A Pediatric Case Study of Blood Gases

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General body health is greatly dependant on the proportions of the blood gases. The important blood gases in the body are oxygen and carbon dioxide (CO_2). CO2 is a by-product of the body's metabolic processes and is therefore transported in the blood by the red blood cells to the sites of excretion, lungs (Hennessey & Japp, 2016). The proportion of dissolved CO2 in the blood determines the pH or rather acidity of the blood. Most metabolic processes of the body require a neutral pH for the proper functioning of the cells and the cell organelles. An imbalance in the acidity of the blood can, therefore, be catastrophic to a person. Both oxygen and carbon dioxide are transported throughout the body by the red blood cells.

Du to such importance in the body, these proportions are therefore critical in acute care cases to monitor the effectiveness of a therapy or therapies and to determine the acidity of the blood. Blood gas analysis, therefore, entails the examination of the proportions of both of these gases in the blood (Hennessey & Japp, 2016). The medical complications that can be diagnosed from this test include kidney and heart failure, uncontrolled diabetes, poisoning(chemical), overdose in cases of drugs, hemorrhage, and shock (Hennessey & Japp, 2016). A blood test might be recommended in cases of the above conditions. A blood sample is taken from the artery. The precise amounts of the two blood gases are then tested from the sample. This test, however, investigates the number of dissolved gases in the blood only and not the total amount of oxygen, does not include the gases bound in the hemoglobin.

This paper shall discuss a case report of a pediatric patient with blood gases complication. During the case study, the HiPPA rules were observed (Tovino, 2016). Firstly, the permission to use the patient's data was acquired (Tovino, 2016). The patients' name was not used in the case study to protect his privacy (Tovino, 2016). The date of admission was also not indicated in the study to ensure the privacy of the patient was maintained (Tovino, 2016). The gender of the infant was, however, maintained. The device that stored the original information of the patient was locked to limit access to non-authorised personnel (Tovino, 2016).

Case Report

A 2-year-old boy who was left unsupervised by his parents in a family garage lying close to an open bottle of antifreeze. He was minimally responsive during admission in the emergency department. He exhibited difficulty in breathing and shortness of breath. He also appeared confused. A laboratory test was done to him to determine the cause of his condition. The laboratory test was reported in the table below.

Parameters	Laboratory data	Reference level.
Haemoglobin (g/dL)	13.9	12-16
Blood pH ()	6.83	7.35- 7.45
pCO_2 (mmHg)	40	38-42
Sodium(mEq/L)	142	135-142
Chloride(mEq/L)	106	
Bicarbonate (mEq/L)	6	22-28

Initial diagnosis of the physical examination suggested acid-base disorder. On further testing, the boy was found to be suffering from metabolic acidosis and respiratory acidosis. The laboratory test indicated reduced bicarbonate levels and very low pH levels indicated a strong suggestion of metabolic acidosis. Normal respiratory ventilation was increased. This was done in an attempt to reduce the CO2 in the body. This process leads to the generation of compensatory alkalosis to move the pH up towards the required value. pCO2 values were normal and indicated the normal values for a healthy patient. In this context, however, the value was considered abnormal. Absence of compensation from severe academia might result in respiratory academia. During treatment of the patient, the winter formula is used to determine the completeness of compensation. The winter formula is

$$pCO2= (1.5\times[HCO_3^-]) + 8 \pm 2mmHg$$

The patient's bicarbonate is very low this might have been attained by the addition of acid or base removal. Bicarbonate electronegativity if often recuperated by chloride retention. The twofold aim of respiration is to transfer oxygen to present in the air that has been inspired to venous blood via the alveoli of the lung and elimination of carbon dioxide from the blood in the veins via expiration. The oxygen is carried in the blood more efficiently by the hemoglobin at a capacity of approximately 3.0- 200mL per liter of oxygen in the blood (Davidson, 2019). About only 1-2 % of oxygen is often dissolved in the blood (Theodore, Manaker, & Hollingsworth, 2018). This, therefore, mean that approximately 98-99% of oxygen is transported via hemoglobin.

Blood gases can result in a variety of complications when an imbalance exists. These conditions range in severity and treatment (Hennessey & Japp, 2016). The complications that arise as a result of blood gases imbalance are metabolic acidosis and alkalosis and respiratory acidosis and alkalosis (Davidson, 2019). Metabolic acidosis and respiratory alkalosis are associated with low pressure of carbon dioxide while metabolic alkalosis and respiratory acidosis are associated with high pCO2 (Davidson, 2019). It is, however, important to note that the blood oxygen levels are affected by longitudes and could be lower if one is in an area above sea level.

References

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