A study to assess the effectiveness of planned teaching programme on ABG analysis and interpretation in terms of knowledge and practice among staff nurses working in ICU of selected hospital, New Delhi

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Abstract

Introduction: Arterial blood gas analysis refers to the measurement of pH and the partial pressure of oxygen and carbon dioxide in arterial blood. From these values we can assess the state of acid base balance in blood and how well lungs are performing their jobs of gas exchanges. Arterial blood gas refers to assess the effectiveness of gas exchange by providing measurement to the partial pressure of oxygen and carbon dioxide in arterial blood. The purpose of this research is to assess the knowledge and practice of staff nurses regarding ABG analysis and interpretation. A pre-experimental study was conducted to assess the effectiveness of the planned teaching programme on ABG analysis and interpretation in term of knowledge and practice among staff nurses working in ICU of selected hospital of New Delhi. To develop the planned teaching programme on ABG analysis and interpretation in terms of knowledge and practice among staff nurses working in ICU. To assess the effectiveness of planned teaching programme on ABG analysis and interpretation in terms of gain in knowledge among staff nurses working in ICU. To assess the effectiveness of planned teaching programme on ABG analysis and interpretation in terms of practice among staff nurses working in ICU. After obtaining ethical clearance and formal administrative permission, data collection was done at conference room of Holy Family Hospital, New Delhi. A quantitative approach with one group pre-test post-test design was implemented and a structured observation questionnaire and structured observation checklist was developed and was validated by nine experts from different fields of nursing. Sample of 30 ICU staff nurses were selected through convenient sampling technique and their participation in the study was on voluntary basis and an informed consent was taken from taken from staff nurses of ICU if selected hospital. Demographic findings show that the maximum number the 24(80%) of staff nurses belonged to 21-25 years of age. the majority of staff nurses 18(60%) had b.sc nursing, and 16(53.33%) staff who has less than one year experience and the majority of I.C.U experience nursing staff i.e., 28(93.33%). The study shows the calculated mean and standard deviation for pre-test i.e., 15.56 $\pm$ 3.27and the mean and standard deviation for post-test i.e., 21.5 $\pm$ 2.69 of knowledge score. The calculated mean and standard deviation of pre-test i.e., 11.9 $\pm$ 3.27 and mean and standard deviation of post-test i.e., 17.86 $\pm$ 2.69 of practice score respectively. The calculated "t" test value 10.464 was found significant a $p< 0.05$. The significant association was found that in between knowledge and demographic variables such as year of experience and education qualification but there is no association found with other variables such as age in years and area of experience. The study result showed that the planned teaching programme was effective for staff nurses as it has increased the knowledge of nurses and improves the skills to perform ABG procedure and they would be able to interpret the ABG analysis.

KEY WORD: *Practice, Knowledge, Effectiveness, Planned teaching programme, ABG analysis, Staff nurse.*

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Introduction:

Arterial blood gas analysis refers to the measurement of pH and the partial pressure of oxygen and carbon dioxide in arterial blood. From these values we can assess the state of acid base balance in blood and how well lungs are performing their jobs of gas exchange. Our cell use oxygen to generate energy and produce carbon dioxide as waste. Blood supplies cells with the oxygen they need and clears the unwanted carbon dioxide. This process depends on the ability of our lungs to enrich blood with oxygen and rid it of carbon dioxide. Pulmonary gas exchange refers to transfer of oxygen from the atmosphere to the blood stream and carbon dioxide from blood stream to the atmosphere. The exchange takes place between tiny air sacs called alveoli and blood vessels called capillaries. Arterial blood gases help us to assess the effectiveness of gas exchange by providing measurements to the partial pressure of oxygen and carbon dioxide in arterial blood. Partial pressure describes the contribution of one individual gas within a gas mixture to the total pressure. When a gas dissolves in liquid, the amount dissolved depends on the partial pressure. The term acidity and alkalinity simply refer to the concentration of free hydrogen ions in a solution. Hydrogen concentration can be expressed directly in Nano moles per litre. Solutions with high H+ are acidic and those with low H+ are alkaline. The point at which a substance changes from alkali to acid is at neutral point. Human blood normally has pH of 7.35-7.45 and therefore, it is slightly alkaline. If blood pH is below the normal range (<7.35), there is acidaemia. If it is above the normal range (>7.35), there is alkalaemia.[1]

In an ABG test a sample of arterial blood is drawn and analysed to help determine the quality and extent of pulmonary gas exchange and acid base status. The ABG test measures PaO_2, SaO_2, $PaCO_2$, pH, and the HCO_3 levels. The procedure involves obtaining arterial blood from a direct arterial puncture or from an arterial line often placed in the radial artery. More recent technology allows the continuous monitoring of ABG using fibrotic sensor placed in the artery. ABG are defined by their degree of compensated, partially compensated, or completely compensated. To determine the level of oxygen.[2]

Methodology:

The study was approved by the institutional ethics committee. The present study was conducted in Holy family hospital, New Delhi. One group pre-test, post-test control group design was used to study the effect of planned teaching programme. Sample size was 30 respondents i.e. staff nurses in the age group of 21– 35 years above were selected using purposive non probability sampling approach. Informed consent was taken before conducting the study.

