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Original Research

To determine cases of acid base disturbances admitted in medicine ward

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ABSTRACT

Background: There are many different buffer systems in the body, but the key one for understanding most acid-base disorders is the bicarbonate system present in the extracellular fluid. The present study was conducted to determine cases of acid base disturbances admitted in medicine ward. **Materials & methods**: This study was conducted on 75 cases of acid base disturbances of both genders. A thorough examination was performed in all patients. Arterial blood gases and plasma electrolytes (sodium, potassium and chloride) was estimated. Cases of acid base disturbances were also evaluated. **Results:** Out of 75 patients, males were 48 and females were 27. Cases were of respiratory acidosis in 23, metabolic acidosis in 30, respiratory alkalosis in 12 and metabolic alkalosis in10. The difference was significant (P<0.05). The mean sodium level was 131.2 mmol/L, potassium was 6.2 mmol/L, chloride was 112.7 mmol/L, bicarbonate was 5.2 mmol/L, lactate was 0.5 mmol/L and pH was 6.2. **Conclusion:** Authors found that common disturbances in patients were metabolic acidosis followed by respiratory acidosis, respiratory alkalosis and metabolic alkalosis.

Key words: Acid base, Respiratory acidosis, Metabolic alkalosis

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Introduction

Like temperature, blood pressure, osmolality and many other physiological parameters, the human body strives to keep its acid-base balance within tightly controlled limits. A buffer is a solution that resists a change in pH.[1] There are many different buffer systems in the body, but the key one for understanding most acid-base disorders is the bicarbonate system present in the extracellular fluid. Like any buffer, this system comprises a weak acid (in this case carbonic acid, H_2 CO_3 and its conjugate base (the bicarbonate ion, HCO_3-), which exist in a dynamic equilibrium. Acid-base disorders are classified according to whether there is acidosis or alkalosis present, and whether the primary problem is metabolic or respiratory. Bear in mind that there may be more than one problem occurring simultaneously and that the body may be compensating for the derangement.[2]

Metabolic acidosis can arise when the concentration of organic anions (e.g. lactate or β-hydroxybutyrate) increases, when there is a loss of sodium bicarbonate (NaHCO3; e.g. due to diarrhea or renal tubular acidosis) or there is a gain of exogenous anions (e.g. iatrogenic acidosis or poisonings).[3] Metabolic alkaloses occur when there is loss of strong anions in excess of strong cations (e.g. vomiting and diuretics), or, rarely, by administration of strong cations in excess of strong anions (e.g. transfusion of large volumes of banked blood containing sodium citrate).[4] The present study was conducted to determine cases of acid base disturbances admitted in medicine ward.

Materials & Methods

This study was conducted in the department of Internal Medicine. It comprised of 75 cases of acid base disturbances of both genders. The study protocol was

approved from institutional ethical committee. All patients or their relatives were informed regarding the study and written consent was obtained.
Patient information such as name, age, sex etc. was recorded. A thorough examination was performed in all patients. Arterial blood gases and plasma electrolytes (sodium, potassium and chloride) was estimated. Cases of acid base disturbances were also evaluated. Results thus obtained were tabulated and subjected to statistical analysis using chi square test. P value<0.05 was considered significant.

Results

Table I Distribution of patients

Total- 75		
Gender	**Males**	**Females**
Number	48	27

Table I, graph I shows that out of 75 patients, males were 48 and females were 27.

