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The Occurrence of Diabetic Ketoacidosis in Type 2 Diabetic Patients in the Emergency Service of the National Hospital "Carlos Alberto Seguin Escobedo" Essalud Arequipa

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ABSTRACT

Objective: To study the diabetic ketoacidosis (DKA) episodes which occurred in the type 2 diabetic adults at the emergency department in CASE Hospital EsSalud Arequipa.

Study Design: We reviewed retrospectively the charts of patients who were admitted to the division of Emergency from Jan. 2018 to Dec. 2019 due to DKA.

Results: Total 72 adult patients with 74 episodes (12 females and 60 males) of DKA were evaluated. The mean was 45, 80 years. One patient suffered repetitive episodes of DKA. 17 episodes (22.9%) occurred in patients without a history of DM. Infection was the most important precipitating factor in type 2 diabetic patients, with respiratory tract and urinary tract accounting for the two most common foci. Two patients expired, giving the mortality rate of 2, 8%. Only old age contributed to fatality in type 2 diabetic patients. Type 2 diabetic patients had lower value of serum potassium and the occurrence of hyperkalaemia was less than expected.

Conclusion: Owing to high percentage of adult DKA episodes occurred in type 2 DM, more attention should be pay to these patients.

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Introduction

In general, diabetic ketoacidosis (DKA) is always described as being closely linked to type 1 diabetes. The occurrence of DKA has been thought to indicate the underlying significant and irreversible damage to B cells that classifies these patients as type 1 diabetics (insulin dependent). However, many patients with DKA have a metabolic course and physical signs of type 2 diabetes mellitus (non-insulin dependent). In Peru and especially in Arequipa, little research has been done focusing on type 2 patients who have suffered episodes of DKA. We examined the clinical characteristics of a cohort of diabetic patients presenting with DKA at the emergency service of an EsSalud referral hospital. In this retrospective study, we focused on CAD episodes in adults with type 2 diabetes mellitus. Clinical features, precipitating factors, and mortality rates were investigated.

Materials and Methods

The population of patients included in this study were adult type 2 diabetics (age ≥ 18 years) who were admitted to the Emergency Service of the "Carlos Alberto Seguín Escobedo" National Hospital of EsSalud for a period of 2 years included in the period January 2018 to December 2019. All the information was obtained by reviewing their medical records. Histories were collected based on the discharge diagnosis of CAD. DKA was defined as hyperglycemia, positive blood or urine ketone test, and elevated anion gap metabolic acidosis. Individuals who were managed at any point with diet or oral antidiabetic drugs and with no prior history of DKA were classified as type 2 diabetics. Information obtained from the analysis included age, sex, precipitating factors, laboratory values, and mortality rates.

Statistic Analysis

All analysis was done using the statistical package SPSS for Windows version 9.0, SPSS Institute, Chicago, IL, USA. Without other specifications, all data were expressed as median ± standard deviation (SD). The statistical method used was Student's t test and Chi square analysis. A p value < 0.05 was considered statistically significant. A multivariate logistic regression analysis was performed to assess which parameters contributed to mortality.

Results

Over the 2-year period, a total of 72 adult patients with 74 episodes were consistent with the diagnosis of CAD and were included in this analysis. The clinical characteristics are shown in Table 1. The patients were 12 female (16.66%) and 60 male (83.34%). The mean age at the time of the episodes was 45.80 ± 15.06 years. Five patients suffered from recurrent episodes of DKA, alternate episodes of DKA and SHH also occurred in type 2 patients. Only

10% of type 2 diabetic patients were <30 years, 48% were >50 years. Type 2 diabetes predominated in those older than 30 years. 17 episodes (22.97%) occurred in patients with no history of diabetes. Except for 8 episodes where any precipitating factor could be found, there were 9 episodes where no obvious factor could be found. The percentage of recent onset type 2 diabetes was 23.61%. The main precipitating factors included infection (37.8%), inadequate drug adherence (28.4%), and recent-onset diabetes (12.2%). No obvious trigger was found in 8.1%. When infection was the trigger, the respiratory tract and urinary tract were the most common foci. 2 patients died, giving an overall mortality of 2.8%. The multiple logistic regression analysis performed on the 74 cases of CAD showed that only advanced age contributed to mortality. The laboratory values are shown in Table 1. A somewhat lower than normal sodium concentration was found, and hyperkalemia was found in 37% of patients.

Table 1: Characteristics of CAD in adults with type 2 diabetes

Characteristic	Type 2 Diabetes (n=74)
Age (years)	45.80±15.06
No. male	60 (73.3%)
History of diabetes	57 (77.0%)
Precipitated by:	
Infection	28 (37.8%)
Poor drugs compl.	21 (28.4%)
Recent diagnosis	9 (12.1%)
Unknown cause	6 (8.1%)
Mortality	2 (2.8%)
Laboratory values:	
Glycemia (mg/dL)	547.56±189.84
pH	7.12±0.34
BUN (mg/dL)	29.40±16.66
Creatinine (mg/dL)	2.56±1.23
Osmolarity (mEq/kg)	310.95±16.83
Sodium (mEq/L)	130.85±7.50
Potassium (mEq/L)	4.48±0.97

