

CLINICAL PROFILE, OUTCOMES AND ADHERENCE TO A STANDARDISED MANAGEMENT BUNDLE IN DIABETIC KETOACIDOSIS PRESENTING TO THE EMERGENCY DEPARTMENT OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To determine the clinical profile and outcomes of diabetic ketoacidosis (DKA) in the emergency department and to evaluate adherence to a standardised management bundle and its association with outcomes.

Study Design: Prospective observational study.

Setting: Department of Accident & Emergency, Jinnah Postgraduate Medical Centre (JPMC), Karachi.

Period: November 2025 to February 2026.

Material & Methods: A total of 186 patients aged ≥ 14 years with DKA (ADA criteria) were enrolled. Completion of four bundle elements within six hours (≥ 1 L saline in the first hour, fixed-rate intravenous insulin, protocol potassium replacement, hourly glucose monitoring) was recorded; $\geq 75\%$ completion was high adherence. Resolution time, intensive care unit (ICU) admission, hospital stay and mortality were compared using SPSS 26.

Results: Mean age was 49.1 ± 15.6 years, 98 (52.7%) were female and 127 (68.3%) had type 2 diabetes. Infection (71.5%) and missed treatment (55.4%) were the leading precipitants; 21.0% had severe DKA. All four elements were completed in 56 (30.1%) patients and high adherence was achieved in 119 (64.0%). High adherence shortened time to resolution (22.8 ± 7.8 vs 26.9 ± 8.4 hours, $p = 0.002$), and this persisted after adjustment for severity and age (-4.8 hours; 95% CI -6.9 to -2.8). ICU admission (31.2%) and mortality (10.8%) did not differ by adherence; severity predicted ICU admission ($p < 0.001$).

Conclusion: DKA at our centre predominantly affected adults with type 2 diabetes and was driven by infection and missed treatment. Only one-third of patients received the complete bundle, yet higher adherence was independently associated with faster DKA resolution.

KEYWORDS: Diabetic Ketoacidosis, Emergency Service Hospital, Guideline Adherence, Hospital Mortality, Patient Care Bundles.

INTRODUCTION

Diabetic ketoacidosis (DKA) is a life-threatening acute complication of diabetes mellitus characterised by hyperglycaemia, high-anion-gap metabolic acidosis and ketonaemia, resulting from absolute or relative insulin deficiency and an excess of counter-regulatory hormones.¹ Although classically linked to type 1 diabetes, a growing proportion of episodes now occur in adults with type 2 diabetes, and DKA continues to impose a substantial burden in terms of emergency visits, critical-care use and cost.² The problem is especially relevant to Pakistan, which in 2024 had the highest age-standardised adult diabetes prevalence in the world at 31.4%.³ While in-hospital mortality from DKA is below 1% in well-resourced systems, pooled and single-centre estimates from low- and middle-income countries range from 7% to more than 35%.⁴⁻⁶

Local data remain limited and heterogeneous. A study from Peshawar reported that non-compliance with therapy precipitated 54% of DKA admissions, with moderate DKA being the commonest severity grade,⁷ while a Karachi cohort found a mortality of 12.5% among patients admitted with DKA alone.⁸ Current international guidance, including the 2024 multi-society consensus report and the Joint British Diabetes Societies (JBDS) guideline, recommends a protocolised approach built on early intravenous fluid resuscitation, fixed-rate intravenous insulin infusion, anticipatory potassium replacement and close bedside monitoring of glucose and ketones.^{1,9} Implementation of such protocols is inconsistent in practice. A recent retrospective study from a private tertiary hospital in Karachi showed that compliance with the institutional DKA protocol below 70% was independently

associated with higher inpatient mortality,¹⁰ and 53.6% of DKA patients presenting to our own emergency department were hypokalaemic on arrival,¹¹ underlining the importance of the potassium step. Order sets that standardise these steps have been shown to shorten the time to DKA resolution.¹² However, prospective data on bundle adherence and its relationship with outcomes are lacking from public-sector tertiary centres in Pakistan, which manage a large, predominantly low-income population.

The objective of this study was therefore to determine the clinical profile, precipitating factors, severity and in-hospital outcomes (time to DKA resolution, intensive care unit admission, length of stay and mortality) of patients with DKA presenting to the Accident & Emergency Department of JPMC, Karachi, and to evaluate adherence to a standardised four-element DKA management bundle and its association with these outcomes.

MATERIAL & METHODS

This prospective observational study was conducted in the Department of Accident & Emergency, Jinnah Postgraduate Medical Centre (JPMC), Karachi, with follow-up of enrolled patients through the medical wards and medical intensive care unit (ICU), over a period of four months from November 2025 to February 2026, after approval from the Institutional Review Board of JPMC. Written informed consent was obtained from every patient or guardian, and confidentiality was maintained by assigning a unique study identification number.

