ORIGINAL ARTICLE

A Retrospective Study to Evaluate Precipitating Factors, Outcome and Importance of Health Education in Diabetic Ketoacidosis

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ABSTRACT

Aim: To observe the frequency, precipitating factors and outcome of diabetic ketoacidosis (DKA) in adults with established and newly diagnosed type 1 diabetes at a tertiary care hospital.
Methods: Patients who were admitted with a diagnosis of DKA at Lahore General Hospital, Lahore from January 2013 through December 2015. The clinical presentations, laboratory investigations, management, time of recovery and outcome were compared.
Results: A total of 202 patients were included who fulfilled the criteria of DKA, of which 160(79.2%) were less than 26 years of age with a male predominance of 156(97.5%). Out of all cases 72(35.6%) had established Type 1 diabetes and 130(64.4%) were newly diagnosed. The most common presenting complaints in both groups were sepsis 105(52%). The comparison of clinical improvement and laboratory investigations between the two groups showed that newly diagnosed Type 1 diabetes patients had lower pH, low bicarbonate and high BSR at presentation as compared to those with established type 1 diabetes. The patients with established diabetes improved earlier, required lesser duration of intravenous fluids and IV insulin was changed to subcutaneous in less time. Hospital stay of more than 7 days was observed in patients with new diagnosis.
Conclusion: It can be concluded from the above data that earlier diagnosis of type 1 diabetes mellitus, appropriate treatment, regular screening for complications and infections will result in less hospital admissions and better outcome.
Keywords: Diabetic ketoacidosis, I/V fluids, sepsis

INTRODUCTION

Diabetic ketoacidosis is a potentially fatal metabolic disorder that may be due to insulin deficiency or peripheral resistance to insulin which can lead to hyperglycemia, ketosis and electrolyte imbalance.It is associated with significant morbidity and mortality in diabetic population. DKA has been seen in all age groups, adolescent to elderly patients. Astudy conducted in 4,807 cases of DKAepisodes showed that 14 percent occurred in older than 70 years, 23 percent in persons ranging from 51 to 70 years of age, 27 percent in persons from 30 to 50 years of age, and 36 percent in persons younger than 30 years[1]. The case fatality rate for DKA is 1 to 5 percent [2, 3]. DKA is the leading cause of death in persons younger than 24 years with diabetes, mostly because of cerebral edema[1, 3]. The most common precipitant of DKA is missing the dose of insulin. Other precipitating factors for DKA include medications, psychological problems, eating disorders, insulin pump dysfunction, and illegal substance use[4,5].Mostly DKA is seen in type 1 diabetes but type 2 diabetes patients can also present with it.Diagnostic criteria for DKA include blood glucose >250 mg/dL, arterial pH of ≤7.30, bicarbonate level of ≤18 mEq/L, and anion gap of >10–12adjusted for albumin [6].

Diabetic ketoacidosis management is mainly based on correcting the underlying electrolyte imbalance, highlighting the precipitating factors and management based on the laboratory results. Most important part of treatment is IV fluid therapy which greatly influences the positive outcome in patients.

METHODS

Retrospective data of patients admitted with a diagnosis of DKA, established and new cases based on the diagnostic criteria for DKA, at a tertiary care hospital from January 2013 through December 2015. The clinical presentations, laboratory investigations, duration of stay in hospital, the treatment required and outcome were compared. Statistical analysis was made by calculating percentages.

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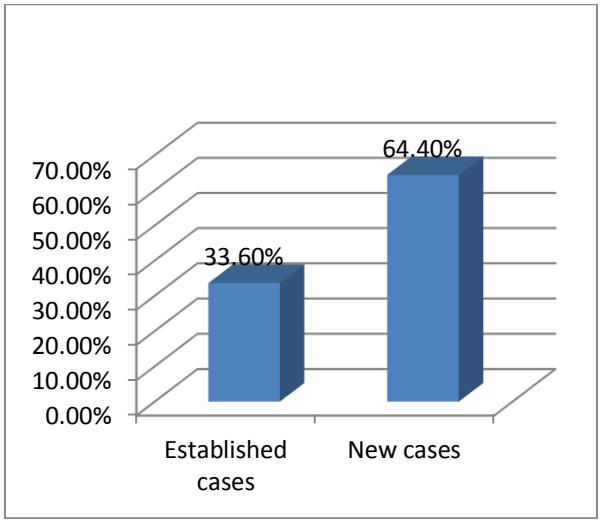
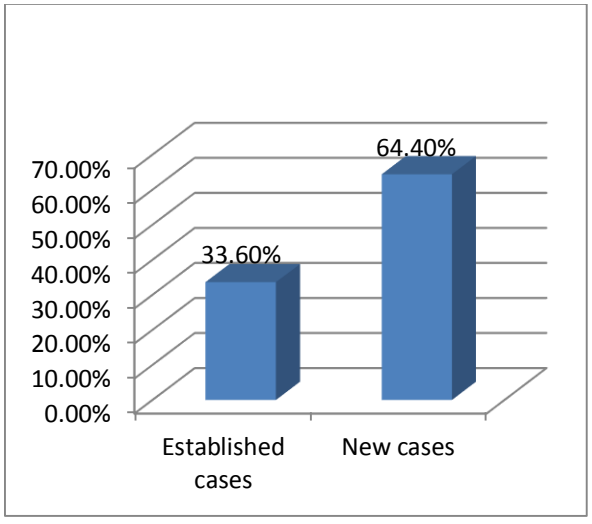
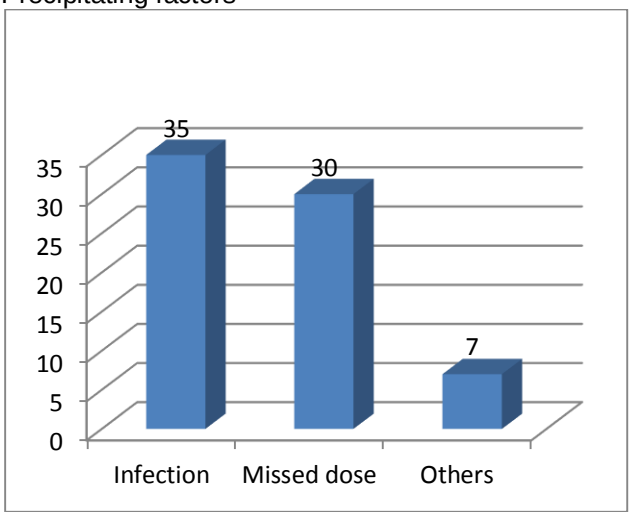
RESULTS

