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Assessment of Nurses' Performance Regarding Advanced Life Support Algorithm in Critical Care Units

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Abstract:
Background: Cardiac arrest is a global health concern, with intra-hospital cardiac arrest (IHCA) requiring prompt intervention via protocols like the Advanced Life Support (ALS) algorithm. Critical care nurses play a vital role as first responders, making their ALS competence essential. **Aim:** To assess nurses' performance regarding the ALS algorithm in critical care units. **Research Design:** Descriptive correlational research design was utilized in this study. **Setting:** Conducted in four critical care units in Assiut Governorate providing critical care services. **Subjects:** A purposive sample of 60 nurses. **Tools:** Two tools were used: **Tool (I):** Nurses' knowledge assessment tool. **Tool (II):** Nurses' practice assessment tool. **Results:** Showed that 53.3% of the nurses demonstrated good knowledge levels, regarding practice, only 16.7% of the participants achieved good to excellent performance, while the majority (83.3%) fell into poor and fair categories. There was a positive correlation between knowledge and practice ($r = 0.319$, $p = 0.013$). **Conclusion:** The study revealed a noticeable gap between knowledge and practice among critical care nurses regarding Advanced Life Support (ALS)." **Recommendations**: Provide regular practical ALS training, conduct performance evaluations, and focus on bridging the knowledge-practice gap.

Keywords: Advanced Life Support, Algorithm, Assessment, Critical Care Units & Nurses' Performance

Introduction
Cardiac arrest (CA) remains one of the most challenging emergencies encountered in clinical settings, with significant implications for patient survival and neurological outcomes. Globally, out-of-hospital cardiac arrest (OHCA) affects approximately 380,000 individuals annually in the United States and 270,000 in Europe, while in-hospital cardiac arrest (IHCA) occurs in 2–4 per 1,000 hospital admissions **(Jerkeman et al., 2022)**. Despite technological advances and improved protocols, survival rates remain relatively low, particularly in low- and middle-income countries.

Advanced Life Support (ALS), as defined by the American Heart Association (AHA), forms a critical component in the chain of survival following early recognition and Basic Life Support (BLS). It encompasses a set of structured interventions including high-quality CPR, early defibrillation, airway management, cardiac monitoring, and administration of emergency medications **(AHA, 2020; Leong et al., 2021)**. These measures are outlined in the ALS algorithm, which provides a step-by-step decision-making framework designed to standardize the response to cardiac emergencies **(Jones et al., 2023).**

Nurses are often the first healthcare professionals to respond to cardiac arrests, especially within critical care units. Their actions in the first minutes of cardiac arrest—such as initiating CPR and defibrillation—are crucial in determining whether return of spontaneous circulation (ROSC) is achieved. The increased specialization of nursing practice and greater autonomy in clinical settings have expanded the nurse's role beyond support to one of active leadership during resuscitation events **(Fijan et al., 2021).**

However, a consistent gap remains between nurses' theoretical knowledge and practical implementation of ALS protocols. Several studies have shown that nurses may possess adequate cognitive understanding of ALS, but lack the necessary psychomotor skills or confidence to perform under pressure **(Ofoma et al., 2018; Mallikethi-Reddy et al., 2017).** Contributing factors include limited training opportunities, absence of regular simulation-based assessments, and inconsistent exposure to real-life cardiac arrest scenarios.

Continuous professional training is a key factor influencing nurses' competence and confidence in performing ALS interventions. Participation in structured training programs, including theoretical updates and hands-on simulation, has been shown to significantly improve nurses' retention of skills and adherence to current guidelines **(Al-Farsi et al., 2020).**

Conversely, limited access to regular training and absence of clinical refreshers have been linked to

poor performance during real resuscitation scenarios, especially in resource-constrained settings **(Wang & Yang, 2023)**. In Egypt, many nurses rely on outdated knowledge obtained during their initial education, with few opportunities for regular retraining. This raises concerns about the readiness of nursing staff to effectively manage cardiac arrest cases using updated ALS algorithms.

