International Journal of Nursing and Medical Science 2024:13(3), 50-57

IJNMS ISSN: 2454-6674

INTERNATIONAL JOURNAL OF NURSING AND MEDICAL SCIENCE

Nursing Education Health Science Research

PANACEA INTERNATIONAL JOURNAL | PRL PUBLISHER

Original Research Article **Volume 13 Issue 3** **May – June 2024**

EVALUATION OF A NURSE-FOCUSED EDUCATIONAL PROGRAMME ON KNOWLEDGE REGARDING ARTERIAL BLOOD GAS ANALYSIS AMONG ICU NURSING PROFESSIONALS

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ABSTRACT

Background: Arterial blood gas (ABG) analysis is an essential diagnostic investigation used in intensive care units to assess oxygenation, ventilation, and acid–base balance among critically ill patients. Intensive care nursing professionals play an important role in monitoring ABG parameters, recognizing abnormal findings, and communicating clinically significant changes to the healthcare team. Adequate knowledge regarding ABG analysis is therefore necessary to support timely clinical assessment and safe patient care. Structured educational programmes may strengthen nurses' theoretical understanding and interpretation of ABG results.

Objectives: To evaluate the effectiveness of a nurse-focused educational programme on knowledge regarding arterial blood gas analysis among ICU nursing professionals and determine the association between pre-test knowledge scores and selected demographic variables.

Materials and Methods: A quantitative evaluative research approach with a quasi-experimental one-group pre-test–post-test design is proposed. The study include 75 ICU nursing professionals working in selected hospitals of Indore, Madhya Pradesh. Participants was recruited through a non-probability convenience sampling technique. Baseline knowledge assessed using a validated structured knowledge questionnaire. A nurse-focused educational programme covering fundamental concepts, indications, normal values, interpretation, acid–base disturbances, and nursing responsibilities related to ABG analysis was administered. A post-test was conducted seven days after the intervention using the same questionnaire. Data was analyzed using descriptive and inferential statistics.

Results: Findings were presented in terms of demographic characteristics, pre-test and post-test knowledge levels, mean knowledge scores, and statistical significance of observed differences. The actual results were incorporated following completion of data collection and analysis.

Conclusion: The study is designed to determine whether a nurse-focused educational programme improves knowledge regarding arterial blood gas analysis among ICU nursing professionals. The findings may provide evidence for incorporating structured ABG education into continuing nursing education programmes.

INTRODUCTION

Arterial blood gas analysis is an important diagnostic procedure frequently utilized in critical care settings to evaluate respiratory function, oxygenation, ventilation, and acid–base balance. It provides essential information regarding the physiological condition of critically ill patients and supports clinical decisions related to oxygen therapy, mechanical ventilation, respiratory support, and management of metabolic disturbances.

ABG analysis primarily measures arterial pH, partial pressure of carbon dioxide ($PaCO_2$), partial pressure of oxygen (PaO_2), and related parameters such as bicarbonate (HCO_3^-), base excess, and arterial oxygen saturation. These measurements assist healthcare professionals in identifying respiratory and metabolic abnormalities and evaluating the effectiveness of therapeutic interventions.

Intensive care units are specialized healthcare environments where patients frequently experience acute respiratory failure, sepsis, shock, metabolic disturbances, renal dysfunction, and other life-threatening conditions. Such patients require continuous physiological monitoring and timely interpretation of diagnostic findings. ABG analysis is particularly important in identifying disturbances that may require immediate clinical attention.

Nursing professionals working in intensive care units are directly involved in monitoring patients, assisting with arterial blood sampling, observing physiological changes, and communicating laboratory findings to physicians and other members of the multidisciplinary healthcare team. Their knowledge regarding ABG analysis contributes to the early recognition of abnormalities and supports appropriate nursing interventions within their professional scope.

However, ABG interpretation requires an understanding of respiratory physiology, renal compensation, normal laboratory values, and the relationship between carbon dioxide, bicarbonate, and blood pH. Nurses may encounter difficulties in differentiating

respiratory acidosis, respiratory alkalosis, metabolic acidosis, and metabolic alkalosis, particularly when mixed acid–base disturbances are present.

Variations in educational preparation, clinical experience, continuing professional development, and exposure to critically ill patients may influence nurses' knowledge regarding ABG analysis. Educational interventions that combine theoretical explanations with clinical examples and interpretation exercises may help address these learning needs.

A nurse-focused educational programme provides a systematic approach to improving knowledge through organized instruction, clinical case discussions, audiovisual materials, and guided interpretation exercises. Such programmes can be adapted to the learning requirements of ICU nursing professionals and implemented within hospital-based continuing nursing education activities.

