

ORIGINAL A R T I C L E

Competencies of Healthcare Workers in Diabetic Ketoacidosis in Children

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Abstract

Background Diabetic ketoacidosis (DKA) is a severe, acute complication of diabetes characterized by hyperglycemia, ketoacidosis, and ketonuria, posing a potentially fatal risk, especially in individuals with type 1 diabetes.

Objective of the study The study aims to evaluate the knowledge of healthcare providers regarding pediatric DKA at Babylon Hospital for Maternal and Child.

Methods A cross-sectional descriptive study design was employed from August 1, 2023, to March 1, 2024, involving the assessment of healthcare providers' knowledge about DKA using a two-section questionnaire. Section one gathered sociodemographic data, while section two assessed knowledge about pediatric DKA. Convenience sampling included 100 healthcare providers. Both inferential and descriptive statistical analyses were applied to the data.

Results The study revealed a significant relationship between healthcare providers' knowledge of DKA and their sociodemographic characteristics, including age, residency, marital status, educational level, work site, years of experience, and years of experience in the unit.

Conclusion The findings suggest that the majority of healthcare providers exhibited moderate to poor levels of knowledge regarding the management of pediatric DKA.

Recommendations It is imperative to implement targeted educational programs and training sessions to enhance healthcare providers' understanding and management skills related to pediatric DKA. Additionally, continuous monitoring and evaluation of healthcare providers' knowledge levels are essential to ensure optimal patient care outcomes.

Keywords: Diabetic ketoacidosis; Healthcare providers; Pediatric patients.

1 Introduction

Diabetic ketoacidosis (DKA) is a perilous complication of diabetes characterized by the overproduction of blood acids called ketones due to insufficient insulin, facilitating glucose entry into cells. In the absence of insulin, the body turns to fat metabolism for energy, resulting in ketone production. Elevated ketone levels

lead to increased blood acidity, culminating in ketoacidosis, necessitating urgent medical intervention [1].

Hypoglycemia, hyperosmolar hyperglycemic non-ketotic syndrome (HHNKS), and DKA exemplify acute diabetic crises. Individuals experiencing diabetic crises often present to the emergency department and require intensive care unit admission and hospitalization [2]. As reported by [3], diabetic crisis rep-

resents one of the most perilous acute complications of diabetes mellitus, with life-threatening potential. DKA disproportionately affects children, particularly during the onset of type 1 diabetes. Despite advancements in treatment and awareness, delayed treatment initiation, resource limitations, or inadequate management can still result in fatalities or severe complications [4]. Mortality rates in developed nations have significantly decreased from 10% in the 1980s to 0.21% in recent decades. Although the precise prevalence of DKA remains elusive, it contributes to over 500,000 hospital days annually and accounted for over 140,000 hospitalizations in the US in 2009 [5]. Despite positive trends and increased awareness, up to 30% of children with type 1 diabetes still experience DKA [6]. Continuous education is imperative for healthcare workers, with continuing education serving as a strategy to bridge knowledge gaps. Rapid technological advancements, changes in medical practices, and implications for healthcare providers' clinical duties underscore the necessity of educational programs. Such programs equip nurses with the theoretical and technical knowledge essential for enhancing nursing practice continuously. To mitigate morbidity and mortality, minimize hospitalizations, and reduce treatment costs, healthcare providers must possess adequate knowledge and preparedness for any suspected complication. This study endeavors to assess caregivers' knowledge and practices concerning various facets of type [7].

Diabetes risk is influenced by race and ethnicity; American Indians and Alaskan Natives have the greatest risk (15.1%). Then come Asian Indians (11.2%), Mexican Americans, non-Hispanic Blacks (12.7%), Hispanics (12.1%), and Puerto Ricans (12.0%). The following groups comprise less than 10% of the population: non-Hispanic whites (7.4%), Chinese (4.3%), Filipinos (8.9%), other Asian Americans (8.5%), Central and South Americans (8.5%), and Cubans (9.0%). Because diabetes affects a large percentage of people of all races and ethnicities, nurses providing inpatient care must be skilled in diagnosing, treating, and teaching patients with diabetes while they are in the hospital [8].

At 159 per 100,000, Baghdad had a type 1 diabetes mellitus prevalence almost equal to that of Saudi Arabia, lower than that of Kuwait, but higher than that of Turkey [9].

2 Method

2.1 Study design

A descriptive cross-sectional research design was employed to assess healthcare providers' knowledge about diabetic ketoacidosis, commencing on August 1, 2023, and concluding on March 1, 2024. Ethical Con-

sideration: Prior to participation, written informed consent was obtained from each healthcare provides. The researcher provided a detailed explanation of the study's objectives to the healthcare provides, emphasizing their voluntary participation. The consent form assured participants of the confidentiality and security of their information throughout and after the study.

2.2 Study setting

The study was conducted from January 7 to February 20, 2024, at Babylon Hospital for Maternity and Child in Babylon province, where a total of 100 healthcare providers are employed.

