care Nurses' Knowledge of ICU Delirium

	Pre N=57	Post N=54	P value*
1. Delirium can occur in up to:			
a. 10% of ICU patients	13(22.8%)	48(90.5%)	<0.001*
b. 33% of ICU patients			
c. 67% of ICU patients			
d. 83% of ICU patients			
2. Delirium can present as:			
a. Hyperactive symptoms			
b. Hypoactive symptoms	32(56.1%)	38(71.6%)	0.067
c. Mixed (i.e. both hyperactive and hypoactive symptoms)			
d. All of the above			
3. The following term can be used interchangeably with delirium:			
a. Sundowning			
b. ICU syndrome	7(12.3%)	34(64.1%)	<0.001*
c. ICU psychosis			
d. None of the above			
4. Characteristics of delirium include:			
a. Disturbances of consciousness	37(64.9%)	44(83.0%)	0.026*
b. A change in cognition or development of perceptual disturbances			
c. It is a condition that occurs over the course of several weeks			
d. A and B			
e. A and C			
5. All of the following are true of mixed delirium <u>except</u> :			
a. It has symptoms of hyperactive delirium	28(49.1%)	18(33.9%)	0.380
b. It has symptoms of hypoactive delirium			
c. It is more common than pure hyperactive delirium			
d. It is more common than pure hypoactive delirium			
6. During the ICU/hospital stay, delirium has been associated with all of the following in clinical trials <u>except</u> :			
a. Increased mortality			
b. Increased incidence of coma			
c. Increased length of stay	12(21.0%)	36(67.9%)	<0.001*
d. Higher costs of care			
e. 3x greater re-intubation rate			
7. Medications associated as risk factors for delirium include:			
a. Antipsychotics (i.e. Haldol)			
b. Anticholinergics (i.e. Cogentin)			
c. Corticosteroids (i.e. Solumedrol)	16(28.1%)	45(84.9%)	<0.001*
d. Benzodiazepines (i.e. Versed)			
e. B, C, and D			
8. When assessing for an altered level of consciousness it is important to:			
a. Consider the patient's level of consciousness over an entire shift			
b. Stop the assessment for a RASS of -3 to -5			
c. Consider the effect recently administered sedation or analgesia therapy on your patient's level of consciousness	39(68.4%)	49(92.4%)	0.001*
d. All of the above			
9. Characteristics of delirium include:			
a. Development over a short course of time (hours to days)			
b. The course is characterized by fluctuations			
c. The course is progressive	23(40.3%)	47(88.6%)	<0.001*
d. A and B			
e. B and C			
10. Hyperactive delirium is characterized by:			
a. Agitation			
b. Withdrawal			
c. Flat affect	19(33.3%)	36(67.9%)	<0.001*
d. A and B			
e. A and C			
11. Hypoactive delirium is not characterized by:			
a. Withdrawal			
b. Apathy	28(49.1%)	42(79.2%)	0.001*
c. Lethargy			
d. Decreased responsiveness			
e. Agitation			

