A STUDY TO ASSESS THE EFFECTIVENESS OF STRUCTURED TEACHING PROGRAMME ON KNOWLEDGE REGARDING ARTERIAL BLOOD GAS ANALYSIS AND INTERPRETATION AMONG STAFF NURSES WORKING IN CRITICAL CARE UNITS OF SELECTED HOSPITALS AT LUCKNOW, U.P.

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ABSTRACT

Introduction: Arterial blood gas analysis is a basic and useful laboratory test for the critically ill patients. It is an essential investigation for assessing ventilation, oxygenation and acid base status among critically ill patients. These three are closely interrelated physiological parameters which maintain pH homeostasis. Measurement of arterial blood gas involves analysis of components: pH, partial pressure (PP), Base excess (BE), Bicarbonate (HCO3), Electrolytes, Haemoglobin (Hb) and Glucose. **Objectives:** 1. To evaluate the Effectiveness of Structured Teaching Programme on Knowledge regarding Arterial Blood Gas Analysis and Interpretation among Staff Nurses working in Critical Care Units. 2. To find the association between the level of knowledge regarding Arterial Blood Gas analysis and interpretation among staff nurses with their selected demographic variables. **Material and methods:** This study was conducted using quantitative approach at Integral Hospital, Lucknow. Pre-experimental One group pre-test post-test design was used in the study. The conceptual framework used in this study was J.W.Kenny's open system model [Modified]. The sample size was 30, selected by Purposive sampling technique. The data was collected by administering structured Knowledge Questionnaire followed by structured teaching program about arterial blood gas analysis and interpretation. After 7 days, Post-test was done to assess the effectiveness of STP. **Result:** The findings demonstrated that the comparison of knowledge regarding Arterial Blood Gas analysis among staff nurses working in Critical Care Unit before and after Structured Teaching Programme. The mean pre-test knowledge score regarding Arterial Blood Gas analysis was 13.96 with a standard deviation of 3.39. After giving STP the mean score was

increased to 23.00 with a standard deviation of 2.36. Increased in knowledge score was statistically tested by paired 't' test. The calculated value 12.54 is highly significant with the degree of freedom of 29 at $p<0.05$. **Conclusion:** The study concluded that the Structured Teaching Programme was effective for improving the knowledge among staff nurses working in Critical Care Unit.

Keywords: Effectiveness, Structured Teaching Programme, Arterial Blood Gas Analysis and Interpretation, Staff Nurses and Critical Care unit.

INTRODUCTION:

Health is considered as one of the most important aspect of life. It is a key factor and is regarded as precious. Health as well as longevity should be protected and enhanced as much as possible. Early detection and treatment are one of the measures to prevent illness and also to reduce complications and even death. Early diagnosis is key to better management.

Arterial blood gas analysis is a basic and useful laboratory test for the critically ill patients. It is an essential investigation for assessing ventilation, oxygenation and acid base status among critically ill patients. These three are closely interrelated physiological parameters which maintain pH homeostasis. Measurement of arterial blood gas involves analysis of components: pH, partial pressure (PP), Base excess (BE), Bicarbonate (HCO3), Electrolytes, Haemoglobin (Hb) and Glucose.

Interpreting an arterial blood gas (ABG) is a crucial skill for physicians, nurses, respiratory therapists, and other health care personnel. Any deviation from a normal value will indicate that the client is experiencing an acid base imbalance. Disorders of acid-base balance can lead to severe complications and occasionally the abnormality may be so severe that it can lead to life threatening condition.

An arterial blood gas (ABG) specifically tests blood taken from an artery. Arterial blood gas analysis assesses a patient's partial pressure of oxygen (PaO2), providing information on the oxygenation status; the partial pressure of carbon dioxide (PaCO2), providing information on the ventilation status (chronic or acute respiratory failure), and is changed by hyperventilation (rapid or deep breathing) and hypoventilation (slow or shallow breathing); and acid-base status. Although oxygenation and ventilation can be assessed non-invasively via pulse oximetry and end-tidal carbon dioxide monitoring, respectively, blood gas analysis is the standard.