Cardiac arrests within intensive care units in Egypt remain a significant clinical concern, particularly among patients with complex medical conditions. Data from the Health Affairs Directorate in Assiut indicate that approximately 420 ICU patients are at risk of cardiac arrest every six months. Despite the availability of advanced monitoring technologies and trained healthcare personnel, delays in initiating Advanced Life Support (ALS) interventions continue to occur, often attributed to variations in nurses' performance and level of preparedness.

The current situation underscores the importance of evaluating and improving the performance of nurses in the application of ALS algorithms. A structured assessment can identify specific areas of weakness, inform the development of targeted training programs, and ultimately contribute to enhanced patient safety and survival outcomes. Therefore, this study was conducted to assess the performance of nurses regarding the Advanced Life Support algorithm in critical care units.

Significance of the Study:

Cardiac arrest (CA) remains a major global health issue and one of the leading causes of mortality in hospital settings, especially within intensive care units (ICUs), where patients are at high risk of sudden cardiac events **(Jerkeman et al., 2022).** The timely initiation of high-quality cardiopulmonary resuscitation (CPR) and adherence to the Advanced Life Support (ALS) algorithm are vital for improving survival outcomes and reducing neurological complications **(Couper et al., 2022)**

Assessing nurses' performance regarding ALS is essential for identifying areas of deficiency and guiding the development of targeted training programs. Such assessments contribute to improving clinical practices and ensuring patient safety in emergency settings **(Benjamin et al., 2017; Ofoma et al., 2018).**

Patient records from hospitals affiliated with the Health Affairs Directorate in Assiut during 2023–2024 revealed that approximately 850 patients at risk of cardiac arrest are admitted to intensive care units annually. In addition, Assiut University Heart Hospital receives an estimated 250 cases each year. Therefore, the current study is significant as it addresses a real clinical need in hospitals affiliated with the Health Affairs Directorate in Assiut and Assiut University Heart Hospital, where critical care nurses play a central role in resuscitation. Enhancing their knowledge and performance through structured evaluation can ultimately improve patient outcomes and reduce the burden of in-hospital cardiac arrest.

Aim of the Study:

This study aimed to assess nurses' performance regarding the Advanced Life Support (ALS) algorithm in critical care units.

Research Question:

What is the level of nurses' performance regarding the Advanced Life Support algorithm in critical care units?

Subject and Method:

Study Design:

A descriptive correlational research design was utilized in this study for the purpose of data collection.

Setting:

The study was conducted in four critical care units in Assiut Governorate, including three Hospitals affiliated with the Ministry of Health (El-Eman General Hospital, Assiut Chest Hospital, and Assiut Fever Hospital) and one Hospital affiliated with Assiut University (Assiut University Heart Hospital).

Subjects:

A purposive sample of 60 nurses was selected from the critical care units in the previously mentioned hospitals. The sample was distributed as follows: 20 nurses from El-Eman General Hospital (general intesive care unit), 20 nurses from Assiut University Heart Hospital (cardiac care unit), 10 nurses from Assiut Chest Hospital (intensive care unit at Assiut Chest Hospital), and 10 nurses from Assiut Fever Hospital (hepatic and gastroenterology intensive care unit).

The Inclusion Criteria were:

Registered nurses working in intensive care units (ICUs).

Having at least one year of experience in critical care nursing.

Tools for Data Collection:

Two tools were developed by the researcher after extensive review of related literature and international guidelines American Heart Association (AHA, 2020), the European Resuscitation Council Guidelines (Soar et al., 2021), and studies on ALS education and training outcomes (Panchal et al., 2020; Leong et al., 2021; Meaney et al., 2013) to assess nurses' knowledge and practice regarding the Advanced Life Support (ALS) algorithm.

Tool (I): Nurses' Knowledge Assessment tool:

This tool was developed by the researcher to assess nurses' knowledge regarding the ALS algorithm. It included two parts:

Part (I): Socio-Demographic Data:
This part covered data such as age, gender, marital status, educational qualification, years of experience in critical care units, attendance of previous ALS training courses.

