

DIABETIC KETOACIDOSIS: FREQUENCY AND CLINICAL CHARACTERISTICS IN CHILDREN AND ADOLESCENTS ADMITTED AT AL-THAWRA HOSPITAL, ALBAIDA- LIBYA (2016-2017)**¹*Dr. Najwa H. Abduljawad and ²Dr Abdalla Saad Abdalla Al-Zawi**MBBCH, AB^{1*}, MBBCH, SD, PhD, FRCS²¹Lecturer in Pediatric Medicine, Faculty of Medicine, Omar Al Moukhtar University, Albaida – Libya.¹Department of Paediatric Medicine, Al-Thawra Teaching Hospital, Albaida-Libya.²Basildon and Thurrock University Hospital, Basildon, Essex-United Kingdom.²Associate Lecturer, Anglia Ruskin University, Chelmsford- United Kingdom.***Corresponding Author: Dr. Najwa. H. Abduljawad**

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ABSTRACT

DKA is the a leading cause of morbidity and mortality in children with diabetes mellitus, it characterized by a biochemical triad of hyperglycaemia, ketonaemia (ketonuria) and academia. In this study, we aimed to determine the frequency of DKA in newly discovered diabetes, and in established cases, and to describe the clinical characteristics of DKA among these patients. 95 children & adolescents admitted to PICU, Al-Thawra Hospital in Albaida-Libya with DKA between [January 2016 and December 2017] were reviewed. 42 patients (44%) were newly discovered diabetes, and 53 patients (56%) were well established diabetes. Male to female ratio was (1 : 2.8). The common leading precipitating factors for DKA in our study were psycho-social causes and infection which observed in 49%, and 31% respectively. While the common presenting symptoms of DKA noticed in the study were: abdominal pain and vomiting in (98%) and (87%) respectively. DKA is an important cause of PICU admissions to Al-Thawra Hospital in Albaida-Libya, more effort should be put to prevent and reduce the incidence of DKA at initial presentation and later.

KEYWORDS: Diabetic ketoacidosis; children and adolescents, Diabetes Mellitus**Abbreviation:** DM: Diabetes Mellitus, DKA: Diabetic Ketoacidosis, T1D: Type1 Diabetes, PICU: Pediatric Intensive Care Unit, HbA1c: Glycosated Hemoglobin.**INTRODUCTION**

Diabetic ketoacidosis is one of the two acute emergency situations in those who have diabetes mellitus. It should be identifiable and can be preventable. Any associated complications of DKA should also be preventable with proper education and treatment. DKA is a state of uncontrolled catabolism triggered by a relative or absolute deficiency in circulating insulin. It is a triad of metabolic acidosis (pH<7.35), hyperglycemia (blood glucose >250 mg/dl), and ketonuria. Insulin deficiency is accompanied by a reciprocal elevation in counter regulatory hormones (glucagon, epinephrine, growth hormone & cortisol), causing gluconeogenesis and lipolysis. Lipolysis provides free fatty acids for the uncontrolled production of ketones by the liver. The production of ketones then leads to a metabolic acidosis. Any disorder that alter the balance between insulin and counter regulatory hormones can precipitates DKA.

DKA may occurs in people not previously diagnosed with diabetes, but most cases (up to 80%) occur in people with previous diagnosis. DKA is most often associated with T1D, however it may also occur in older patients with type 2 particularly when associated with a major inter-current illness.^[1, 2, 3, 4, 5]

Other triggers rather than infection are emotional stress, trauma, medications (e.g steroids) or hormonal changes (pre ovulation) in females. Many patients with recurrent episodes of DKA have deficient knowledge about their insulin regimen or have not been taught how to test their blood and urine for ketones or how to handle diabetes during times of illness. Nausea and vomiting, abdominal pain, dehydration, rapid (Kussmaul) respirations and acetone odor on the breath are common clinical features of DKA. There is wide geographic variation in the frequency of DKA at onset of diabetes;. Frequencies range from 15–70% in Europe and North America.^[6, 7, 8, 9, 10, 11, 12]

OBJECTIVES

This study was designed to determine the frequency of DKA in children & adolescents with diabetes, and to

describe the clinical characteristics of DKA patients treated at the pediatric department and PICU of Al-Thawra Hospital in Albaida-Libya.