Tools used:

Structured knowledge questionnaire and observation checklist

To assess the knowledge and practice of staff nurses on ABG analysis and interpretation validity and reliability was established. It is comprised of 30 items to test knowledge and 20 items for practice. Knowledge questionnaire included items to assess the concept of pH, concept of metabolic acidosis, metabolic acidosis, concept of respiratory acidosis, alkalosis, concept of bicarbonate, Allen's test, and concept of sample collection of ABG. A score of 1 was given for each correct answer and 0 for the wrong answer. Practice was assessed by a structured observation checklist. It comprised of 20 items: ranging from score 0-10 'poor practice', score 11-15: 'average practice', score 16-20: 'good practice'.

INTERVENTION PLANNED TEACHING PROGRAMME

Development and description of a planned teaching programme

The content of educational package was validated by 11 experts and final version of the planned teaching programme included one time teaching program on definition and components of ABG, purpose, indications and contraindications, types of acid base balance- respiratory acidosis, alkalosis and metabolic acidosis and alkalosis, its causes, sign and symptoms, importance of ABG analysis, ABG sample sites, modified Allen's test, how to interpret ABG its procedure.

PROCEDURE FOR DATA COLLECTION

Ethical permission was obtained from ethical committee. Formal permission was obtained from the concerned authority of the hospital. Staff nurses were selected and purposive non probability sampling technique was done for data collection. Informed consent was taken from the participants and anonymity was assured. Pre- test was administered using structured knowledge questionnaire and observation checklist to assess the effectiveness of planned teaching programme on knowledge and practice of staff nurses. Educational package was implemented and post-test was administered after 7 days. Data of pre-test and post-test were analysed using SPSS version 20.

S.NO.	TOOL	TECNIQUE	PURPOSE
1.	**SECTION A** Structured questionnaire on demographic data	Paper & pen	To find out selected demographic variables
2.	**SECTION B** Structured knowledge questionnaire on ABG analysis and interpretation	Paper and pencil test	To assess the knowledge on ABG analysis and interpretation.
3.	**SECTION C** Observational checklist	Demonstration and re-demonstration	To assess the practice of ABG analysis and interpretation

RESULTS

Demographic Profile of the subjects

Data in table 1 describe the demographic characteristics (age, educational qualification, duration of experience, area of experience in different critical care unit) on ABG Analysis and interpretation of the samples. Regarding the age of staff nurses, data revealed that, most of the staff nurses i.e., 24 (80%) were in the age group of 21-25 years ,06 (20%) of them were in the age group of 26-30 years. Regarding the educational qualification of staff nurses, out of 30 samples, 11 (36.33%) were general nursing and midwifery, 18(60%) were B.Sc. nursing and 1(3.33%) were post basic b.sc nursing. Regarding the duration of experience in different critical care unit of staff nurses, out of 30 samples,16(53.33%) was less than 1 year, 10(33.33%) were between 1-2 years, 1(3.33%) were 2-3 years, 3 (10%) were between in 3-4years.Regarding the area of experience in different critical care unit of staff nurse, out of 30 samples,28(93.33%) was working in ICU, 1(3.33%) was working in SEMI ICU,1(3.33%) was working in C.C.U.

Table-1: Description of the sample demographic characteristics by using frequency & percentage distribution.

n=30

S.NO.	SAMPLE CHARACTERISTCIS	FREQUENCY	PERCENTAGE

1.	Age (in years) a) 21-25 years b) 26-30 years c) 31-35years d) 35 and above years	 24 06 00 00	 80% 20% 0% 0%
2.	Educational qualifications: a) GNM (general nursing and midwifery) b) Post -BSc nursing c) B.Sc. nursing d) M.sc nursing	 11 1 18 0	 36.66% 3.33% 60% 0%
3.	Duration of experience in different critical care unit: a) Less than 1year b) 1-2 years c) 2-3 years d) 3-4years	 16 10 1 3	 53.33% 33.33% 3.33% 10%
4.	Area of experience in different critical care unit: a) I.C.U(intensive care unit) b) H.D.U(highly dependent unit) c) Semi I.C.U d) C.C.U	 28 0 1 1	 93.33% 0% 3.33% 3.33%

Table-2: Frequency and percentage distribution of pre-test and post -test knowledge. (N=30)

Knowledge score	**Pre-test**		**Post-test**	
	f	**%**	**f**	**%**
EXCELLENT	0	0%	1	3.33%
GOOD	1	3.33%	12	40%
AVERAGE	16	53.33%	17	56.66%
POOR	13	43.33%	0	0%

Effectiveness of planned teaching programme on knowledge of staff nurses regarding ABG analysis and interpretation. The finding reveals that:

Majority of the sample that is 16(53.55%) had average pre-test knowledge score and, whereas in post-test 17(56.66%) had average knowledge. In the pre-test13 (43.33%) had poor knowledge score whereas none of them had poor knowledge score in the post-test. In the pre-test1 (3.33%) had good knowledge score where in the post-test 12(40%) had good knowledge score. And in pre-test none of them have excellent knowledge where as in post-test 1(3.33%) had excellent knowledge.