Part (II): Nurses' Knowledge Questionnaire:
It included 30 multiple-choice questions (MCQs) covering the essential areas of ALS, including: Chest compression techniques, Defibrillation safety and timing, Emergency medications, advanced airway management, and post-resuscitation care.

Scoring System:
(Knowledge): Each correct answer was given 1 mark, and incorrect answers received zero. **The total score** was 30 marks, which was converted into a percentage.

Based on the percentage, knowledge levels were categorized as:

Excellent: ≥ 90%, Good: 70 % – 90%, Poor: < 70%

This classification was based on the modified **Bloom's cut-off point**, as adopted in previous nursing research **(Mukhtar et al., 2022; Ashebir et al., 2023)**, with minor modifications made by the researcher to better fit the context of the present study.

Tool (II): Nurses' Practice Assessment Tool
This tool was developed by the researcher to evaluate the nurses' performance in applying the ALS algorithm during actual clinical situations. This tool covering different aspects of performance for advanced life support algorithm regarding Electrocardiogram (ECG), Direct Current shock (DC), cardiac monitoring and emergency medication.

Scoring System:
(Practice): Each performance item was scored as follows:

2 marks: Correctly done
1 mark: Partially correct,
0 mark: Incorrect or not performed

The total performance score was calculated and converted into a percentage.

Practice levels were categorized as:

Excellent: ≥ 86%, good: 76%–85%, Fair 60–75%, Poor: < 60%

(Abd El-Aziz & Ahmed, 2019; Al-Moteri, Plummer, Cooper, & Symmons, 2020).

Methods
The study conducted throughout **two main phases**: preparatory phase and data collection phase

Preparatory Phase:
- An official permission to conduct the study was obtained from the hospital responsible authorities after explanation of the nature and aim of the study.
- After reviewing the available literatures concerning the topic of the study, Arabic translation of the study tools was done.

Validity
To ensure face validity, the tools were reviewed by a jury of five academic experts in critical care and emergency nursing from the Faculty of Nursing, Assiut University. These experts evaluated the tools in terms of clarity, relevance, and appropriateness of items in relation to the study objectives. Necessary modifications were applied based on their feedback to improve tool accuracy and applicability.

Reliability
The reliability of the tools was assessed using Cronbach's Alpha coefficient, which showed a score of 0.816 for Tool I (knowledge questionnaire) and 0.912 for Tool II (practice checklist), indicating a high level of internal consistency. This confirmed that the instruments were sufficiently reliable for assessing nurses' knowledge and performance in ALS-related practices.

Pilot Study
A pilot study was conducted on 10% of the total nurses (6 nurses) who worked in the selected critical care units. The aim was to test the clarity, feasibility, and applicability of the tools, and to estimate the time required for data collection. The findings from the pilot study lead to final refinements in the tools. Nurses who participated in the pilot phase were excluded from the final study sample to prevent bias.

Ethical Considerations
Approval to conduct the study was obtained from the Ethical Committee of the Faculty of Nursing, Assiut University (Approval NO: 112024092, dated 27/10/2024). Ethical principles were strictly observed throughout the research process:
- Informed consent was obtained from each nurse after explaining the study's purpose and procedures.
- Participation was voluntary, and nurses were free to withdraw at any time without penalty.
- Confidentiality and anonymity of all participants were fully maintained.
- Data were used exclusively for scientific research purposes, and no harm was inflicted on any nurses during data collection.
- Study nurses have the right to refuse to participate and/or withdraw from the study without any rational any time. Study nurses' privacy was considered during collection of data.

Data Collection Procedure
The researcher met with each nurse who participated in the study to explain the purpose of the research and to ask for participation. After obtaining consent. Data were collected using two tools: a self-administered questionnaire and an observational checklist.