**Impact of Educational Program on Critical Care Nurses' Knowledge of ICU Delirium**

12. The most common type of delirium seen in the ICU is:			
a. Hyperactive delirium			
b. Hypoactive delirium	2(3.5%)	18(33.9%)	<0.001*
c. Mixed delirium			
d. A and C are equally common			
13. Hypoactive delirium is characterized by:			
a. Withdrawal	35(61.4%)	43(81.1%)	0.019*
b. Restlessness			
c. Flat affect			
d. Apathy			
e. A, C and D			
14. Ordering the subtypes of delirium from least commonly to most common observed:	7(12.2%)	34(64.1%)	<0.001*
a. Hyperactive, hypoactive, mixed			
b. Hypoactive, hyperactive, mixed			
c. Hypoactive, mixed, hyperactive			
d. All are equally common			
15. During the ICU/hospital stay, delirium is associated with all of the following <u>except</u> :			
a. Increased mortality	17(29.8%)	41(77.3%)	<0.001*
b. Development of multi-organ dysfunction			
c. Increased length of stay			
d. 3x greater re-intubation rate			
e. Higher costs of care	31(54.3%)	26(49.1%)	0.357
16. After hospital discharge delirium is associated with:			
a. Requirement for care in chronic care facility			
b. Decreased functional status at 6 months			
c. No long-term sequelae	16(28.1%)	36(67.9%)	<0.001*
d. A and B			
17. All of the following have been shown in clinical trials to be risk factors for the development of delirium <u>except</u> :			
a. Increased age			
b. Disruptive family/visitors			
c. Use of physical restraints			
d. Use of tubes and catheters	12(21.1%)	36(67.9%)	<0.001*
18. After hospital discharge, delirium is associated with all of the following:			
a. Increased mortality			
b. Development of dementia			
c. Long-term cognitive impairment			
d. B and C			
e. All of the above			
19. All of the following regarding increased cost and mortality for patients associated with delirium are true <u>except</u> :	20(35.1%)	11(20.0%)	0.072
a. Occurs if delirium was ever present			
b. Increases with each additional day spent in delirium			
c. Can result in an average of \$10,000+ in costs			
d. Can result in 3x the mortality risk			
e. All of the above statements are true			
f. Lack of nutrition			
20. Modifiable risk factors for delirium include all of the following <u>except</u> :			
a. Lack of daylight/clocks/orienting items			
b. A noisy environment			
c. Sepsis	11(19.2%)	30(56.6%)	<0.001*
d. Baseline pulmonary disease			
e. All are modifiable risk factors			
21. The difference between hallucinations and delusions is that:			
a. Hallucinations are the perception of something that is not there with no stimulus and delusions are false beliefs that are fixed/unchanging			
b. Delusions are the perception of something that is not there with no stimulus and hallucinations are false beliefs that are fixed/unchanging	31(54.4%)	40(75.4%)	0.017*
c. The terms are interchangeable			
d. Hallucinations are the perception of something that is not there with a known stimulus and delusions are false beliefs that are fixed/unchanging			

**Table 3. Comparison Between Nurses pre and post Test Score on Each Question of Delirium Knowledge Questionnaire**

Demographics	Median (Range)	P value
Age in years		
21- 29	42.8 (14.3 – 95.2)	KW =1.479 P=0.477
30-39	47.6 (14.3 – 90.5)	
40-49	57.1 (19.1 – 85.7)	
50-59	-	
Gender		
Male	47.6 (14.3 – 95.2)	MW=0.726 P= 0.468
Female	54.7 (33.3 – 85.7)	
Education		
Diploma	59.5 (14.3 – 90.5)	KW = 2.601 P=0.272
Bachelor	45.2 (14.3 – 95.2)	
Master	59.5 (38.1 – 71.4)	

**Table 4. Association between overall Delirium Knowledge score and nurses demographics characteristics. KW = Kruskal-Wallis MW = Mann-Whitney U**

	Number	Percentage
How important is assessing delirium:		
Not important	4	7.1%
Somewhat important	4	7.1%
Very important	29	50.9%
Essential	20	35.1%
Have you heard of any formal test of delirium applicable to the ICU		
Yes	32	56.1%
No	25	43.9%
Which test have you heard of:		
CAM-ICU (Confusion Assessment Method of the ICU)	27	47.4%
ICDSC (Intensive Care Delirium Screening Checklist)	13	22.8%
DDS (Delirium Detection Scale)	12	21.1%
NuDESC (Nursing Delirium Screening Checklist)	5	8.9%
Did you use a formal test of delirium when you made your assessment over the last month?		
Always	5	8.9%
Often	4	7.0%
Sometime	8	14.0%
Rarely	9	15.8%
Never	31	54.4%

**Table 5. Nurses Perception About the Important of Delirium Assessment tool (Pre-test)**

that the delirium tool is important while 35.1% reported it as an essential tool. However, the post-test indicates that there is an improvement on the nurses' perception about the importance of delirium tool 'essential' with score of 45.3%, which is more than 10 %.

