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Research Article

**A CROSS-SECTIONAL STUDY TO ASSESS THE
ASSOCIATION OF VENOUS AND ARTERIAL BLOOD GASES
(PH, PCO₂ AND HCO₃) IN COPD PATIENTS**¹Khadija Aslam Bara, ²Dr. Aiesha Baloch, ³Aysha¹Shaikh Khalifa Bin Zayed Al Nahyan Medical And Dental College Lahore²Medical Officer, BHU Bhoel Aasal, Kasur³Punjab Medical College Faisalabad**Abstract:**

Objective: Body acid base balance can best be determined through the analysis of arterial blood gas. It is also an important assessment tool for acid base balance verification in the human body. COPD (Chronic Obstructive Pulmonary Disease) is a disease that limits the airflow that cannot be reversed and causes failure of the respiration process. Our aim of this particular research was to determine the association between venous and arterial blood gases in the COPD patients.

Material and Methods: The research is cross-sectional and it is completed in the Chest Medicine Department of Allied Hospital, Faisalabad (February 2017 to December 2017). A total of one hundred participants took part in the research. Every patient fulfilled the prescribed inclusion criteria. An informed consent was also secured before the commencement of research. Patients were drained for blood samples anaerobically from dorsal hand vein and radial artery with the help of two separate syringes. We analyzed the samples for pH, HCO₃ and PCO₂. Data analysis was made through SPSS software.

Results: The outcomes reflected a patient's mean age of (52.68 ± 10.51) years. There was a strong association between ABGs and VBGs as analyzed through pH, HCO₃ and PCO₂ which is $r = 0.913, 0.994$ and 0.999 respectively. A significant P-value was under 0.0001.

Conclusion: There was a strong association of VBGs and ABG's in COPD patients.

Corresponding author:**Khadija Aslam Bara,**Shaikh Khalifa Bin Zayed Al Nahyan Medical and Dental College,
Lahore

QR code



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INTRODUCTION:

Although, ABG's is a reliable and quick assessment tool but patients do show reluctance due to the pain factor that is experienced during the test. There are chances of injury to hemorrhage, vessel wall, distal extremity ischemia, thrombosis, aneurysm formation, nerve injury and infection [1]. There is a requirement of this time more than once and it is repeated repeatedly. There is alternative of the ABGs in the shape of VBG's, where the samples can be easily drained from peripheral vein; it is less complicated and easy method. Patients also feel comfortable with this test. There are numerous research references about the measurement of pH, HCO₃ and PCO₂ in venous blood sample and it associates with the samples of arterial blood [2, 3]. Elborn conducted a research on COPD patients, which reflected an association of CO₂ tension in venous and arterial blood samples [4]. Rees studied chronic lung disease in the patients and reported PH & PCO₂ have an association in the samples of VBG's and ABG's [5].

Specifically, the arterial blood gases also give a direct estimation of pH, PO₂, PCO₂ and HCO₃. These outcomes can also be used for the further measurement of base excess, Alveolar-arterial gradient and anion gap in an indirect way. Important information can be taken about respiratory and metabolic functions in the body. This information can be further helpful in the monitoring, diagnosis and treatment of the patients [6].

COPD is among four lethal diseases of world; which also causes mortality and morbidity [7]. Chronic inflammation which a patient experiences limits the flow of air. It is not completely reversible due to mixture of parenchymal damage and small airway disease. These variations also cause acidosis and respiratory failure [8].

Body acid base balance can best be determined through the analysis of arterial blood gas. It is also an important assessment tool for acid base balance verification in the human body. COPD (Chronic Obstructive Pulmonary Disease) is a disease that limit the airflow that cannot be reversed and also causes failure of the respiration process. Our aim of this particular research was to determine the association between venous and arterial blood gases in the COPD patients.

PATIENTS AND METHODS:

The research is cross-sectional and it is completed in the Chest Medicine Department of Allied Hospital, Faisalabad (February 2017 to December 2017). A total of one hundred participants took part in the

research. Every patient fulfilled the prescribed inclusion criteria. An informed consent was also secured before the commencement of research. Patients were drained for blood samples anaerobically from dorsal hand vein and radial artery with the help of two separate syringes. We analyzed the samples for pH, HCO₃ and PCO₂. The age bracket of participants extended from 30 – 70 years. Both genders were included in the research who were diagnosed COPD in the previous six months' period. We did not include Grade – IV (MMRC), history of bleeding diathesis and COPD clinical assessment in the last six weeks.