Nurses are integral part to health care delivery system and it is important that they have a clear understanding of the nature of the procedures that they would have to perform for the patients. The critical care nurse serves as a catalyst in the healing process, making complex and timely judgements and decisions and taking actions for which, the nurse remains accountable. The rationale of such decision is based upon the thorough knowledge of

the health and life saving procedures. The knowledge base is upgraded continuously by new clinical and educational experiences that reinforce the critical care nurses' professional practice and autonomy.

In the health care area, scientific and technological advances lead to the out-dated knowledge and professional skills in a remarkably short period of time. Thus, a comprehensive basic professional preparation is no longer sufficient for a whole life of practice. Moreover, given the emphasis on evidence-based practice, nursing staff members constantly need to update their knowledge and professional abilities. Therefore, continuing education has increasingly become essential to guarantee high-quality nursing practice.

Need for the study

Among the different advanced laboratory tests, arterial blood gas monitoring. is one amongst them, concerned with respiration, the exchange of gases between the lungs and blood, and between blood and tissues. ABG sampling represents the gold standard method for acquiring patient's acid-base status. Most of the patients inintensive care unit who are on ventilator suffer from acid base disorders. Arterial blood gas analysis has become an essential skill for all healthcare practitioners.

ABG measurements have been increasingly used in different medical conditions irrespective of pulmonary and non-pulmonary disease conditions for accurate diagnosis. Alteration in Oxygen, Carbon Dioxide, pH, and HCO, level leads to conditions like respiratory or metabolic acidosis or alkalosis. These conditions should be early diagnosed and treated else may lead to several complications and may unable to restore normal health.

The nurse plays an important role in monitoring the patient's progresses. A nurse has to be competent and skilful in handling situations that will result in effecting the ABG analysis of the patients. A nurse has to make a decision which is beneficial to the client life. By carefully analysing the nurse is able to recognize early causes and manage problems before they arise. When ABG analyses have been done properly the patient experience more rapid positive outcomes.

During the clinical experiences in ICU the investigator found that majority of patient's ventilation is being monitored by ABG analysis in spite of continuous monitor with pulse oximeter. Though the nurses take an active part in collecting ABG samples but their knowledge in interpreting ABG reports is inadequate. Keeping this in view, the investigators have justified the need to improve nurses' knowledge and practice regarding ABG analysis among ICU nurses.

During the clinical experience in Critical Care Unit the researcher found that ABG analysis is frequently monitored in order to assess the ventilation status of the critically ill patients along with the pulse oximeter. The nurses take active part in collecting ABG sample, their knowledge in interpreting ABG reports in not adequate. After investigating the researcher identified that there is the need to make the staff nurses learn about ABG

analysis. So, keeping this is mind, the researcher has justified the need to improve nurse's knowledge regarding ABG analysis among staff nurses working in Critical Care Unit.

STATEMENT OF THE PROBLEM

A Study to assess the Effectiveness of Structured Teaching Programme on Knowledge regarding Arterial Blood Gas Analysis and Interpretation among Staff Nurses working in Critical Care Units of Selected Hospitals at Lucknow, U.P.

OBJECTIVES OF THE STUDY

1. To evaluate the Effectiveness of Structured Teaching Programme on Knowledge regarding Arterial Blood Gas Analysis and Interpretation among Staff Nurses working in Critical Care Units.

2. To find the association between the level of knowledge regarding Arterial Blood Gas analysis and interpretation among staff nurses with their selected demographic variables.

RESEARCH METHODOLOGY

Research Approach:

A quantitative approach was adopted to determine the research study.

Research Design:

Pre-experimental one group pre test post test design was used for the study.

Setting of the Study:

The setting of the study was Integral Hospital, Lucknow.

Target Population:

The target population for this present study includes Staff Nurses working in Critical care unit in selected hospitals at Lucknow, U.P.

