

# SERUM BIOCHEMISTRY IN NIGERIANS WITH HYPERGLYCEMIC EMERGENCIES

**Background:** Management of plasma biochemical changes plays an important role in determining the prognosis of patients with hyperglycemic emergencies. This biochemical aspect, which has not been examined in detail in Nigerians with hyperglycemic emergency was the focus of this study.

**Patients and Methods:** Patients who presented with hyperglycemic emergency over a one-year period were studied. Demographic data and clinical evaluation findings were documented in a protocol. Plasma levels of glucose, electrolytes, and urea as well as urine samples for glucose, ketones, and protein were determined before and after initiating treatment for hyperglycemic emergency.

**Results:** Thirteen (40.6%) patients presented with diabetic ketoacidosis (DKA), 11 (34.4%) with hyperglycemic hyperosmolar state (HHS), while 8 (25%) had normo-osmolar nonketotic hyperglycemic state (NNHS). The mean glucose level at presentation in HHS was statistically significantly higher than in DKA and NNHS. Seventeen (53.1%) patients had hyperosmolality and 11 (64.7%) of these were in the HHS group, while 6 (35.3%) were in the DKA category. Mean anion gap in DKA was significantly higher when compared to patients with NNHS. Plasma bicarbonate was significantly lower in DKA than in HHS and NNHS.

**Conclusion:** Presenting plasma glucose in Nigerian patients with hyperglycemic emergency appear to be generally lower than values reported elsewhere. A group of patients with hyperglycemic emergency have biochemical features intermediate between DKA and HHS; this NNHS accounts for  $\approx 25\%$  of all our hyperglycemic emergency patients. (*Ethn Dis.* 2008;18:26–30)

**Key Words:** Diabetic Ketoacidosis (DKA), Hyperglycemic Hyperosmolar state (HHS), Normo-osmolar Nonketotic Hyperglycemia (NNHS), Serum Osmolality

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## INTRODUCTION

A hyperglycemic emergency (HE) is a state of uncontrolled diabetes in which the degree of metabolic derangement is such that immediate administration of fluids and insulin is required to save the patient's life.<sup>1,2</sup> Diabetic ketoacidosis (DKA), hyperglycemic hyperosmolar nonketotic state (HHS), and lactic acidosis are the three main types of hyperglycemic emergencies; these complications are life-threatening and, therefore, require immediate management.<sup>3,4</sup>

The annual incidence of DKA among patients with type 1 diabetes is between 1% and 5% in Western countries. Mortality rates are  $<5\%$  in experienced centers in western countries with DKA, but HHS mortality rates are much higher,  $\approx 15\%$ .<sup>2,5</sup> In developing countries, the incidence of hyperglycemic emergencies is likely higher than in the Western world. It accounts for 20%–60% of all diabetic admissions and has a mortality rate of 20%–30%, often due to lack of appropriate medical facilities and centers with specialist diabetes care.<sup>6–8</sup>

The diagnosis of hyperglycemic emergencies depends on serum and urine biochemical changes. Reports on hyperglycemic emergencies among Nigerians are limited.<sup>9–11</sup> In particular, the reports lack details of serum electrolyte findings. The diagnosis, classification, management and outcome of these emergencies are heavily influenced by the pattern and degree of serum biochemical derangements. We report on the biochemical findings and categorization of hyperglycemic emergencies as seen in a prospective study in a group of Nigerians with diabetes.

## PATIENTS AND METHODS

This study was carried out at the Lagos University Teaching Hospital,

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Lagos, in a one-year period. This hospital is a tertiary health institution located in Lagos, in the western part of Nigeria. It has admission facilities for  $\approx 600$  patients. All acutely ill patients are admitted through the Accident and Emergency Centre of the hospital, where patients were recruited. The study was approved by the ethics committee of the hospital.

Consecutive patients with hyperglycemic emergencies who met set criteria were studied. Criteria for the diagnosis of a hyperglycemic emergency included symptoms of acute metabolic decompensation and plasma glucose level  $\geq 300$  mg/dL<sup>5,12</sup> in a person previously known to have diabetes or diagnosed with diabetes on admission.

Clinical data obtained about each patient included sex, age, history of diabetes, and treatment. The historical and physical findings were recorded in a case report form. Venous blood was sampled hourly (until defined criteria were met) for glucose estimation, while serum electrolytes and urea were determined at 0, 2, 6, and 12 hours after starting treatment. A urinalysis for glucose, ketones, and protein and other tests were performed on each patient.

Plasma glucose level was estimated according to the method of Trinder with the glucose oxidase method,<sup>13</sup> while plasma electrolyte estimation was