COPD is characterized a disease which represents a limited airflow. This limited airflow is measured through spirometer (FEV – I / FVC < 70 %). Levels of pH, HCO₃ and CO₂ is measured for ABGs in arterial blood. We measured it in the patients when they presented themselves for assessment. Whereas, the measurement of VBGs was taken as the levels of pH, HCO₃ and CO₂ in venous blood during presentation of patients.

All blood samples were assessed in the time duration of fifteen minutes. Sample reports were also evaluated for the levels of pH, HCO₃ and CO₂. It was observed for venous and arterial samples of blood. We documented all information on a pre-designed Performa.

Data analysis made through SPSS software. The values of Mean and SD taken for COPD duration, Age, venous and arterial level of gases (pH, HCO₃ and CO₂). Calculation of Pearson's correlation also carried out for pH, HCO₃ and CO₂ between VBGs and ABGs (P-value < 0.05).

RESULTS:

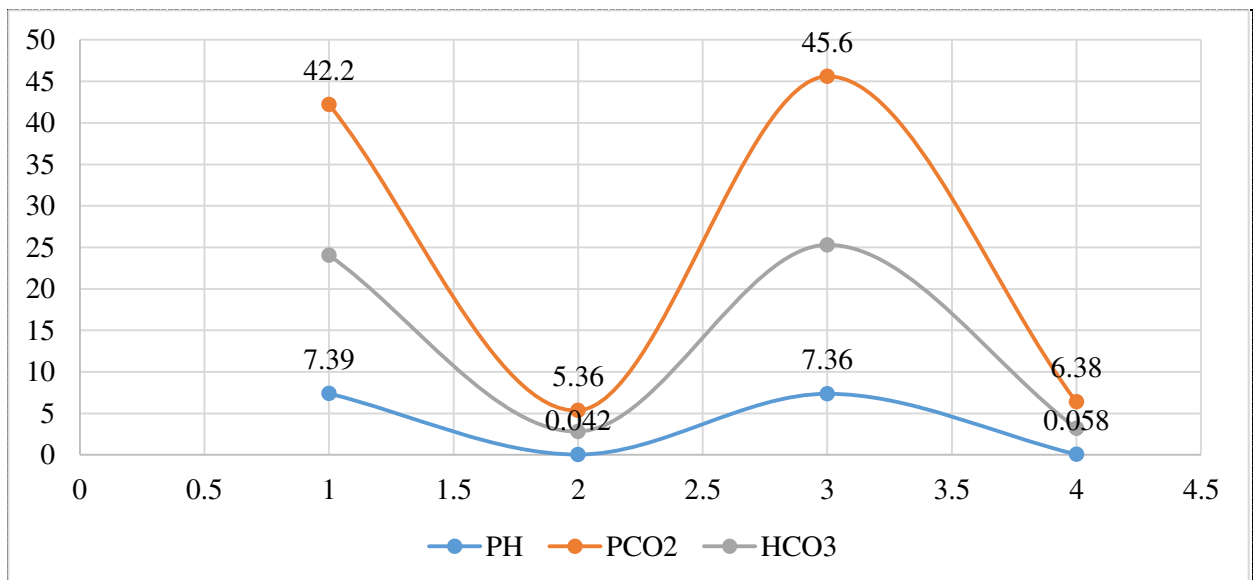
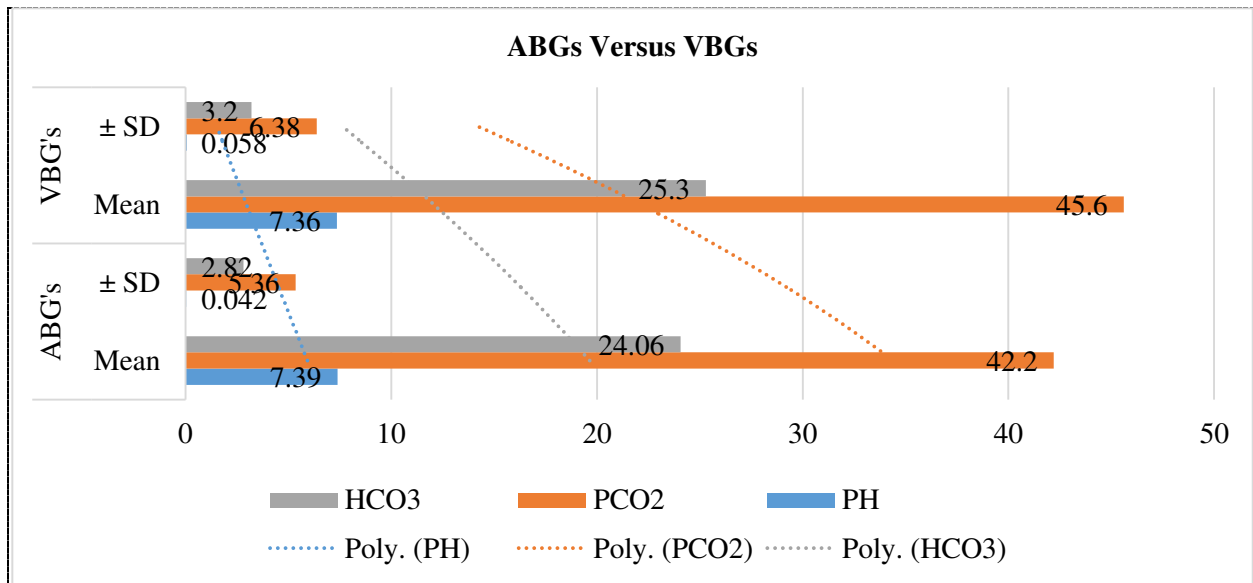
Research sample included a total one hundred patients with mean age as (52.68 ± 10.51) years. Male to female proportion was such that we included 79 males and 21 females (3.8:1). COPD mean duration was reported as (7.31 ± 4.49) months. This duration also taken as minimum and maximum respectively as seven and fifteen months. Value of mean pH in ABGs and VBGs was respectively (7.39 ± 0.042) and (7.36 ± 0.058) (P < 0.001). Value of mean PCO₂ in ABG's and VBGs respectively was (42.20 ± 5.36) and (47.60 ± 6.38) (P < 0.001). Whereas, mean value of HCO₃ among ABG's and VBGs was respectively (24.06 ± 2.82) and (25.30 ± 3.20) (P < 0.001).