2.3 Study sample

Convenience sampling was utilized to select 100 healthcare provides to evaluate healthcare providers' knowledge about children with diabetic ketoacidosis at Babylon Hospital for Maternity and Child in Babylon Province.

2.4 Study instrument

Following a thorough review of literature, researchers developed a questionnaire to assess healthcare providers' knowledge about children with diabetic ketoacidosis at Babylon Hospital for Maternity and Child. The questionnaire comprised two sections:

2.4.1 Sociodemographic information

This section included nine items covering age, gender, marital status, residence, educational level, monthly income, department of employment, years of experience in the hospital, years of experience in the unit, and whether the participant had undergone DKA training.

2.4.2 Knowledge of healthcare provides regarding DKA

The second section consisted of five domains, each containing five items related to definitions, causes or risk factors, early symptoms and signs, diagnosis, and more associated with diabetic ketoacidosis.

3 The study

Table 1 shows that the age of (72%) participants was 20-29 years. In relation to sex, about two third of the samples (56%) were female, (80%) were urban and more than half (52%) were single and (44%) were Diploma in Nursing. Regarding to employment data, (44%) were work in RCU, (88%) were did not have

training, (68%) have (1-5) year of experience, and finally (92%) have (1-5) year of experience in unite.

Table 2 shows that overall healthcare providers' knowledge are less than half (44%) of nurses were have a Moderate knowledge regarding diabetic ketoacidosis.

Table 3 shows that there was significant relationship between knowledge regarding diabetic ketoacido-

sis and (Age, Resident, Marital status, Educational level, work site, Year of experience, and Year of experience in unit) respectively at p-value < 0.05 , except (sex and training) that there are a non-significant relationship between knowledge regarding diabetic ketoacidosis.

Table 1: Distribution of demographical and employment data for health care providers.

		Frequency	Percent
Age	20-29	72	72.0
	30-39	20	20.0
	40-49	8	8.0
	Total	100	100.0
Sex	Male	44	44.0
	Female	56	56.0
	Total	100	100.0
Resident	Rural	20	20.0
	Urban	80	80.0
	Total	100	100.0
Marital status	Single	52	52.0
	Married	36	36.0
	Divorced	8	8.0
	Widow	4	4.0
Year of experience	Total	100	100.0
	1-5	68	68.0
	6-10	20	20.0
	11-15	8	8.0
	16-20	4	4.0
Year of experience in unit	Total	100	100.0
	1-5	92	92.0
	6-10	4	4.0
	11-15	4	4.0
Training	Total	100	100.0
	No	88	88.0
	Yes	12	12.0
	Total	100	100.0
Educational level	Preparatory school	12	12.0
	Diploma	44	44.0
	Bachelor	40	40.0
	Master	4	4.0
	Total	100	100.0
Work site	Emergency unite	16	16.0
	Pediatric unite	40	40.0
	RCU	44	44.0
	Total	100	100.0

Table 2: Overall Health Care Providers' Knowledge Regarding diabetic ketoacidosis.

Items		Frequency	Percent
What nurses know about diabetic ketoacidosis.	Poor knowledge	32	32.0
	Moderate knowledge	24	24.0
	Adequate knowledge	44	44.0
	Total	100	100.0
Health Care Providers' knowledge about intravenous fluid replacement	Poor knowledge	44	44.0
	Moderate knowledge	20	20.0
	Adequate knowledge	36	36.0
	Total	100	100.0
Health Care Providers' knowledge about insulin administration	Poor knowledge	36	36.0
	Moderate knowledge	40	40.0
	Adequate knowledge	24	24.0
	Total	100	100.0
Health Care Providers' knowledge about electrolyte replacement	Poor knowledge	32	32.0
	Moderate knowledge	20	20.0
	Adequate knowledge	48	48.0
	Total	100	100.0
Health Care Providers' knowledge about blood acidosis	Poor knowledge	39	39.0
	Moderate knowledge	21	21.0
	Adequate knowledge	40	40.0
	Total	100	100.0
Overall knowledge	Poor knowledge	40	40.0
	Moderate knowledge	44	44.0
	Adequate knowledge	16	16.0
	Total	100	100.0

Table 3: Relationship between health care providers' knowledge regarding diabetic ketoacidosis and demographical characteristic.