About 44 % of nurses were not aware about the existence of an assessment tool to measure delirium. Considerable number of nurses (47.4%) claimed that they heard about the Confusion Assessment tool (CAM), however, 54.4% of nurses never used it and only 9% claimed using the tool in the past month (Table 5). Post awareness confidence on assessments using CAM illustrates that 54.7% are very confident, whereas 33.9% were quite confident on their assessment. About 45% thought that CAM is quite easy, while 43.4% thought that usage

	Number	Percentage
How important is assessing delirium:		
Not important	1	1.9%
Somewhat important	1	1.9%
Very important	27	50.9%
Essential	24	45.3%
Are you confident your assessment using the CAM-ICU were accurate? (compared to a full psychiatric assessment of delirium, or your own usual assessment of a patient mental state)		
Very confident	18	33.9%
Quite confident	5	9.4%
Not very confident	1	1.9%
Not at all confident		
Did you think that CAM-ICU easy to use		
Yes usually very easy	23	43.4%
Yes, usually quite easy	24	45.3%
No, usually quite hard	5	9.4%
No, usually very hard	1	1.9%
Assuming we keep using the CAM-ICU how often do you think we should ask that bedside nurses make this assessment		
Once a day	3	5.7%
Twice a day	1	1.9%
Once per shift	46	86.8%
More than once per shift	3	5.7%

**Table 6. Nurses Perception About the Important of Delirium Assessment tool (Post test)**

of CAM is usually very easy. Assuming that the usage of CAM-ICU, 86.7% of the participants answer stated that assessment should be made at least once per shift (Table 6).

## 5. DISCUSSION

It has been identified that most of the ICU nurses lack knowledge about ICU delirium, which is one of the important conditions faced by the critically-ill patients. The current study is aimed at analyzing the effectiveness of an educational program on increasing the ICU nurses' knowledge about ICU delirium. The median score of critical care nurses' knowledge in this study at the pre-intervention was relatively low (38.1% ), compared to 44% to 88% reported in other studies (18,19,20). The knowledge score was almost similar to other studies (10,11). The possible explanations for the slight differences could be due to variance in the instrument used among the studies (10,11) to assess ICU delirium knowledge, and also the ICU delirium topic was not included in the undergraduate study curriculum and it's only included in the postgraduate critical care nurse's courses (21,23). Therefore, the nurses without a postgraduate degree may have less exposure to the topic of ICU delirium.

In another word, nurses might encounter patients with delirium in ICU, but they might lack evidence-based training and appropriate knowledge. However, the finding demonstrates significant increases in critical care

nurses' knowledge of delirium and delirium assessment tool post-interventional education program with overall knowledge of 76.2 %, which was not influenced by their demographic characteristic, and consistent with previous studies (10,11,21) which also used educational program intervention. Nevertheless, this study demonstrates that a simple educational intervention, within a short time could significantly increase critical care nurses' knowledge of ICU delirium and delirium assessment tool regardless of their educational level. The finding is similar to a study conducted by Ramoo et al.(10). However, Studies have shown that multifaceted over long time educational program has long term impact on nurses' knowledge (9,14,15).

Although nurses' knowledge had significantly improved after the educational intervention, it is noticeable that the score for some of the questions did not improve significantly after the intervention, especially for impact of ICU delirium related question only 49% of the participants answered it correctly. Another question is the effects of ICU delirium on critically ill patients and the hospital, 20 % of the participants answered it correctly. In contrast to the study by Gesin and colleagues (14) where the majority of participants more than half answered the question correctly. An additional item that was not significantly improved after the intervention is related to ICU delirium subtype. In contrast to Christensen and colleagues study, which report that nurses can easily recognize hyperactive delirium compared to hypoactive delirium, it may give the perception that hyperactive delirium captures nurses' attention since it is linked to patient safety (19).

