FACTORS AFFECTING TIME TO RECOVERY FROM DIABETIC KETOACIDOSIS IN ADULT DIABETIC PATIENTS IN ALEXANDRIA MAIN UNIVERSITY HOSPITAL

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Introduction

Diabetic ketoacidosis (DKA) represents a critical metabolic consequence of absolute or relative insulin deficiency in DM. This deficiency disrupts glucose utilization, promoting lipolysis and formation of ketone bodies as alternative fuel, this uncontrolled ketogenesis leads to ketonemia and metabolic acidosis. DKA diagnosis and classification depend on American Diabetes Association (ADA) criteria: blood glucose > 200 mg/dl, arterial pH < 7.3, bicarbonate ≤ 18 mEq/L, presence of ketonemia or ketonuria. Missed insulin doses and infections are the most common precipitating factors. Early symptoms include nausea, vomiting, polyuria, and polydipsia. Progression to Kussmaul breathing, dehydration signs, and coma can occur if untreated. DKA may be the initial presentation in undiagnosed DM. Management necessitates ICU admission within the first 24-48 hours for fluid resuscitation, insulin therapy, electrolytes correction, correction of acid-base abnormalities, and treating the precipitating factor. Prompt diagnosis and early intervention are crucial to prevent significant morbidity and mortality associated with DKA.

Aim of the work

The aim of this study was to identify the factors affecting time of recovery from DKA in adult diabetic patients including patient related factors (e.g. age, severity of illness, electrolyte imbalance, time of presentation) and treatment related factors (e.g., type and timing of insulin therapy, fluid management, electrolyte replacement).

Patients and Methods

This prospective study was performed on 150 patients who were admitted to AMUH with DKA. Inclusion criteria involved patients aged ≥18 years old and patients diagnosed DKA. Exclusion criteria involved pregnant females, patients ≤18 years old, patients presented with hyperglycemia without ketoacidosis, hyperglycaemic hyperosmolar state (HHS), patients with CKD, and hemodynamically unstable patients. Patients were managed with hospital admission for IV fluids, IV insulin infusion, electrolytes correction, and treatment of predisposing factors. Criteria for resolution are RBS < 200 mg/dL with at least two of: serum $HCO_3^- \geq 15$ mEq/L, venous pH > 7.3, and anion gap ≤ 12 mEq/L. The data analysis was done using IBM SPSS software package version 22.0 (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level.

Results

Males contributed to (58.7%) of the total patients in this study with a mean age of (32.16 ± 15.06) years. DKA mean time of resolution was (18.76 ± 14.07) hours. The majority of patients were with T1DM (86%), while T2DM were (14%). Missed insulin dose was the leading precipitating factor (60.7%) followed by infections (38.7%). There was a statistically significant relationship between DKA resolution time with age, time of presentation, type of diabetes, initial PH, initial serum K+ level, initial HCO_3^- level, initial anion gap, initial base excess, and initial RBS. (*p value <0.001*).

Table (1): Distribution of the studied patients according to different parameters (n = 150)

Sex	No.	%
Male	88	58.7
Female	62	41.3
Age (years)		
Min. - Max.	18.0 - 83.0	
Mean ± SD.	32.16 ± 15.06	
Median (IQR)	25.50 (20.0 - 39.0)	
Time for resolution (hours)		
<24 hours	107	71.3
≥24 hours	43	28.7
Min. - Max.	2.0 - 71.0	
Mean ± SD.	18.76 ± 14.07	
Median (IQR)	15.0 (8.0 - 24.0)	
Precipitating factors		
Missed insulin dose	91	60.7
Infections	58	38.7
Emotional stress	23	15.3
First presentation of diabetes	4	2.7
Type of DM		
T1DM	129	86.0
T2DM	21	14.0

Table (2): Correlation between resolution time (hours) and different parameters (n = 150)

	Resolution time (hours)	
	r_s	p
Age (years)	<0.001*	0.581*
Time of presentation	<0.001*	0.673*
PH	<0.001*	-0.882*
HCO_3 (mmol/L)	<0.001*	-0.940*
BE base excess	<0.001*	-0.962*
HBA1C	0.471	-0.059
Anion gap	<0.001*	0.707*
Initial RBS	<0.001*	0.517*

Table (3): Correlation between resolution time (hours) and different parameters (n = 150)

	N	Resolution time (hours)			p
		Min. – Max.	Mean ± SD.	Median	
Type of DM					
T1DM	129	2.0 – 45.0	14.78 ± 9.02	12.0	<0.001*
T2DM	21	15.0 – 71.0	43.24 ± 14.95	43.0	
Type of insulin regimen					
Pre - Mixed	24	15.0 – 71.0	41.04 ± 15.21	42.50	
Basal Bolus	125	2.0 – 45.0	14.26 ± 8.49	12.0	<0.001*
OAD	1		47.0		
First presentation					
No	146	2.0 – 71.0	18.9 ± 14.15	14.0	0.087
Yes	4	19.0 – 40.0	26.0 ± 9.56	22.50	
Severity of DKA					
Mild	7	2.0 – 6.0	4.57 ± 1.62	5.0	
Moderate	127	4.0 – 71.0	17.35 ± 12.87	14.0	<0.001*
Severe	16	19.0 – 60.0	36.13 ± 11.93	30.50	
K (mmol/L)					
Normal (3.5 - 5.5)	114	2.0 – 56.0	13.88 ± 8.63	12.0	<0.001*
Abnormal	36	6.0 – 71.0	34.22 ± 16.72	30.0	

Conclusion

Delayed time of resolution from DKA was associated with initial lower PH, initial lower HCO_3^- level, initial lower base excess level, initial higher anion gap level, type 2 diabetes mellitus, patients on pre-mixed insulin regimen, old patients, delayed time for seeking medical care, and abnormal serum K+ level. This study adds to the existing knowledge related to factors affecting DKA resolution time. The findings emphasize the importance of early diagnosis, prompt treatment, and well-defined management protocols to improve patient outcomes.