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EFFECTIVENESS OF A STRUCTURED TEACHING PROGRAMME ON ABG ANALYSIS AND INTERPRETATION IN TERMS OF KNOWLEDGE AND PRACTICE OF NURSING PERSONNEL

Nursing

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ABSTRACT

Introduction: Even though Nursing Personnel take active participation in ABG analysis and interpretation on regular basis, there is a scope for improvement to minimize errors and initiate prompt and appropriate interventions. The main aim of the study was to evaluate the effectiveness of Structured Teaching Programme on ABG analysis and interpretation in terms of knowledge and practice of Nursing Personnel. **Methods:** Quantitative research approach and pre-test post-test control group design was used. Total enumeration sampling was used to select Nursing personnel working in Transplant ICU (Experimental group =22) and High Dependency Unit (control group = 25) of ILBS, New Delhi. Structured knowledge questionnaire and observation practice checklist was used to collect data. **Results:** Total 22.7 % of experimental group and 44 % of control group never attended any in-service education programme. A highly significant difference was found between post-test knowledge scores of both groups ($t = 6.79$; $p < 0.001$) and post-test practice scores of both groups ($t = 12.79$; $p < 0.001$). **Conclusion:** STP was effective in enhancing the knowledge and improving the practice of Nursing Personnel on ABG analysis and interpretation.

KEYWORDS

Structured Teaching Programme; ABG analysis and interpretation; Knowledge; Practice; Nursing Personnel

INTRODUCTION

Arterial Blood Gas (ABG) test provides rapid and accurate information about alveolar ventilation, oxygenation and acid-base balance (Smeltzer et al, 2011). Nurses play a major role in ABG analysis and interpretation. They collect blood sample for ABG analysis and control various factors which affect the validity of the ABG report (Youssef et al, 2014). Also, their role is expanded to correct and quick interpretation of report to initiate prompt, appropriate nursing intervention and medical consultation (Taylor & Stephens, 1990)

NEED OF THE STUDY

ABG are valuable only if obtained properly and measured carefully (Youssef et al, 2014). Also, correct interpretation of ABG report is also very important for prevention and early identification of acid-base disorders. Even though ABG analysis and interpretation is an essential skill for Nurses, the study conducted by Basnett, Devi and Chetia (2016) concluded that their Knowledge and Practice on ABG analysis and its interpretation is inadequate.

METHODS

Approach and Design: Quantitative research approach with Pre-test Post-test control group design

Setting: HDU and TICU of ILBS, New Delhi.

Sampling technique

Simple random sampling using lottery method was used to select HDU and TICU units as experimental and control group. Total enumeration sampling technique was used for selection of the Nursing Personnel.

Sample

All Nursing Personnel working in TICU and HDU and meeting the inclusion and exclusion criteria.

Inclusion criteria: Nursing Personnel who was working in TICU and HDU of ILBS and available during the data collection time-period and involved in direct patient care.

Exclusion criteria: Nursing Personnel who was on prolong (More than 15 days) / maternity or paternity leave.

Sample size

There were total 25 nursing personnel working in TICU. Out of them one was Nursing Incharge, one was on maternity leave and another one refused to take participation as she was in her job resignation period. Therefore, sample size for the experimental group was 22.

In HDU, total no. of nursing personnel was 31. Out of them one was Nursing Incharge and five nursing personnel refused to take participation. So, sample size for the control group was 25.

Tools for data collection

Tool – I: Structured knowledge questionnaire

Section-A: Demographic variables including age, gender, educational qualification, area of posting, working experience in clinical area, exposure to in-service education programme and last attended in-service education programme.

Section-B: Structured Knowledge Questionnaire composed of 30 multiple-choice questions with four options and one correct answer for each. Score-1 is given to each correct response while score-0 is given to each incorrect response. The maximum score is 30 while minimum score is zero.

Tool – II: Observation practice checklist constituted of 47 steps of the procedure. A score-1 is given to each "correctly done" and "not applicable" step while score-0 is given to "incorrectly done" and "not done" step. The maximum possible score is 47 while minimum score is zero.

