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Awareness Level Of Critical Care Nurses Regarding ABG Analysis Interpretation In Selected Hospital Of Chandigarh And Punjab

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ABSTRACT:

Background-Critical care nurses are playing an essential role in care of patients of intensive care units. They are frequently involved in taking ABG but for analyzing the report they regularly dependent on doctors. They need to be aware regarding the Interpretation.

Objective-To assess the knowledge of critical care nurses regarding ABG Procedure and ABG analysis interpretation.

Material and Method-A descriptive design was conceded for the present study. Total 200 Critical care nurses were working different critical care units were enrolled. Non randomized convenient sampling technique was used. A pre validated self-structured questionnaire including of 10 questions related to knowledge about the ABG procedure and 20 ABG analysis interpretations was developed and administered to assess the knowledge of critical care nurses.

Results- The majority of the Critical Care Nurses are between 20-30 years i.e. 74%, the next main group is 31-40 i.e.91% of the critical were nurses are female (61% of the working were GNM, 27% were B.Sc. and 9% were P.B.BSc and 3% were M.Sc. Nursing A significant majority have 0-5 year experience 84%-59% of them had knowledge about Allen Test. 70% of critical care nurses correctly knew about pH normal range 38 percent knew about respiratory acidosis and only 20% nurses were able to solve the equation of ABG interpretation. According to category the Good, Average and poor. The majority of participants (88%) score in the "Poor" category range i.e. (0-49), with 10% scoring in the "Average" range i.e. (50-79) and only 2% achieving a "Good" range score i.e. (80-100) This indicates that critical care nurses have lower knowledge of ABG analysis interpretation.

Conclusion-Critical care had gap in ABG procedure and ABG Analysis interpretation knowledge. They need to be taught regarding ABG procedure and ABG Analysis interpretation.

Key Words –Critical care nurses, ABG Analysis interpretation.

INTRODUCTION

An Arterial Blood Gas is an investigation is used to assess the oxygen, Carbon dioxide, acidity, oxy haemoglobin saturation and by carbonate level in blood. It helps to interpret respiratory, circulatory and metabolic disorders.[1] Imbalance of acid base in body can become life threatening. ABG interpretations knowledge must require for nurses who are working in critical care areas to prevent the complications of patients.

An Arterial Blood is required for ABG analysis. It is obtained from an artery. It is frequently taken from the radial, brachial and femoral and axillary artery. In neonates ABG sample is usually taken from the umbilical cord immediate after the birth. It can be taken with a needle puncture and intra-arterial catheterization. Radial arteries are preferable site for ABG because it is easily assessable and also comfortable for the patients. Before doing the radial artery puncture 'Allen's Test' is required to assess the collateral flow of the ulnar artery through the superficial palm or arch.[2]

The person who has impaired collateral circulation has increasing the risk of complications. The artery should be palpated before puncture the needle. The recommended needle insertion angles are 30-45 degree in radial, brachial, axillary artery and at 90 degree for femoral artery. 2 to 3 ml blood should be withdrawn by pre-heparinized syringe and pressure should be applied at least 5 to 10 minutes until the haemostasis is achieved.[3]

ABG analysis mostly used in critical care units. It helps to early detection of acid based disturbance and evaluates the partial pressure of oxygen (Pao_2) and carbon dioxide ($Paco_2$). It is also helpful to assessment the response of therapeutic treatment of patients of diabetic ketoacidosis. It is not recommendeds in patients with bleeding disorders.

