Original Research Article

A Study to Assess the Effectiveness of STP on Knowledge and Practice Regarding ABGs among ICU Nurses in Selected Hospitals at Jalandhar, Punjab

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ABSTRACT

Arterial blood gas analysis is a basic and useful laboratory test for the critical care of patients. Arterial blood gas analysis is an essential investigation for assessing clinical oxygenation and acid-base status in critically ill patients, providing information about ventilation, oxygenation, and acid-base status, the three closely and interrelated physiological parameters that maintain pH homeostasis. A pre experimental one group pretest post-test design therefore was undertaken to assess the effectiveness of structured teaching programme on knowledge and practice regarding arterial blood gas analysis among the ICU nurses at selected hospitals, Jalandhar. 60 samples were selected using convenience sampling technique. Structured knowledge questionnaire was used to collect data and practices were observed by checklist. The study results revealed that mean difference of pretest and post-test knowledge score of nurses was 7.83 and tcal value 20.631 which is more than tabulated value at 5% level of significance. For the practice score, there was significant difference between pretest and post-test practice score, tcal 10.492 which is more than tabulated value at 5% level of significance this shows that structured teaching programme had significant effect on knowledge and practice of nurses regarding ABG analysis.

Key Words: Arterial blood gas analysis, nurses, pre-experimental study

INTRODUCTION

Over the last few years, there has been a tremendous increase in the knowledge, technology and skills required to treat critically ill patients. This has lead to the development of intensive care units (ICUs), which are essentially areas, where severely ill patients can be concentrated and looked after and provided with the infrastructure and expertise necessary to treat critical illness. [1] An intensive care unit (ICU), is a specially staffed and equipped area of a hospital dedicated to the management of patients with life threatening illnesses, injuries or complications. It is the most challenging work environment for the nurses because they are primary carer at the bedside and monitors, manages and supports critically ill patient. [2] Common conditions that are treated within ICUs include acute respiratory distress syndrome, trauma, multiple organ failure and sepsis. All critically ill adult in patients with; inappropriate hypoxaemia, deteriorating oxygen saturations or increasing breathlessness, patients with risk factors for hypercapnic respiratory failure, breathless patients thought to be at risk of metabolic conditions, would indicate that a blood gas result would be useful in the management of their care. [3] Arterial blood gas analysis (ABG) is the most common diagnostic procedure

performed in ICU. [4] It is an essential investigation for assessing clinical oxygenation, acid-base status in critically ill patients, and the degree of compensation that has occurred. [5] It provides information about ventilation, oxygenation, and acid-base status, the three closely and interrelated physiological parameters that maintain pH homeostasis. [6] Cornock (1996), defined that arterial blood gas analysis (ABG) is used to describe a set of values that permit the assessment of an individual's ability to maintain normal cell function. [7] Disorders of respiratory and cardiovascular system are overcoming day by day and are encountered by nurse in intensive care unit. Respiratory tract infections are common. Lower respiratory tract infections are the most common cause of death in the world. Chronic lower respiratory disease is the fourth leading cause of death in United States, and pneumonia ranks as the seventh leading cause of death. [3] Acute repository failure is the most common problems seen in critical care with the survival rate of 55%. [8] The incidence of adult primary respiratory failure in the united states accounts for 137 hospitalizations per 100,000 residents annually. [9] In India, the overall prevalence of chronic cough, chronic phlegm and dyspnea was 2.0%, 1.2% and 3.4%, respectively, and for chronic obstructive pulmonary disease has reported figures ranging from 1.4% to 9.4% in males and 1.3% to 4.9% in females. [10]

It is estimated that there are about 70,000 ICU beds available including all types and across all hospitals and small time nursing homes in India that cater to five million patients requiring ICU admission every year. India currently spends Rs. 103,000 crore on healthcare, which is projected to grow to Rs 283,000 crore by 2012.However, government and international agencies will only be able to spend Rs 30,000 crore over the next 10 years on healthcare infrastructure. Therefore almost 80 per cent of investment will have to come from the for-profit private and charitable sector where Critical Care accounts for 20 to 30 per cent of a hospital's budget. [11]