PATIENTS & METHODS

Observational descriptive study was performed at PICU and pediatric Department of Al-Thawra Hospital in Albaida-Libya. All children admitted with DKA over a 2 year-period from [January 2016 to December 2017] were reviewed. Clinical, and laboratory data at the time of admission and during stay in the hospital were collected and analyzed. The criteria used for the diagnosis of DKA as defined by the American Diabetes Association (ADA)^[13] is blood glucose level > 250 mg/dl, blood pH < 7.3, serum HCO₃ level < 15 mmol/L and ketonuria. The severity of DKA is classified based on the degree of acidosis into mild, venous pH 7.2-7.3 (HCO₃ 15–18 mmol/L); moderate, pH 7.1 <7.2 (HCO₃ 10 – 14 mmol/L); and severe, pH < 7.1 (HCO₃ < 10 mmol/L).

RESULTS

Over 2year period, a total of 145 diabetic children & adolescents were hospitalized in the Pediatric department and PICU, 95 patient (65.5%) of the admitted cases presented in state of DKA [Figure1].

Out of 95 DKA cases, 42 patients (44%) were newly discovered diabetes, 53 patients (56%) were well established diabetes presented in DKA state [Figure2].

The mean age of newly diagnosed children & adolescents with DKA was 9 years ranging from (1-17 years) and in established diabetic patients was 14 years ranging from (12-16), their mean duration of diabetes was 4years (1-7 years) (Table 1).

Hyperglycemia ranging from (250-650 mg/dl), and HbA1c average results for newly diagnosed patients showed mean of 12% ranging from (8.8% -17%) (Table 1). According to the acid base results 30 of the patients (32%) were mild DKA, 45 patients (47%) were moderate and 20 patients (21%) were presented in severe DKA state (Table 2).

70 cases (74%) were Girls, while 25 (26%) were boys, male to female ratio was (1 : 2.8) [Figure3] . 33 patients (31%) had infection as predisposing factor of DKA, omission of insulin was seen in 15 of cases (16%), psycho-social factor was the contributing cause in 47 (49%) of cases, while in 11 patients (12%) there was no identified cause for DKA [Figure4].

Abdominal pain was the major clinical presenting symptoms of DKA, it presented in almost all of the cases with DKA 93 (98%), vomiting was seen in 83 of cases (87%), dehydration was found in 79 patients (83%) with 48% having severe degree, while impairment of consciousness level was noticed in 16 cases (17%), and one case in severe coma [Figure5].

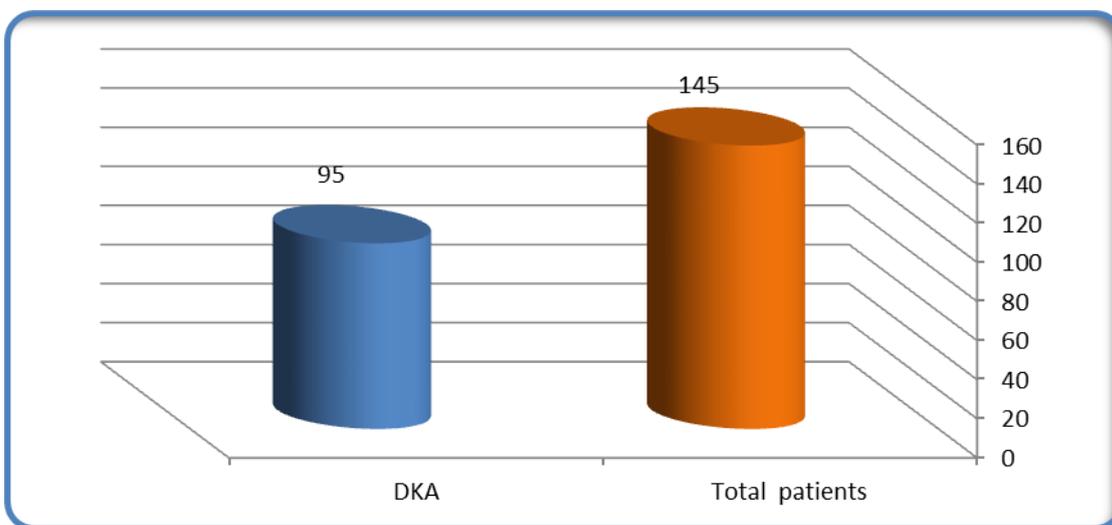


Figure 1: Distribution of the diabetic children and adolescents cases admitted to Al-Thawra Hospital in Albaida-Libya in the period between [January 2016 and December 2017].

