

Fortification of Knowledge on Arterial Blood Gas (ABG) Analysis and its Interpretation: Interventional Study

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Received: November 20, 2019; **Published:** January 30, 2020

Abstract

Background: Blood is a fluid connective tissue which transports substances from one part of the body to another. It provides nutrients and hormones to the tissues and removes their waste products. The functions of Blood include Nutritive, Respiratory, excretory, Transport, protective, Homeostatic, Maintenance of Body temperature, storage function. Arterial blood gas studies alarmed with the exchange of gases between blood and the lungs between tissues and blood. It is very useful laboratory test in patients with metabolic and respiratory disorders. Nurses play a vital role in early identification of risky patients with acid-base imbalance in critical care areas, in tremendous situation, the nurse should be knowledgeable about ABG analysis and its interpretation to know the potential risks of the patient and able to carefully monitor, administration rates and therapeutic responses.

Aim: The study was designed to evaluate the knowledge of ABG analysis and its interpretation among Nursing officers in Emergency Departments.

Subjects and Methods: A pre-experimental one group pretest and post-test study was conducted among Nursing officers in selected Hospitals at Puducherry. Sample size was 50, selected through purposive sampling. The approach used for the study was Quantitative approach and design was pre-experimental one group pretest and post-test design. Researcher made questionnaire contained four sections i.e. demographic variables, questions related to normal values of ABG Analysis, Technique of ABG sampling, and interpretation of ABG Results respectively.

Results: The major findings of the study in pretest was, 60% had moderate knowledge and 38% had adequate knowledge 2% had inadequate knowledge on ABG Analysis and its Interpretation and post-test showed 98% had adequate knowledge and 2% had moderately adequate knowledge.

Conclusion: The study revealed that most of the Nursing officers had Adequate knowledge in post-test compared to pretest regarding ABG Analysis. Hence the results of the study proves that the Educative approach is effective.

Keywords: Arterial Blood Gas Analysis; Interpretation; Educative Approach; Knowledge; Nursing Officers; Emergency Department

Introduction

Khurana I [1] blood is a fluid connective tissue which transports substances from one part of the body to another. Nutrients and hormones are provided by the blood to the tissues and removes. The blood includes plasma and cellular elements. 55% of the blood is constitutes of plasma and 45% volume are cellular elements. Blood functions includes Nutrition, Respiratory, excretory, Transport, pro-

tective, Homeostatic, Maintenance of Body temperature, storage function. The transport of the Oxygen from the lungs to the body cells and Carbon-dioxide from the all tissues to the lung are primary function of the Blood. This is important to prevent the death of the tissues from hypoxia when body tissues are not getting adequate supply of oxygen; it leads to acid-base imbalance. Arterial blood gas (ABG) studies are alarmed with the exchange of gases between blood and the lungs and between tissues and blood.

The regulation of acid base balance is the normal function of all body cells. It is usually balanced by the lungs, kidneys and blood buffers. Respiratory and metabolic acidosis or alkalosis is mainly due to the disorders of the kidneys, lungs and metabolism. An ABG helps in provided that exact information about how good the Lungs and Kidneys are functioning. It is the very useful laboratory test in patients with metabolic and respiratory disorders. Thus, the ABG is an excellent indicator to know the disturbances of respiratory or metabolic status.

Hanan M [2] *Egyptian Journal of Chest Diseases and Tuberculosis*, For monitoring patients with acute respiratory failure blood gas analysis are used as a common investigation in the department of emergency and Intensive care unit. It has some applications in general practice, such as assessment of the needs of domiciliary oxygen therapy in patients diagnosed with chronic obstructive pulmonary disease (COPD). The result of the arterial blood gas helps in the assessment of ventilator control, exchange of patients gas and acid-base balance. Analyzing ABG reports, the Nurses interpret results to the Doctors or Anesthesiologist then prescribe further treatment for the patients who are critically ill. Nurses play a vital role in early identification of dangerous patients with acid-base imbalance in critical care areas. In tremendous situation, the nurse should be knowledgeable about ABG analysis and its interpretation to know the potential risks of the patient and able to carefully monitor, administration rates and therapeutic responses. In general, clinical areas the patients becoming sicker and sicker patients require more accurate care and treatment. Accurate and timely interpretation of test results has become an essential skill for nursing officers to function successfully. However, many nurses find acid-base balance confusing and view interpreting arterial blood gas (ABG) results as outside of the scope of their practice. Nurses are the first members of the health care team to observe ABG results and an understanding of their importance and the ability to make a decision when medical staff needs to be informed are essential.