There was a positive association between VBGs and ABGs (pH, PaCO₂ and HCO₃) as reported in the outcomes of our research with significant p-value as

<0.0001 and r-value as 0.913, 0.999 and 0.994.

Table 1: Mean values of ABG's and VBG's

	ABG's		VBG's		P-Value
	Mean	± SD	Mean	± SD	
PH	7.39	0.042	7.36	0.058	< 0.001
PCO2	42.2	5.36	45.6	6.38	
HCO3	24.06	2.82	25.3	3.2	



DISCUSSION:

There is a regular need of blood gas analysis in critical and emergency patients in order to diagnose respiratory and metabolic disorders. COPD is

considered among global common diseases with an increased prevalence all over the world. Worldwide mortality and morbidity is also associated to COPD [10]. There was a positive association between VBGs

and ABGs (pH, PaCO₂ and HCO₃) as reported in the outcomes of our research with significant p-value as <0.0001 and r-value as 0.913, 0.999 and 0.994. We included stable patients of COPD in our research in order to determine HCO₃, PCO₂ and pH between VBGs and ABGs among COPD patients.

According to McCanny P, the arterial HCO₃ and pH are strongly associated with venous HCO₃ and pH with a significant P-value of (< 0.001) [11]. They also reported that venous sensitivity of CO₂ is one hundred percent for the detection of arterial hypercarbia in the presence of cutoff value of CO₂ as (45 mmHg) [11].

According to Elborn J, there is a strong association between arterial and venous pH, HCO₃ in COPD cases with significant P-value as (< 0.001) [4]. Whereas, according to Novovic M et al, COPD acute exacerbation cases had a significant relation between venous and arterial HCO₃, PCO₃ and pH with a significant P-value of (< 0.001) [12]. These outcomes can be compared with the outcomes of our research. Razi is of the view that PCO₂ and pH values have a better association in the samples of VBGs and ABGs with significant P-value of (< 0.001) [13]. Kim carried out a research on 34 cases hospitalized in ICU and reported significant relation venous and arterial HCO₃ (P < 0.0001) [9].

McKeever TM and Kelly also reported same outcomes in their research studies as they focused COPD exacerbation and acute respiratory patients [14, 15]. Trager reported an association between venous and arterial samples of blood in HCO₃, PCO₂ and pH that is comparable with the outcomes of our research (P < 0.001) [16].

CONCLUSION:

Outcomes reflect that HCO₃, PCO₂ and pH in the samples of venous and arterial blood have a strong association to each other; so, VBGs can replace ABGs in order to reduce associated arterial puncture complications. It is learnt through research outcomes that there was a strong association of VBGs and ABG's in COPD patients. Large-scale studies can be helpful for further probe in the subject.

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