

Final-year medical students' awareness and knowledge about DKA: A cross-sectional study from a Saudi University

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ABSTRACT

Background: Final-year medical students are soon to be physicians who are expected to have sufficient knowledge about a life-threatening condition such as diabetic ketoacidosis (DKA); thus, the present study aimed to evaluate awareness and knowledge of medical students about DKA in a large Saudi University. **Methods:** An online survey was conducted using a convenience sample of 81 participants aged 18 years and above from Jazan region, Saudi Arabia. Awareness and knowledge about DKA were assessed using a prestructured questionnaire. Statistical analysis using the Statistical Package of Social Sciences (SPSS) included descriptive studies and Chi-square or Fisher's exact test, with the significance level set at P value < 0.05 . **Results:** A total of 81 valid responses were analyzed (85.3% response rate), of which 51.9% were males. The mean age was 23.06 (Standard deviation 1.66 years). Regarding basic information about diabetes mellitus, most of the respondents correctly answered questions related to the system involved in diabetes, classic symptoms, glycemic control test, and the meaning of postprandial blood sugar. Also, students had a good knowledge regarding DKA definition and management. However, inadequate knowledge was found regarding electrolyte disturbance in DKA (59% of males vs. 30.8% of females $P = 0.014$) and fluid replacement in DKA patients ($P < 0.05$). **Conclusion:** The present study revealed that students had a good knowledge regarding basic information about diabetes and DKA definition and management. Students' knowledge was deficient regarding electrolyte disturbance and fluid replacement in DKA. Interventions using study seminars and workshops are warranted to increase knowledge about DKA among final-year medical students.

Keywords: Awareness, diabetic ketoacidosis, knowledge, medical students, Saudi Arabia

Introduction

Diabetic ketoacidosis (DKA) is an acute and life-threatening metabolic complication of diabetes mellitus (DM) that is caused by severe hyperglycemia. According to the International Society for Pediatric and Adolescent Diabetes (ISPAD) in

2018, DKA is characterized by a triad of hyperglycemia (blood glucose > 200 mg/dL), metabolic acidosis (Venous pH < 7.3), and ketosis (blood ketones > 3 mmol/L beta-hydroxybutyrate or moderate to large urine ketones).^[1] DKA is still the most common cause of morbidity, mortality, and hospitalization in children with type 1 diabetes mellitus (T1DM). Although at lower rates compared with those observed in T1DM, DKA can also occur in patients with type 2 diabetes.^[1-4] The prevalence rate of DKA at diabetes onset has been estimated to reach up to 30% of children in the United States.^[5-7] Factors associated with the

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presence of DKA at T1DM onset include young age (<5 years of age), ethnic minority, low socioeconomic status, and delayed diagnosis of diabetes.^[8] Saudi Arabia has the highest diabetes incidence in the Middle East and North Africa (prevalence rate of 17.7%)^[9] and the fourth highest incidence of T1DM in the world (33.5/100,000 individuals per year).^[10] In a 10-year retrospective review (2005- 2014) conducted in the region of Al-Madinah, Saudi Arabia, DKA was the initial presentation in 44.9% in children with T1DM.^[11] These findings make DKA a major public health problem in the country and warrant investigating possible prevention programs and management protocols to reduce the sequelae of DKA, including childhood death.

Access to high-quality primary care centers is crucial to the welfare of children as having a usual primary care physician has been linked with better health outcomes.^[12] Raising the medical and public awareness of diabetes and DKA has been proven to be effective in reducing the frequency of DKA at the initial diagnosis of T1DM.^[13,14] One 2-year intervention study conducted a diabetes awareness campaign in children with T1DM and showed a reduction rate of 64% in the occurrence of DKA at diabetes onset in children aged 0-18 years.^[15] Despite the high reported incidence of diabetes in Saudi Arabia, awareness and knowledge about diabetes and its complications have been found to be deficient in both the public and medical students and healthcare workers as per a 2018 systematic review by Alanazi *et al.*^[10] Studies have also suggested that the knowledge of medical students about DKA is limited.^[16] One study showed that although medical students had basic knowledge about diabetes, only 50% of them were aware of DKA.^[17] Final-year medical students are soon to be physicians who are expected to have sufficient knowledge about a life-threatening condition such as DKA; thus the present study aimed to evaluate awareness and knowledge of medical students about DKA in a large Saudi University.

Materials and Methods

This is an observational cross-sectional survey to evaluate awareness and knowledge of final-year medical students about DKA in Jazan University, Saudi Arabia. The survey targeted all male and female students who are aged 18 years or above. Students of other years or other colleges/universities were excluded from the study. The total number of final-year medical students (or students of the 6th year in the college of medicine) in the academic year 2018/2019 is 95 students, to whom we sent an online link to the study survey during the period from March 2019 to June 2019. The survey consisted of three main parts assessing sociodemographic details (sex, age, etc.); participants' awareness and knowledge about basic information on diabetes; and participants' knowledge about DKA. We used a structured questionnaire developed by a previous study with similar objectives.^[17]

All invited participants were asked to provide an informed written consent for participation in the survey. Names were not included

in the survey. To eliminate duplicate responses, used students' personal emails, which were kept confidential.

Data were analyzed using Statistical Package of Social Sciences (SPSS) Version 21 (SPSS Inc., Chicago, IL). Categorical variables were presented as frequencies and percentages. Chi-square or Fisher's exact test were used for the comparison of categorical variables. Differences were considered significant at P value < 0.05.