A study conducted among the clinical nurses to determine the concepts of acid base balance are confusing. The step-by-step approach to arterial blood gas (ABG) analysis was added in this study. In addition, the components of ABGs include pH, PCO_2 and HCO_3 are presented metabolic and respiratory acidosis and alkalosis are in relation to cause and signs and symptoms. It is reviewed the degrees of compensation in the five steps of ABG analysis are explained and outlined. The nurse analyzes the ABG values confidently and makes a wise alternative about right nursing actions using this approach. The majority of patients 'ventilations are monitored by ABG analysis in spite of constant monitor with pulse-oximeter during the clinical experience in ICU by the investigator. Though the nurses take an active part in collecting ABG samples, their knowledge in interpreting ABG reports is inadequate. In the early stage of the study the researcher had recognized the need of the nursing personnel know all about ABG interpretation empirically which needs 100%. The investigator has justified the need to improve nurses knowledge and practice by organizing the protocol about the ABG interpretation among nurses in the critical care areas [3-17].

Objectives of the Study

1. To assess the existing level of knowledge on ABG Analysis and its Interpretation among Nursing officers working in Emergency Department.
2. To evaluate the effectiveness of Educative approach regarding ABG Analysis and its interpretation.
3. To associate the post-test level of knowledge with selected Demographic Variables.

Materials and Methods

The quantitative research approach was found to be appropriate and research design was used in this study was pre-experimental one group pre-test and post-test design. the research variables are level of knowledge and the Educative approach on ABG Analysis and its interpretation. The study was conducted in selected hospitals at puducherry. The population comprised of all the nursing officers in emergency departments come under the inclusion criteria were chosen as samples. The size of the samples consists of 50 nursing officers. Purposive sampling technique was used for this study. The inclusion criteria for this study was 1. Nursing officers who were Working in

Emergency departments. 2. Nursing officers who were Registered GNM, BSc Nursing, MSc Nursing Officers. 3. Nursing officers who were Willing to participate. 4. Both genders. 5. Available at the time of study period. The tool description was divided into four sections. Section A: consists of demographic variables which include age, sex, qualification, experience, no of years experience in emergency Department and Area of experience. Section B: consists of normal values of ABG analysis. Section C: consists of technique of ABG Sampling. Section D: interpretation of ABG Results. It contains questions, correct answer carries one mark and zero for the wrong answer. Data collection procedure includes prior permission from the concern authority. The study was done for one month period and data was collected from each nursing officers in all emergency department of selected hospitals at Puducherry. A formal permission from the concerned authority to do the data collection. An informed consent was obtained from the Nursing officers in Emergency Department by explaining the study purpose and its advantages. Data collection was done in Emergency Units. Samples were selected by convenience sampling Technique. Totally 50 Nursing officers were selected based on the Inclusion criteria. A pretest was conducted by providing structured questionnaire to study group of Nursing officers on knowledge on ABG Analysis for 30 minutes. After provided video assisted teaching and distributed the informational Booklet on ABG Analysis and its interpretation. After 7 days the posttest was administered to the Experimental group for 15 - 20 minutes regarding knowledge on ABG Analysis and its interpretation using the same questionnaire.

Result

The table 1 shows that majority 34 (68%) were in the age group of above 35 years, 48 (96%) were female, 42 (84%) had the qualification of GNM, 44 (88%) had an experience of above 10 years and 42 (84%) had an experience of above 3 years in emergency unit and 17 (34%) had the experience of working in ICU (Table 1).

Demographic Variables	No.	%
Age		
25 - 35 years	4	8
36 - 40 years	34	68
41 - 45years	12	24
46 - 50 years		
Sex		
Male	2	4
Female	48	96
Qualification		
GNM	42	84
B.Sc. Nursing	2	4
PBBSc Nursing	6	12
M.Sc. Nursing	0	0
No. of years of experience		
1 to 5 years	1	2
5 to 10 years	5	10
Above 10 years	44	88
Years of experience in emergency unit		
0 - 1 year	6	12
1 - 3 years	2	4
Above 3 years	42	84
Area of experience		
ICU	17	34
Emergency ward	14	28
Post - operative ward	10	20
Casualty	9	18

Table 1: Frequency and percentage distribution of demographic variables of nursing officers.