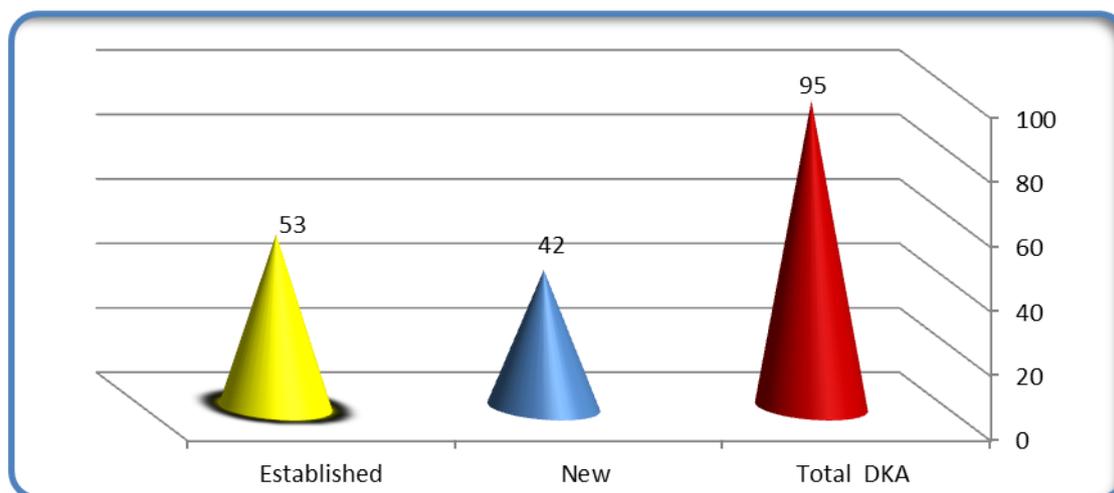


Figure 2: Distribution of study group with Diabetic ketoacidosis (DKA) according to DM diagnosis time.

Table 1: Demographic and glycaemic profile 95 patients diagnosed with DKA.

Variables		No	%
Total diabetes patients		145	
Total DKA patients		95	65.5
Mean Age of new diagnosed DM with DKA		9 yr	
Mean Age of established DM with DKA		14 yr	
Mean duration of diabetes patients		4 yr	
Sex	Females	70	74
	Males	25	26
Hyperglycemia ranging from (250-650 mg/dl)		(250-650 mg/dl)	
HbA1c ranging		(8.8 -17)	12

Table 2: Distribution of the study group according to DKA severity.

