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ACID - BASE IMBALANCE IN MALARIA- A SINGLE CENTRE EXPERIENCE

General Medicine

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ABSTRACT

Introduction: Acid base imbalance is a common complication in severe infectious disease including falciparum malaria. The aim of this study was to evaluate the acid base imbalance in malaria.

Material and Methods: This descriptive observational study was carried out from March 2015 to Aug 2016 in department of medicine Gandhi medical college Bhopal. All malaria positive cases admitted in medical ward and who were willing to participate were enrolled the study and those patient who received i/v fluid before admission and associated with co morbid condition like copd acute exacerbation , diabetic ketoacidosis, chronic renal failure etc. Were excluded from the study. ABG analysis was done by ESCHWELER COMBISYS II.

Results: Out of 100 malaria positive cases [P. Vivax(39), P. Falciparum(46), Mixed infection(15)] Metabolic acidosis and respiratory acidosis were observed as 17%, 3%, respectively and P. Falciparum had most common acid base Imbalance [Metabolic.acidosis(12/46), Metabolic alkalosis(3/46), Respiratory acidosis(1/46)].

Conclusion: This study was aimed to assess acid base imbalance, associated with malaria .Most commonly observed acid base imbalance was metabolic acidosis which had a very high correlation with falciparum malaria, other acid base imbalances common in decreasing order were metabolic alkalosis and respiratory acidosis.

KEYWORDS

Malaria, acid-base imbalance, metabolic acidosis, metabolic alkalosis, respiratory acidosis.

Introduction

Malaria is life threatening disease, with nearly half of the world's population being vulnerable to this infection. Four species of Plasmodium cause malaria in humans. These are P. falciparum, P. vivax, P .malariae and P. Ovale. P.falciparum is responsible for most of the deaths and most of the severe complications which result from malaria. [5] which include cerebral malaria, anemia and renal failure. [6]]. It is observed that malaria is often associated with abnormalities of fluid, electrolytes (Na+ and K+) and acid-base balance. These can occur in any type of malaria but are more common in severe falciparum malaria, extremes of age and in patients with high degree of fever and vomiting.[8]. The pathophysiology of the hypernatremia in malaria remains unclear,. The aim of this study was to determine the prevalence of acid base imbalances and their association with the severity of malaria which was caused by various Plasmodium species

Material and Methods

The present study conducted in the department of medicine, Hamidia hospital and Gandhi Medical College Bhopal from March 2015 to September 2016.

Objectives

1. To Study Acid base imbalance in malaria.

Inclusion Criteria

1. All Malaria positive cases admitted in medical ward.
2. Who were willing to participate were enrolled in the study.

Exclusion Criteria

1. Patient referred from hospitals after giving treatment like I/V fluids.
2. Other associated co morbid conditions like COPD acute exacerbation, DKA, CRF, etc.

The following data were included for analysis:

1. All malaria Positive Patients admitted in Medical ward after exclusion.
2. Question regarding symptoms like fever, onset, duration, pattern, associated with symptoms were asked.
3. Detailed history regarding other systemic diseases was taken.
4. These enrolled patients were examine thoroughly.
5. Routine investigations including PS for MP, degree of parasitemia, malaria antigen test, Serum sodium, potassium and ABG were performed.

A. Blood Analysis

1. Blood haemoglobin was measured by sahli's haemoglobinometer
2. Blood urea was measured by nesslers method.
3. Serum creatinine was estimated by picric acid method.
4. Serum sodium and potassium Venous blood samples (10ml) OF malaria positive patient were collected into sample tube without the addition of anticoagulant. The blood samples were centrifuged at 1500 rpm for 20 minutes; the serum was separated and immediately used for the determination of the electrolytes, sodium, potassium was analyzed using flame emission spectrophotometric method.

B. ABG Analysis

1.Using ESCHWELER COMBISYS – II (Microprocessor -controlled Automatic Analysis system for quantitative measurements and calculation) PH, Electrolytes and Blood gas status were measured - (Na, K, Cl, Hco3, Po2, Pco2, Ph. BE.) Normal blood gas parameters and electrolyte levels are:

PH = 7.35 – 7.45, PaO2 = 80 – 100 mmHg, PaCO2 = 35 – 45 mmHg, HCO3 = 24 ± 2 mEq/L, BE = 0 ± 2 mEq/L, S. Na+ = 135-145 mEq/L, S. K+ = 3.5 – 5.0 mEq/L, S. Cl- 102-109 mEq/L

C. Malaria parasite detection method

1. The malaria parasite density determines by examine a thick blood film stained by the Giemsa stain.
2. Detection in patient samples of malaria parasite antigens such as histadine rich protein II (HRP-II) plasmodium lactate dehydrogenate (pLDH) performed by rapid tests based on immunechromatographic methods.