Contrary to the above, our findings demonstrate that both highly qualified nurses and the lower diploma holders showed a similar level of knowledge attainment (15). In general, educational program showed a significant positive result in improving critical care nurses' knowledge regarding ICU delirium which may lead to improving self-confidence in caring for patients with delirium. However, decrease in knowledge scores was identified with respect to three factors including mixed delirium, risk factors of developing delirium, and modifiable risk factors. It may be possible that the educational program was not effective in presenting the topic related to delirium risk factors, or it may also be possible that participants might have found it hard to understand. However, further exploration in future research is required to assess the differences in detail.

The findings were similar to a various studies (9,10,14,15,21) conducted in the past few years. Bedside teaching is the most relevant method for teaching healthcare professionals about ICU delirium and it linked with increasing nurses' knowledge and it's supported by a study. Moreover, a study on critical care nurses' knowledge and practice of delirium assessment concluded that providing proper education is vital to improve the knowledge and training of critical care nurses regarding delirium (22). Therefore, it is important that the regular education programs may not be completely effective as identified in this study, where scores in relation to three

questions were reduced in post-test. Therefore, traditional educational programs have to be aligned with the effective pedagogic techniques such as bedside teaching.

The importance of educational program can be understood from the findings in previous studies (12,14) reflecting the lack of knowledge to recognize and prevent delirium. This study revealed that the educational program shows effectiveness in improving delirium knowledge and screening from 38.1% overall knowledge to 76.2% similar to Hickin and colleagues (15) study. Short-term educational intervention shows a positive correlation between delirium knowledge and screening of ICU delirium, however without ongoing educational program delirium identification and assessment will not occur (9,14,15). Critical care nurses knowledge of ICU delirium significantly improved post the interventional program in similar to Van de Steeg and colleagues (21) study. Similar study (15) conducted at a Canadian urban tertiary care center ICU. The study concluded that multifaceted education is effective in improving delirium knowledge. The education improved perceived tool utility and over time utility perception and physician value improved, but they also stated that without sustained effort, progress in knowledge level is transient.

This study has certain limitations. Firstly, there was a limited time (two weeks) for completing the study, due to Covid-19 restrictions. As most of the nurses were busy and stressed-out with increased burden at work, it was hard to get enough responses from them on time; and increased stress might have affected the responses of the nurses due to their condition. Secondly, the study was conducted at only one hospital, it limits the generalizability implications.

This study has both practical and theoretical implications. Firstly, it aids decision-makers in understanding the current knowledge of the nurses regarding the ICU delirium, so that they can be provided with enough training and educational programs, as it is important for improving the healthcare services and ensure sustainable operations as a part of vision 2030 initiatives. Secondly, this study contributes to the literature, as there is inadequacy of research in relation to ICU delirium knowledge among nurses in Saudi Arabia.

## 6. CONCLUSION

ICU delirium is an unwanted common complication for critically ill patients with severe consequences and complication in term of mortality, increased ICU length of stay, high health care cost and decrease quality of life. It has been observed that ICU delirium is under-recognized and poorly managed; and for addressing this issue, enhanced educational program for critical care nurses was identified to be effective in increasing knowledge related to ICU delirium, which will lead to improving critical ill patients' outcome. Overall, these current study findings support the existing evidence of evaluated critical care nurses' knowledge of ICU delirium in one of Saudi Arabia hospital. The data reveals that critical care nurses lack the proper knowledge of ICU delirium. Since knowledge on delirium is essential for recognition, as-

assessment, and prevention of ICU delirium. Also previous researchers' findings support the importance of an educational program to enhance critical care nurse knowledge. The current study found that a simple educational program intervention improves critical care nurses' knowledge of ICU delirium which can help in delirium recognition and assessment.

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