Table-3: Frequency and percentage distribution of pre- test and post-test practice score. (N=30)

Practice score	Pre-test		Post-test	
	F	%	F	%
GOOD	03	10%	28	93.33%
AVERAGE	15	50%	02	6.66%
POOR	12	40%	00	00%

Effectiveness of planned teaching programme on practice of staff nurses regarding ABG analysis and interpretation. The finding reveals that:

Majority of the sample that is 15(50%) had average pre-test practice score where as in the post-test practice score 2(6.66%) had average practice score. In the pre- test 12(40%) had poor practice score, whereas none of them had poor practice score in the post-test. In the pre-test 3(10%) had good practice score, whereas 28(93.33%) had good practice score in post-test.

Table-4: Findings related effectiveness of planned teaching programme on knowledge score. (N=30)

Knowledge score	Mean	Median	Mean difference	Standard deviation	't' value	'p' value
Pre-test	15.56	15.5	5.94	2.94	9.910	8.099*
Post –test	21.5	15.5		2.17		

Table-5: Finding related to effectiveness of planned teaching programme on practice.

Practice score	Mean	Median	Mean difference	standard deviation	't' value	'p' value
Pre-test	11.9	15.5	5.96	2.37	10.46	2.331*
Post-test	17.86	15.5		1.42		

Effectiveness of planned teaching programme on both knowledge and practice shows that:

The mean post-test knowledge score of experimental groups (21.5) is higher than the mean pre-test knowledge score of the experimental group (15.56) with mean difference 5.94. The obtained mean difference between pre-test and the post-test knowledge score of experimental groups is found to be statistically significant as evident by 't' 9.910*. The mean post –test practice score (17.86) is higher than post- test practice score (11.9). The computed mean difference (5.96) was found to be statistically significant as evident by 't' valve was 10.464*.

DISCUSSION

The present study aimed to assess the effectiveness of planned teaching programme on ABG analysis and interpretation among ICU staff nurses. The findings of the present study have been discussed in relation to the observation made by the other studies which the researcher reviewed. In the present study, the pre-test among experimental group, 16(53.55%) had average pre-test knowledge score, whereas in post- test 17(56.66%) had average knowledge, in pre-test 1(3.33%) had good knowledge where in post- test 12(40%) had good knowledge score. in pre-test 13(43.33%) had poor knowledge score whereas in post-test none of them had poor knowledge score. The level of knowledge score findings was similar to the study findings of Akashpreet Kaur, Gopal Sing Charan 2018, who studied the effectiveness STP on knowledge and practice regarding ABG among ICU nurses. The study shows that in pre-test majority of nurses 39(65.0%) were having average knowledge score followed by 14(23.3%) in below average score and 7(11.7%) with good score. And after post-test majority of the nurses 40(43.3%) nurses were in good score followed by 24(40%), 10(16.7%) in average and below average. In the present study, majority of the experimental group 15(50%) had average pre-test practice score, whereas in post-test 2(6.66%) had average practice score. In the pre-test 12(40%) had average practice score and none of them had poor score. In pre-test 3(10%) had good practice score, whereas in post-test 28(93.33%) gad good practice score. The levels of practice score are similar to the study findings of Akashpreet Kaur, Gopal Singh Charan 2018. The study shows that in pretest majority of nurses 33(55%) were 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.In the present study, it was found that the planned teaching programme on ABG analysis and interpretation was effective and significant to improve knowledge and practice regarding ABG analysis and interpretation as evidenced by the mean difference of pre-test and the post test is 5.94 and't' value 9.910 at 0.05 level of significance which accepts the hypothesis and rejects the null hypothesis. A similar pre-experimental study was conducted by Divya Upreti, Rakhi Mishra 2020 to assess the effectiveness of planned on knowledge and practice regarding ABG analysis and interpretation among nurses working in critical care units. The result shows that the obtained mean difference 6.6 was found to be statistically significant as evident by the t valve 12.60 at 0.05 level of significance. Hence the planned teaching programme was effective in improving knowledge and practice of the staff nurses.

CONCLUSION

The major conclusions drawn on the basis of the findings of the study were as follows: It was found among the sample of 30 staff nurses, (3.33%) of them had good knowledge, (53.33%) of had average knowledge while (43.33%) of them have Poor knowledge. The planned teaching programme was necessary for improving the knowledge and practice of the staff nurses. The planned teaching programme was effective to increase the knowledge and practice of the staff nurses on ABG analysis and interpretation.

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