

Awareness of Risk Factors of DKA among Diabetic Patients

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Abstract

Background: Diabetic ketoacidosis (DKA) is a complication of Diabetes mellitus (DM) that lingers to have high rates of morbidity and mortality regardless of advances in the management of DM. Knowledge of risk factors and management of DKA is very important among general population generally and family members of the diabetic patient specially because DKA is a life threatening condition which needs fast management to save the patient's life.

Aim: This review aims to identify awareness level of risk factors of DKA among diabetic patients.

Conclusion: Awareness level of general population especially families of diabetic patients, should be point of care and awareness campaigns should be carried to improve the awareness level and life style of the patients.

Keywords: Diabetic Ketoacidosis; DKA Awareness about DKA; Diabetes

Introduction

Diabetic ketoacidosis (DKA) is a complication of Diabetes mellitus (DM) that lingers to have high rates of morbidity and mortality regardless of advances in the management of DM. Diabetic ketoacidosis is a serious complication of diabetes that occurs when your body starts to run out of insulin. When this happens, your body begins to break down fat as fuel. This process produces a buildup of acids in the bloodstream called ketones, which can be life-threatening if it's not found and treated quickly [1].

Diabetic ketoacidosis (DKA) is a serious complication of type 1 diabetes and, much less commonly, of type 2 diabetes, however, DKA has been reported to occur also in type 2, mainly under stressful conditions such as surgery or infections [2,3].

Ketoacidosis shouldn't be confused with ketosis, which occur as a result of an extremely low carbohydrate diet, known as a ketogenic diet, or fasting and its harmless. DKA only happens when you don't have enough insulin in your body to process high levels of glucose in the blood.

Frequent causes include stress and infection in a new diabetic or a missed insulin dose in an established diabetic [4]. Diabetic ketoacidosis signs and symptoms often develop quickly, sometimes within 24 hours but when vomiting occurs it can develop in a few hours [4]. For some, these signs and symptoms may be the first indication of having diabetes. Between 20% and 30% of cases of DKA occur in patients with newly diagnosed DM [5].

The WHO had reported the number of DKA cases to be almost “221” million cases in the year 2010 and expected to be up to “285” million cases in the year 2025 [6]. Many longitudinal studies were done to estimate the prevalence of DKA and they indicated that 20% of pediatric patients account for 80% of all admissions for DKA, and the incidence of DKA peaks during the adolescent period [7].

DKA has a high recurrence rate and many patients usually have recurrence of their DKA [8]. The number of episodes of DKA is a significant outcome measure for diabetes care [9].

The sequelae of DKA cannot be predicted with certainty for any given patient [10,11], but DKA tends to be more common in younger patients and is still the major cause of death in children with diabetes [11]. Most deaths occur from complications of cerebral edema especially in children. Other complications associated with DKA are Adult respiratory distress syndrome (ARDS) and Hyperchloremic acidosis. Diagnosis of the case is the first step of treatment and in such a dangerous case diagnosis should be accurate and fast to save the patient's life. Diagnosis is firstly done by noticing the symptoms of the disease like; frequent urination, extreme thirst, nausea or vomiting abdominal pain, confusion, fruity-smelling breath, a flushed face, fatigue, rapid breathing, dry mouth and skin and if take long time, coma or death would happen. Secondly; blood test for the sugar level and urine test for ketone bodies are done [10].

DKA is a serious case, which should be treated in the hospital. The main treatment of DKA is insulin injection (intravenously or subcutaneous), and then some management treatment should be offered such as: fluid therapy to rehydrate the body and nutrients are given into a vein to replace any loss [9].

Patient also should be closely monitored for any life-threatening problems that can happen, such as problems with the brain, kidneys or lungs and he can leave hospital when he is well enough to eat and drink and tests show a safe level of ketones in the body. It's common to stay in hospital for around 2 days [6].

Following the rules is the most important part in the treatment, because always, prevention is better than treatment. It's important to check your blood sugar level regularly so you can notice and treat an increase quickly read about how to treat high blood sugar; following the treatment plan is necessary and do not stop taking insulin unless you're told to by a healthcare professional and be careful taking new medicines and check with a doctor or pharmacist first, as some medicines can increase the risk of DKA. Effective treatment of DKA requires frequent monitoring of patients, replacement of electrolyte losses, modification of hypovolemia and hyperglycemia, and careful search for the precipitating cause. The frequency of hospitalization for DKA has been reduced following diabetes education programs, improved follow up care and access to medical advice [3].

Knowledge of risk factors and management of DKA is very important among general population generally and family members of the diabetic patient specially because DKA is a life threatening condition which needs fast management to save the patient's life. This review aims to identify awareness level of risk factors of DKA among diabetic patients.

Risk factors of DKA

DKA occurs when blood sugar levels are very high due to lack of insulin in the blood. Our bodies need insulin to use the available glucose in the blood. In DKA, glucose can't get into the cells, so it builds up, resulting in high blood sugar levels. In response, our body breaks down fat for energy. Ketones are released into the body as the fat is broken down. When too many ketones build up, your blood becomes acidic. This is diabetic ketoacidosis [11].