Physiology of ABGs

PaO2	80-100mmHg
ph	7.35-7.45
Paco2	35-45 mmHg
HCO3	22-26mEq/L
AG (anion gap)	8-16mEq/L
B E (base excess)	-2to +2meEq/L [3

In critical units the nurses play a vital role in delivering high quality patient care . However it is observed that nurses are usually dependent on the physicians for the interpretation of ABG analysis. It is main investigation of the critical care units patients and provides information regarding early detection of respiratory, metabolic, circulatory complications. Nurses spend the maximum time with patients. So it becomes necessary need to know the essential skill of ABG interpretation and analysis for nurses in critical areas. If nurses become familiar in interpretation skill of ABG they can early detect of respiratory changes of critically ill patients and prevent them respiratory complications[4]

An observational cohort study on epidemiology of acute respiratory failure in critical ill patients stress is that acute respiratory failure is common in ICU 56% in all patients.[5] Metabolic syndrome was found to be approximately 25%. The overall incidence is 31% for women and 18.5 for men . In India However ABG is not used for a specific diagnosis test e.g. patients have same values of with different diagnosis. But is the essential diagnosing tool for the care of critically ill patients. It is imperative critical care nurses interpret ABG and they can ensure that their patients are receiving timely and appropriate care.[6]

Objective-To assess the knowledge of critical care nurses regarding ABG Procedure and ABG analysis interpretation,

Review of literature

The literature review of this study aims to provide current knowledge including finding of the related researches and methodological contributions in particular topic. The review of literature is summaries of the related topic under the concern and provides a base of the current study.

Section –A General Information related to Arterial Blood Gas Analysis

Sacha C. Rowling etal (2013) conducted a multi-centre historical cohort study, they included all patients performed ABG analysis at three Danish hospitals from January1, 1993–Feb 2013. They analysis adult 473327 patient and they 669 adult patients led to major complications embolism, aneurysm, nerve damage, arterial venous fistula 49%, 15.4%, 1.5% and 0.6% and another kind 33.5%.They find major complications rates who are on antithrombotic medications. They consider ABG analysis for adult patient's procedures. [(7)]

Clementin Y F Yap et all (2011)[(8)] stated that indication of ABG result are giving information on the acid base status, oxygenation haemoglobin saturation and co2 elimination. Asked about limitation on the patient

with bleeding diathesis, arterial venous fistulas, and absences of arterial pulse, hematoma and severe peripheral vessel diseases

Parmod Sood et all (2010) supported that disorder of acid base imbalance can lead to risk factors which can life threatening .[9] The process of analysis and monitoring in arterial blood gas is an essential part of diagnosing and managing the oxygenation status and acid base balance of the high risk patients and as well as the critically ill patients of ICU.

Section-B Review of literature related to Knowledge of nurses regarding ABG Analysis interpretation

Shimmad Elsoudi Imbrahem et al (2021) Arterial blood gas interpretation knowledge of précised in critical care nurses. The outcome determines that 94.6 to 100% had unsatisfactory knowledge level with a mean of 9.45+-2.94 and 30.5+8.7 respectively. Knowledge level was not found to be significant in relation to sex i,e (t=11.142 at P <-0.261). Sex is not play role in relation of program i.e t=0.538 at P<- 0.601.So conclusion that critical care nurses who were participated in study have unsatisfactory knowledge practices score regarding ABG analysis interpretation.[10]

Amang Mohammed Safwat et al 2021 conducted a study to assess the effectiveness of Computer based learning module on arterial blood gas interpretation Quasi Experimental Design was used in this study. The results of this study revealed that there was highly difference in significant level of knowledge and practices before and after the implementation of interventions i.e. online learning module. ($X^{2=}$ 53.333, 58.880) respectively and p value < 0.001. This result also depicts that p t positive co-relation association between total satisfactory level of knowledge and practice and pre, post of online learning module (r=0.566,0.809) respectively.[11]

Manju Bala Dash et al 2019 conducted a descriptive on 50 nursing emergency care unit the major finding of the study the finding of the study was 72% nurses have average knowledge in analysis and interpretation of ABG during pre-test regarding arterial gas analysis and interpretation.[12]

Amol Gharib Sabaq et al 2019 conducted a quasi-experimental design. In this study 30 nurses were taken structured questioner sheet to assess the knowledge observational check list tool was used to assess the practices of nurses. The finding of this study was highly statistical significance difference in knowledge of practices of nurses before and after implementation of teaching program. This teaching program was highly effective to increase the knowledge and practices of nurses.

