Editorial

# Hyperglycemia in PICU- Predictor of outcome

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## Abstract

Stress hyperglycemia is common in pediatric critical illness. It is associated with poor outcome in large number of patients.

**Keywords:** Hyperglycemia, Pediatric ICU stay, Mortality

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## Introduction

Hyperglycemia is a stress response of disturbed homeostasis in critically ill patients due to peripheral insulin resistance, relative insulin deficiency, impaired glucose metabolism and effect of medications like catecholamine, glucocorticoids and exogenous dextrose administration [1]. Mechanical ventilation, vasoactive infusions, renal replacement therapies, cardiopulmonary bypass and extracorporeal life support, therapeutic hypothermia, prolonged immobility, nutrition support practices also contribute to hyperglycemia in Paediatric Intensive Care Units (PICU). Stress hyperglycemia is common in pediatric critical illness, with about 49–72% children having glucose concentrations more than150 mg/dl (>8.3 mmol/liter)[2].

Hyperglycemia is associated with mortality, multiple organ dysfunction& morbidities like prolonged requirement of ventilation, inotropic support & prolonged length of PICU stay [3]. Hyperglycemia stimulates a cascade of proinflammatory events, is prothrombotic, increases oxidative stress by lipid peroxidation, causes endothelial dysfunction, promotes infection by decreasing neutrophil phagocytic activity and oxidative burst of leukocytes [4]. It exacerbates ischemic brain injury, myocardial cell apoptosis due to reactive oxygen species & affects pulmonary and renal tissue due to free radical injury [5]. Hyperglycemia causes cellular toxicity & apoptosis by causing intracellular glucose overload & oxidative phosphorylation [6].

Hyperglycemia prolongs duration of mechanical ventilation directly via lung damage and indirectly through development of critical illness myopathy [7]. It promotes osmotic diuresis with hypovolemiaand electrolyte abnormalities like hypokalemia, hypomagnesemia, hypophosphatemia and also worsens catabolism in skeletal muscle. It impairs fibrinolysis and platelet function leading to hypercoagulability [6]. It causes abnormalities in vascular reactivity and endothelial dysfunction leading to compromised microcirculation and subsequent cellular hypoxia leads to organ failure and death in critically ill patients.

Studies have shown that peak glucose levels and longer duration of hyperglycemia significantly correlated with predicted mortality and negatively correlated with ventilator free days at 30 days [8]. Peak glucose concentrations tend to be much higherin nonsurvivors compared with survivors [9]. Similarly, nonsurvivors tend to have exposure to longer duration of Hyperglycemia compared with survivors [10]. This association of Stress Hyperglycemia with mortality appears across different pediatric diseasestates, including septic shock, burns, traumatic brain injury, post cardiac surgery and trauma. Hyperglycemia is associated with longer periods of intensive care unit stayand more frequent nosocomial infections [9].

Patients with blood glucose more than10 mmol/L have worse outcome. Arecent NICE-SUGAR study demonstrated that moderate glucose control (140-180 mg/dl) wass associated with lower mortality [11]. Tight glucose control to manage Stress Hyperglycemia is emerging as a promising therapy to improve outcomes in critically ill children. Hence hyperglycemia can be useful as a predictor of outcome in pediatric intensive care units & prompt management of glycemic state can improve outcome and reduce morbidity and hospital stay among critically ill children.

Jain h et al has in this issue published an article in this issue & noted that intense hyperglycemia during first 24 hours of PICU admission was associated with higher mortality rate and a longer duration of PICU stay in their study [12].

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