Results

A total of 81/95 (85.3%) responded to our survey; whom ages ranged from 19 to 27 years with a mean age of 23.06 (SD 1.66 years). Males and females were almost equally distributed; 42 males (51.9%) and 39 females (48.1%). Students' responses to the survey questions were analyzed and categorized into correct and incorrect answers [Table 1]. Regarding general information about diabetes mellitus, most of the respondents correctly answered questions related to the system involved in diabetes, classic symptoms (e.g. polyuria, polydipsia and polyphagia), glycemic control test, and the meaning of postprandial blood sugar. Comparison of males' and females' responses did not reveal a significant difference (all P values < 0.05).

Participants' responses to the questions assessing knowledge about DKA are shown in Table 2. Students had good knowledge regarding DKA definition and management. However, only 59% of males and 30.8% of females correctly answered the question regarding electrolyte disturbance in DKA, with a statistically significant difference ($P = 0.014$). Also, there were a large proportion of incorrect answers regarding fluid replacement among males (47.6%) and females (33.3%) [Table 2].

Discussion

DKA is an emergency and potentially life-threatening complication of T1DM and, to a lesser extent, type 2 diabetes mellitus.^[1-4] The present study assessed awareness and knowledge about DKA in a sample of final-year Saudi medical students. Our results are comparable with those of a similar study conducted in Southern Indian University, which found students to have basic knowledge regarding diabetes clinical features and management, but inadequate knowledge about DKA.^[17] As expected, final-year students in this study were knowledgeable in general information about diabetes as they have finished their basic learning in the physiology, pathology, and pharmacology of diabetes, and the basics of DKA. The majority of students in this study correctly answered questions related to the definition, mechanism, and some questions about DKA management. More advanced questions about DKA management, such as electrolyte disturbances and fluid replacement, were the weak spots in the current sample as a large proportion of students were not aware of these aspects of DKA.

A 2018 systematic review by Alanazi *et al.*^[10] showed a considerable gap in awareness and knowledge about diabetes in the general

Table 1: Basic knowledge about diabetes

Questions	Males n (%)		Females n (%)		P
	Correct answers	Incorrect answers	Correct answers	Incorrect answers	
Diabetes is related to endocrine pancreas	39 (92.9)	3 (7.1%)	37 (94.9)	2 (5.1)	1.000
Classical symptoms of DKA	37 (88.1)	5 (11.9)	36 (92.3)	3 (7.7)	0.714
HbA1c is the best indicator of glycemic control	36 (85.7)	6 (14.3)	35 (89.7)	4 (10.3)	0.739
A cut-off value of FBS for diagnosing diabetes mellitus	38 (90.5)	4 (9.5)	34 (87.2)	5 (12.8)	0.732
Meaning of PPBS	36 (85.7)	6 (14.3)	34 (87.2)	5 (12.8)	1.000

DKA-diabetic ketoacidosis; HbA1c-hemoglobin A1c; FBS-fasting blood sugar; PPBS-postprandial blood sugar

Table 2: Knowledge about DKA

Questions	Males n (%)		Females n (%)		P
	Correct answers	Incorrect answers	Correct answers	Incorrect answers	
DKA is not an acute complication of diabetes	36 (85.7)	6 (14.3)	32 (82.1)	7 (17.9)	0.766
DKA is seen in both type 1 and 2 diabetes	29 (69.0)	13 (31.0)	34 (87.2)	5 (12.8)	0.063
Decreased blood glucose is not a component of DKA	39 (92.9)	3 (7.1)	34 (87.2)	5 (12.8)	0.472
Electrolyte depleted in DKA is potassium	25 (59.5)	17 (40.5)	12 (30.8)	27 (69.2)	0.014
Fluid should be replaced is NS and DNS	20 (47.6)	22 (52.4)	13 (33.3)	26 (66.7)	0.258
Short acting insulin is used in DKA	29 (69.0)	13 (31.0)	28 (71.8)	11 (28.2)	0.812
IV is the mode of insulin administration	32 (76.2)	10 (23.8)	32 (82.1)	7 (17.9)	0.592
DKA is managed in ICU	38 (90.5)	4 (9.5)	34 (87.2)	5 (12.8)	0.732
Insulin and IV fluids are the first line management of DKA	39 (92.9)	3 (7.1)	37 (94.9)	2 (5.1)	1.000

DKA-Diabetic ketoacidosis; NS-normal saline; DNS-dextrose normal saline; ICU-intensive care unit; IV-intravenous fluid

Saudi population, including medical students and healthcare workers. Several studies from different countries suggested that health education is a powerful tool to control diabetes and other chronic diseases. Therefore increasing awareness and knowledge about diabetes in the general population may lead to better public health outcomes.^[18] For medical students and health care workers, higher levels of knowledge about diabetes and its complications, such as DKA, are necessary because they are the primary source of information for patients.^[10,19] The need to improve awareness and medical students and physicians is particularly critical in Saudi Arabia, given the high prevalence of diabetes among Saudis.^[9,10] Seminars and workshops focusing on diabetes in general and DKA may be effective methods to bridge the gaps in medical students' knowledge about DKA, although studies are needed to support this hypothesis.

Further studies are recommended to use higher sample sizes randomly selected from different universities in Saudi Arabia. As well, a validated structured questionnaire used in interview-based studies is highly recommended to reach clear conclusions.

Conclusions

The present study revealed that students had a good knowledge regarding basic information about diabetes and DKA definition and management. Students' knowledge was deficient regarding electrolyte disturbance and fluid replacement in DKA. Interventions using study seminars and workshops are warranted to increase knowledge about DKA among final-year medical students. Evaluating students' knowledge before and after such interventions is one method to evaluate the effectiveness of such interventions.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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