Akashpreet kaur et al 2018 [13]conducted a quantitative study in Punjab to assess the effectiveness of STP on knowledge and practices regarding ABG among ICU nurses. The result of the study reveals about the mean difference of the pre-test and post- test knowledge score i.e. 7.83 and total value 20.63. The value of this score is more than 5% level of significance. There was significance difference practice score of pre-test and post -test i.e. total 10.492 and more than5% level of significance. The result of this study shows that there was significance improvement in the knowledge and practices of the ICU nurses after the implementation of the structure teaching programme .[14]

Rokesh Thorat et al 2017 Experimental study conducted to assess the effectiveness of structured teaching program on the effectiveness of structure education program on arterial blood gas suggest that the the average score for knowledge increased by 50% to75% but no participant achieved an excellent level on the other hand in the post test. Improvement in the post test good knowledge was improved 38%. Sample in at excellent level.[8]

D Thaulasimani et al 2010[15] conducted a quasi-experiment study to assess the effectiveness of structured program regarding ABG analysis among nurses working in ICU the major result of the study showed the knowledge of experimental group was improved from 41.50%. 81.93% On the hand the overall knowledge of contrast was 40.75% in pre-test .They had improved 42.00 in post-test. The overall comparison of pre - test t with post-test to test knowledge eg. 16.6% to 32.7% and in control group and control group i.e.16.3% to 16.80, this was shown no improvement was found.[16]

Thus, the review of literature shows that Technology Based Structured Teaching Program Regarding Interpretation of ABG analysis for early detection of respiratory failure by critical care nurses is effective.

This structured teaching will enhance the knowledge of nurses working in critical care unit. It may facilitate in early recovery and reduce the complications in critically ill patients.

Material and Method

The present study was conducted in selected hospital of Punjab and Chandigarh .A descriptive design was conceded for the present study. Total 200 Critical care nurses those were working in various critical care units were enrolled. Non randomized convenient sampling technique was used. A pre validated self-structured questionnaire comprising of 10 questions related to knowledge about the ABG procedure and 20 ABG analysis interpretations was developed and administered to assess the knowledge of critical care nurses.

The total knowledge score was categorized in three categories i.e. poor, average and good according to score obtained by critical care nurses. Critical care nurses who scored > 80% were in good category, 50-79 average and <50 were in poor category.

Result - - The majority of the Critical Care Nurses are between 20-30 years i.e. 74%, the next largest group is 31-40 i.e.91 % of the critical were nurses are female and males were only 9 %. (61% of the working was GNM, 27% were B.Sc. and 9% were P.B.BSc and 3% were M.Sc. Nursing). A significant majority have 0-5 year experience 84% and similar percentage of participants have previous knowledge about ABG.

Knowledge regarding ABG procedure

70% of critical care nurses correctly knew about pH normal range 72% knew about remove the air before sending ABG. 59% of them had knowledge about Allen Test but only 26% nurses were known about that Allen test is performed to check the collateral supply of ulnar artery. 9% nurses knew about how to heparinized the syringe. Approximate 40% critical care nurses have knowledge regarding time of pressure applied after ABG sample.

Knowledge regarding ABG Interpretation

70% of critical care nurses correctly knew about pH normal range 38 percent knew about respiratory acidosis and only 20% nurses were able to solve the equation of ABG interpretation. Approximately 35% nurses knew about ABG normal values and only 20% nurses were able to solve the equation of ABG interpretation.

Categories vise knowledge regarding ABG Interpretation

According to category the Good, Average and poor. The majority of participants (88%) score in the “Poor” category range i.e. (0-49), with 10% scoring in the “Average” range i.e. (50-79) and only 2% achieving a “Good” range score i.e. (80-100) This indicates that critical care nurses have lower knowledge of ABG analysis interpretation.