Assessment of Knowledge:
The structured self-administered questionnaire was distributed to nurses during their free time in the unit. The researcher remained available to clarify any

questions. Each nurse took approximately 20–25 minutes to complete the questionnaire, which was then collected immediately after completion.

Assessment of practice:

The researcher used a structured observation checklist to assess nurses' actual practice during Advanced Life Support (ALS) procedures. Each nurse was observed individually while performing ALS on real cases, depending on availability. Observation focused on adherence to the ALS algorithm and correct sequence of actions.

Statistical Design

The data were tested for normality using the Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (No, %), where continuous variables described by mean and standard deviation **(Mean, SD)**. **Chi-square test** and fisher exact test used to compare between categorical variables where compare between continuous variables by **t-test** \and **ANOVA TEST.** We are Used Person Correlation to Appear the Association between scores, **A two-tailed p < 0.05** was considered statistically significance all analyses were performed with the **IBM SPSS 20.0** software.

Result:

Table (1): Distribution of Socio Demographic Data of the studied Nurses (n=60)

Socio demographic Data	Frequency (n=60)	Percentage (%)
Age (years)		
Mean±SD	31.72±4.89	
Age group		
≤ 30 years	26	43.3
> 30 years	34	56.7
Gender		
Male	20	33.3
Female	40	66.7
Marital Status		
Single	25	41.7
Married	35	58.3
Qualification		
Diploma	8	13.3
Bachelor's	42	70.0
Master's	10	16.7
Years of Experience		
Min.-Max.	0 - 16	
Mean±SD	7.98±4.7	
Years of Experience Levels		
<5 years	17	28.3
5 - 10 years	20	33.3
>10 years	23	38.3
Attended ALS Training		
Yes	38	63.3
No	22	36.7

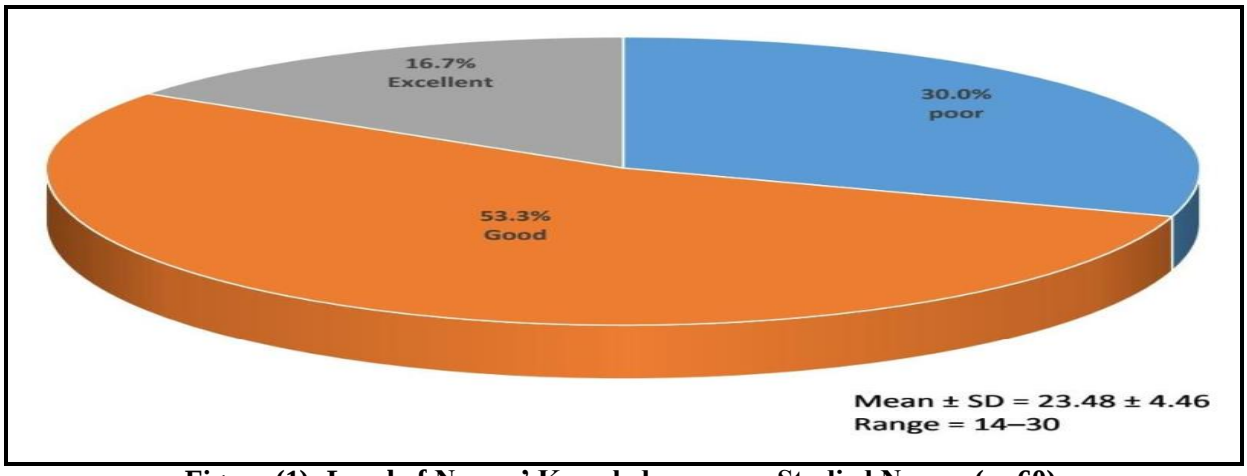

Figure (1): Level of Nurses' Knowledge among Studied Nurses (n=60)

