

Original Research Article

Nurses Knowledge Regarding Arterial Blood Gases Interpretation

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Abstract

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Arterial Blood Gases Interpretation is one of the most important studies in critical care, as it directs doctors in the right path for a better diagnosis, treatment, and projected result of the illnesses in question. Because nurses are the primary care providers in critical care units, their understanding of ABGs interpretation and analysis could be essential in the management of very ill patients with respiratory, cardiovascular, acid-base, and renal disorders. The main objective of this study was to assess nurse's knowledge regarding ABGs interpretation. A cross sectional study was conducted on 134 nurses at University of Lahore Teaching Hospital Lahore. A reliable and verified questionnaire was used to collect data. Data was analyzed by using spss-25. According to result of the study 4(3.0%) nurses out of 134 nurses was excellent knowledge regarding ABGs interpretation, 5(3.7%) nurses out of 134 was good knowledge regarding ABGs interpretation, 40(29.9%) nurses out of 134 was moderate knowledge regarding ABGs interpretation and 85(63.4%) nurses out of 134 was poor knowledge regarding ABGs interpretation. The result of the this study was depict that majority of the nurses 85(63.4%) had poor knowledge regarding ABGs interpretation. The study conclude that structured teaching programme had significant effect on nurse knowledge regarding arterial blood gases analysis and interpretation

Keywords: Knowledge, Nurses, ABGs

INTRODUCTION

Global statistics

In a developed country like the United States of America, about 137 individuals per 100,000 people are hospitalized each year due to respiratory failure (Gibson,2016). Chronic kidney disease affects 10% of the world's population, and a large number of individuals die each year due to these diseases. According to the survey over 17.7 million deaths occurred in 2015 due to cardiovascular respiratory and metabolic disorders. The respiratory, cardiovascular, and kidney function are monitored arterial blood gases using a diagnostic indicator. As a result, nurses need to update their knowledge regarding arterial blood gases for the best

possible care to patients admitted in critical care units with respiratory or metabolic disorders (Sabaq and Mohammed, 2019).

The study was conducted in Siri Guru Ram Das (SGRD) University of Health Sciences in 2021 in Northern India. Majority of nurses (60%) were in the age (21-25) years and have less knowledge regarding arterial blood gases. The majority of nurses are classified based on their sexual orientation. Female, 54 percent (90 percent) and 06 percent male (10.00) . The majority of the nurses were women qualified as a general nursing and midwifery (GNM) 53 (88.33%) and a BScN 7 (11.7%) with (2-4) years of experience. A total of 25 nurses (41.7%) were job in surgical ICU, 19 (31.67%) in cardiac

Table 1. ABGs interpretation or analysis for nurses

Diagnose	pH	PCO3	HCO3
Metabolic acidosis	Less than 7.35	Normal range	Less than 22
Respiratory acidosis	Less than 7.35	More than 45	Normal or abnormal
Metabolic alkalosis	More than 7.45	Normal or Abnormal	More than 28
Respiratory alkalosis	More than 7.45	Less than 35	Normal or abnormal

ICU, 19 (31.67%) in medical ICU, 9 (15%) in the brain ICU and 7 (11.7%) in the intensive care unit ICU for surgical procedures.

Statistics in Pakistan

The study's findings discovered that the majority of nurses were Females. The majority of the participants (60%) were between the ages of 21 and 25. Nurses' post-test knowledge score in relation. The post test results of the arterial blood gases (ABGs) analysis were to be greater than pretest (pre-test 18.88, post-test 26.72). The majority of the sample 39 (65.0 percent). The average knowledge score was discovered. Which is higher than the calculated value .There is a considerable difference between the pretest and the posttest. 10.492 is the post-test practise score more than the calculated value at the 5% level significance (Zeb et al., 2021). Table 1

The most common diagnostic method is arterial blood gas analysis (ABGs) in critical care units. Arterial blood gas tests are used to determine the body's ability to control PH and the patient's condition oxygen level. As a result, taking a holistic approach to ABGs interpretation is critical. Assessing oxygenation, determining pH status, analysis the respiratory component (PaCO₂), assessing the metabolic component (HCO₃), assessing for a variety of illnesses, and assessing for compensation are the approaches that enable safe and competent arterial blood gases (ABGs) interpretation (Kaur and Charan, 2018).

pH

Is the power of hydrogen ions. It indicates blood acidity or alkalinity. If pH value less than 7.35, indicates blood more acidic, or more than 7.45 indicates blood more alkaline.

