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Diabetic ketoacidosis in a hospital based population in Pakistan

J Akhter
Aga Khan University

A Jabbar
Aga Khan University

N Islam
Aga Khan University, najmul.islam@aku.edu

M A. Khan
Aga Khan University

Diabetic Ketoacidosis in a Hospital Based Population in Pakistan

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J. Akhter, A. Jabbar, N. Islam, M.A. Khan (Department of Medicine, Aga Khan University Hospital, Karachi.)

Abstract

Sixty-two consecutive episodes of diabetic ketoocidosis (DKA) were studied ot Ago Khon University Hospital, Korochi. Forty-four (71%) were type I ond 18(29%) type II diobetics. Meon age wos 28.1 years ond mean durotion of diobetes 4.1 yeors. Infections were the most common precipitoting factor occounting for 28 episodes (45.2%). Twenty-two potients (35.5%) hod hyperosmolality (serum osmolality> 320 mosmol/L). Mean serum Na+ was 131.7 mmol/L ond K+ 4.6 mmol/L. Twenty-three (37.1%) were hyperkalemic ot presentation with seven patients (11.3%) being comatosed and 35 (56.5%) alert. Mean random blood glucose (RBG) was 624 mg/dl, mean pH 7.09, osmolality 316 mosmol/L and the neurological status correlated statistically significantly with mean RBG, pH and asmalality. A leukemaid response was seen in 83.9% episodes. Mortality rate was 8.0% in patients with DKA managed in this hospital (JPMA43: 137, 1993).

Introduction

Diabetic ketoacidosis (DKA) is an acute complication of diabetes mellitus which requires prompt assessment and treatment to avoid devastating consequences. DKA is characterized by hyperglycemia, ketonemia and acidosis due to increased glucose and ketone body formation with decreased peripheral utilization of glucose and ketone bodies[1]. This occurs due to a bi-hormonal disorder of insulin deficiency and glucagon excess[2]. We report observations made in the course of studying 62 episodes of diabetic ketoacidosis inclusive of demographical characteristics, clinical features, biochemical and other abnormalities as well as the final outcome.

Patients and Methods

A retrospective analysis of 62 consecutive episodes of DKA presenting to Aga Khan University Hospital between January, 1989 to December, 1991 was made. Criteria for inclusion in the study were RBG> 200 mg/dl, pH <7.30 and ketonuria 2 + . All patients were in-patients. Records were analyzed for clinical features, precipitating factors and biochemical profile at presentation. Patients were classified into type I and type II according to clinical criteria of age, body mass index, rapidity of weight loss and previous tendency for ketosis. All had serum electrolytes, blood urea nitrogen, creatinine, assayed by the Astra Autoanalyser, Rb and WBC by Coulter Counter and arterial blood pH analyzed by Corning pH blood gas analyzer. Serum osmolality was calculated by the formulae(Nax2 + Kx2 + G ÷ 18 + BUN ± 2.8). Ketoneswere checked by multis the and essential specimens cultured. Neurological state on admission was assessed and patients divided into 3 groups; alert, stuporous/drowsy or comatosed. Survival, death and duration of hospitalization were used as markers of outcome.

Results

There were 32 males and 30 females with DKA included in the study. Of these 17 were above 40 years of age. The mean age was 28.1 years (range 8-72 years). Forty-four (71%) patients were type I

diabetics and 18 (29%) type II. Thirty-two were on insulin, of which 3 were type II diabetics requiring insulin, while 15 were on oral hypoglycemic agents. Fifteen patients (24.2%) had DKA as the first manifestation of diabetes. Mean duration of diabetes in this cohort was 4.1 years. Main precipitating factor was infection accounting for 28 episodes (45.2%) followed by new onset diabetes in 15 patients (24.2%). Ten episodes (16.1%) occurred in patients who failed to take prescribed dose of insulin, 3 (4.8%) had miscellaneous causes for DKA while in 6 (9.6%) no cause for ketoacidosis was identified. Most common presenting feature was gastrointestinal disturbance (anorexia, nausea, abdominal pain, vomiting or diarrhoea), in 44 patients (71%). Twelve patients complained of overt polyuria and polydipsia. Only 2 patients (3.2%) were in shock at the time of presentation. Seven patients (11.3%) were comatosed, 12 (19.2%) were drowsy or stuporosed and 35 (56.5%) alert. Biochemical profiles at presentation are shown in Table I.

Table I. Biochemical profiles of DKA patients.