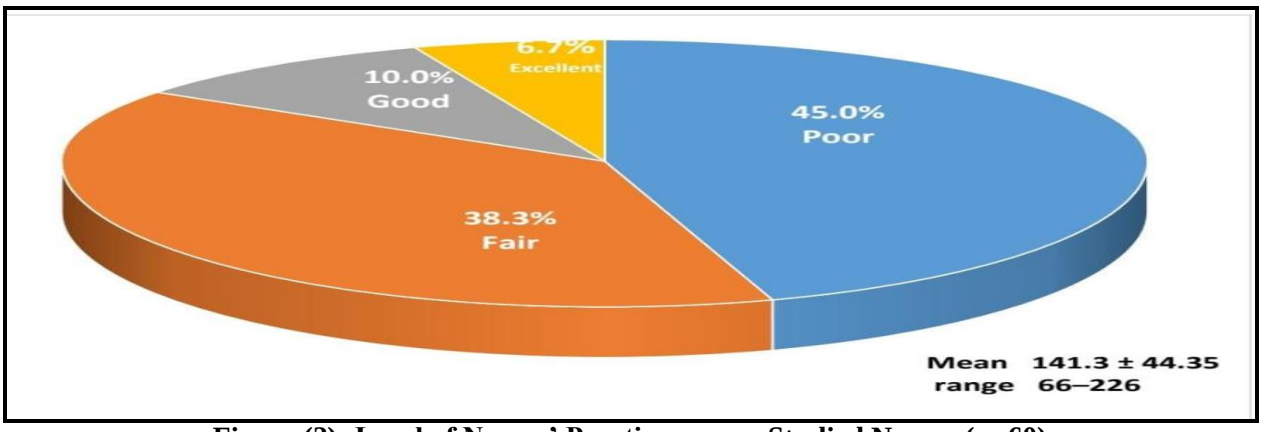

Figure (2): Level of Nurses' Practice among Studied Nurses (n=60)

Table (2): Relationship between Nurses' Knowledge Level and Their Socio Demographic Data (n=60)

	Nurses' Knowledge Level						P. Value
	Poor		Good		Excellent		
	N	%	N	%	N	%	
Age group							
≤ 30 years	9	50%	13	40.6%	4	40%	0.792
> 30 years	9	50%	19	59.4%	6	60%	
Gender							
Male	8	44.4%	9	28.1%	3	30%	0.487
Female	10	55.6%	23	71.9%	7	70%	
Marital Status							
Single	7	38.9%	12	37.5%	6	60%	0.434
Married	11	61.1%	20	62.5%	4	40%	
Qualification							
Diploma	1	5.6%	5	15.6%	2	20%	0.539
Bachelor's	15	83.3%	20	62.5%	7	70%	
Master's	2	11.1%	7	21.9%	1	10%	
Years of Experience							
<5 years	6	33.3%	7	21.9%	4	40%	0.628
5 - 10 years	7	38.9%	11	34.4%	2	20%	
>10 years	5	27.8%	14	43.8%	4	40%	
Attended ALS Training							
Yes	10	55.6%	20	62.5%	8	80%	0.433
No	8	44.4%	12	37.5%	2	20%	

Chi square test for qualitative data between two or more than two groups **Significant level at P value < 0.05,*

Table (3): Relationship between Nurses' Practice Level and Their Socio Demographic Data (n=60)

	Nurses' Practice Assessment (MCQs)				X2	P.Value
	Poor <60% (n=27) N (%)	Fair60%-75% (n=23) N (%)	Good 76%-85% (n=6) N (%)	Excellent 86%-100% (n=4) N (%)		
Age group						
≤ 30 years	9(33.3%)	11(47.8%)	4(66.7%)	2(50%)	2.69	0.442
> 30 years	18(66.7%)	12(52.2%)	2(33.3%)	2(50%)		
Gender						
Male	8(29.6%)	11(47.8%)	1(16.7%)	0(0%)	5.09	0.165
Female	19(70.4%)	12(52.2%)	5(83.3%)	4(100%)		
Marital Status						
Single	11(40.7%)	11(47.8%)	2(33.3%)	1(25%)	1.00	0.802
Married	16(59.3%)	12(52.2%)	4(66.7%)	3(75%)		
Qualification						
Diploma	1(3.7%)	2(8.7%)	3(50%)	2(50%)	15.22	0.119
Bachelor's	21(77.8%)	16(69.6%)	3(50%)	2(50%)		
Master's	5(18.5%)	5(21.7%)	0(0%)	0(0%)		
Years of Experience						
<5 years	6(22.2%)	6(26.1%)	3(50%)	2(50%)	3.03	0.805
5 - 10 years	10(37%)	8(34.8%)	1(16.7%)	1(25%)		
>10 years	11(40.7%)	9(39.1%)	2(33.3%)	1(25%)		
Attended ALS Training						
Yes	17(63%)	14(60.9%)	6(100%)	1(25%)	6.07	0.108
No	10(37%)	9(39.1%)	0(0%)	3(75%)		