PCO3

Bicarbonate is a chemical (buffer) that prevents blood's pH from getting too acidic or basic. If the value of Co₂ is

less than 35, it indicates blood more alkaline or more than 45 indicate blood more acidic.

HCO3

The result of the human body's metabolism is HCO₃. Human blood carries bicarbonate to the lungs, where it is expelled as carbon dioxide. Human kidneys are also essential for the maintenance of bicarbonate levels. Bicarbonate is secreted and reabsorbed by the human kidney. This manages the PH, or acid balance, of the human body. If value of HCO₃ is less than 22 it indicate blood is acidic, or more than 28, blood more base. A medical staff can diagnose four type of problem related kidney and respiratory
Metabolic acidosis?
Respiratory acidosis?
Metabolic alkalosis
Respiratory alkalosis?

Arterial blood gases are one of the most important investigations in the critical care units, because they point medical staff to the right diagnosis, treatment, patient response to treatment, and expected results. It has been discovered that eight out of ten patients have an acid base disorder in critical areas, which if not controlled and addressed appropriately by nurses will undoubtedly result in health misery and suffering. If these interpretations contain even a minor inaccuracy, it could result in a life-threatening medical judgement (Zeb et al., 2021).

As a result, knowledge of Arterial Blood Gases Interpretation is an important ability for nurses to have in order to provide the best possible care to patients in critical care units. Although nurses play an important role in constant observation, performing skills, and providing the best Possible care in critical care units, nurses have been found to be lacking in their knowledge of arterial blood gases interpretation in several studies (AbdElaziz, Hassan, & Mohamed, 2021).

Research question

To assess a nurse's knowledge regarding understanding of parameters that are evaluated and interpreted based

Table 2. Data analysis

SR #No	Demographic profile	Frequency	Percentage
01	Gender		
	Male	10	7.2%
	Female	124	92.5%
02	Professional qualification		
	GNM	116	86.6%
	Bachelor	18	13.4%
	Master	0	0%
03	Clinical experience (in year)		
	1-5 year	120	89.6%
	6-10 year	14	10.4%
	1-5 year	99	73.9%

on ABGs result?

Significance of study

For participants

This study was helping them to improve learning capabilities by improving their understanding about arterial blood gases interpretation.

For institute

Upon completion of the research study, the result of the study was discussed with authoritative person. This thing was help them to know about nurse's knowledge towards ABGs analysis. Authoritative person conducted a teaching session, in this way patient quality care will be improved, decrease patients mortality rate and enhance hospital reputation.

For researcher

The research study was serving as a paradigm for researchers' own understanding about interpretation of ABGs. Hence researchers can improve their academic performance.

Purpose of study

To determine the nurses knowledge regarding interpretation of arterial blood gases

Problem statement

Nurses in clinical practice were often involved in the collection and analysis of ABGs (Mathew et al., 2014).

According to a study conducted by Bhanu et al. (2016), the 2.5 % nurses in wards have insufficient knowledge of ABG interpretation. Inaccurate interpretation may lead the patient towards life threatening conditions. Nurses face a challenge with ABGs analysis and interpretation, implying a lack of confidence in their expertise gained throughout their education and training in nursing schools (Teles et al., 2013). So far, the aim purpose of research was to evaluate the knowledge regarding analysis and interpretation of arterial blood gases (ABGs) among critical care unit nurses.

Purpose of study

To determine the nurse's knowledge regarding interpretation of arterial blood gases.

METHODOLOGY

Study setting: The study was carried out at University of Lahore Teaching hospital.

Study design: Descriptive Cross Sectional Study

Sample size: The sloven formula was used to compute the sample size. $n = \frac{N}{1 + N(e)^2}$
Sample size was 134.

Sampling strategy

Convenient sampling was used for data collection. For suitable presentation, the collected data was analyzed using Software SPSS Version-25. A total of 20 questions were included in this survey. After assessing the data, the findings and conclusion will be distributed and shown as percentages and frequencies, graphs, tables and charts.
Table 2

Table 3. Demographics profile of participants

	6-10 year	30	22.4%
	11-15 year	5	3.7%
05	Working unit:		
	Surgical ICU	43	32.1%
	Medical ICU	42	31.3%
	Cardiac ICU	19	14.2%
	Neuro ICU	5	3.7%
	Other specialty	25	18.7%

Inclusion criteria

Both male and female nurses was included in this study
Experience more than five month nurses was included in this study

Exclusion criteria

Nurses attended training, seminar, workshop regarding ABGs interpretation.

