SEVERE HYPERGLYCAEMIA DUE TO NEONATAL SEPSIS- A CASE REPORT

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ABSTRACT

Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteremia in the first month of life. The clinical signs of neonatal sepsis are neither specific nor uniform. Neonatal sepsis may present with fever, hypotonia, respiratory distress, apnea and hyperglycaemia. Untreated hyperglycemia unequivocally leads to undesirable clinical outcomes. Hyperglycemia is associated with increased mortality, which is significantly related to the duration of the elevated blood glucose. The constant risk that hyperglycaemia presents must be borne in mind when evaluating neonates presenting with sepsis. Adequate measurement and control of elevated blood sugar must be done bearing in mind that the administration of insulin can cause a precipitous fall in glucose and increase the risk of hypoglycemia. This report documents a case of severe hyperglycaemia due to neonatal sepsis.

Key Words: Neonatal sepsis; Hyperglycaemia; Diabetes mellitus.

INTRODUCTION

Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of

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infection with or without accompanying bacteremia in the first month of life. It is a common and complex entity, with marked heterogeneity in affected patients and with wide variations in its outcome.[1] It encompasses various systemic infections of the new born such as septicemia, meningitis, pneumonia, arthritis, osteomyelitis, and urinary tract infections. Gram-positive organisms are the leading cause of sepsis in neonates, accounting for more than 50% of cases.[2] The most common gram-positive organisms involved include *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Staphylococcus epidermidis* and other coagulasenegative staphylococci, and *Enterococcus* species. The clinical signs of neonatal sepsis are neither specific nor uniform. Neonatal sepsis may present with fever, hypotonia, respiratory distress, apnea and hyperglycaemia.

There is no consensus about the exact definition of neonatal hyperglycemia. Some clinicians have used statistical definitions, for example, blood glucose concentration greater than 126 mg/dl and higher rates of mortality have been demonstrated in critically ill patients with glucose levels greater than 178 mg/dL.[3] Untreated hyperglycemia unequivocally lead to undesirable clinical outcomes. It may initially present without any clinical manifestations or it could cause glycosuria, osmotic diuresis, impaired immunologic function and intracranial haemorrhage.[4] Other complications of neonatal hyperglycemia are dehydration and cerebral damage resulting from the osmolar changes.[5] Hyperglycemia is associated with increased mortality, which is significantly related to the duration of the elevated blood glucose.[6] The constant risk that hyperglycaemia presents must be borne in mind when evaluating neonates presenting with sepsis. This report documents a case of severe hyperglycaemia due to neonatal sepsis.

CASE REPORT

A 12 days old female neonate was admitted at the Paediatrics Emergency ward of General Hospital, Alimosho-Igando on account of fever and tachypnea of 3 days duration. She was born at a private hospital after 41weeks of gestation via forceps delivery.

There was a history of prolonged labour and antibiotic therapy had been commenced at the private hospital where she was born. She had a birth weight of 4500g while her weight at admission was 2800g. She was the first child of her parents and there was a notable family history of diabetes mellitus in both her maternal and paternal grandparents.

The patient had clinical features that was consistent with neonatal sepsis. On examination, she was conscious, warm to touch with a temperature of 37.5C, anicteric, acyanosed but ill looking with her tones globally increased. She was tachypneic and had a heart rate (HR) of 149beats/min. Her abdomen moved with respiration with no palpably enlarged organs. Initial laboratory evaluation showed leucocytosis (17800/c.mm) with marked neutrophilia and a random blood glucose (RBS) of 284mg/dl. Blood samples were taken for blood culture and initial management with IV antibiotics and infusion were commenced for the patient.

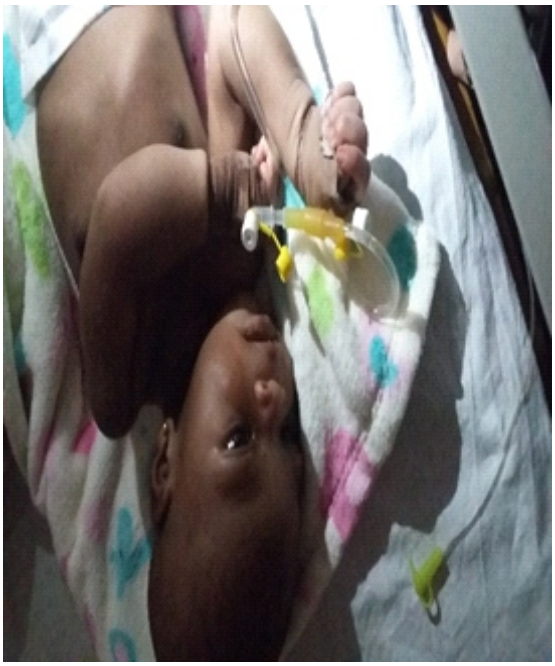
On the second day of admission, the patient started grunting and twitching and her temperature had risen to 38.5C. She was severely dehydrated with dry mucous membranes and a depressed anterior fontanelle. She also remained tachypneic with a respiratory rate of -120cycles/min and with subcostal and intercostal recession. Her oxygen saturation was 88% and 100% oxygen was commenced to increase it to 98%. She had a raised neonatal blood pressure of 90/60mmHg and had not made any urine since admission. Resuscitation was commenced with normal saline at anti-shock level of 20ml/kg. The RBS was extremely high and she was still anuric. The kidneys were challenged at this point with 80ml of normal saline and frusemide over one hour and the patient made urine. RBS remained high in a range of 538 to 577mg/dl over the next 36hours.