Content validity and Reliability of tools

Content Validity Index (CVI) of structured knowledge questionnaire was "0.82 to 1" and observational practice checklist was "0.89 to 1" and had good internal consistency.

Structured knowledge questionnaire (Guttmann split half coefficient = 0.853) and observational practice checklist (interclass correlation coefficient = 0.97) was also found to be reliable.

Development of Structured Teaching programme

Topics covered in STP: Basic physiology in relation to ABG, Parameters of ABG, Indications of ABG sampling**,** Arterial line & its indications, Arterial waveform, Factors influencing ABG results Blood sample collection from arterial line for ABG analysis, Complications related to arterial line and ABG sampling and their prevention, Acid-base disorders including respiratory acidosis/alkalosis, metabolic acidosis/ alkalosis and Stepwise approach to ABG interpretation.

STP was provided by investigator herself with Lecture cum discussion method and power point presentation in 20 minutes.

Method of Data collection

Formal permission was obtained from Ethical Clearance Committee and administrative authority of ILBS, New Delhi. HDU and TICU departments were randomly allocated to Experimental and Control group using lottery method. HDU was selected as Control group and TICU as Experimental group. Total enumeration sampling technique was used and those who met the selection criteria were recruited. Participant Information Sheet was provided to each participant and Informed consents were taken. Firstly, Principal Investigator assessed

Practice using Observation Practice Checklist followed by assessment of Knowledge using Structured Knowledge Questionnaire. On the same day, STP was administered to Experimental group only. On seventh day, data was collected using same tools.

Data analysis: Master data sheet was prepared in Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 22

RESULTS

Section 1: Demographic variables of Nursing Personnel

Table 1

Frequency and percentage Distribution of Nursing Personnel by Demographic Characteristics $n_1 + n_2 = 22+25$

Demographic Variable	Experimental group f (%)	Control Group f (%)	X^2/ Fisher's exact test	Df	P Value
Age (in years)					
25-30	4(18.2)	9(36)	3.00	2	0.23
31-35	9(40.9)	11(44)			
36-40	9(40.9)	5(20)			
Gender					
Male	10(45.5)	7(28)	1.54	1	0.24
Female	12(54.5)	18(72)			
Educational Qualification					
GNM			0.28	1	0.77
B.Sc. Nursing/Post Basic B.Sc. Nursing	14(63.6) 08(36.4)	14(56) 11(44)			
Working experience in the clinical area (in years)					
< 5	3(13.6)	3(12)	3.49	3	0.33
6-10	6(27.3)	11(44)			
11-15	7(31.8)	9(36)			
> 15	6(27.3)	2(8)			
Exposure to In-service Education Programme					
Nil	5(22.7)	11(44)	3.47	3	0.29
< 5	11(50)	11(44)			
5-10	1(4.5)	0			
>10	5(22.7)	3(12)			
Last attended In-service Education programme					
<1 month ago	1(5.9)	0	3.33	2	0.12
1-6 months ago	5(29.4)	1(7.1)			
>6 months ago	11(64.7)	13(92.9)			

Not significant; $p \geq 0.05$

Section 2: Evaluation of Structured Teaching Programme in terms of Gain in Knowledge of Nursing Personnel regarding ABG analysis and interpretation.

In Experimental group, the mean post-test Knowledge score (26.73± 2.55) was significantly higher than pre-test Knowledge score (20.46 ± 2.96) with a mean difference of 6.27 (Table 2)

Table 2

Description and Comparison of Pre-test and Post-test Knowledge Score of Nursing Personnel

$n_1 + n_2 = 22+25$

Group		Knowledge Score Range	Knowledge Score Mean ± SD	MD	t value	p value
Experimental	Pre-test	14-26	20.46 ± 2.96	6.27	-9.29	0.00**
	Post-test	21-30	26.73 ± 2.55			
Control	Pre-test	12-25	19.76 ± 3.92	0.64	- 1.16	0.26
	Post-test	13-27	20.40 ± 3.65			

**Significant; $p < 0.001$ Maximum possible score = 30

In pre-test, majority of the Nursing Personnel, 17 (77.3 %) had average knowledge scores (18-23), three (13.6 %) had below average (less than 18), two (9.1 %) had above average knowledge scores (24-30). In post-test, majority i.e. 19 (87.4 %) scored above average and three (13.6 %) scored average.