Chi square test for qualitative data between two or more than two groups **Significant level at P value < 0.05,*

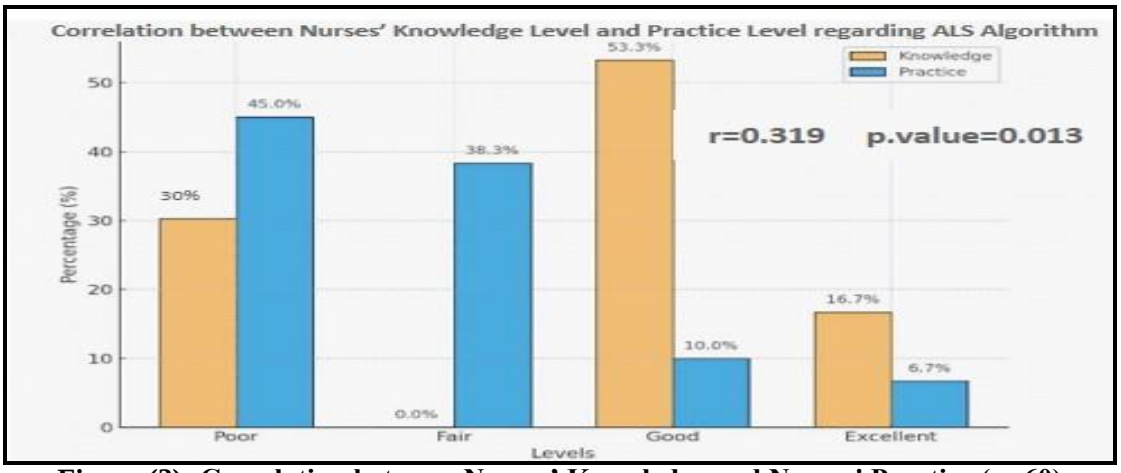

Figure (3): Correlation between Nurses' Knowledge and Nurses' Practice (n=60)

Table (1): The ***socio demographic data*** of the studied **Nurses** (n=60) revealed a relatively balanced age distribution, with a slight predominance of nurses above 30 years (56.7%). The mean age was 31.72 ± 4.89 years. Two-thirds of the nurses were female (66.7%), and over half were married (58.3%). In terms of educational background, the majority held a bachelor's degree in nursing (70.0%), while 16.7% had a master's degree. The average years of clinical experience was 7.98 ± 4.7, with 38.3% having more than 10 years of experience. Notably, 63.3% of the nurses had previously attended ALS training,

Figure (1): As presented in figure (1), the majority of nurses (53.3%) demonstrated a "Good" level of knowledge, whereas only a small proportion (16.7%) reached the "Excellent" category. In contrast, nearly one-third of nurses (30 %) exhibited "Poor" knowledge. The overall mean score (23.48 ± 4.46; range 14–30) indicates noticeable variability among the nurses' knowledge levels concerning the Advanced Life Support algorithm. These results indicate that the majority of the nurses possessed an adequate to high level of theoretical knowledge

regarding ALS concepts, which may reflect the impact of previous training or academic preparation.