Items		Overall Knowledge			Total	p-value
		Poor knowledge	Moderate knowledge	Adequate knowledge		
Age	20-29	28	32	12	72	.006
	30-39	12	8	0	20	
	40-49	0	4	4	8	
	Total	40	44	16	100	Sig
Sex	Male	16	20	8	44	.767
	Female	24	24	8	56	
	Total	40	44	16	100	
	Total	40	44	16	100	N.S
Resident	Rural	16	4	0	20	.001
	Urban	24	40	16	80	
	Total	40	44	16	100	
	Total	40	44	16	100	Sig
Marital status	Single	20	24	8	52	.001
	Married	8	20	8	36	
	divorced	8	0	0	8	
	Widow	4	0	0	4	Sig
Educational level	Total	40	44	16	100	.002
	Secondary school	8	4	0	12	
	Diploma	20	12	12	44	
	Bachelor	12	24	4	40	Sig
Work site	Master	0	4	0	4	.015
	Total	40	44	16	100	
	Emergency unite	8	8	0	16	
	Pediatric unite	16	12	12	40	Sig
Training	NICU	16	24	4	44	.140
	Total	40	44	16	100	
	No	36	36	16	88	
	Yes	4	8	0	12	N.S
Year of experience	Total	40	44	16	100	.004
	1-5	28	28	12	68	
	6-10	8	12	0	20	
	11-15	4	0	4	8	Sig
Year of experience in unit	16-20	0	4	0	4	.024
	Total	40	44	16	100	
	1-5	36	40	16	92	
	6-10	4	0	0	4	Sig
Total	11-15	0	4	0	4	Sig
	Total	40	44	16	100	

N.S = no significant, Sig= significant, p-value=0.05.

3.1 Discussion the baseline demographic characteristic of the study sample

Based on the current study, Table 1 illustrates that 72% of participants fall within the age group of 20-29 years. This aligns with findings from research by [10], which indicated that 38% of the sample fell within the age range of 25-29 years. Similarly, a study conducted in Iraq by [3] revealed that 53% of nurses were within this age bracket. Moreover, the majority of participants in the current study are female, consistent with research conducted in Iraq by [5], where 57.5% of the study group comprised females. This finding contradicts the research by [3], which reported that 57% of participants were male. In terms of marital status, the current study reports that 52% of participants are single, in contrast to findings from a study in Egypt by [5], where 62.9% of nurses were married. This discrepancy also contradicts the findings of [3], who reported that 70% of participants were married. Regarding educational qualifications, the majority of participants (44%) in the current study held a diploma in nursing, conflicting with the findings of [3], which reported that 67% were bachelor's degree holders. These results also diverge from a prior study conducted in Iraq by [11], where 51.7% of nurses were graduates of nursing schools. Finally, the majority of nurses (68%) in the current study had one to five years of nursing experience, consistent with findings from research in Iraq by [12], which revealed that 53.3% of nurses had worked in nursing for one to five years.

3.2 Distribution of responses Health Care Providers' knowledge regarding the diabetic ketoacidosis

Less than half (44%) of nurses reported having only a moderate understanding of diabetic ketoacidosis, according to the present study. The items with the highest mean score, signs of low potassium in the blood are, and the lowest mean score, the primary effect of insulin deficiency in the body is, both had mean scores of 1.2. These findings are consistent with conclusions drawn from various other studies. For instance, a study by [13] indicated that insufficient knowledge among healthcare providers regarding the cause, etiology, signs, symptoms, and management of a disease may increase the risk of complications related to DKA. Similarly, a study conducted in China by [14] demonstrated limited nursing knowledge and inadequacy of healthcare providers' pre-program knowledge in managing diabetes mellitus for safe and effective patient care. Furthermore, findings from a study conducted in the Emirates by [15] revealed that 90% of healthcare providers had poor pretest scores in diabetes treat-

ment knowledge. Consistent with the agreement of research conducted in Mosul by [3], which found that 56.7% of healthcare providers had low knowledge levels regarding diabetic ketoacidosis, with over half falling into this category. The results also indicate that the majority of nurses had only average knowledge about diabetic ketoacidosis, likely due to being graduates of technical institutes with diplomas in nursing. Hence, their understanding of diabetic ketoacidosis was weak, further compounded by the absence of training programs on this disease.

3.3 Relationship between health care providers' knowledge regarding diabetic ketoacidosis and demographic characteristic

The present study reveals a significant correlation (p -value < 0.05) between healthcare providers' knowledge of diabetic ketoacidosis and several variables, including age, residency, marital status, educational attainment, work site, years of experience, and years of experience in the unit. However, there is no significant correlation between training and sex. These results align with a study conducted in Egypt by [16], which similarly found no statistically significant relationship between healthcare providers' total knowledge levels and their age, years of experience, education level, or participation in training programs related to caring for children with diabetic ketoacidosis. Conversely, these findings contradict a study by [3], which found no evidence of a significant relationship between healthcare providers' pre-test knowledge of DKA and their workplace.

The study also indicates that the highest percentage of individuals with good knowledge about diabetic ketoacidosis were graduates of nursing colleges, while moderate and weak percentages were observed among graduates of nursing institutes and middle schools.

Furthermore, the percentage of healthcare providers who underwent training courses outside their place of work predominantly comprised city residents.

4 Conclusion

The study findings indicate that the majority of healthcare providers possess moderate to poor levels of knowledge and insufficient experience in caring for children with diabetic ketoacidosis. Furthermore, the research highlights a lack of adequate training in DKA care procedures among nurses in the past.

Conflict of Interest: No conflicts of interest exist between the authors and the publication of this work.

Ethical consideration: The ethical committee approved the study at University of Kerbala, Kerbala, Iraq.

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