

Editorial

The Role of Thiamine in the Management of Refractory Hypoxemia, Refractory Hypotension and Shock in Critically Ill Covid-19 Patients

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Dear editor, we would like to share you our experience regarding the management of refractory hypoxemia, refractory hypotension and shock in critically ill Covid-19 patients.

We believe that, one of the main causes of the deterioration of Covid-19 patients could be malnutrition with vitamins depletion from the body. Many of these patients presented with loss of appetite and taste accompanied with poor oral intake for several days or even weeks. This will deplete the body resources from Macro-& micro-nutrients especially thiamine, which can be deficient in 3-14 days particularly if the patient is already malnourished, taking anti-thiamine products (as coffee, tea), receiving Total Parenteral Nutrition (TPN), on Continuous Renal Replacement Therapy (CRRT), or had a bariatric surgery. From the daily practice, we have noticed that refractory hypoxemia, refractory hypotension, or septic shock is exaggerated by Thiamine deficiency.

In the first wave of Covid-19 pandemic era, many patients were admitted in the ICUs with severe respiratory symptoms, deteriorated, became severely hypoxemic, intubated and maximally supported with oxygen; the inspired oxygen fraction (FiO₂) was 100% for several days, diagnosed as severe stages of ARDS, ultimately, these patients passed away. Our observations have been emphasized when we admitted to our ICU a 33 years old patient, with Body Mass Index (BMI) of 58 who remained severely hypoxemic (FiO₂ 100%) for about 9 days. We used all the means and resources to improve his oxygenation including Nitric oxide but we were unsuccessful. The process of deterioration started by developing acute renal failure and treated with CRRT. Hemodynamically remained stable with 0.15 mcg/Kg/min of norepinephrine in the prone position 18 hours a day.

As just a trial to support his cardiovascular system, we administered 200 mg of thiamine intravenously. Luckily, 5 hours later, the FiO₂ has declined from 100% to 95%. Then, after about 9 hours, the FiO₂ was improved to 70%. After two weeks the patient transferred to the ward with 4 liters/min. oxygen provided by a nasal canula.

Thiamine [according to the Multi-Modal Hospital Treatment Protocol (MATH+)], is given to optimize cellular oxygen utilization and energy consumption, protecting the heart, brain and immune system [1]. Thiamine is working as carbonic anhydrase inhibitor, preventing high altitude sickness and pulmonary oedema and subsequently limit hypoxia and increase oxygen levels [2]. Hypoxia and dyspnea can be triggered by inducible intrapulmonary arteriovenous shunt in patients with thiamine deficiency [3].

In the beginning of Covid-19 era, we gave thiamine only to selected patients with refractory hypotension and severe hypoxemia. The (EVMS Medical Group) protocol is released in Sept. 28th, 2020 which advocated the MATH+ for Covid-19 patients [T stands for thiamine]. In this protocol thiamine is considered as anti-cytokine agent (Damping the cytokine storm). Based on our observations in covid patients, we believe that thiamine is more effective as anti-cytokine than Tocilizumab. Therefore, we have started prescribing thiamine & multi-vitamin with trace elements to every covid 19 patient admitted in the ICU. Our protocol was to administer 200 mg of thiamine IV, BID. Thereafter, we noticed clearly the better outcome and the reduction of the mortality rate. The ICU length of stay, the number of intubated and mechanically ventilated patients, and the sudden death events due to Cytokine storms were substantially reduced. Additionally, we treated many patients successfully from refractory septic shock with thiamine administration. These patients were maximally supported with vasopressors, antibiotics and received hydrocortisone 100 mg stat iv, then 50 mg 4 times per day for 3 days [4].

Considering the background of our thiamine use, we started using it in some Libyan ICUs in 2004. We observed that thiamine improved the neurological and cognitive activity of critically ill patients after cessation of sedation. Since then, we prescribed it to all critically ill patients. Surprisingly, we noticed improvement in the hemodynamics of the critically ill patients as well. Recently, the experimental studies suggested that thiamine is a very safe drug even at very high doses and has an anti-cytokine effect [5].

Our ICU patients were checked daily for IL6, Ferritin, D-Dimer, LDH, CRP, and lactate. ABG analysis is checked many times a day. If these parameters were trending up, we gave an extra dose of thiamine.

Patients on devices with filters, have to receive extradoses of thiamine. We assume the mortality rate would be high if thiamine is not added to those patients on CRRT and ECMO as this vitamin is filtered by these devices [6,7].

In conclusion, we believe that, supporting critically ill patients with intravenous thiamine will aid in treating refractory hypoxemia (after excluding the other causes of hypoxia) and will help in treating refractory hypotension and shock during cytokine storm.

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