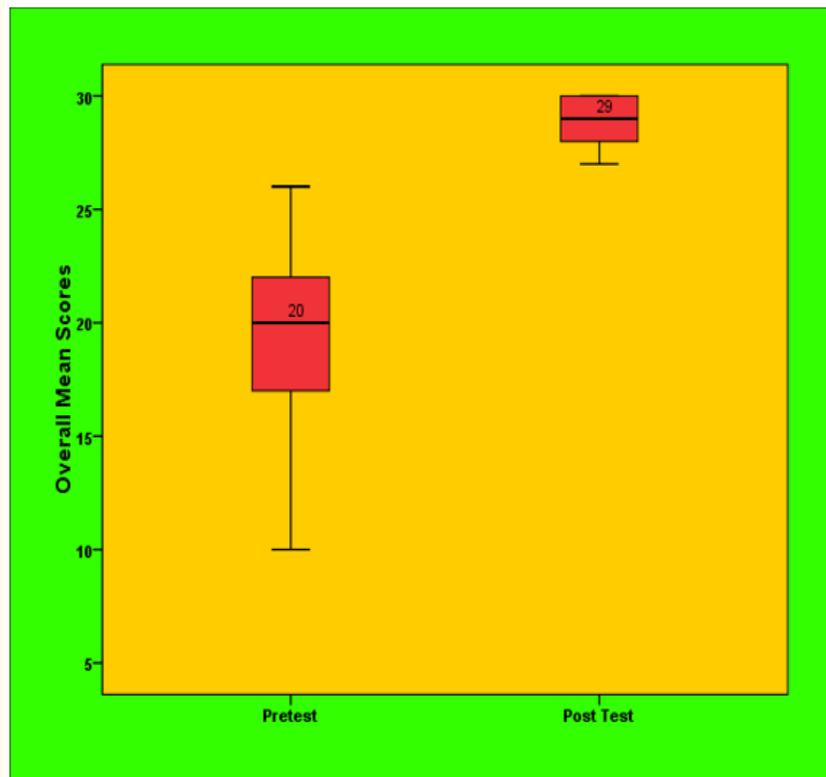


Figure 1: Boxplot showing the comparison of pretest and post-test knowledge scores on ABG analysis and interpretation among nursing officers.

The table 2 depicts that the pretest mean score of knowledge on normal values of ABG was 9.02 ± 1.52 and the post-test mean score was 12.64 ± 0.48 . The pretest mean score of knowledge on technique of ABG sampling was 6.22 ± 2.21 and the post-test mean score was 9.88 ± 0.33 . The pretest mean score of knowledge on interpretation of ABG analysis was 4.00 ± 1.84 and the post-test mean score was 6.52 ± 0.71 . The overall pretest mean score of knowledge was 19.24 ± 4.05 and the post-test mean score was 29.04 ± 0.95 .

Knowledge Domains	Score	Pretest		Post Test		Paired 't' Test Value
		Mean	S.D	Mean	S.D	
Normal values of ABG	13	9.02	1.52	12.64	0.48	t = 15.977 p = 0.0001, S***
Technique of ABG sampling	10	6.22	2.21	9.88	0.33	t = 11.664 p = 0.0001, S***
Interpretation of ABG analysis	7	4.00	1.84	6.52	0.71	t = 9.337 p = 0.0001, S***
Overall	30	19.24	4.05	29.04	0.95	t = 16.797 p = 0.0001, S***

Table 2: Comparison of pretest and post test knowledge scores on ABG analysis and interpretation among nursing officers (N = 50).

The calculated paired 't' test value of $t = 15.977$, $t = 11.664$, $t = 9.337$ and $t = 16.797$ was found to be statistically significant at $p < 0.001$ level and this clearly indicates that the Educational Incorporated Approach on Arterial Blood Gas (ABG) analysis and its interpretation implemented among Nursing Officers was found to be effective in increasing their level of knowledge in the post-test.