Graph I Distribution of patients

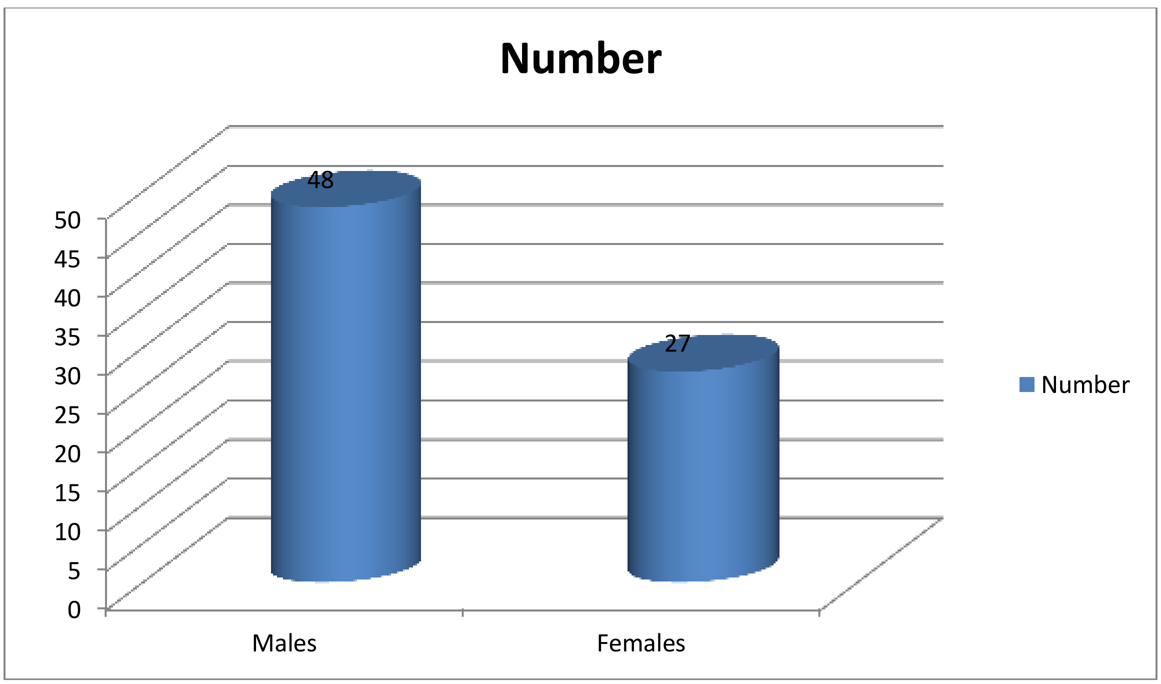


Table II Type of acid base electrolyte disturbances

Disturbances	Number	P value
Respiratory acidosis	23	0.05
Metabolic acidosis	30	
Respiratory alkalosis	12	
Metabolic alkalosis	10	

Table II, graph II shows that cases were of respiratory acidosis in 23, metabolic acidosis in 30, respiratory alkalosis in 12 and metabolic alkalosis in10. The difference was significant (P<0.05).