Variables	No	%
Mild DKA	30	32
Moderate	45	47
Severe DKA	20	21
Total	95	

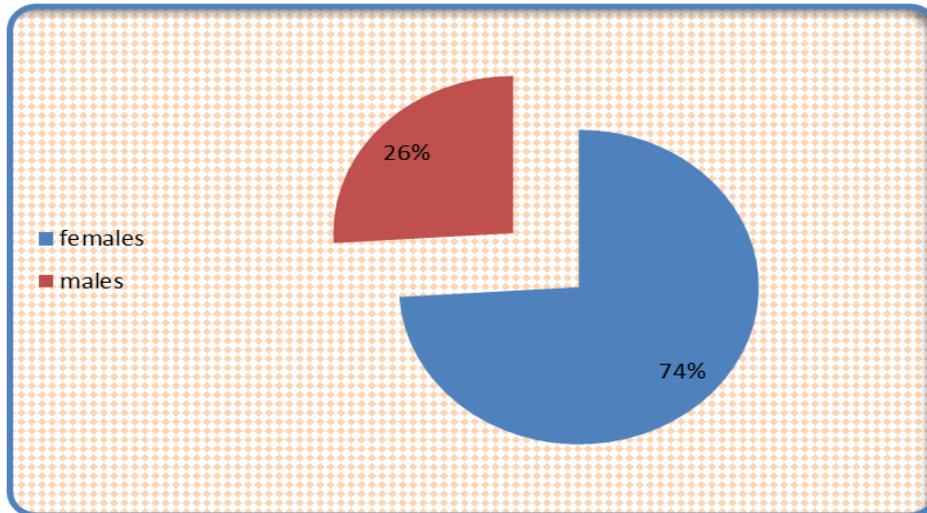


Figure 3: Gender distribution of the study group with DKA.

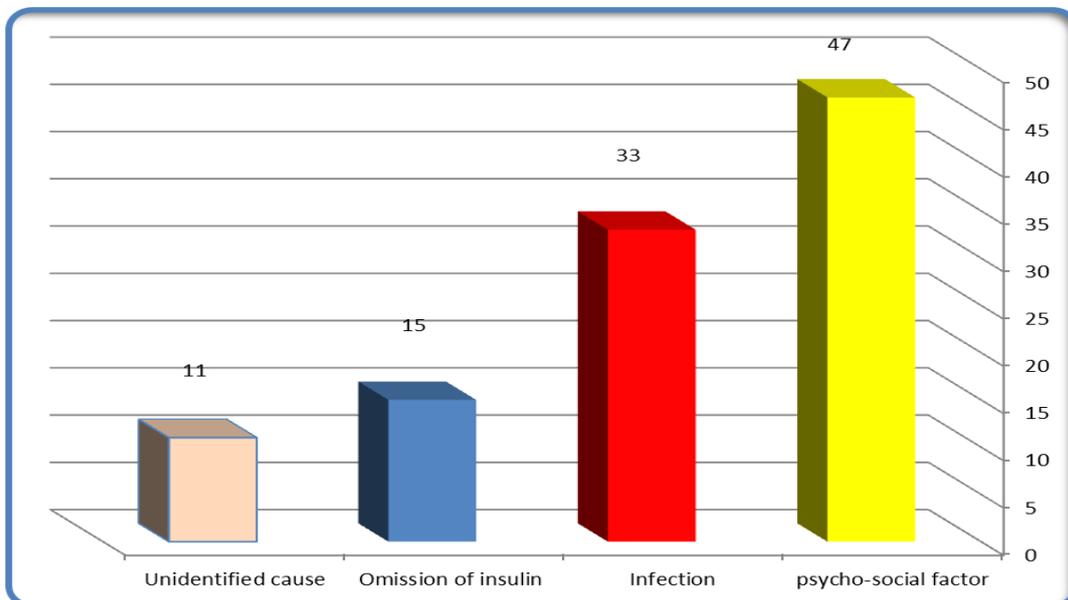


Figure 4: Risk factors distribution among the 95 patients with DKA.