Discussion

An Arterial Blood Gas (ABG) test is crucial diagnostic tool that helps detect respiratory failure by measuring the level of oxygen (o_2) and carbon dioxide (co_2), ventilation and acid base status in the blood. Arterial blood gases sampling is part of nurses’ practice in the care of patients admitted to the intensive care unit, particularly for those are on respiratory support. So the present study have been undertaken with the view to assess the Awareness level of critical care nurses regarding ABG analysis interpretation in selected hospital of Chandigarh and Punjab .The aim of this study is To assess the knowledge of critical care nurses regarding ABG Procedure and ABG analysis interpretation.Nurses must have knowledge about ABG procedure and ABG analysis interpretation so they can also involve in treatment plan of critical ill patient and prevent them from respiratory and metabolic complications

In present study the majority of the Critical Care Nurses are between 20-30 years i.e. 74%, the next largest group is 31-40 i.e.91% of the critical were nurses are female and males were only 9%. (61% of the working were GNM, 27% were B.Sc. and 9% were P.B.BSc and 3% were M.Sc. Nursing). A significant majority

have 0-5 year experience 84% and similar percentage of participants have previous knowledge about ABG. Similar results were found Umar Zeb*, Said Alam, Farman Ali, Mohammad Hanif, Sardar Ali 20211[7] Demographic variables reported that most of the nurses(73.33%) were female nurses in the current study while the mean age of the CCN was calculated as 31 years. Majority of nurses 46% had up to 5 years of clinical experience. Based on qualification majority (66%) of the study participants had diploma in nursing. Another study done by Kaur, A., & Charan, G. S. (2018)[13] that majority of nurses 36 (60%) were found in age group 21-25years, followed by 20 (33.3%) in 26-30 years 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 Nursing.

In this study knowledge regarding ABG procedure and ABG Analysis interpretation were not found sufficient. The majority of participants (88%) score in the "Poor" category range i.e. (0-49), with 10% scoring in the "Average" range i.e. (50-79) and only 2% achieving a "Good" range score i.e. (80-100) This shows that critical care nurses have lower knowledge of ABG evaluation interpretation.Another study conducted by A study by Karpukkarasi and Arasuman (2020) [16] also supports the present findings. Their study on ICU nurses in Bengaluru showed that before training, 70% had inadequate knowledge, 30% had moderate knowledge, and none had adequate knowledge. After training, 80% had adequate knowledge, 20% had moderate knowledge, and none had inadequate knowledge **Umar Zeb** [17]in this study pre-test knowledge scores among critical care nurses showed that only a small percentage (16.66%) had excellent knowledge, while 20% had good knowledge. A very few (10%) had an average understanding, whereas the majority (53.33%) had poor knowledge before the intervention. Another study conducted by Rokesh Throat [15] also support the present study findings 50 -75 % staff nurses had good knowledge but no one had excellent knowledge about ABG analysis interpretation

Conclusion- In present study revealed that nurses need education regarding the ABGB procedure and ABG Analysis interpretation.

Table 1 Socio demographic profile of critical care nurses

Variables		Frequency (N)	Percentage
Age (years)	20-30	148	74%
	31-40	48	24%
	41-50	4	0.5%
Gender	Male	18	9%
	Female	182	91%
Religion	Hindu	114	57%
	Sikh	71	36%
	Muslim	6	3%
	Christian	9	4%
Marital Status	Unmarried	137	69%
	Married	63	31%
Education	GNM	122	61%
	Post Basic BSc Nursing	19	9%
	BSc Nursing	53	27%
	MSc Nursing	6	3%
Previous knowledge	Yes	164	82%
	No	36	18%
In service Education	Yes	95	47%
	No	105	53%
Critical Care Experience	0-5 years	171	84%
	6-10 years	16	8%
	11-15 years	17	8%
	16-20 years	2	0%
Total Work Experience	0-5 years	147	73%
	6-10 years	36	19%
	11-15 years	13	6%
	16-20 years	4	2%

Table 2 Knowledge of critical care nurses regarding ABG Procedure

Variable knowledge questionnaires of ABG Procedure	Frequency	Percentage
Modified Allen's test is performed before taking a sample from the radial artery	114	59%
90^0 angle of the needle should be inserted before taking the ABG from the Femoral Artery	66	29 %
30-45^0Angle of the needle should be inserted before taking the ABG from the Radial Artery	106	52 %
Allen test is performed to assess the collateral supply of ulnar artery	41	26%
1000 units heparin of aspirated and pushed out of pre-heparinized the syringe before taking ABG	18	9%
Remove the air if present in syringe after taking ABG	134	72%
Syringe rolling in the palm the correct method of sending ABG sample	53	25%
5 to 10 minutes pressure to be applied After taking sample from radial artery .	79	40%
Respiratory distress is not a complication of ABG	48	27%