The present study therefore proposes to evaluate the effectiveness of a nurse-focused educational programme on knowledge regarding arterial blood gas analysis among 75 ICU nursing professionals working in selected hospitals of Indore, Madhya Pradesh.

NEED FOR THE STUDY

Arterial blood gas analysis is frequently performed in critically ill patients requiring respiratory monitoring, mechanical ventilation, or management of complex metabolic disturbances. Accurate interpretation of ABG findings is important for understanding patients' physiological status and recognizing potentially serious clinical abnormalities.

ICU nurses have a significant responsibility in observing changes in patients' conditions, reviewing investigation reports, and reporting abnormal findings promptly. Although clinical decisions regarding treatment are made within the multidisciplinary healthcare team, nurses require adequate knowledge to understand the significance of ABG parameters and provide appropriate monitoring and supportive care.

Knowledge gaps may arise because of limited exposure to structured ABG education, differences in clinical experience, insufficient opportunities for continuing education, and the complexity of acid–base interpretation.

A structured educational programme may offer an accessible and cost-effective strategy to strengthen theoretical knowledge among ICU nurses. Assessing knowledge before and after the programme can help determine whether measurable improvement occurs following the educational intervention.

The findings of this study may be useful for nursing administrators, clinical educators, critical care nurse managers, and hospital education departments in planning continuing nursing education programmes.

STATEMENT OF THE PROBLEM

"Evaluation of a Nurse-Focused Educational Programme on Knowledge Regarding Arterial Blood Gas Analysis among ICU Nursing Professionals in Selected Hospitals of Indore, Madhya Pradesh."

OBJECTIVES OF THE STUDY

1. To assess the pre-test level of knowledge regarding arterial blood gas analysis among ICU nursing professionals.
2. To evaluate the effectiveness of a nurse-focused educational programme by comparing pre-test and post-test knowledge scores.
3. To determine the association between pre-test knowledge scores and selected demographic variables among ICU nursing professionals.

RESEARCH HYPOTHESES

H_1: There will be a statistically significant difference between the mean pre-test and post-test knowledge scores regarding arterial blood gas analysis among ICU nursing professionals following the nurse-focused educational programme at the 0.05 level of significance.

H_2: There will be a statistically significant association between pre-test knowledge levels and selected demographic variables among ICU nursing professionals at the 0.05 level of significance.

MATERIALS AND METHODS

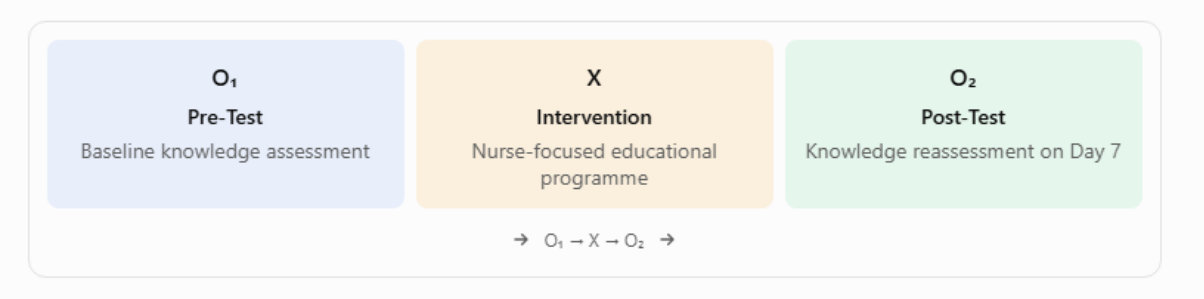
Research Approach

A quantitative evaluative research approach was adopted to assess the effectiveness of the nurse-focused educational programme.

Research Design

A quasi-experimental one-group pre-test–post-test research design was used.

Schematic Representation



Where O_1 represents the pre-test knowledge assessment, X represents the nurse-focused educational programme, and O_2 represents the post-test knowledge assessment.

Study Setting

The study was conducted in the intensive care units of selected hospitals located in Indore, Madhya Pradesh.

Study Population

The target population was comprising nursing professionals working in intensive care units of hospitals.

The accessible population consist of ICU nursing professionals working in the selected hospitals during the study period.

Sample Size

The proposed sample size were 75 ICU nursing professionals.

Sampling Technique

A non-probability convenience sampling technique were used to select eligible participants.

Inclusion Criteria

The study includes ICU nursing professionals who are registered nurses, have at least six months of ICU experience, are willing to participate, provide informed consent, and are available during the study period.