Accessible Population:

The accessible population for the present study includes Staff Nurses working in Critical care unit in Integral Hospital, Lucknow, Uttar Pradesh

Sample Size:

The sample size of the present study was 30 staff nurses.

Sampling Technique:

Non probability purposive sampling technique was adopted for this study.

Inclusion criteria:

- Staff nurses who were working in Critical care unit at Integral Hospital, Lucknow.
- Staff nurses who have completed GNM, Post Basic B.Sc. Nursing and B.Sc. Nursing.
- Staff nurses who were available at the time of study period.

Exclusion criteria:

- Staff nurses who were not willing to participate in this study.

Variables of the Study:

I. INDEPENDENT VARIABLE

Structured Teaching Programme regarding Arterial Blood Gas analysis and Interpretation.

II. DEPENDENT VARIABLE

Knowledge of the staff nurses regarding Arterial Blood Gas analysis and Interpretation.

III. DEMOGRAPHICAL VARIABLES: Age**,** Gender**,** Educational qualification**,** Years of Experience in critical care unit and Previous knowledge about Arterial Blood Gas analysis and Interpretation.

Description of the Tool:

The tools used for the study consisted of two sections:

Part A- Demographic variable- Age**,** Gender**,** Educational qualification**,** Years of Experience in critical care unit and Previous knowledge about Arterial Blood Gas analysis and Interpretation.

Part B –Structured knowledge questionnaire to assess the knowledge of staff nurses regarding Arterial Blood Gas analysis and Interpretation.

RESULTS

PART I: Distribution of demographic characteristics of staff nurse:

Table1: Frequency and percentage distribution according to demographic variables of staff nurses.

n=30

S.NO	DEMOGRAPHIC DATA	CATEGORY	FREQUENCY (f)	PERCENTAGE (%)
1.	Age (in years)	20-25 years	8	26.7%
		26-30 years	10	33.3%
		31-35 years	9	30.0%
		36 and above	3	10.0%
2.	Gender	Male	9	30%
		Female	21	70%
3.	Qualification	GNM	16	53.3%
		BSc Nursing	4	13.3%
		Post Basic Nursing	10	33.3%
4.	Years of experience in Critical Care Unit	<1 year	2	6.7%
		1 year-<3 years	8	26.7%
		3 year-<5 years	12	40.0%
		5 year-<7 years	6	20%
		>7 years	2	6.7%
5.	Previous knowledge	No	22	73.3%
		Yes	8	26.7%

Table 1 reveals the percentage distribution of staff nurses according to the demographic variables such as Age, Gender, Qualification, No. of year of experience, Area of experience and Previous knowledge.

Out of 30 samples 8 (26.7%) had belonged to age group 20-25 years, 10 (33.3%) had belonged to age group 26-30 years, 9 (30.0%) had belonged to age group 31-35 years and 3 (10.0%) were belonged to age group 36 and above.

With respect to the gender 9 (30%) were male and 21 (70%) were female.

With regards to the qualification 16 (53.3%) were undergone GNM course, 4 (13.3%) were undergone BSc nursing course and 10 (33.3%) were undergone post basic nursing course.

With respect to the year of experience in Critical Care Unit 2 (6.7%) were having less than 1 years of experience, 8 (26.7%) were having experience between l year- <3 years, 12 (40.0%) were having experience between 3 years - <5 years, 6.7%) were having experience between 5 years - <7 years and 2 (6.7%) were having experience more than 7 years.

With respect to the previous knowledge 22 (73.3%) don't have any previous knowledge regarding arterial blood gas analysis and 8 (26.7%) were having some knowledge regarding arterial blood gas analysis and interpretation.

PART II: Assessment of level of knowledge about Arterial Blood Gas analysis among Staff Nurses:

SECTION A: Assessment of pre-test level of knowledge about Arterial Blood Gas analysis and interpretation among Staff Nurses.