Graph II Type of acid base electrolyte disturbances

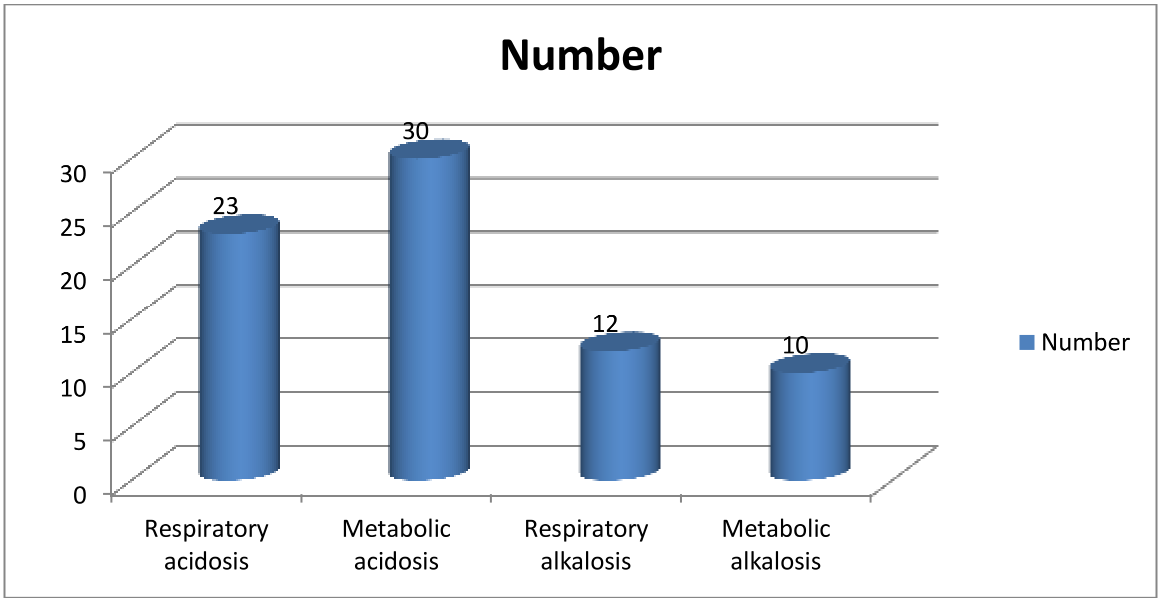
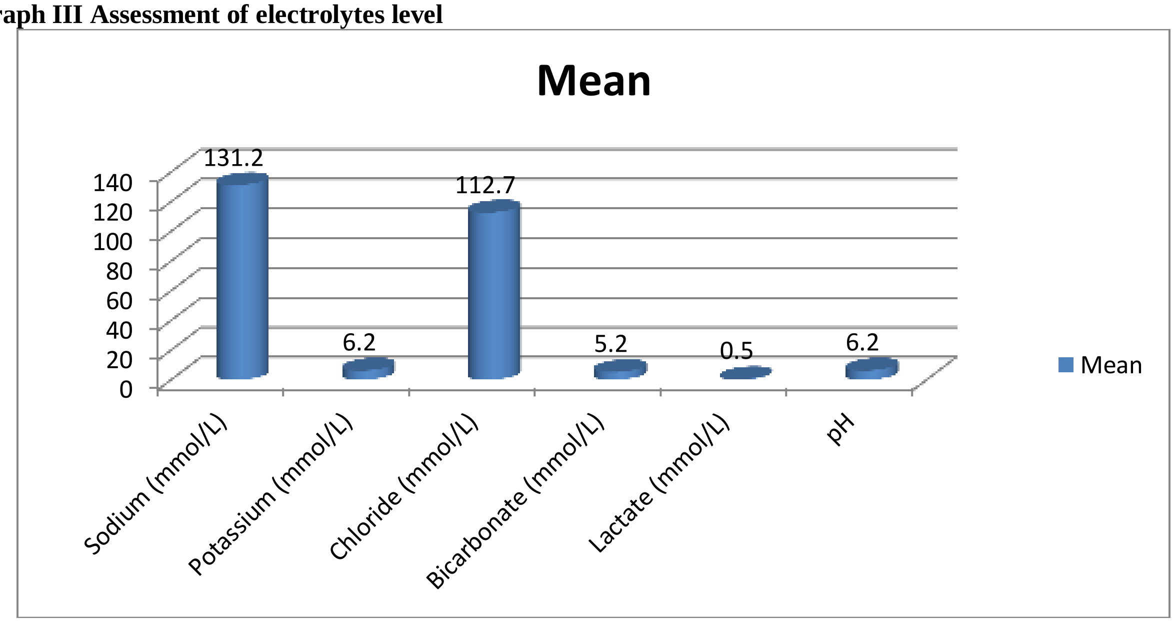


Table III Assessment of electrolytes level

Electrolytes	Mean
Sodium (mmol/L)	131.2
Potassium (mmol/L)	6.2
Chloride (mmol/L)	112.7
Bicarbonate (mmol/L)	5.2
Lactate (mmol/L)	0.5
pH	6.2

Table III, graph III shows that mean sodium level was 131.2 mmol/L, potassium was 6.2 mmol/L, chloride was 112.7 mmol/L, bicarbonate was 5.2 mmol/L, lactate was 0.5 mmol/L and pH was 6.2.

Graph III Assessment of electrolytes level



Discussion

The modern intensive care unit is a place where complex acid– base and electrolyte disorders are common.[5] Although it is generally believed that most cases of acid–base derangement are mild and self-limiting, extremes of blood pH in either direction, especially when happening quickly, can have significant multiorgan consequences. Advances in evaluating acid–base balance have helped in understanding the impact of fluids in the critically ill patients.[6]

The acidity of a solution is governed by the concentration of hydrogen ions (H+) present. If a disease process results in an increase in the concentration of hydrogen ions, one would expect the body to become more acidic.[7] However, the bicarbonate buffer system resists this change because the excess of hydrogen ions drives the reaction to the right: hydrogen ions react with and "consume" bicarbonate ions and any change in acidity is minimized. This process requires an adequate supply of bicarbonate ions. The kidneys are vital organs in acid-base balance as they can both generate "new" bicarbonate buffer and reclaim filtered bicarbonate in the proximal tubules.[8] The present study was conducted to determine cases of acid base disturbances admitted in medicine ward.