ETHICAL CONSIDERATION

Ethical clearance letter from the institutional review board Committee of University of Lahore must be taken before carrying out research work. The study was conducted in University of Lahore Teaching Hospital after getting approval from HOD/Dean Lahore School of Nursing and after approval from Nursing Superintendent University of Teaching Hospital. Data kept confidential and participants had the right to leave the study at any time without any penalty.

RESULTS

This chapter discussed the result of the study including interpretation of demographic data dependent or independent variables.

Table 3 depict that according to the sex majority of nurses were female 124(92.5%) and 10(7.3%) male. Most of nurses were qualified as GNM 116(86.6%) and BScN 18 (13.4%) with clinical experience 1 to 5 year 120(89.6%) and 6 to 11 year 14(10.4%).43(32.1%) nurses working in Surgical ICU ,42(31.3%) nurses in Medical ICU 19(14.2%) work in Cardiac ICU and 5(3.7%) work in Neuro ICU and 25(18.7%) nurses work in other special areas of hospital wards. 99(73.9%) having 1 to 5 year experience in critical areas 30(22.4%) having 6 to 11 year experience in critical areas and 5(3.7%) gave major experience 12 to 15 year in critical areas.

In this study total 134 nurses both male and female

were willing to fill survey related this study. ABGs stand for: 122out of 134(91%) nurses give correct response and 12 nurses out of 134(9.1%) give incorrect response. The ABGs test is used: 24 out of 134(17.9%) nurses give correct response and 110 nurses out of 134(82.1%) give incorrect response. ABGs test and analysis is considered as one of the: 78 out of 134(58.2%) nurses give correct response and 56 nurses out of 134(48.8%) give incorrect response. ABGs test and analysis should be recommended to perform at what specific time: 12 out of 134(9.0%) nurses give correct response and 112 nurses out of 134(91.0%) give incorrect response. The normal range of blood PH is: 19 out of 134(14.5%) nurses give correct response and 115 nurses out of 134(85.5%) give incorrect response. The blood pH gives information about: 24 out of 134(17.9%) nurses give correct response and 110 nurses out of 134(82.1%) give incorrect response. Acidosis is a condition when : 36 out of 134(26.9%) nurses give correct response and 98 nurses out of 134(73.1%) give incorrect response. Alkalosis occurs: 19 out of 134(14.2%) nurses give correct response and 115 nurses out of 134(85.8%) give incorrect response. The normal value of HCO₃ in arterial blood is: 28 out of 134(23.9%) nurses give correct response and 106 nurses out of 134(76.1%) give incorrect response. The normal range of SaO₂ is: 32 out of 134(20.9%) nurses give correct response and 102 nurses out of 134(79.1%) give incorrect response. Which of the given elements represent metabolic changes in acid-base status: 32 out of 134(20.9%) nurses give correct response and 102 nurses out of 134(79.1%) give incorrect response. Which of the following represents respiratory changes in acid-base status: 40 out of 134(29.9%) nurses give correct response and 94 nurses out of 134(70.1%) give incorrect response. The Base excess is an amount that reflects: 29 out of 134(21.6%) nurses give correct response and 105 nurses out of 134(78.4%) give incorrect response. The blood PaCo₂ provides information about the physiological aspects of: 37 out of 134(27.6%) nurses give correct response and 97 nurses out of 134(72.4%) give incorrect response. How much time is required to analyze ABGs after a sample at room temperature: 44 out of 134(32.8%) nurses give correct response and 90 nurses out of

Table 4. Result of Study

	Frequency	Percent Valid	Percent	Cumulative Percent	Mean
Excellent	4	3.0	3.0	3.0	
Good	5	3.7	3.7	6.7	3.5373
Moderate	40	29.9	29.9	36.6	
Poor	85	63.4	63.4	100.0	
Total	134	100.0	100.0		