Exclusion Criteria

Nursing professionals who are on extended leave during data collection, have participated in a formal ABG interpretation training programme within the preceding three months, or are unable to complete both assessments were excluded.

Study Variables

Independent Variable: Nurse-focused educational programme on arterial blood gas analysis.

Dependent Variable: Knowledge regarding arterial blood gas analysis among ICU nursing professionals.

Description of the Educational Programme

The nurse-focused educational programme cover the following topics:

- Introduction, definition, purposes, and clinical significance of ABG analysis.
- Normal ABG parameters and their physiological importance.
- Indications, precautions, and factors affecting sample accuracy.
- Interpretation of respiratory and metabolic acidosis and alkalosis.
- Recognition of compensatory mechanisms and basic mixed acid–base disturbances.
- Clinical case scenarios and nursing responsibilities related to ABG analysis.

RESULT

Section I: Demographic Characteristics

Table 1: Frequency and Percentage Distribution of ICU Nursing Professionals According to Selected Demographic Variables (N = 75)

Demographic variables	Frequency (f)	Percentage (%)
Age (years)		
21–25	24	32.0
26–30	28	37.3
31–35	15	20.0
Above 35	8	10.7
Sex		
Male	29	38.7
Female	46	61.3
Professional qualification		
GNM	28	37.3
B.Sc. Nursing	34	45.3
Post Basic B.Sc. Nursing	9	12.0

M.Sc. Nursing	4	5.3
ICU experience		
Less than 1 year	18	24.0
1–3 years	29	38.7
4–6 years	19	25.3
Above 6 years	9	12.0
Previous ABG training		
Yes	21	28.0
No	54	72.0

Section II: Assessment of Knowledge Regarding ABG Analysis

Table 2: Distribution of Pre-Test and Post-Test Knowledge Levels (N = 75)

Knowledge level	**Pre-test f (%)**	**Post-test f (%)**
Inadequate (0–15)	44 (58.7%)	5 (6.7%)
Moderately adequate (16–22)	25 (33.3%)	18 (24.0%)
Adequate (23–30)	6 (8.0%)	52 (69.3%)
Total	75 (100%)	75 (100%)

Section III: Effectiveness of the Nurse-Focused Educational Programme

Table 3: Comparison of Mean Pre-Test and Post-Test Knowledge Scores (N = 75)

Statistical parameter	**Pre-test**	**Post-test**
Mean knowledge score	14.20	23.69
Standard deviation	5.27	3.84

Mean percentage score	47.33%	78.98%
Minimum score	10	13
Maximum score	25	26

NURSING IMPLICATIONS

Nursing Practice: Knowledge regarding ABG analysis may support the early recognition and timely reporting of abnormal findings, appropriate patient monitoring, and communication within the critical care team.

Nursing Education: ABG interpretation can be incorporated into continuing nursing education, critical care orientation programmes, and periodic knowledge assessments.

Nursing Administration: Nursing administrators may use the findings to identify educational priorities and organize structured training sessions for ICU nursing professionals.

Nursing Research: The study may provide preliminary evidence for further controlled investigations examining ABG interpretation accuracy, clinical decision-making, and knowledge retention.

REFERENCES

1. World Health Organization. Patient Safety Curriculum Guide: Multi-professional Edition. Geneva: World Health Organization; 2011.
2. Polit DF, Beck CT. Nursing Research: Generating and Assessing Evidence for Nursing Practice. 11th ed. Wolters Kluwer; 2021.
3. Creswell JW, Creswell JD. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 5th ed. SAGE Publications; 2018.
4. Guyton AC, Hall JE. Textbook of Medical Physiology. 14th ed. Elsevier; 2021.
5. Marino PL. The ICU Book. 4th ed. Wolters Kluwer; 2014.
6. Berend K, de Vries APJ, Gans ROB. Physiological approach to assessment of acid–base disturbances. New England Journal of Medicine. 2014;371:1434–1445.
7. Adrogué HJ, Madias NE. Management of life-threatening acid–base disorders. First of two parts. New England Journal of Medicine. 1998;338:26–34.
8. Adrogué HJ, Madias NE. Management of life-threatening acid–base disorders. Second of two parts. New England Journal of Medicine. 1998;338:107–111.
9. Yunos NM, Bellomo R, Story D, Kellum J. Bench-to-bedside review: Chloride in critical illness. Critical Care. 2010;14:226.
10. Kohn LT, Corrigan JM, Donaldson MS, editors. To Err Is Human: Building a Safer Health System. Washington, DC: National Academies Press; 2000.