Figure (2): Illustrates that nurses' practice level was generally weak. Almost half of the nurses (45.0%) fell within the "Poor" category (<60%), and an additional 38.3% were classified as "Fair" (60%–75%). This means that more than four-fifths of the sample (83.3%) demonstrated performance below the "Good" level. In contrast, only 16.7% of the nurses achieved higher levels of performance (10.0% "Good" and 6.7% "Excellent"). The mean score (141.3 ± 44.35; range 66–226) further reflects wide variability among nurses. Overall, these findings clearly indicate deficiencies in practical skills,

Table (2): Illustrates the relationship between nurses' knowledge levels and their socio-demographic data. The findings revealed no statistically significant associations between nurses' knowledge levels and their socio-demographic data ($p > 0.05$), which means that socio-demographic data had no impact on nurses' knowledge of the ALS algorithm.

Table (3): Shows the relation between nurses' practice levels and their socio-demographic data. The result showed that there were no statistically significant associations between nurses' practice levels and their socio-demographic data, including age, gender, marital status, qualification, years of experience, and attendance of ALS training ($P > 0.05$). This indicates that none of these factors had a decisive influence on the practice of the studied nurses."

Figure (3): The figure demonstrates that while more than half of the nurses exhibited good knowledge levels (53.3%), the majority showed fair to poor performance in practice (38.3% and 45.0%, respectively). This indicates a clear gap between knowledge level and practical application of the ALS algorithm. The result show a weak positive correlation between knowledge and practice ($r = 0.319$, $p = 0.013$).

Discussion:

Nurses play a crucial role in Advanced Life Support (ALS) through the early recognition of cardiac arrest, initiation of high-quality cardiopulmonary resuscitation, and effective collaboration within the resuscitation team. So the current study assessed nurses' knowledge and practice regarding Advanced Life Support (ALS).

The present study revealed that the majority of the nurses were bachelor's degree underscoring the role of high qualified nurses in ensuring quality outcomes in critical care. A recent scoping review supports the move toward requiring a bachelor's degree for nursing entry, showing that it leads to a more competent and safer nursing workforce **(Curtis et al., 2023).**

Contrary to the common belief that nurses with bachelor's degrees perform better in critical care settings due to their extended academic training, the findings by **(Gad et al., 2025)** showed that graduates from technical nursing institutes achieved the highest post-test knowledge scores. Their practical skills were nearly equal to those of bachelor's degree holders, with no significant difference. This implies that academic qualifications alone do not guarantee better performance; rather, continuous education and effective training are more important in improving nurses' knowledge and skills.

The findings of the present study demonstrated that the majority of nurses had clinical experience of five years or more, with a considerable proportion exceeding ten years. This highlights that ALS management requires nurses with substantial expertise, as advanced decision-making and rapid interventions in critical care are strongly linked to accumulated practice and professional maturity **(Maharmeh. et al., 2016)**

A large number of the studied nurses had previously attended ALS training, reflecting a positive orientation toward professional development. Despite more than half of them having attended such training, their actual practice remained insufficient, highlighting a gap between training and practice. Recent evidence confirms that structured ALS and simulation-based programs are highly effective in maintaining knowledge, practical competence, and confidence, underscoring the importance of continuous training for sustaining high-quality resuscitation practices. **(Alharbi et al., 2024).** This gap may result from inadequate practical exposure during training, limited opportunities for real-case application, or the absence of periodic skill refreshers. Without consistent reinforcement, psychomotor performance tends to decline even when theoretical knowledge is retained.

More than half of the nurses achieved a "Good" level of knowledge. This could be explained by the fact that most of them held bachelor's degrees and had considerable years of clinical experience, in addition to the participation of many nurses in ALS training programs. These factors collectively contribute to strengthening knowledge acquisition and retention. Recent evidence also shows that higher educational level and longer clinical exposure are associated with improved knowledge scores in advanced life support and resuscitation practices. **(Mohammed et al., 2022).**

Several studies reported different findings, finding no significant association between nurses' educational level or years of experience and their knowledge

scores in critical care settings. Previous studies suggested that knowledge is more strongly influenced by continuous professional education and recent training updates rather than academic degree or length of experience alone. This indicates that without ongoing refreshment courses, knowledge may decline over time regardless of qualification or experience. **(Hussein et al., 2021)**.