	Range	Mean
RBS (mg/dl)	321-1536	624
pH	6.84-7.29	7.09
Osmolality (mosmol/L)	273-380	316
Na^+ (mmol/L)	112-148	131.7
K^+ (mmol/L)	2.5-7.8	4.6

Twenty-two patients (35.5%) had osmolality greater than 320 mosmol/L at admission. Twenty-three (37.1%) had hyperkalemiawhile 7(11.3%) had hypokalemia. Serum potassium (C) closely correlated with creatinine and renal function (Figure).

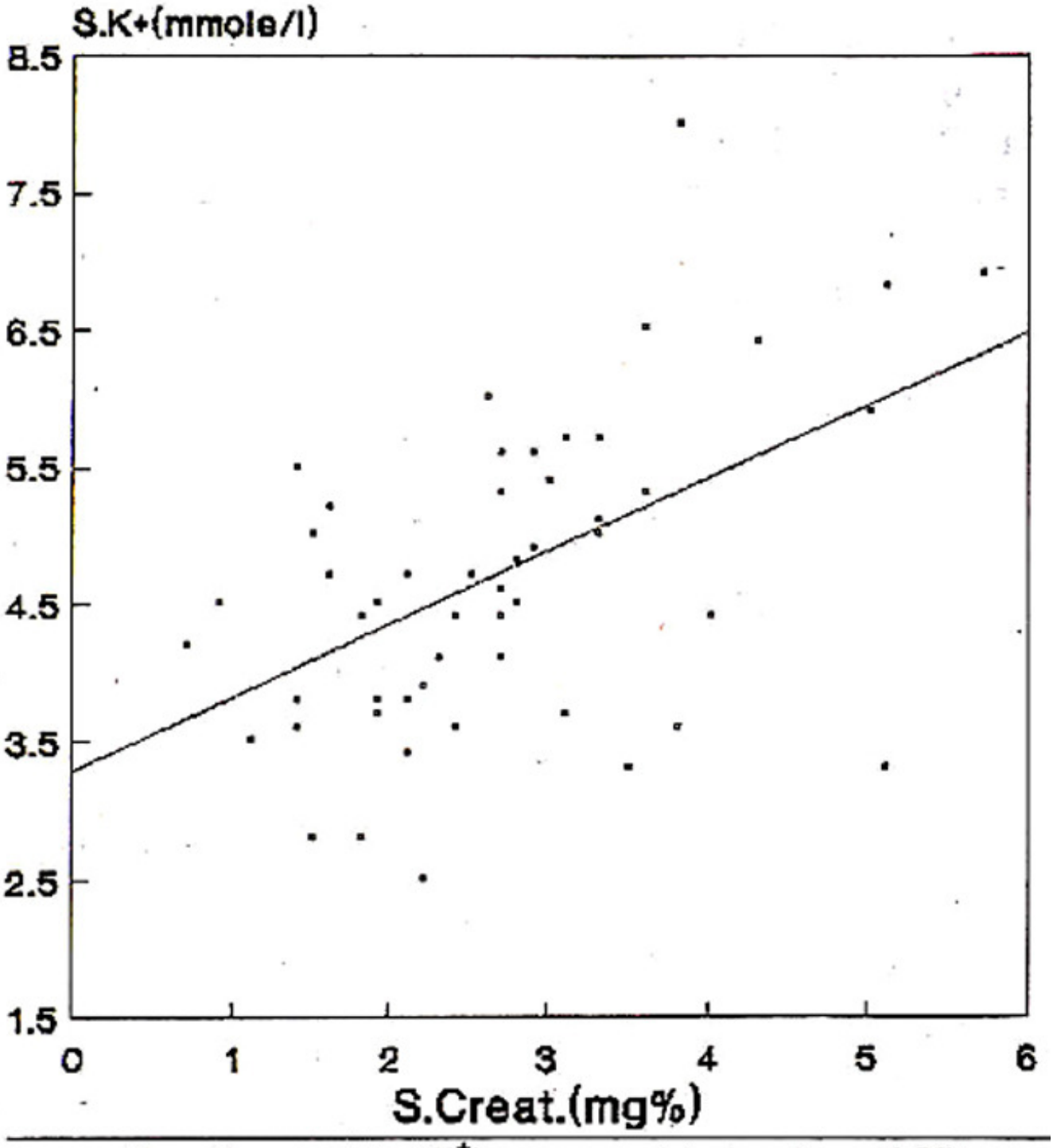

Figure. Serum potassium (K^+) vs serum creatinine in patients with DKA.