Table 2: Precipitating factors for DKA in adults with type 2 diabetes

Precipitating factor	No. cases (%)
Infection	28 (37.8)
Respiratory tract	9 (12.2)
Urinary tract	7 (9.5)
Unknown focus	4 (5.4)
Cellulitis	3 (4.0)
Joint	1 (1,4)
Poor compliance to medication	21 (28.4)
Recent diagnosis without factor	9 (12.2)
Obvious precipitant	
Herbal administration	7 (9.5)
Acute myocardial infarction	1 (1.4)
Acute cerebrovascular event	1 (1.4)
Gestation	1 (1.4)
Unknown cause	6 (8.1)

Table 3: Factors contributing to mortality in adult type 2 diabetic patients with CAD

Factor	coefficient (ß)	SE of (ß)	X2	df	p value
Age	0.309	0.156	3.930	1	0.048

Other factors included: sex, precipitating factor (infection, poor drug compliance, recently diagnosed diabetes), serum glycemia values, osmolarity, pH, sodium, potassium, BUN, creatinine.

Discussion

DKA in common is not only found in the pediatric population but is also frequently found in adults with diabetes. In our study of adult CAD patients, the mean age was 45.80 years, with a significant predominance of males over females. Only 10% of the episodes were in people under 30 years of age, and almost half in people over 50 years of age. Classically associated with type 1 diabetes, DKA can occur in patients with clinical courses and metabolic features of type 2 diabetes mellitus [1-4]. In European reviews, DKA occurs mostly in type 1 diabetic patients, but in populations where the majority of diabetic patients are type 2, a considerable number of episodes occurred in these patients, as in our study [1, 2, 5-7]. There are a few possible explanations for this finding; Type 1 diabetes is mostly a Caucasian disease, and it occurs rarely in our society [8]. Likewise, the majority of type 1 diabetes develops in the pediatric population; conversely, type 2 diabetes presents unusually in this population. The clinical features of CAD that occur in adult patients may therefore present in different characters. DKA may be the first manifestation of diabetes, which is considered DKA-onset diabetes [9]. This situation is common in the pediatric population, with a percentage of around 24% to 58% [10-12]. In adult patients with CAD, the percentage is less common, ranging from 7% to 27% [1, 6]. In our study, of all 74 episodes in adults, the percentage of CAD-onset diabetes was 22.97%. Consistent with previous studies, infection, poor drug compliance, and new-onset diabetes without an obvious precipitating factor were the three most common triggers for CAD [2, 13-15]. Our study showed the same results. In our type 2 diabetic patients, infection was the most important trigger found in 37.83%, followed by poor compliance with drugs in 28.38%. We hypothesize that type 2 patients may become transiently insulin deficient during severe physical stress (infection for example), and recover when the insult has ceased, although in some cases no obvious triggering factor is found. We also assume that marked hyperglycemia can induce severe insulinopenia and predispose to DKA even in type 2 diabetic patients. In the case of no obvious triggering factor, we assume that a weak clinical history or physical examination partially accounted for these data. In this study, the physical stress that precipitated DKA in type 2 diabetic patients was infection, poor drug compliance, new-onset diabetes with no obvious predisposing factor, herbal use, myocardial infarction, and acute cerebrovascular event. The most frequent sources of infection were the respiratory and urinary tracts. There were also events where an obvious infectious focus could not be identified. One patient suffered from recurrent CAD events, these events occurred due to poor metabolic control combined with significant stress. As can be seen, education and good diabetes management are important for the prevention of repeat attacks of CAD in both types of diabetes. Some investigators have postulated that hyperglycemic crises are states of severe decompensated hyperglycemia, differing only in the magnitude of dehydration and the severity of acidosis [16, 17]. Looking at the history of some type 2 diabetic patients in our study, alternative episodes of CAD and SHH were also documented. This evidence seems to be consistent with the

assertions, however, further investigations to delineate the status of acute hyperglycemic decompensation are necessary. Worldwide, CAD-associated mortality varies between 3.8% and 12.2% in different studies [13, 14]. The CAD fatality rate in adults in our study was 2.8%. In the 74 episodes of DKA that occurred in adult type 2 diabetic patients, logistic regression analysis showed that only advanced age contributed to fatality. It is important to say that the degree of severity of the acidosis was not a factor that contributed to the fatality, this agrees with data from previous sagas [18]. Regarding laboratory values on admission, hyperkalemia was noted in 37% of patients. DKA-induced hyperkalemia has been described by some authors, hyperglycemia due to insulinopenia is implicated as one of the factors [19]. In conclusion, our study exposed a series of adult type 2 diabetic patients with episodes of DKA that occurred in an EsSalud referral hospital. These events occurred preferentially in older patients and mortality was within the previously established parameters. Most of the events were precipitated by infection, although there were events without an obvious precipitating factor. These events merely represent the evidence of a reference hospital, at an altitude of approximately 2,300 masl, in the city of Arequipa, Department of Arequipa, Peru, and not an entire country, although to our knowledge it is the first to be carried out in these terms. In any case, diabetes control and education of adult type 2 diabetic patients is very important, and diabetes screening in adults should not be relegated.

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