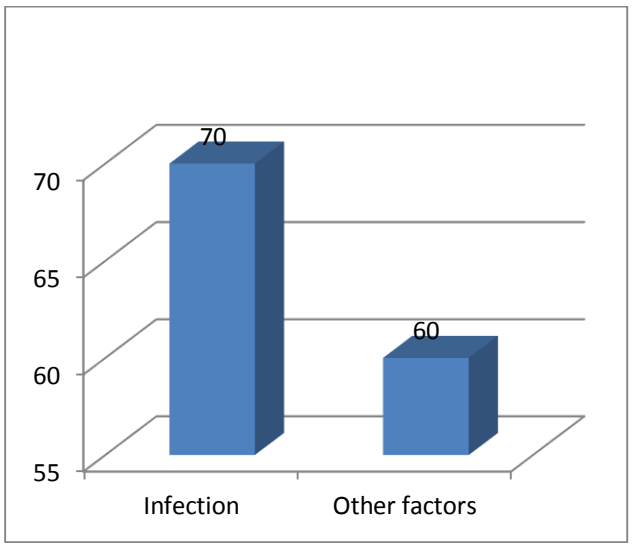
A total of 202 patients were included who fulfilled the criteria of DKA, of which 160 (79.2%) were less than 26 years of age with a male predominance of 156 (77.2%). Out of all cases 72 (35.6%) had established Type 1 diabetes and 130 (64.4%) were newly diagnosed. The most common presenting complaints in both groups were sepsis 105 (52%). The comparison of clinical improvement and laboratory investigations between the two groups showed that newly diagnosed Type 1 diabetes patients had lower pH, low bicarbonate and high BSR at presentation as compared to those with established type 1 diabetes. The patients with established diabetes improved earlier, required lesser duration of intravenous fluids and IV insulin was changed to subcutaneous in less time. Hospital stay of more than 7 days was observed in patients with newly diagnosed type 1 diabetes. Mortality rate was 14(6.9%) and higher ratio was seen in newly diagnosed patients.