TABLE 2: Assessment of pre-test level of knowledge about Arterial Blood Gas analysis and interpretation among Staff Nurses.

n=30

LEVEL OF KNOWLEDGE	SCORE	FREQUENCY	PERCENTAGE
ADEQUATE	21-30	00	00%
MODERATE	11-20	26	86.7%
INADEQUATE2	0-10	4	13.3%

The table above shows the pre-test knowledge score of 30 subjects, 26 (86.7%) had moderate knowledge and 4 (13.3%) had inadequate knowledge.

SECTION B: Assessment of post-test level of knowledge about Arterial Blood Gas analysis and interpretation among Staff Nurses.

TABLE 3: Assessment of post-test level of knowledge about Arterial Blood Gas analysis and interpretation among Staff Nurses.

n=30

LEVELOF KNOWLEDGE	SCORE	FREQUENCY	PERCENTAGE
ADEQUATE	21-30	24	80%
MODERATE	11-20	06	20%
INADEQUATE	0-10	00	00%

The table above shows the post-test knowledge score of 30 subjects, 24 (80%) had moderate knowledge and 06 (20%) had inadequate knowledge

Section C: Area wise mean, SD and mean percentage of pre-test and post-test knowledge score:

Table 4: Area wise mean, SD and mean percentage of pre-test and post-test knowledge score.

n =30

S. No	Sections	Min-Max Score	Pre-test knowledge			Post-test knowledge		
			Mean score	Percentage	SD	Mean score	Percentage	SD
	General information	0-4	2.93	73.25%	0.87	3.70	92.5%	0.53
2.	Pre procedural	0-6	2.73	45.50%	1.04	4.73	78.83%	1.14
3.	Intra procedural	0-4	1.80	45%	1.29	2.96	74%	0.99
4.	Post procedural	0-4	1.56	39%	1.04	2.93	73.25%	0.82

5.	Interpretation	0-12	4.93	41.08%	1.96	8.66	72.16%	1.80

The table above displays the area wise mean, SD and percentage of the pre-test and post-test knowledge scores about Arterial Blood Gas analysis and interpretation.

In the area of 'General information', it reveals that mean percentage of pre-test score was 73.25% with total mean and SD 2.93 ± 0.87 which was increased in post-test to 92.5% with total mean and SD 3.70±0.53

In the area of 'Pre-Procedural', it shows that the mean percentage of pre-test knowledge score was 45.50% with total mean and SD 2.73 ± 1.04 and after giving STP the mean percentage of post-test score was increased to 78.83% with total mean and SD 4.73± 1.14.

With respect to the area of 'Intra Procedure', it shows that the mean percentage of pre-test score was 45% with total mean and SD 1.80 ± 1.29, which was increased in post-test as mean percentage score was 74% with total mean and SD 2.96 ±0.99.

With respect to the area of 'Interpretation', it shows that the mean percentage of pre-test score was 41.08% with total mean and SD 4.93 ± 1.96, which was increased in post-test as mean percentage score was 72.16% with total mean and SD 8.66±1.80.

PART III: Analysis of effect of structured Teaching Programme about Arterial Blood Gas analysis and Interpretation:

Table 5: Comparison of pre-test and post-test knowledge score among staff nurses about Arterial Blood Gas analysis and interpretation using Paired t- test.

N =30

CATEGORY	Mean	SD	Mean Difference	Df	Paired t value	P value	Table value at 0.05
Pre-test	13.96	3.39	9.04	29	-12.547	.000	2.05
Post-test	23.00	2.36					

**Significance at 0.05 level

The above table shows the comparison of knowledge regarding Arterial Blood Gas analysis among staff nurses working in Critical Care Unit before and after Structured Teaching Programme. The mean pre-test knowledge score regarding Arterial Blood Gas analysis was 13.96 with a standard deviation of 3.39. After giving STP the mean score was increased to 23.00 with a standard deviation of 2.36. Increased in knowledge score was statistically tested by paired 't' test. The calculated value-12.54 is highly significant with the degree of freedom of 29 at $p<0.05$ which shows that STP was effective for improving the knowledge among staff nurses working in Critical Care Unit.