Table 3 Knowledge of critical care nurses regarding ABG Interpretation

Variable knowledge questionnaires of ABG Interpretation	Frequency	Percentage
7.35-7.45 is range of normal value of pH	126	70%
+ 2 is range of base excess	50	25%
22-26 me q/l is normal value of HCO_3	68	34%
pH indicates Hydrogen ion concentration	65	33%
$PaCo_2$ indicates Respiratory parameters	75	38%
Equation value interpret respiratory acidosis	73	38%
Equation value interpret Metabolic alkalosis	67	34%
pH decrease and Co_2 increase indicates respiratory acidosis	46	23%
pH increase and HCo_3 decrease indicates metabolic acidosis	40	20%
pH logarithm higher the H+ concentration and higher the pH	48	23%
80-100 mm hg is normal Pao_2 in Blood	38	20%
Co_2 accumulation is the main cause of respiratory acidosis	64	32%
Decrease Co_2 is main cause of respiratory alkalosis	68	34%
pH is < 7.35 and HCO_3 is < 22 meq/l indicates metabolic acidosis	61	34%
High blood lactate concentration indicates tissue hypoxia	27%	14%
Body compensates for metabolic alkalosis to increase Co_2	41	20%
Acute compensation occurs within 6-24 hours	40	20%
Body compensate for respiratory acidosis to increase the excretion of acids	86	43%
Base excess indicates increase Alkali in the blood	66	39%

Table 4 Frequency & Percentage distribution of Knowledge Score of Critical Care Nurses

CRITERIA MEASURE OF KNOWLEDGE SCORE			
Category Score		Frequency (N200)	Percentage
Good	(80-100)	3	2%
Average	(50-79)	21	10%
Poor	(0-49)	176	88%

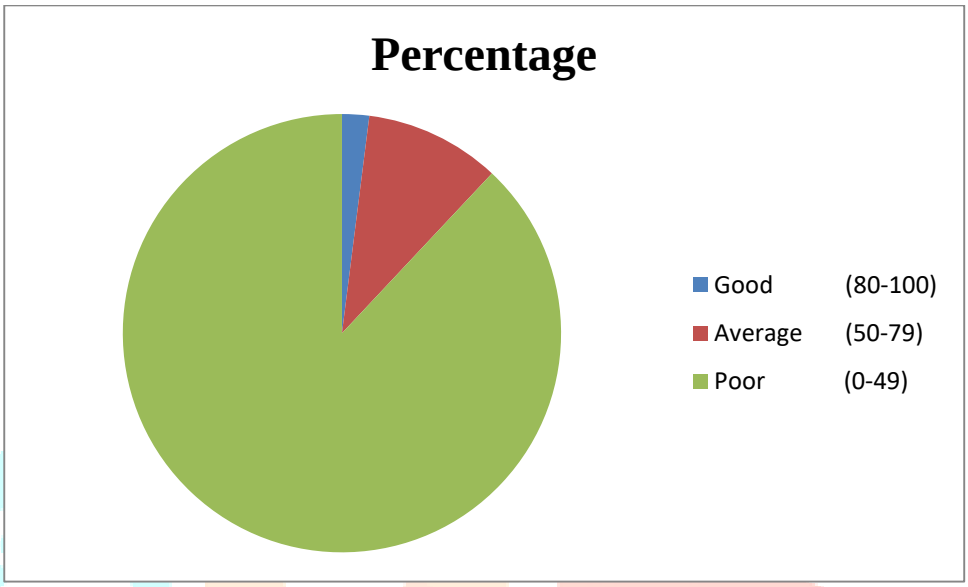

Figure1 shows knowledge score of critical care nurses

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