Serum Na+ ranged from 112-148 mrnol/L with 4 (6.4%) having hypernatremia and 28 (45.2%) hyponatremia at the time of admission. Rest had serum sodium (Nat) in normal range. There was a trend of decreasing Na+. with increase in blood glucose. Neurological status on admission correlated statistically significantly with mean BEG, osmolality as well as acidosis (pH) in our patients, as shown in Table II.

Table II. Biochemical profiles and neurological status.

	Group I coma	Group II drowsy	Group III alert	Statistical difference between group I and III
Mean osmolality (mosmol/L)	333	326	309	P = 0.001
Mean RBG (mg/dl)	837	737	517	P = 0.005
Mean pH	7.01	7.02	7.14	P = 0.002

Only 10 cases (16.1%) had normal WBC counts on admission, while 52 (83.9%) had leucocytosis with 9 (14,5%) having WBC> 30x 103/ml. Aleukemoid response was encountered in patients with and without infections. Positive cultures identified, urinary tract infection - 3 patients, malaria - 1, enteric fever - 1, staph. aureus abscess - 7 and candidiasis - 1. Management of these patients followed standard guidelines[3-6]. Mean duration of hospitalization was 6.1 days. Mean length of stay in hospital in those patients having RBGc 800 mg/dl was 5.7 days while those with RBG>800 mg/dl was 7.9 days. Five patients died with mortalityrate of 8.0 percent. Ages of patients who expired were 16, 20, 45, 49 and 50 years. Mean pH, BEG, osmolality of the two groups (survival vs expired) was 7:10 vs 7:06, 618 vs 688 mg/dl, 314 vs 332 mosmols/L respectively. Mean length of stay in patients who expired was 3.2 days. wo patients had cerebral oedema while 4 had septicaemia complicating DKA.

Discussion

Diabetic ketoacidosis (DKA) may occur at any age in diabetics and may either be the first manifestation or may be precipitated after many years of stable diabetes, as shown in our study. Twenty-nine percent episodes occurred in patients not thought to be type I diabetics. Wahtel et al[7] found that infections were the most common precipitating factor of DKA (30%). Other causes were non-compliance with therapy (20%) and newly diagnosed diabetics (24%). These findings were comparable with our patients and with those reported by Matoo et al[8] from India. In DKA, infections may be present even if body temperature is normal or sub-normal, but an elevated temperature strongly suggests presence of infection[3]. Non-specific abdominal pain is arecognised feature of DKA and a surgical cause of abdominal pain may be misdiagnosed in these patients[9]. Plasma glucose levels in patients with DKA range from nearly normal to extreme concentrations that are characteristic of hyperosmolar state. The plasma glucose levels are very high primarily when extracellular volume has decreased to a point where urine flow, (and therefore ability to excrete glucose) is impaired[10]. During evolution of DKA losses of water are disproportionately greater than losses of sodium (Na^+) and this will precipitate dehydration of brain tissue. The mean plasma level of Na^+ in patients with DKA tends to below, despite an increase in osmolar concentration. This is because glucose draws water into the extracellular compartment thereby decreasing Nat concentration. A very low serum Nat level is usually due to hypertriglyceridemia but may be due to vomiting and water intake[4]. Patients with DKA tend to have elevated serum potassium (C) concentration despite decreased body K^+ content. This is due to decreased C excretion by the kidney once volume depletion reduces GFR, also due to the corresponding acidosis and insulin deficiency resulting in shift of C from intracellular to extracellular compartment. Studies have shown serum K^+ to correlate independently with both blood pH and renal

function[11]. The metabolic acidosis is primarily due to accumulation of beta hydroxybutyric and acetoacetic acid in plasma, although free fatty acids and lactic acidosis also contribute towards acidosis[4]. Wahfel et al[7] in their study of 613 patients with DKA. found that 33% were hyperosmolar (serum osmolality>320 mosmoles/L). We also noted the frequent occurrence of mixed acidotic and hyperosmolar state. A leucocytosis occurs commonly in DKA[12]. A leukemoid response does not necessarily indicate the presence of infection. Only about 10% patients with DKA are actually unconscious and 20% have no demonstrable clouding of consiousness[3]. Between these extremes, the spectrum ranges from drowsiness to pre-coma. In their study Fulop et al concluded the depth of coma did parallel hyperglycaemia and more closely hyperosmolality but not acidemia[13]. Mortality from diabetic ketoacidosis has decreased to 1-2% in good centres in western countries over the past 20 years[14], but mortality still remains high in underdeveloped countries. Due to significant morbidity and mortality, prevention should remain the main focus in diabetic patients, but good critical care management is required when the condition arises.

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