Other investigation

1. Ultrasonography:-USG abdomen was done to see size of kidney, Renal Parenchymal Disease etc.
2. CT HEAD:- when needed

Results

Table 1 Showing Distribution of Acid Base Imbalance Among Cases of Malarial Fever

Acid Base Imbalance	P. vivax	P. falciparum	Mixed	Total	P value	Mean	S.D.
Metabolic acidosis	2	12	3	17	0.07	.2	.50755
Metabolic alkalosis	0	3	0	3	0	.03	1.732051
Respiratory Asidosis	0	1	1	2	0	.02	

Table 2 Showing Correlation of Degree of Metabolic Acidosis with Malarial Fever

Degree of metabolic acidosis	p. vivax	P. falciparum	Mixed	Total	Mean	S.D	P value
Mild (ph 7.25-7-34)	**2**	**4**	**1**	**7**	**.003**	0.8146	0.0354
Moderate (ph 7.1-7.24	**0**	**6**	**3**	**9**	**.009**	2.5098	**0**
Severe (pH less than 7.1)	**0**	**2**	**1**	**3**	**.003**	0.08366	**0**
Total	**2**	**12**	**5**	**19**			

Discussion

Acid base imbalance

In current study, 20% patients were having metabolic acidosis of which mild metabolic acidosis (ph- 7.25-.7.34) found in 8% of cases and moderate metabolic acidosis (ph- 7.10-7.24) found in 9% of patients and severe (ph <7.1) metabolic acidosis found in 3% patient. Maximum no. of metabolic acidosis was found in severe plasmodium falciparum malaria (45.45%). Out of 3 patients of severe metabolic acidosis, 2 were associated with severe plasmodium falciparum and 1 is associated with mixed severe infection. And all cases are associated with the hyperkalemia and ARF. This contributes to the cause of metabolic acidosis. The association of mild metabolic acidosis with malarial infection was significant (p value- 0.03) In current study it was also noted that 3 patients (3%) patient had metabolic alkalosis most probably due to persistent vomiting and 2 patient (2%) had respiratory acidosis might be due to development of ARDS or Pulmonary edema. This study is further supported by Maitland K (2005) [13], Reported metabolic acidosis in 17% of patients with severe falciparum malaria and 57% of patients with ARF with metabolic acidosis.Das et al (2014) [11], 12 patients (20%) had metabolic acidosis Among the patients of severe falciparum malaria with ARF, 9 patients (50%) had metabolic acidosis and compensatory respiratory alkalosis. As per this study, Increased incidence of acidosis in this study may be due to delayed referral, improper correction of fluid status, increased incidence of bacterial septicemia and judicious use of vasopressor. He also reported 3 patients (5.0%) with metabolic alkalosis and 2 patients (3.3%) had respiratory acidosis. 23 patients (57.5%) out of 40 severe falciparum malaria had normal acid base parameter. Among the patients of severe falciparum malaria with ARF. 3 patients had metabolic alkalosis reported in their study and probably due to persistent vomiting. 2 had respiratory acidosis and this might be due to development of ARDS and/or pulmonary edema. In the current study depits ARF in a total of 20(20%) patients. Out of which 16(34.78%) patients were plasmodium falciparum and 4 patient (26.66%) were mixed infection whereas no patient of p. vivax was associated with ARF. The higher incidence of ARF in plasmodium falciparum was attributed to intravascular hemolysis, oliguria, and ATN. Incidence of ARF was reported to be 30% by Das et al (2014) [13] and the cause of ARF was due to ATN in their study. In current study 6 patients were having ARF without hyperkalemia and total no of 14 patient (14%) had both ARF and Metabolic acidosis. Thus the present study very well establishes electrolyte imbalance namely hyperkalemia, hypokalemia, hypernatremia and acid base imbalance mainly metabolic acidosis and ARF in patients of malarial fever, and there is positive relation of severity and complication associated with p. falciparum and less with p. vivax, and the study of mixed infection (p. vivax and p. falciparum) provides an important reason to investigate complication associated with malaria.

Conclusion

100 patients of diagnosed malarial fever, pl.falciparum, pl.vivax, and mixed infection (pl.falciparum+ pl.vivax) admitted in hamidia hospital over period of 1 year included in study had undergone laboratory tests The mean age of the patients were 32.47 with age wise distribution from 13-75 years . Most cases were of pl. falciparum (46%) followed by pl..vivax (39%) and mixed infections were (15%).

A higher proportion of cases observed were that of uncomplicated malaria (72%) in contrast to those having severe malaria (28%).In those having severe malaria the most common cause of severity was again due to pl.falciparum followed by mixed infection. The most common complication of severe malaria was acute renal failure (20% cases).And this was associated with hyperkalemia. Next common complication seen was metabolic acidosis, these complications were seen to be most commonly associated with falciparum infections. Among the acid base imbalances the most commonly observed was metabolic acidosis which had a very high correlation with falciparum malaria, other acid base imbalances common in decreasing order were metabolic alkalosis and respiratory acidosis respectively, the cause of metabolic acidosis was mostly due to acute renal failure.

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