An initial impression of diabetes ketoacidosis secondary to neonatal diabetes was considered in view of her family history. IV insulin was commenced and continued over the next 48hours with IV 5%D/S with potassium. RBS reduced to 107mg/dl and she had a few

episodes of hypoglycemia before her blood sugar was stabilised. On further investigation, urinalysis did not demonstrate ketones or glucose while cerebrospinal fluid analysis was negative for meningitis. Her blood urea was 389mg/dl and creatinine was 11.6mg/dl but it returned to normal values after 4 days. Her electrolytes then remained within normal range and there was no acidosis. The blood culture for aerobic and anaerobic organisms yielded no growth possibly due to administration of antibiotics at the private hospital where the patient was delivered. Confirmatory tests for transient neonatal diabetes mellitus using genetic markers could not be done due to the patient's financial status.

Oral feeds was gradually commenced and blood glucose returned to normal within 96hours. She was transfused at Hb 10.1mg/dl on the 14th day of admission. Trans-fontanelle Ultrasound scan of the brain was normal and the patient was continued on antibiotics and discharged home after 29days on admission when all her clinical parameters were stable. She was seen at follow up in one week and had regained her weight. Blood sugar monitored at home had remained normal. She was also seen at 12weeks and her weight, length and occipito-frontal circumference were normal for her age. Her blood glucose also remained normal and she did not develop signs of malabsorption such as diarrhea, edema, abdominal distension, and hypoalbuminemia.

1. Patient on 2nd day of admission.



2. Patient after 1 week on admission.

3. Patient at 12 weeks of age (6 weeks after discharge).

DISCUSSION

Sepsis is a multifactorial process activated by the inflammatory cascade and mediated by hormones, cytokines, and enzymes. Sepsis is the commonest cause of neonatal mortality; it is responsible for about 30-50% of the total neonatal deaths in developing countries.[7,8] It is estimated that up to 20% of neonates develop sepsis and approximately 1% die of sepsis related causes.[8] The diagnosis of neonatal sepsis may be difficult even when the neonate appears ill because blood cultures have a substantial false-negative rate, especially when based on small volumes of blood.[9] At the National Institute for Child Health and Human Development Neonatal Research Network, although 50% of neonates were treated with 5 or more days of antibiotics, only 1.9% of neonates had culture-proven infection. [10] Neonatal sepsis can be characterized by hyperthermia, tachycardia, tachypnea, weak peripheral pulses, lactic acidosis, decreased urine output, wide pulse pressures, delayed capillary refill, and hypotension, ultimately progressing to cardiovascular collapse. Other clinical symptoms can include irritability, lethargy, confusion, and oliguria.[11] Several neuroendocrine and inflammatory mediators are involved in sepsis and hyperglycemia is an important feature of the acute changes that occur during this response.

Hyperglycemia may be due to peripheral resistance to insulin[12] and can be further compounded by the administration of excess dextrose in IV fluids. In the acute phase of the stress response to sepsis, neuroendocrine stimulation yields high circulating levels of glucagon, growth hormone, catecholamines, and glucocorticoids. This increases hepatic glycogenolysis, and gluconeogenesis to maintain energy supply to vital organs and results in hyperglycaemia.[13] The monitoring and maintenance of appropriate glucose levels in paediatric patients with sepsis is thus of utmost importance.

Adequate and proper supportive care is crucial in a sick neonate with sepsis. Management of neonatal sepsis is based on the principles of initial resuscitation, elimination of pathogens by early administration of appropriate

antibiotics, correction of the consequences of sepsis, and the correction of both coagulation and immunological homeostasis.[14] The appropriate treatment of hyperglycemia associated with sepsis is not conclusive. Studies evaluating strict insulin therapy in paediatric patients are scarce.[15] Recent guidelines however state that it is reasonable to use insulin therapy to prevent prolonged periods of hyperglycemia in paediatric patients with sepsis.[16]The present approach to the management of hyperglycemia in the neonate involves the use of glucose restriction or exogenous insulin therapy to achieve euglycemia and to improve nutritional uptake.[17,18]

CONCLUSION

Sepsis is a serious inflammatory condition caused by an overwhelming infection, which could lead to several severe adverse consequences.[19] The constant risk that hyperglycaemia presents must be borne in mind when evaluating neonates presenting with sepsis. Adequate measurement and control of elevated blood sugar must be done bearing in mind that the administration of insulin can cause a precipitous fall in glucose and increase the risk of hypoglycemia.

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