The nurses' practice scores revealed a considerably weaker profile compared with their knowledge, with nearly half falling within the "Poor" category and only a small fraction achieving "Good" or "Excellent" levels. This gap highlights the persistent challenge of translating knowledge into practice. It may be attributed to heavy workloads and a lack of continuous supervision, which limit nurses' ability to maintain and apply their skills effectively.

Another possible reason for the observed weak performance is that Advanced Life Support (ALS) procedures are often primarily performed by physicians, while nurses predominantly handle Basic Life Support (BLS) tasks in daily practice **(O'Connor et al., 2019)**. This limited hands-on exposure to ALS may reduce nurses' opportunities to apply and maintain advanced resuscitation skills.

The present findings emphasize the importance of structured programs that combine practical application with knowledge delivery, ensuring that nurses can confidently perform critical life-saving procedures in real clinical settings. Studies have demonstrated that simulation-based and competency-focused training programs significantly enhance ALS performance, proving more effective than traditional lecture-based approaches **(Kumar et al., 2021).**

Participation in previous training programs did not result in significant improvement in nurses' ALS practice scores. Factors such as high patient-to-nurse ratios, limited hands-on practice opportunities, and insufficient follow-up were suggested to reduce the effectiveness of training, indicating that attendance alone does not guarantee improved practice **(Lee & Kim, 2022)**. These findings are consistent with previous research reporting that, although nurses participated in ALS training programs, their practice remained unsatisfactory due to a lack of continuous practice and clinical reinforcement **(Ahmed et al., 2020).**

The present study revealed that no statistically significant correlation between socio-demographic variables (age, gender, marital status, educational level, years of experience, or prior ALS training) and nurses' theoretical knowledge. Similarly, no significant correlation was found between socio-demographic factors and overall practice, indicating that these characteristics alone may not decisively predict either knowledge or practical competency in ALS **(Li et al., 2021).** This suggests that competence is shaped more by ongoing professional engagement, motivation, and exposure to emergency situations rather than by static demographic characteristics such as age or years of experience.

Importantly, the study also found a positive correlation between knowledge and practice scores, indicating that higher levels of theoretical knowledge were associated with better practice. This finding aligns with **(Kim & Park, 2021)**, who demonstrated that integrated curricula combining theoretical instruction with simulation-based training improve both cognitive understanding and psychomotor skills. Together, these results underscore the interdependence of knowledge and practice and reinforce the need for educational approaches that simultaneously address both domains.

A positive correlation was found between knowledge and practice, indicating that nurses with higher theoretical understanding tend to perform better in practice. However, the existence of a noticeable gap between both domains suggests that theoretical understanding alone is not sufficient. Therefore, strengthening theoretical knowledge should be accompanied by regular hands-on training and continuous clinical reinforcement to ensure effective ALS performance and patient safety. The findings carry important implications for nursing practice, as inadequate ALS performance can directly affect patient outcomes during critical situations.

Conclusion:

The findings of the present study revealed that more than half of the nurses demonstrated a good level of knowledge regarding Advanced Life Support (ALS). In contrast, practice was considerably weaker, with the majority falling within poor and fair categories. A positive correlation was found between knowledge and practice $r = 0.319$, $p = 0.013$.

Recommendation:

- Provide regular practical ALS training, conduct performance evaluations, and focus on bridging the knowledge-practice gap.
- In light of the study findings, it is recommended to strengthen nurses' performance in advanced life support through implementing regular structured ALS training with practical and simulation-based sessions to enhance skill retention and confidence during cardiac arrest management.
- Future research should involve larger and more diverse samples, as well as longitudinal designs, to evaluate knowledge retention, skill decay, and the relative effectiveness of different training approaches, including simulation-based, blended, and traditional methods.

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