A highly significant mean difference (6.33) was found between post-test Knowledge scores of Experimental and Control group ($t = 6.79$; $p < 0.001$) indicating that STP was effective in enhancing the knowledge.

Domain wise gain in Knowledge scores of Nursing Personnel

In pre-test, minimum mean percentage was in the domain 'Interpretation of ABG'. The post-test mean percentage of Experimental group in all the five domains was higher than the pre-test. In experimental group, maximum mean percentage was 27.9 in 'Blood sampling for ABG analysis' domain

Section 3: Evaluation of Structured Teaching Programme in terms of Gain in Practice of Nursing Personnel regarding ABG analysis and interpretation.

In Experimental group, the mean post-test Practice score (44.27± 1.35) was significantly higher than the pre-test Knowledge score (37.36 ± 2.44) with a mean difference of 6.91. (Table 3).

Table 3

Comparison of Pre-test and Post-test Practice score of Experimental and Control Group

$n_1 + n_2 = 22+25$

Group		Practice Score Range	Practice Score Mean ± SD	MD	t value	P Value
Experimental	Pre-test	34-43	37.36 ± 2.44	6.91	-12.22	0.00**
	Post-test	42-46	44.27 ± 1.35			
Control	Pre-test	31-44	36.72 ± 3.31	0.12	-0.18	0.86
	Post-test	33-42	36.84 ± 2.41			

**Significant; $p < 0.001$

Only 9.1 percent Nursing Personnel were skilled (> 42) in performing ABG analysis and interpretation while after the administration of STP, only 13.6 percent of Nursing Personnel were not skilled (which can be attributed to individual differences related to their learning capabilities).

A highly significant mean difference (7.43) was found between post-test Practice scores of Experimental and Control group ($t=12.79$; $p <0.001$) indicating that Structured Teaching Programme was effective in improving the practice of Nursing Personnel.

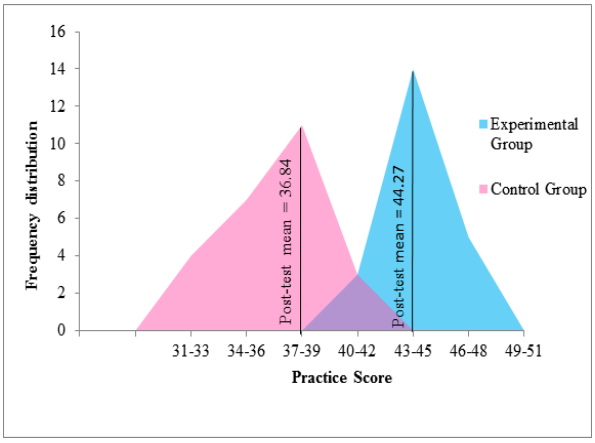

Figure 1. Area chart showing Comparison of post-test Practice scores of Experimental group and Control group

Section - IV: There was no significant correlation ($r = 0.092$, $p = 0.69$) found between post-test Knowledge and post-test Practice scores regarding ABG analysis and interpretation

Section - V: There was no significant association found between Change in Knowledge scores and Practice scores with selected demographic variables in Experimental group

LIMITATIONS

The present study has limitations including limited setting of HDU and TICU of selected hospital, small sample size, use of structured tools, lecture and discussion method of teaching while demonstration is most effective method.

RECOMMENDATIONS

Similar study can be replicated with large sample size, in different hospitals and different settings, sample collection by direct arterial puncture, use of Video-assisted Teaching (VAT), comparative study between Nursing Personnel working in Critical Care Units and wards. Also, educational and training programme on ABG analysis and interpretation should be made available to Nursing students and Nursing Personnel on regular basis.

CONCLUSION

The study concluded that STP was effective in enhancing the Knowledge and improving the Practice of Nursing Personnel regarding ABG analysis and interpretation.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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