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Interpretation of Arterial Blood Gas Analysis of ICU Patients in a Tertiary Care Referral Hospital Of Tripura:

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ABSTRACT: Intensive care unit (ICU) patients are often investigated for their arterial blood gas levels in order to diagnose the underlying cause and provide prompt and appropriate treatment and thus avoid the future consequences.Hence ,we decided to check the utility of the arterial blood gas analysis in our intensive care unit (ICU). **Methodology:** A cross-sectional study was conducted in a randomly selected eligible patients from the medical ICU(MICU) of AGMC & GBP Hospital during the period from January 2021 to December 2021.**Results:** The diagnostic yield of the study is 96.05%. Out of 532 patients,178 of them had an acidic blood pH and 128 patients had an alkaline blood pH .406 of them turned out positive for respiratory balance disorders and 432 of them had metabolic acid-base balance disorders.**Conclusion:** Arterial blood gas estimation is an efficient tool in diagnosing and treating the patients of an intensive or critical care unit.Proper and timely estimation thus can reduce the complications and prove effective in controlling the disorders.

Keywords: ICU, Arterial Blood Gas (ABG) ,Metabolic Acidosis, Metabolic Alkalosis, Respiratory Acidosis, Respiratory Alkalosis.

I. INTRODUCTION:

The arterial blood gas (ABG) is a frequently ordered laboratory test. Laboratory tests should be ordered to make accurate diagnosis,management,monitor the response to management[1-2].The continued frequency of ABG valuation may be influenced by routine work-patterns and easy access via arterial lines[3].Many laboratory analysis including ABG are repeated too early [4].Inappropriate utilization and blood collection not only escalate cost but may also create unnecessary patient discomfort and complications [5].Anciallary expenditures in the intensive care setting can be decreased without compromising care of the patient [6]. Proper guidelines for blood gas measurement has been shown to decrease test utilization without affecting outcome [7]. Arterial blood gas monitoring is of utmost importance.It helps in diagnosing the underlying imbalance in acid-base system or respiratory balance.It is essential to correct these changes in order to avoid the ill-effects on various internal organs and homeostasis of the body.

Aim & Objectives: To assess the clinical utility of routine ABG tests in our ICU.

Inclusion & Exclusion Criteria: Adult patients (both male and female) admitted in MICU of AGMC & GBP Hospital are included in this study. ABG tests performed outside our ICU were not included in this study.

Methodology: A cross- sectional study was conducted in a randomly selected eligible patients from the MICU of AGMC & GBP Hospital.Accurate results for an ABG estimation depends on the proper manner of collecting, handling and analyzing the specimen[8].The site for puncture is usually the radial artery or femoral artery or brachial artery.About 2 ml of blood is collected in a heparinized syringe under strict anaerobic conditions and kept at ‘ 0 ‘ degree Celsius until the sample is processed [9].The results obtained were tabulated and recorded and analysed by appropriate statistical tests.

The normal ranges for the estimated arterial blood gas parameters are given below[10].

Sr.No.	Parameter	Reference Range
1.	Blood pH	**7.35-7.45**
2.	pO2	75-100 mmHg
3.	pCO2	35-45 mmHg
4.	Base excess in e.c.f	-2 -2 mmol/L
5.	Bicarbonate ions	22-26 mmol/L

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Sampling Method:
Type of Study: Observational study
Study design: Cross sectional
Study setting: Study was conducted in MICU of AGMC & GBP Hospital.
Study duration: 1 year(1st January 2021-31stDecember 2021)
Sample size: 532
Sampling method: Simple random sampling (by lottery method)

II. RESULTS:

Although most cases of acid base derangement are mild and self limiting, some cases where it occurs quickly can lead to significant multi organ consequences [11]. The various disorders detected among the study participants are mentioned below.

Acid –base disorder	Number of patients	Frequency
Metabolic Acidosis	241	45.15%
Metabolic Alkalosis	191	36.03%
Respiratory Acidosis	141	26.62%
Respiratory Alkalosis	265	49.76%

Blood PH: There are various buffer systems in the human body that maintain this blood pH(bicarbonate buffer, phosphate buffer,haemoglobin,proteins)[12].In this study 178 patients had acidic blood pH and 128 of them had alkaline blood pH.This indicates that acid base balance of the body is disrupted.

Metabolic Acidosis: Metabolic acidosis is a clinical disturbance characterized by a low arterial pH,reduced plasma bicarbonate concentration and compensatory hyperventilation[13].241(45.15%) of the patients were positive for this imbalance.It is caused due to renal dysfunctions,ketoacidosis,hyponatremia,hyperkalemia,diarrhea,etc.If not treated properly,it can lead to decreased cardiac functions,hypotension,altered mental function,impaired glucose tolerance etc[14].

Metabolic Alkalosis: Characterized by increased HCO3 (bicarbonate) concentration in extracellular space with compensatory increase in arterial Pco2.191 of the patients were positive for this imbalance.It is caused due to hypokalemia,vomiting,hypertension,hypercalcemia, cystic fibrosis **[15].** Needs prompt attention in early detection and treatment to avoid future ill-effects.

Respiratory Acidosis: It is an abnormal physiologic state which occurs when the blood level of dissolved CO2 ,and consequently of carbonic acid ,is elevated[16].141 patients were diagnosed with this disorder.It is caused due to depressed respiratory drive,as in trauma ,general anaesthesia,brain tumors,muscle dysfunction ,airway flow resistance ,chest wall stiffness,lung stiffness.[17]

Respiratory Alkalosis: It is a primary decrease in Pco2 due to an increase in respiratory rate and hyperventilation. 265 of the patients were diagnosed with this disorder.It is caused due to hyperventilation,pneumonia,asthma,heat exposure,laryngospasm,drowning,high altitude ,etc.

Mixed Disorders: Each of the above mentioned disorders may occur singly or as two or more simple acid base disorders.This is particularly obtained in the critically ill patients.

III. DISCUSSION:

Maintenance of acid-base homeostasis is a vital function of the living organism.Arterial blood gas sample gives information on oxygenation of blood through gas exchange in lungs,carbon dioxide elimination through lungs and acid base balance or imbalance in the ECF.Even a slightest deviation in any of the parameters can lead to potential damage to human body.From this study it was seen that a majority of the patients admitted to the ICU have either any one or more acid base balance disorders.So,early detection can initiate earliest best possible treatment.This can lead to a decline in the death toll and improve the life afterwards.

IV. CONCLUSION:

Arterial blood gas estimation is a very common investigation carried out in the ICU apart from other routine tests such as serum electrolytes,complete blood count,kidney function tests,liver function tests, and blood glucose level.This study confirms the fact that it is very much essential in diagnosis of acid base imbalance disorders and lung functioning.Thus it emphasizes that proper sample collection,analysis,reporting and prompt intervention to decrease the mortality of the patients.Also,availability of ABG monitoring at primary level can lead to better prognosis and medical help in cases requiring urgent medical attention.

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