Discussion

The nurse should have sound knowledge on Blood chemistry because they are first person to notice all the health deviations happens to the patients. Considering the distribution of samples based on their demographic variable, Out of 50 samples, with respect to age, the majority of samples 34 (68%) were in the age group of 31 - 40 years, 12 (24%) samples belonged to the age group of 41-50 years, 4 (8%) samples belonged to the age group 20 - 30 years of age. In sex, majority of samples 48 (96%) were female and 2 (4%) were male. Among qualification, majority 42 (84%) were GNM, and 6(17%) were PBBSc Nursing, 2(4%) were B.Sc. Nursing respectively. The Number of years of Experience majority 44 (88%) of the samples had above 10 years of Experience, 5 (10%) of them had 5 to 10 years of Experience, and 1(20) had to 5 years of Experience respectively. In years of Experience in Emergency Unit, majority 42 (84%) of the samples were emergency Unit, (12%) of them were Experienced of 1 year and 2 Experienced years in and (4%) of them were Experienced about 1 to 3 years respectively. And the Area of Experience, majority 17 (34%) were in the Area of ICU, 14(28%) were in Emergency ward, 10 (20%) were in the area of post-operative ward and 9 (18%) were in the area of Casualty.

The first objective of the study was to assess the pretest and post-test knowledge on ABG Analysis and its Interpretation among Nursing officers.

On knowledge in Normal value of ABG Analysis. The Overall knowledge of experimental group shows, The overall pretest level of knowledge revealed that 30 (60%) had moderately Adequate knowledge, 19 (38%) had adequate knowledge and only one (2%) had inadequate knowledge on ABG Analysis and Interpretation among Nursing Officers.

In Post-test, the result shows that, regarding knowledge on Normal values of ABG almost 50 (100%) had Adequate knowledge. And none of the staff nurses were having inadequate knowledge regarding ABG analysis. Therefore, H1 is accepted.

Demographic variable study results also says that almost all the nursing officers possess the knowledge on ABG Analysis and its interpretation that (31) had adequate level of knowledge, (18) had average of knowledge and except (1) had inadequate level of knowledge. The second objective of the study was to assess the effectiveness of Educative Approach on ABG Analysis and its Interpretation among Nursing officers.

And a study conducted by V Hemavathy, *et al.* the findings of effectiveness of structured teaching programme (STP) is reveals that 4 (13.3%) had moderate knowledge, and 26 (86.7%) had adequate knowledge and none had inadequate knowledge about ABG Analysis in post-test. The difference was found to be statistically significant at $p < 0.001$ level which indicates the effectiveness of Structured Teaching Programme in improving the level of knowledge regarding ABG Analysis among Staff nurses.

So, the present study findings of effectiveness of Educative Approach on ABG Analysis is improved from the overall pretest mean score of knowledge was 19.24 ± 4.05 and the post-test mean score was 29.04 ± 0.95 . The calculated paired 't' test value of $t = 16.797$ was found to be statistically significant at $p < 0.001$ level and this clearly indicates that the Educative Approach on Arterial Blood Gas (ABG) analysis and its interpretation implemented among Nursing Officers was found to be effective in increasing their level of knowledge in the post-test.

The third objective of the study was to Association of post-test level of knowledge on ABG analysis and interpretation among nursing officers with their selected demographic variables.

It reveals that none of the demographic variables had shown statistically significant association with post-test level of knowledge on ABG analysis and interpretation among nursing officers. So, the Hypothesis H2 is rejected.

Conclusion

From this study the researcher concluded that, the Nursing officers have gained adequate knowledge on ABG Analysis and its interpretation in selected hospitals, at Puducherry. The educative approach showed effectiveness on knowledge of ABG Analysis and its interpretation among the nursing officers.

Recommendations

1. This study can be done as comparative study with different ward staff nurses
2. A similar study can be done on larger sample to draw more definitive conclusions.
3. A study can be conducted among nursing student
4. A study can be done among senior nurses regarding Arterial Blood Gas interpretation.
5. A study can be conducted using various method of teaching to determine the most effective method of teaching example instructional module, demonstration video assist teaching.

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Volume 2 Issue 2 February 2020

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