In present study, out of 75 patients, males were 48 and females were 27. Palange et al[9] in their study established the overall frequency distribution and combination of acid-base and electrolyte disturbances as they occur in a general population requiring hospital care, and studied arterial blood gases and plasma electrolytes (sodium, potassium and chloride) in 110 consecutive patients (age = 68 +/- 8 SE; 64 M, 46 F) at the time of admission to a general medical ward. Disturbances were defined on the basis of the standard pH/pCO2 plot and the normal (mean +/- 2 SD) electrolyte range for our laboratory. Sixty-two patients (56%) showed a disturbance in acid base equilibrium: acidosis: respiratory 16, metabolic 6; alkalosis: respiratory 26, metabolic 10; in 4/62 the acid base disturbance was mixed. In 47 of the 62 patients, the acid base imbalance were associated with electrolyte derangements (low PNa+, 12; high PNa+, 1; low PK+, 10; high pK+, 7; increased anion gap, 17). Electrolyte disturbances with a normal acid base status were detected in only 2 patients. Of significance, in 7 of the 58 individuals considered to have a "pure" acid base disturbance on the basis of the pH/pCO2 plot (5 respiratory alkalosis; 1 respiratory acidosis; 1 metabolic alkalosis), a widened anion gap revealed that the acid-base change was mixed, i.e. there was a concomitant component of metabolic acidosis. Thus, the total number of mixed acid base equilibrium disorders were eleven. This study emphasizes the frequent incidence of acid base and electrolyte disorders, very often in combination, among unselected adult patients admitted to a general medical ward.

We found that cases were of respiratory acidosis in 23, metabolic acidosis in 30, respiratory alkalosis in 12 and metabolic alkalosis in10. The mean sodium level was 131.2 mmol/L, potassium was 6.2 mmol/L, chloride was 112.7 mmol/L, bicarbonate was 5.2 mmol/L, lactate was 0.5 mmol/L and pH was 6.2.

Most acid-base disturbances resulted from disease or damage to organs (kidney, lungs, brain) whose normal function is necessary for acid-base homeostasis, disease which causes abnormally increased production of metabolic acids such that homeostatic mechanisms are overwhelmed and medical intervention (e.g. mechanical ventilation, some drugs). Arterial blood gases are the blood test used to identify and monitor acid-base disturbances. Three parameters measured during blood gas analysis, arterial blood pH (pH), partial pressure of carbon dioxide in arterial blood (pCO_2(a)) and concentration of bicarbonate (HCO_3^-) are of crucial importance.[10] Results of these three allow classification of acid-base disturbance to one of four etiological categories such as respiratory acidosis, respiratory alkalosis, metabolic acidosis and metabolic alkalosis.

Conclusion

Authors found that common disturbances in patients were metabolic acidosis followed by respiratory acidosis, respiratory alkalosis and metabolic alkalosis.

References

1. Kraut JA, Nagami GT. The anion gap in the evaluation of acid-base disorders: what are its limitations and can its effectiveness be improved. Clin J Am Soc Nephrol 2013; 8: 2018–2024
2. Corey HE. Stewart and beyond: new models of acid-base balance. Kidney Int 2003; 64: 777–787.
3. Kellum JA, Kramer DJ, Pinsky MR. Strong ion gap: a methodology for exploring unexplained anions. J Crit Care 1995; 10: 51–55.
4. Gunnerson KJ, Srisawat N, Kellum JA. Is there a difference between strong ion gap in healthy volunteers and intensive care unit patients? J Crit Care 2010; 25: 520–524.
5. Mizock BA, Falk JL. Lactic acidosis in critical illness. Crit Care Med 1992; 20: 80–93
6. Weil MH, Afifi AA. Experimental and clinical studies on lactate and pyruvate as indicators of the severity of acute circulatory failure (shock). Circulation 1970; 41: 989–1001
7. Mikkelsen ME, Miltiades AN, Gaieski DF et al. Serum lactate is associated with mortality in severe sepsis independent of organ failure and shock. Crit Care Med 2009; 37: 1670–1677
8. Levy B. Lactate and shock state: the metabolic view. Curr Opin Crit Care 2006; 12: 315–321.
9. Palange P, Carlone S, Galassetti P, Felli A, Serra P. Incidence of acid-base and electrolyte disturbances

in a general hospital: a study of 110 consecutive admissions. Recenti progressi in medicina. 1990 Dec;81(12):788-91.

10. Durward A, Murdoch I. Understanding acid–base balance. Current Paediatrics. 2003 Dec 1;13(7):513-9.