RECOMMENDATIONS FOR FUTURE RESEARCH:

Based on the findings of the present study, the following recommendations are made:

1. The study can be conducted with the large sample to validate the findings and generalizations can be made.
2. An Experimental study can be done with video assisted teaching and informational booklet method.
3. A similar study can be conducted to assess knowledge and practice regarding ABG Analysis among staff nurses.
4. Comparative study can be done between staff nurses working in private or Government Hospital.
5. Comparative Study can be done between the staff nurses working in ICU or General Ward.

CONCLUSION:

The present study findings revealed that the Structured Teaching Programme was effective in improving the knowledge of staff nurses working in critical care unit regarding Arterial Blood Gas Analysis and Interpretation. The findings was undertaken to assess the knowledge on ABG Analysis among staff nurses. If they are able to interpret correctly can prevent complications, keep away from errors and help in improving the condition of the patient. So, the study motivates staff nurses in improving knowledge on ABG analysis and ultimately improve the patient care and quality of nursing care. It becomes vital for the nurses working in critical care departments should have additional knowledge on ABG Analysis in order to save the patients from developing lot of complications.

SOURCE OF FUNDING: NIL

CONFLICTS OF INTEREST: There are no conflicts of Interest.

REFERENCES:

1. Black M Joyce, Jacobs Matassarin Esther. Medical Surgical Nursing clinical management for continuity of care 3rd Edition: New Delhi.W.B.Saunders Company: 1997.
2. Black Hawles (2003), "Medical and Surgical Nursing", 7th edition, Elsevier Publications, volume 11, pp. 2107-2137, Mumbai.
3. Brunner, Suddarth (2002), "Textbook of Medical and Surgical Nursing" 10th edition, Lippincott Publications, 846-848, New Delhi.
4. Divatia JV, Baronia AK, Bhagwati A, Chawla R, lyer S, Jani CK, Joad S, Kamat V et al. Critical care delivery in intensive care units in India: Defining the functions, roles and responsibilities of a consultant intensivist. Indian J Crit Care Med. 2006; 10(1): 53-63.
5. Black MJ, Hawk HJ. Medical Surgical Nursing. 8th Edition. Missouri: Elsevier, 2009
6. Thomas, P., Rory A., & Jefferson, A. (2006) Affects of Syringe Material, Sample Storage Time, and Temperature on Arterialized Human Blood Samples. IN: American Association for Respiratory Care Journal. 51(7):732-736.
7. American Association for Respiratory Care (2001). AARC Clinical Practice Guideline: blood gas analysis and hemoximetry. Respiratory Care Revision and update, available at: www.med.umich.edu/AnesCritical care
8. Higgin, C. (2007). Nursing implications in laboratory studies. Understanding Laboratory Investigations for Nurses and Health Professionals, 2nd.ed. Blackwell publishing, Oxford, pp. 59-76
9. MS Barthwal. Analysis of arterial blood gas A comprehensive approach. JAPI. 2004[cited 2011 Dec]; 52:573-77. Available from:

http://www.japi.org/july2004/R-573.pdf

10. Castro danny; Keenaghan Michael; arterial blood gas; statpearls publishing;2020
https://www.ncbi.nlm.nih.gov/books/NBK536919/
11. Andrews T.et.all nurses critical care 2008 may PMID18426468
12. Dunning, B., & Fischbach, F. (2009). Arterial sampling. A manual of Laboratory and Diagnostic Tests. (8th.ed.). Lippincott Company, China, pp. 62-65.
13. Barthwal MS. (2004): Analysis of Blood Gases Approach. JAPI, VOL. 52. A Comprehensive
14. Darren J, et al. (2005): Correlation of Central Venous and Arterial Blood Gas Measurements in Mechanically Ventilated Trauma Patients. ARCH SURG/VOL 140, NOV
15. S. Goldsworthy, Mechanical Ventilation Education and Transition of Critical Care Nurses into practice, Crit Care, Vol. 28, 2016.