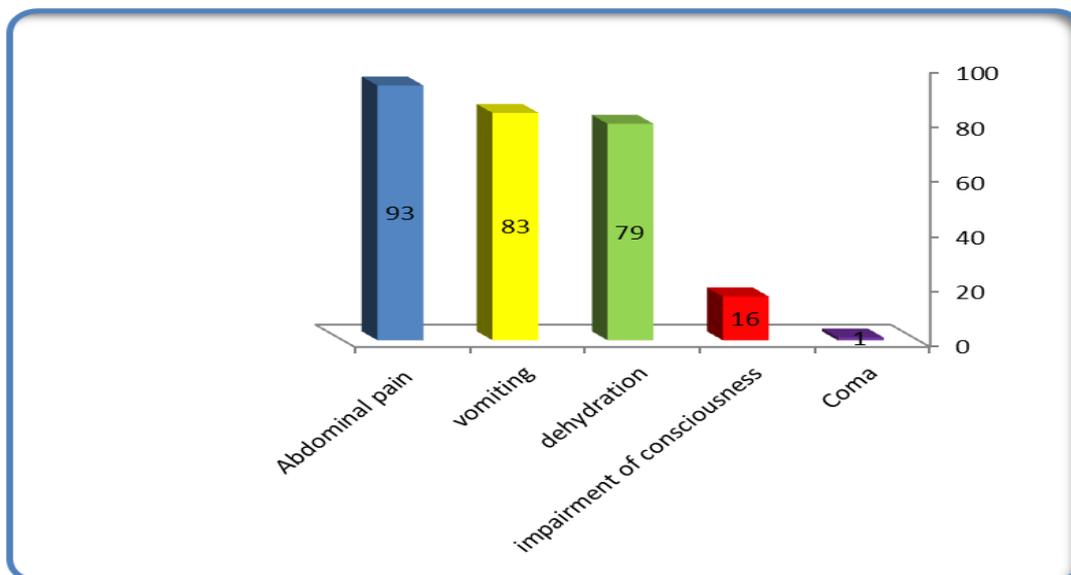


Figure 5: Clinical presentation of the study group with DKA.

DISCUSSION

Diabetic ketoacidosis (DKA) is a potentially life-threatening acute complication. It can be the initial presentation of diabetic patients or can occur in patients with established DM. Infants and toddlers who present in DKA may be misdiagnosed as having respiratory infection and treated accordingly. Lack of awareness of the nonspecific and subtle symptoms of diabetes in infants & young children result in delayed diagnosis and it ends up in DKA.^[14]

Girls were more affected than boys, which were similar to our findings. In a study done in Al-Madina Al-munawarah, females with DKA were 58.7% and males were 41.3%^[15] It was stated that adolescent girls were at higher risk for DKA than other groups of children and young people.

In the present study we have 95 (65.5%) episodes of DKA out of 145 during the studied period. Among 42 patients (44%), DKA was the first clinical presentation of the disease, which more than other studies were 25% to 40% of newly diagnosed children presented in DKA.^[16, 17] and is less than the figures reported from Ethiopia and India of 58% and 66% respectively.^[18, 19]

In the current study, abdominal pain was the commonest presenting symptom (98%) followed by vomiting (87%), this is similar to the experiences from India and Saudi Arabia where vomiting and abdominal pain were the commonest presenting symptoms.^[18, 20] Dehydrated patients were No= (83%) with 48% having severe degree, which lesser than the experience found in India where only 50% had clinical evidence of dehydration.^[18] It could well be that our patients arrived relatively late to the hospital or almost all of them were had vomiting. In the present study 17% of cases had altered level of consciousness with only one case being comatose, this is nearly similar to the experience of Saudi center where only 12.2% were said to have been drowsy with no cases of coma.^[15] In this study, we have found that infection was one of the major precipitating factors of DKA in 31%, and this is consistent with a study done in Addis Abeba Children's Hospital,^[19] which revealed that the most common precipitating factors for DKA in children were infections (52%), in contrast the study done among children and adults with DKA in Jeddah between 1999 and 2001 showed that poor compliance i.e omitting insulin was the most common factor (54.4%), followed by infections which cause 28% of DKA.^[20] In current study, omission of insulin contributed to only 6%. Another study done in Sudan^[21] revealed that DKA (among children and adults) was precipitated by poor compliance to therapy or diet and infections, particularly malaria.

In the present study, near half ((47%) %) of the cases presented form of DKA were moderate, and (21%) were severe DKA state, this is in agreement with the frequency of severe DKA reported from Kuwait.^[22] On the other hand, the frequency of severe DKA observed in

the present study is much higher than that reported from Finland.^[23] The reason for this difference might be that the background higher prevalence of diabetes mellitus in Finland makes the recognition of the disease easier by both the public and the physician. Average level of HbA1c for the newly diagnosed patients was (12%) ranging from (8.8% -17%), and this reflects the lack of awareness extent and the tendency to the delay in diagnosis.

CONCLUSION

Diabetic ketoacidosis (DKA) is an important cause of PICU admissions in Albaida hospital. Psycho-social causes and infections are the commonest precipitating factors. Abdominal pain and vomiting are the commonest presenting symptoms in this study.

More efforts should be put to prevent and reduce the incidence of DKA. Urgent availability of intensive care facilities are needed, as well as standardized guidelines for management, to result in good management outcome closer to the experience in developed Countries.

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