Arterial blood gas values provide information about acid-base status, the body's ability to regulate pH and the patient's overall oxygen status. So, a systemic approach to ABG interpretation is essential. The methods which enable safe and competent ABG interpretation are to assess oxygenation, determine the status of pH, assess the respiratory component ($PaCO_2$), assess the metabolic component HCO_3^-, assess for mixture of disorders and assessing for compensation. [6] Interpreting an arterial blood gas (ABG) is a crucial skill for physicians, nurses, respiratory therapists, and other health care personnel as misinterpretation can lead to serious complications like electrolyte imbalance, muscle weakness, narcosis, respiratory failure, organ failure, seizures, chronic kidney disease, arrhythmias, coma, shock and death. [12] The nurses are front-liners or first health care practitioners in critical care unit who provide quality care to critically ill patient must be familiar with arterial blood gases values. Sarah Dodds (2007) conducted a study on nurses to evaluate nurse led arterial blood gas sampling for patients. It was concluded that respiratory nurse specialist became competent in ABG sampling after undergoing practical training and teaching programme and thus shows how a doctor-led service is now nurse led. Thus, ABG sampling is now a core skill for respiratory nurses and is also used on acute medical assessment units and respiratory wards. [13] The good technique is of the utmost importance requiring continuous skill and practice to obtain accurate blood gas results.

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. [14]

Hypotheses

Ho-There is no significant difference between pretest and post-test knowledge and practice score regarding ABGs among ICU nurses.

Objectives

1. To assess pretest knowledge and practice regarding ABG analysis among ICU nurses.
2. To develop and implement structured teaching programme i.e. lecture cum demonstration regarding ABG analysis among ICU nurses.
3. To assess post-test knowledge and practice regarding ABG analysis among ICU nurses.
4. To compare pretest and post-test knowledge and practice regarding ABG analysis among ICU nurses.
5. To find association between knowledge and practice scores with selected socio-demographic variables.

MATERIALS AND METHODS

The quantitative research approach was adopted with pre experimental research design to assess knowledge and practice regarding arterial blood gas analysis among ICU nurses. The study was conducted in selected hospitals (S.G.L Hospital, Shri Ram Cardiac Hospital and Chawla Heart Care hospital) at Jalandhar. The researcher recruited 60 nurses through convenience sampling with inclusion and exclusion criteria. The research instrument was divided into three parts i.e. part A; socio-demographic data, part B; self structured questionnaire (30 items) and part C observational checklist (15 items) to assess the practice of nurses regarding arterial blood gas analysis. The criterion measure used in the study was extent of score on level of knowledge. Maximum obtainable score was 30 and divided into three categories i.e. good: 26-30, average: 16-25 and below average: ≤15. The criterion measure of practice was divided in same

categories i.e. good: 13-15, average: 8-12 and below average: ≤7

Tool was prepared by extensive review of literature and validated by experts of intensivist, anaesthetist, critical care nursing. Ethical permission was obtained from ethical and research committee of Institution. After gaining approval, permission was taken from Medical and Nursing Superintendent of selected hospitals to conduct research study. Confidentiality and anonymity were maintained during and after data collection. The reliability of tool was estimated by Karl Pearson's coefficient of correlation and it was found to be 0.9 and 0.85.

RESULTS

Table 1: Socio-demographic profile to assess the effectiveness of STP on knowledge and practice regarding ABGs among ICU nurses. N=60

S. No.	Socio-demographic Profile	f	%
1.	**Age (In Year)**		
	21-25	36	60.0
	26-30	20	33.3
	31-35	04	06.6
2.	**Sex**		
	Male	06	10.0
	Female	54	90.0
3.	**Professional qualification**		
	GNM	53	88.3
	B.Sc.(N)	07	11.7
4.	**Clinical Experience (in years)**		
	<1	18	30.0
	2-4	36	60.0
	5-7	06	10.0
5.	**Current Working Area**		
	Medical ICU	19	31.7
	Surgical ICU	07	11.7
	Cardiac ICU	25	41.7
	Neuro ICU	09	15.0
6.	**Attended In-service programme**		
	Workshop	04	06.7
	Conference	06	10.0
	None	50	83.3