134(67.2%) give incorrect response. The amount of blood required for routine ABGs analysis is: 39 out of 134(29.1%) nurses give correct response and 95 nurses out of 134(70.9%) give incorrect response. Which of the following is the probable color of blood taken from the arteries: 30 out of 134(22.4%) nurses give correct response and 104 nurses out of 134(78.6%) give incorrect response. Multiple ABGs samples can be taken from: 52 out of 134(38.8%) nurses give correct response and 82 nurses out of 134(61.2%) give incorrect response. A 50- year's patient is admitted in the intensive care unit showing the lab values: 104 out of 134(77.6%) nurses give correct response and 30 nurses out of 134(22.4%) give incorrect response. If the patient is experiencing metabolic acidosis, what you suspect is HCO₃ lab: 65 out of 134(48.5%) nurses give the correct response.

Table 4 and figure #08 depict that 4(3.0%) nurses out of 134 nurses have excellent knowledge regarding ABGs interpretation, 5(3.7%) nurses out of 134 have good knowledge regarding ABGs interpretation, 40(29.9%) nurses out of 134 have moderate knowledge regarding ABGs interpretation and 85(63.4%) nurses out of 134 have poor knowledge regarding ABGs interpretation and mean of the study was 3.5373.

DISCUSSION

Study depict that according to the sex majority of nurses were female 124(92.5%) and 10(7.3%) male. Most of nurses were qualified as GNM 116(86.6%) and BScN 18 (13.4%) with clinical experience 1 to 5 year 120(89.6%) and 6 to 11 year 14(10.4%). 43(32.1%) nurses working in Surgical ICU ,42(31.3%) nurses in Medical ICU 19(14.2%) work in Cardiac ICU and 5(3.7%) work in Neuro ICU and 25(18.7%) nurses work in other special areas of hospital wards. 99(73.9%) having 1 to 5 year experience in critical areas 30(22.4%) having 6 to 11 year experience in critical areas and 5(3.7%) gave major experience 12 to 15 year in critical areas .

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ABGs interpretation and 85(63.4%) nurses out of 134 was poor knowledge regarding ABGs interpretation.

Padma et al.,(2017) discovered that 4 (13.3%) of staff nurses had A grade knowledge, 7 (23.3%) had B + grade information, 12 (40%) had B grade knowledge, 5 (16.7) had C grade knowledge, and 2 (6.7%) had D grade knowledge, with a mean value of 19.0 and a standard deviation of 3.5. The majority of staff nurses had D-grade knowledge.

CONCLUSION

The study was conducted on 134 ICU nurses for assess nurses knowledge regarding ABGs interpretation at University Of Lahore Teaching Hospital Lahore, both male or female was include in participants .The result of the this study was depict that majority of the nurses 85(63.4%) had poor knowledge regarding ABGs interpretation .

RECOMMENDATION

Structured teaching programmes, workshops and seminars had a significant effect on nurse knowledge regarding arterial blood gases analysis and interpretation.

Limitation

Cross sectional study was coherent and concise
Sample size was very small
Large sample size will improve accuracy of the result.