16. Chintamani (et al). Lewis Medical Surgical Nursing. 7th edition. Philadelphia: Elsevier Publication. 2011; 130-131.

17. Lewin Heitkember Drikson. Medical Surgical Nursing. Assessment and Management of Clinical Problems. 7th edition. Philadelphia: Mosby and Elsevier publication. 2007; 523-525.

18. Morino PL. Arterial Blood Gas interpretation. 2nd edition. USA; Lippincott Williams and Wilkins publishers, 2008; 582-605.

19. Kaur A, Charan GS. A study to assess the effectiveness of STP on knowledge and practice regarding ABGs among ICU nurses in selected hospitals at Jalandhar, Punjab. IJHSR. 2018[cited 2018 agu]:8(8):182-88.

20. Meleis Al. Theoretical Nursing. Development and Progress. 5th ed. Philadelphia: Lippincott Williams and Wilkins; 2011

21. Mariner A. Nursing Theorists and their work. 3rd ed. Philadelphia: Mosby; 2010

22. Tomey AM, Alligood MR. Nursing Theorists and Their Work. 2nd ed. New York: Elsevier; 2006

23. Polit FD, Hungler PD. Nursing research principles and methods. 6th ed. Philadelphia: Lippincott; 2008

24. Dash M, et al. (2019) "ABG Analysis and its Interpretation". Acta Scientific Paediatrics 2(10): 108-111.

https://www.actascientific.com/ASPE/pdf/ASPE-02-0153.pdf.

25. 26. S Jeeva. A study to assess the knowledge regarding ABG analysis and interpretation of ABG results among staff nurses. MAT Journals.2019,2(1):7-10. Available from: https://zenodo.org/record/3484609.

26. Sehrawat V. Shokeen J, Saharan K. Assessment of knowledge regarding arterial blood gases analysis among staff nurses working in selected hospital, SGT hospital Gurugram, Haryana. IJSR. 2019; 8(11):19-20, Available from: https://www.worldwidejournals.com/international-journal-of-scientific-research-(IJSR)/recent_issues_pdf/2019/November/assessment-of-knowledge-regarding-arterial-blood-gases-analysis-among-staff-nurses-working-in-selected-hospital-sgt-hospital-gurugram-haryanaNovember20191572698034622375 4.pdf

27. Padma K, Priya A, Subhashini N, S Indra. A study to assess the knowledge regarding ABG analysis and interpretation of ABG results among staff nurses in NMCH, Nellore. IJAR. 2017; 3(1): 06-08. Available from: http://www.allresearchjournal.com/archives/?year=2017&vol=3&issue=1&part=A&ArticleId=3004

28. Abadi NZ., Jafari Nasim, Farsi Zahra, Zareiyan Armin. Knowledge of critical care nurses of Tehran's selected hospitals about Arterial Blood Gas interpretation. Cardiovascular Nursing Iranian Cardiac Nurses Society. 2014; 3(2): 23-16.

29. Kumari A, Choudhary R, Sharma P. A pre-experimental study to assess the effectiveness of structured teaching programme on knowledge regarding arterial blood gas analysis and interpretation among staff nurses working in selected hospitals of district Mohali, Punjab. AJNER. 2020; 10(2): 235-39. Available from: https://ajner.com/HTMLPaper.aspx?Journal=Asian%20Journal%20of%20Nursing%20Education%20and%20Research:PID-2020-10-2-25.

30. Patil TK, Zagade TB, Shinde MB, Kshirsagar VY. Effectiveness of Structured Teaching Programme on Arterial Blood Gas Analysis among Staff Nurses of Critical Care Unit. IJAST.2020; 29(35): 476-480. Available from: http://sersc.org/journals/index.php/UAST/article/view/5657

31. Begum Reshma, et al. A study to assess the effectiveness of structured teaching programme on knowledge of ABG analysis among staff nurses ofICU in selected private hospitals of Guwahati, Assam, UCAR. 2019; 8(7):19508-19513. Available from: http://www.journalijcar.org/issues/study-assess-effectiveness-structured-teaching-programme-knowledge-abg-analysis-among-staff