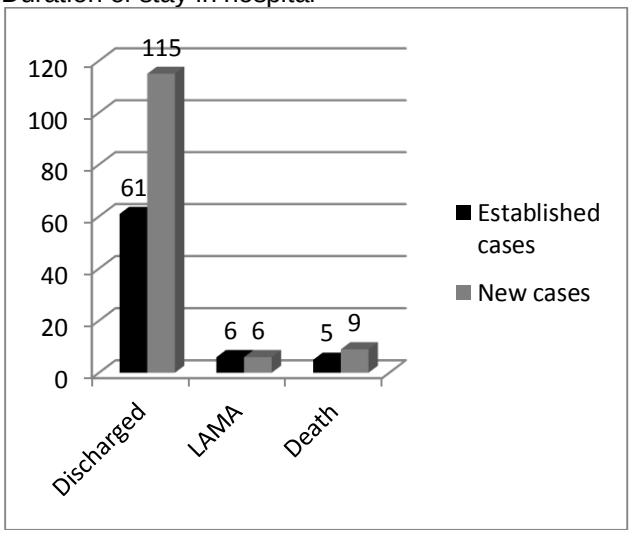


Precipitating factors

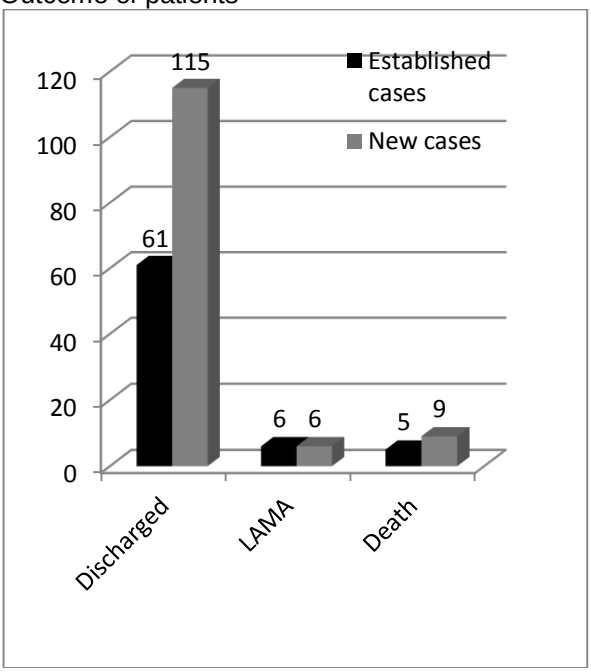




Duration of stay in hospital



Outcome of patients



DISCUSSION

In this study, we evaluated 202 patients presenting with DKA, both established and new cases with Type 1 diabetes. Most of the patients in our study group were less than 26 years of age and large proportion of them were newly diagnosed cases of type 1 diabetes presenting with DKA for the for the first time.

In patients with established Type 1 diabetes, the most common precipitating factor was infection (48.6%) followed by a missed dose of insulin (41.7%). Even in newly diagnosed patients, it was seen that infection was the most common precipitating factor (53.8%). The study showed that most common infection precipitating DKA was pneumonia, more than 65% cases, followed by urinary tract infection in both groups. A similar study conducted also showed that there were 20%–25% of cases where infections were the first manifestations in a previously undiagnosed diabetes mellitus cases[7]. In 2%–10% cases, no obvious precipitating factor can be identified[7].

The most important concern was the health education and knowledge regarding the Type 1 diabetes as the majority of the patients were newly diagnosed and they had no knowledge that this condition can occur in a young patient with some serious consequences. Even the patients who were on Insulin had not have enough knowledge regarding the importance of taking insulin on time. Nearly half of the patients in our study presented with DKA after missing their insulin dose. The lack of compliance was mostly due to limited financial resources and lack of awareness. A study done on African-American patients also showed the rate of insulin discontinuation and a history of poor compliance accounts for more than half of DKA admissions in inner-city and minority populations[12, 13].

In our study, we concluded that infections were the main culprit which precipitated DKA, leading to the conclusion that patients with diabetes should be closely monitored for infections. The most common precipitating factor in the development of DKA is infection[11].It is to emphasize that health education is very important in preventing these episodes and ultimately less burden on health care system especially in developing countries. Approximately 2.4 billionUS dollars are spent annually on hospitalization of patients with DKA[9,10].

Secondly, there was large proportion of patients who were presenting for the first time with DKA largely due to the fact that most people are unaware that diabetes can occur in adolescent. In the newly diagnosed patients the most common symptom was weight loss and no proper work-up was done to rule out diabetes, eventually leading to DKA and emergency admissions. Most of these patients were from rural settings where there was no proper screening and education about these conditions.

Based on the fact regarding established and new cases, there was a difference in the management, hospital stay and outcome of the patients. It has been seen that in newly diagnosed cases the management was more aggressive and mean duration of hospital stay was 7 days as compared to established cases where the mean duration was 5 days. In 2009 there were 140,000 hospitalizations for diabetic ketoacidosis (DKA) with an average length of stay of 3.4 days[8]. The morbidity rate was higher in newly diagnosed patients. Although the mortality rate was the same in both the newly diagnosed cases and established cases presenting with DKA (6.9% vs 6.9%). DKA has a case fatality rate of 1 to 5 percent with a higher rate in elderly patients[2,3]. In our study, the mortality was on higher side considering the fact that most of the patients were less than 26 years of age.

The major emphasis should be on creating awareness to prevent such episodes which can be done by better access to health care facilities, health education for both the family members and the patients, and effective communication between the patient and health care provider during an inter-current illness. Equally important is the compliance of patients regarding insulin use and especially during an infection. Regular home glucose monitoring and maintaining blood glucose level within the reference range also helps to prevent such episodes. Regular glucose monitoring has the advantage of signaling to

patients the early detection of glucose abnormalities, allowing for timely intervention[14,15]. Recent studies suggest that nutritional education also resulted in reduced hospitalization[16]. In fact, the guidelines for diabetes self-management education were developed force to identify ten detailed standards for diabetes self-management education[17].

CONCLUSION

Diabetic Ketoacidosis is a preventable condition, the rate of morbidity and mortality can be greatly reduced by creating awareness in the community, accessibility to health care facilities, overcoming financial barriers and timely management of concurrent infections. Not only will it help to reduce medical expenses but also a better outcome for the diabetic patients. Nevertheless health education is the most important factor.

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