Table1 depicts that majority of nurses 36(60%) were found in age group 21-25years, followed by 20(33.3%) in 26-30years and 4(06.6%) were above 35 years of age. According to sex, most of the nurses were female i-e 54(90%) and 06(10.00) were male. Most of the nurses were qualified as GNM 53(88.33%) and B. Sc (N) 7(11.7%) with 2-4 years experience36(60%), followed by 18(30%) having less than 1year experience and 6(10%) with 5-7 years of

experience.25(41.7%) nurses were working in Cardiac ICU,19(31.67%) in medical ICU, 9(15%) in neuro ICU and 7(11.7%) in surgical ICU. Majority of the subjects 50(83.33%) had not attended any in-service programme regarding ABGs, remaining 6(10%) and 4(06.7%) had attended conference and workshop.

Table 2: The level of knowledge regarding ABGs among ICU nurses. N=60

Sr. No.	Level of Knowledge	Pretest		Post-test	
		f	%	f	%
1.	Good	07	11.7	40	66.7
2.	Average	39	65.0	20	33.3
3.	Below average	14	23.3	00	00

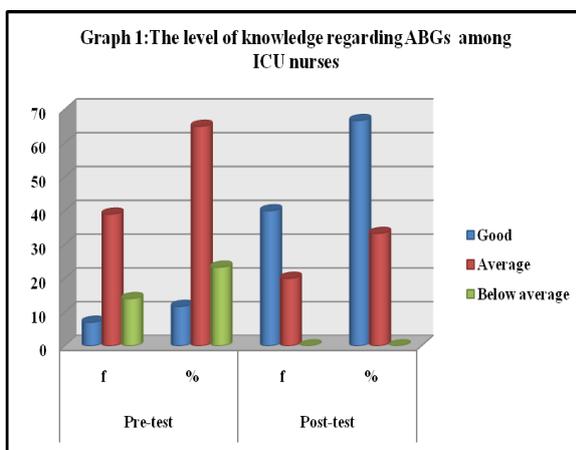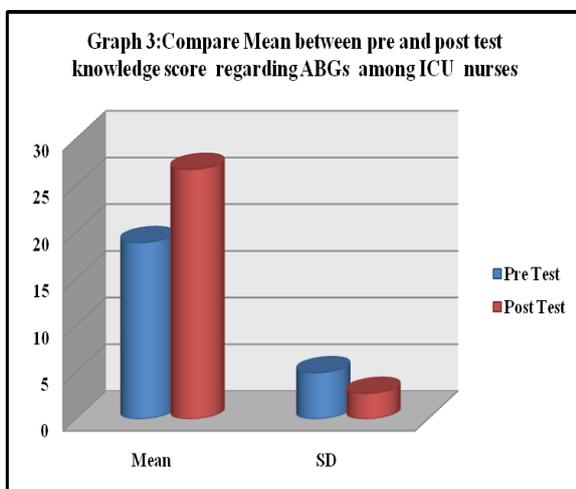Graph 1:The level of knowledge regarding ABGs among ICU nurses

Table2. The table depicts that in pretest most of the nurses 39(65.0%) were having average score followed by 14(23.3%) in below average score and

7(11.7%) with good score and after post-test majority of nurses 40(66.7%) gain good score and remaining 20(33.3%)were having average score

Table 3: The level of practice regarding ABGs among ICU nurses. N=60

Sr. No.	Level of Practice	Pretest		Post-test	
		f	%	f	%
1.	Good	00	00	26	43.3
2.	Average	27	45.0	24	40.0
3.	Below average	33	55.0	10	16.7

Table 3.shows that in pretest, majority of nurses 33(55.0%) were in below average score and 27(45%) in below average score and after post-test, 26(43.3%) nurses were in good score followed by 24(40%), 10(16.7%) in average and below average.