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REFERENCES

- Abdelaziz SM, Hassan GA, Mohamed RAE (2021). Effect of Video-Assisted Teaching Intervention on Nurses' Knowledge and Practice Regarding Arterial Blood Gases Sampling for Ventilated Children at Pediatric Intensive Care Units. *International Journal of Novel Research in Healthcare*
- Barnette L, Kautz DD (2013). Creative ways to teach arterial blood gas interpretation. *Dimensions of Critical Care Nursing*, 32(2), 84-87. doi:10.1097/DCC.0b013e31826bc732
- Basnett S, Devi MB, Chetia P (2016). Effectiveness of pocket reference on arterial blood gas analysis among the staff nurses working in critical care units. *Manipal J. Nurs. Health Sci. (MJNHS)*, 2(2), 25-28.
- Bhanu PB, Limi ED, Indira S (2016). A study to assess the knowledge regarding ABGs among staff nurses and student nurses in NMCH, Nellore. *Int. J. App. Res.* 2(6), 150-152. Retrieved from www.allresearchjournal.com
- Dr. Prabhakar Kore Hospital and Medical Research Centre , Bel. J. Krishna Institute of Med. Sci. University, 2(1), 98-104.
- Gattinoni L, Pesenti A, Matthay M. Understanding blood gas analysis. *Intensive Care Med.* 2018 Jan;44(1):91-93.
- Gibson V (2016). Pulse oximetry and arterial blood gas analysis *Respiratory Care* (pp. 59-72): Routledge.
- Hemavathy., Manjubala Dash., (2019) "ABG Analysis and its Interpretation". *Acta Scientific Paediatrics* 2.10 : 108-111 -
- Jeeva S (2019). A study to assess the knowledge regarding ABG analysis and interpretation of ABG results among staff nurses. *Management of Cardiovascular and Orthopedic Complications*, 2(1), 7-10. doi:10.5281/zenodo.3484609
- Kaur A, Charan GS (2018). A study to assess the effectiveness of STP on knowledge and practice regarding ABGs among ICU nurses in selected hospitals at Jalandhar, Punjab. *Int. J. Health Sci. Res.* 8(8), 182-188.
- Knowledge and Skills Regarding Use of Glasgow Coma Scale in Neurological Assessment of Patients among Nurses Working in Critical Care Units of KLE
- Mathew R, Hemavati G, Pillai S, Biswal A (2014). A study to assess the effectiveness of structured teaching programme regarding arterial blood gas analysis and interpretation in terms of knowledge among nurses working in ICU in selected hospitals of Indore (MP). *International Journal of Nursing Education and Research*, 2(4), 286-289. doi:10.5958/2231-5713
- Meehan A, Beinlich N (2014). Peer-to-peer learning/teaching: An effective strategy for changing practice regarding arterial blood gases in the surgical patient. *Int. J. Orthopaedic and Trauma Nursing*, 18(2), 122- 28. doi:10.1016/j.ijotn.2013.12.004
- Mohammed HM, Abdelatif DA (2016). Easy blood gas analysis: Implications for nursing. *Egyptian J. Chest Dis. Tuberculosis*, 65(1), 369-376.
- Nasimi MH, S. Nasimi, MS Kasmaei, HS Kasmaei, F. Basirian, H. Musapour (2013). Knowledge and competitive advantage for organizations. *Kuwait Chapter of Arabian J. Bus. Manag. Rev.* 2(5): 56-64.
- Padma K, Priya A, Subhashini N, Indira S (2017). A study to assess knowledge about ABG analysis and interpretation of ABG results among nurses from the NMCH team, Nellore. *Int. J. Appl. Res. [Internet]*, 3(1), 06-08.
- Pagana K, Pagana T, Pagana TN (2017). *Arterial Blood Gas. Mosby's Diagnostic and Laboratory Test Reference hospital*, Bangalore., 8(2), 1-26.
- Patrisia et al. (2012). Effectiveness of protocol on Knowledge and practice regarding ABG interpretation among staff nurses working in critical care units at selected hospital, Bangalore., 8(2), 1-26.
- Polit DF, Beck CT (2013). *Nursing Research principles and method. Nursing Research Principles and Method* 310.
- Sabaq AG, El-aasar HN, Mohammed M (2019). Effect of Educational Program on Improving Nurses' Performance Regarding Arterial Blood Gases Sampling for Critically Ill Children. *Int. J. Nursing Didactics*, 9(05), 01-1
- Safwat AM, Khorais AM (2018). Effectiveness of a computer-based learning module on arterial blood gas interpretation among staff nurses in critical care units. *Innov. J. Med. Health Sci.* 8(3), 31-40. doi:10.15520/ijmhs.v8i3.2091
- Teles M, Preeti, B MMilka, M. (2013). Effectiveness of Self Instructional Module o
- Upreti D, Mishra R (2020). Effectiveness of Planned Teaching Programme on Knowledge and Practice regarding Arterial Blood Gas analysis and its Interpretation among Staff Nurses working in Critical Care Quantitative Research Approach. *International Journal of Advances in Nursing Management*, 8(1), 12-18.
- Yu TC, Wilson NC, Sigh PP, Lemanu DP, Hawken SJ, Hill AG (2011). Medical students as teachers: A systematic review of peer assisted teaching during medical school. *Advances in Medical Education and Practice*, 2, 157- 172.
- Zeb U, Said Alam FA, Hanif M, Ali S (2021). Effectiveness of the Instructional Module on Knowledge and Interpretation of ABGs Among Critical Care Nurses. *Ame. J. Nurs.* 10(5), 216-221.