Some factors increase the liability of DKA in diabetic patients such as having an infection, not following the treatment plan or missing doses of insulin, an injury or surgery, some certain medicines intake, alcohol addiction or drug addiction, pregnancy and having period. Many studies were done in this area, Juliet A Usher, *et al.* [12] classified the risk factors of DKA into 1) individual factors such as: age, sex,

ethnicity, family history of diabetes, body mass index and parenteral consanguinity, 2) family factors such as: parenteral education, family structure, health insurance status, rural or urban residence and family income, parental employment, and social status, 3) physician factors such as: delayed diagnosis, diagnostic error, Number of medical consultations before diagnosis and Delayed treatment and presence of structured diabetes team, 4) disease factors such as: Duration of symptoms, Pattern and frequency of symptoms and Preceding infection or febrile illness, 5) other factors such as: time of year and Background incidence of type 1 diabetes. Also, Satti Abdulrahim, *et al.* [13], had discussed the risk factors of DKA.

Prevalence and awareness level about DKA

There are too many studies aimed to evaluate the prevalence and frequency of DKA as a common complication of diabetes mellitus. H Zayed [14] did the first comprehensive descriptive quantitative estimation of the prevalence of DKA using 25 different studies covering 12 Arab nations in a period of 46 years, starting from 1969 to 2015. They found that DKA rates in the 12 Arab countries ranges from 17% to 100%, with overall DKA frequency of 46.7%.

This is a very high prevalence in comparative with that found by Soulmaz Fazeli Farsani, *et al.* [15] in North America. The incidence of DKA showed a general reduction over the duration of study follow-up, with an incidence rate of approximately 20 cases per 1000 PYs at baseline to 0 events at the 12 year follow-up in one cohort and a decrease from approximately 30 cases per 1000 PYs at baseline to < 10 cases per 1000 PYs at the 18 year follow-up in another cohort [16].

In very broad terms, the incidence rates and prevalence reported for European studies were similar to those described in investigations conducted in North America [17].

In the same study, H Zayed [14] found that the frequency of DKA among Arabs ranges from a low of 17% in Egypt [17] and was very high of 100% in each of Algeria [18], Morocco [19] and Tunisia [20], while Saudi Arabia represents most of the T1D patients with 36.3% of the total number of patients with DKA frequency ranging from 25% to 80% [21-23], followed by Egypt 23.8% of T1D patients, with DKA frequency ranging from 17% to 61% [17,24,25]. Similar findings was found in a study in Finland estimated the frequency of DKA, over a period of 19 years (1982 - 2001), found that the overall DKA incidence at diagnosis was 18.1% [26]. In another study of 113 young adults in Oxfordshire, England, the Incidence rates ranged from approximately 8 cases per 1000 PYs [27], to 51.3 cases per 1000 PYs for over 18 000 adult patients selected from the DPV database [28].

Prevalence of DKA was reported in two European studies [29,30]. One single-centre longitudinal study of 104 patients performed in Sweden [31] found a numerical (but not statistically significant) reduction in DKA cases with increasing year of age from 18 to 24 years (prevalence ranged from 0 to 60 cases per 1000 people over this period and was calculated for each 1 year of age separately by the authors).

Three studies conducted in other regions reported only incidence rate data, with very low rates observed in two studies based on patient medical records from the same tertiary care facility in Israel [31,32] and very high rates described in a multicenter study conducted in tertiary care units in a single province in China [33].

In children with established diabetes, the risk of DKA in established T1DM is 1 - 10% per patient per year [34,35]. Several studies [36-38] reported that adolescents are most affected with DKA, specially girls were the highest risk for RDKA, which is confirmed by the study of Ayman A Al-Hayek, *et al.* [39] among the Saudi adolescents. During 2005 - 2014, 44.9% (243/541) of children diagnosed with T1D presented with DKA. Of these, 22.7% had pH < 7.1. In both genders DKA was higher in children < 6 years (47.8% vs. 40%; p < 0.01) and more severe in < 3 years old compared to older children (30% vs. 20%; p < 0.01) [40].

Knowledge of disease and its risk factors of family/mother/caregiver play an important role in the management of DKA, especially in children. But there is paucity of data on these aspects in Saudi population. In a study done by Ahmed Maashi Alanazi, *et al.* [41] the majority of the respondent scored low knowledge on DKA (54%). Regarding awareness of predisposing risk factors: 9% and 29% of the participants have related DKA to infection and febrile illness respectively. While, 50% of them suggested that there was an association between physical stress and DKA. Another study was done among medical students to evaluate the awareness level about DKA [42], they reported a medium level of awareness.

In another study done among Medical Students [42], From the analysis of the data regarding general awareness of diabetes, there was a statistically significant difference in between two groups in questions related to classical symptoms ($p = 0.005$) and meaning of PPBS ($p = 0.008$). Regarding awareness of world diabetes day only 15.07% of the total respondents were able to give correct answer. So even though DM is known to everyone as it is the important topic in every medical, general, social area, there was a lack in awareness among the final year MBBS students.

In another study, following the awareness campaign DKA rate dropped from 48% in 2010 to 39% in 2014 and 15.8% had severe DKA compared to 26.1% in 2005 - 2010 ($p < 0.01$) [40], which means rising the awareness level has a clear effect on management and prevalence of DKA. Another study conducted to assess knowledge of parents of type 1 diabetes mellitus (T1DM) children about diabetic ketoacidosis (DKA) concluded that Parents' knowledge about DKA is suboptimal. Some characteristics are significantly associated with lower knowledge regarding diabetes and diabetic ketoacidosis, i.e. being a father of a diabetic child, older parents, being less educated or unemployed parents, those whose occupation is not healthcare-related, having low monthly income and having diabetic siblings [43].

Conclusion

Awareness level of general population especially families of diabetic patients, should be point of care and awareness campaigns should be carried to improve the awareness level and life style of the patients.

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