Graph 2: The level of practice regarding ABGs among ICU nurses

Table 4: Compare Mean between pre and post test knowledge score regarding ABGs among ICU nurses. N=60

Group	Mean	SD	Mean difference	t-value	df	p-value
Pre Test	18.88	4.944	7.83	20.631	59	.000**
Post Test	26.72	2.738				

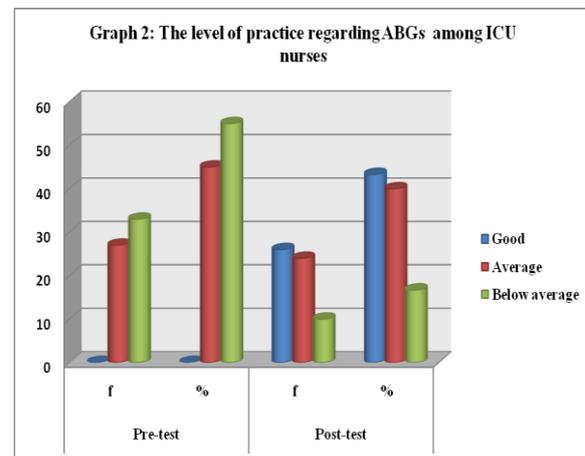Graph 3:Compare Mean between pre and post test knowledge score regarding ABGs among ICU nurses

Table. 4 depicts that comparison between mean pretest and post-test knowledge score regarding ABGs among nurses was 18.88 and 26.72 with mean difference 7.83.Calculated t-value was found to be 20.631 which was found to be highly significant (p-value .000).

Table.5 depicts that comparison between mean pretest and post-test post test score regarding ABGs among nurses was 7.18 and 11.35 with mean difference 4.167.Calculated t-value was found to be 10.492 which was found to be highly significant (p-value .000).

Table 6 depicts that association between post test knowledge score with socio-demographic variables, age (χ^2=8.150, p-value=0.017), professional qualification (χ^2=3.692, p-value=0.047) and current working area (χ^2=16.827,p-value=0.001) were found significant. Remaining variables were non-significant because p-value was >0.05.

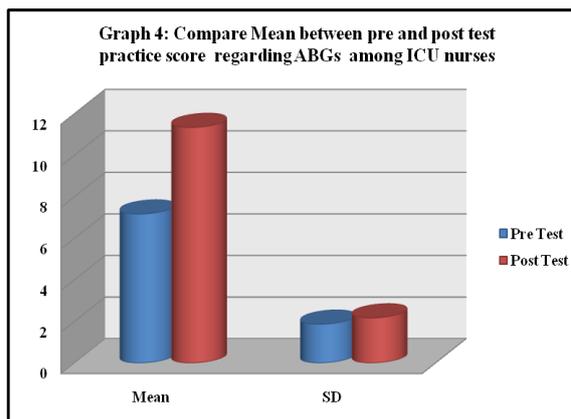Graph 4: Compare Mean between pre and post test practice score regarding ABGs among ICU nurses

Table 5: Compare Mean between pre and post test practice score regarding ABGs among ICU nurses. N=60

Group	Mean	SD	Mean difference	t-value	df	p-value
Pre Test	07.18	1.873	4.167	10.492	59	.000**
Post Test	11.35	2.177				

Table 6: Association between post test knowledge scores with selected socio-demographic variables. N=60

S. No.	Socio-demographic Variables	Post Test Knowledge Score		χ^2 Value	df	P-value
		Good	Average			
1.	**Age (in years)**					
	21-25	19	17			
	26-30	17	03	8.150	2	.017[S]
	31-35	04	00			
2.	**Sex**					
	Male	03	03	0.833	1	.361[NS]
	Female	37	17			
3.	**Professional qualification**					
	GNM	33	20	3.962	1	.047[S]
	B.Sc.(N)	07	00			
4.	**Clinical Experience (in years)**					
	<1	09	09			
	2-4	25	11	5.375	2	.068[NS]
	5-7	06	00			
5.	**Current Working Area**					
	Medical ICU	10	09			
	Surgical ICU	01	06	16.827	3	.001[S]
	Cardiac ICU	20	05			
	Neuro ICU	09	00			
6.	**Attended In-service programme**					
	Workshop	02	02			
	Conference	03	03	1.500	2	.472[NS]
	None	35	15			

NB: df=degree of freedom, NS= Non-significant, S= Significant (at p-value<0.05)

Table7: Association between post test practice scores with selected socio-demographic variables. N=60

S. No.	Socio-demographic Variables	Post Test Practice Score			χ^2 Value	df	P-value
		Good	Average	Below average			
1.	**Age (in years)**						
	21-25	14	12	10			
	26-30	10	10	00	8.077	4	.089[NS]
	31-35	02	02	00			
2.	**Sex**						
	Male	03	02	01	0.142	2	.931[NS]
	Female	23	22	09			
3.	**Professional qualification**						
	GNM	23	20	10	1.903	2	.386[NS]
	B.Sc.(N)	03	04	00			
4.	**Clinical Experience (in years)**						
	<1	10	05	03			
	2-4	13	16	07	3.282	4	.512[NS]
	5-7	03	03	00			
5.	**Current Working Area**						
	Medical ICU	10	06	03			
	Surgical ICU	01	02	04	11.673	6	.070[NS]
	Cardiac ICU	11	11	03			
	Neuro ICU	04	05	00			
6.	**Attended In-service programme**						
	Workshop	02	01	01			
	Conference	04	01	01	2.345	4	.673[NS]
	None	20	22	08			

Table 7 depicts that association between post-test practice score with selected socio-demographic variables- age, sex, professional qualification, Clinical Experience, Current working area and in-service programme were found to be non-significant at p-value>0.05.

DISCUSSION

The study was conducted to assess knowledge and practice of ICU nurses regarding ABGs. The results revealed that 07 (11.7%) nurses had good pretest knowledge followed by 39(65.0%) in average score and 14(23.3%) in below average score.

The findings depict that in post-test, majority of nurses 40(66.7%) had good knowledge score, 20(33.3%) had average score and none in below average whereas in post-test practice score, 26(43.3%) lies in good score, 24(40.0%) in average score and none in below average. This is congruent with findings from other studies conducted by Julie Considine on effects of educational preparation of 20 emergency nurses on knowledge of ABG in which post-test knowledge score of nurses regarding ABGs was 81.6% which increased significantly from pre- test which was 41.6%. [15]

The present study findings revealed that mean pretest and post-test knowledge score of ICU nurses was 18.88 and 26.72.t value (t cal20.631) was observed at 5% level of significance. The mean pretest and post-test practice score of nurses regarding ABG analysis was 7.18 and 11.5 with t value (tcal110.492) at 5% level of significance. This shows that the difference between pretest, post-test knowledge and practice score of nurses regarding ABG analysis was statistically significant (p<0.05). Similar study was conducted by Schneiderman J, Corbridge S, Zerwic JJ (2009) on the effectiveness of an online, computer based learning module for ABGs on 58 nurses by using pretest post- test design. The findings showed that the knowledge of nurses is increased significantly after viewing computer based learning module (t= 6.3, P<0.001) and was concluded that computer based online learning emerged as a means of providing continuing education to nurses. [16] In the present study, there was significant association between knowledge with their selected socio-demographic variables-age, professional qualification and current working area. There was no significant association between practice score with their selected socio-demographic variables.

CONCLUSION

The study was undertaken to assess knowledge and practice of ICU nurses regarding ABGs. The study results revealed that majority of the nurses were females54(90%)with age group21-25 years 36(60%) were in age group 21-25.The post-test knowledge score of nurses regarding ABG analysis was found to be higher than pretest (post-test 26.72, pretest 18.88) and t value was found to be 20.631 and 10.492 in terms of knowledge and practice. The majority of sample 39(65.0%) in pretest knowledge score were found in average score, but after implementation of structured teaching programme the majority of sample 40(66.7%) had good knowledge score whereas for practice score majority of sample 33(55%) had below average score but after STP, majority 26(43.3%) had good score. In the present study, there was significant difference between pretest and post-test knowledge of nurses regarding arterial blood gas analysis (p<0.05) with tcal value 20.631 which is more than tabulated value. For the practice score, there was significant difference between pretest and post-test practice score, tcal 10.492 which is more than tabulated value at 5% level of significance. The study concluded that structured teaching programme had significant effect on knowledge and practice of nurses regarding ABG analysis.

selected hospitals, Jalandhar granting me the permission to conduct the study and a sincere gratitude to my supervisor for their co-operation.

Conflict of interest: The authors have no conflict of interest to declare.

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