The sample size was calculated with the WHO formula for a single proportion, taking an anticipated frequency of infection as the precipitating factor of DKA of 69%,¹³ a 95% confidence level and an absolute precision of 7%. This yielded 168 patients, which was increased to 186 to account for 10% non-response. Patients were selected by non-probability purposive sampling, and every consecutive eligible patient was approached until the sample was complete.

Patients of either gender aged 14 years or above presenting to the emergency department and fulfilling the American Diabetes Association (ADA) diagnostic criteria for DKA were included. DKA was defined as blood glucose >250 mg/dL, arterial or venous pH <7.30 or serum bicarbonate <18 mmol/L, and urine ketones $\geq 2+$ on dipstick or blood ketones ≥ 3 mmol/L. Patients with hyperosmolar hyperglycaemic state without ketoacidosis, starvation or alcoholic ketoacidosis without diabetes, those brought in dead or dying within one hour of arrival, those transferred after 48 hours or more of management at another facility, and those refusing consent were excluded.

Severity was graded according to the ADA classification as mild (pH 7.25–7.30, bicarbonate 15–18 mmol/L, alert), moderate (pH 7.00–7.24, bicarbonate 10–15 mmol/L, drowsy) or severe (pH <7.00 , bicarbonate <10 mmol/L, stupor or coma). The standardised DKA management bundle consisted of four interventions, each recorded as performed or not performed within the first six hours of presentation: (i) intravenous 0.9% normal saline at ≥ 1 L in the first hour; (ii) fixed-rate intravenous insulin infusion at 0.1 units/kg/h; (iii) potassium replacement according to protocol; and (iv) hourly capillary blood glucose monitoring for the first six hours. Bundle adherence was expressed as the percentage of the four elements completed (0–100%), and adherence of $\geq 75\%$ (at least three of four elements) was classified as high. DKA resolution was defined in line with current consensus as normalisation of acid–base status (venous pH ≥ 7.30 or bicarbonate ≥ 18 mmol/L) with clearance of ketonaemia.¹ In-hospital mortality was defined as death from any cause during the index admission.

Baseline demographics, diabetes type and duration, precipitating factors, vital signs, Glasgow Coma Scale (GCS) score and admission biochemistry (blood glucose, pH, bicarbonate, urine and blood ketones, potassium, creatinine, glycated haemoglobin [HbA1c] and white cell count) were recorded on a structured proforma. Each bundle element was documented in real time, and patients were followed until DKA resolution, discharge or death to record time to resolution, ICU admission and duration, total hospital stay and outcome, including cause and day of death.

Data were analysed using IBM SPSS Statistics version 26. Normality was assessed with the Shapiro–Wilk test. Quantitative variables were presented as mean $\pm$ standard deviation or median (interquartile range, IQR), and qualitative variables as frequencies and percentages. The chi-square or Fisher exact test was used for categorical comparisons. Continuous outcomes were compared between adherence groups with the independent-samples *t*-test and the Mann–Whitney *U* test, and across severity grades with the Kruskal–Wallis test. The relationship between the number of bundle elements completed and time to resolution was examined with Spearman correlation, and multiple linear regression was used to adjust the effect of high adherence on time to resolution for DKA severity and age. Univariable and multivariable binary logistic regression (age, GCS, severity, creatinine and bundle adherence, as specified in the protocol) were used to identify predictors of in-hospital mortality, reporting odds ratios (OR) with 95% confidence intervals (CI); model fit was assessed with the Hosmer–Lemeshow test. A *p*-value ≤ 0.05 was considered significant.

RESULTS

A total of 186 patients were enrolled. The mean age was 49.1 ± 15.6 years (range 14–84), and 95 (51.1%) patients were aged 40–59 years. There were 98 (52.7%) females and 88 (47.3%) males, and 151 (81.2%) resided in urban areas. Type 2 diabetes was present in 127 (68.3%) patients, type 1 in 41 (22.0%), and DKA was the first presentation of diabetes in 18 (9.7%). Patients were markedly tachycardic and acidotic at presentation, with a mean pH of 7.13 ± 0.13 and a mean HbA1c of $9.9 \pm 1.6\%$. (Table-I)

TABLE-I. Baseline demographic, clinical and biochemical characteristics of patients with DKA (n=186)

Variable	Value
Age (years), mean $\pm$ SD	49.1 $\pm$ 15.6
Age group, n (%)	
14–39 years	46 (24.7)
40–59 years	95 (51.1)
≥ 60 years	45 (24.2)
Gender, n (%)	
Male	88 (47.3)
Female	98 (52.7)
Residence, urban, n (%)	151 (81.2)
Diabetes status, n (%)	
Type 1	41 (22.0)
Type 2	127 (68.3)
New diagnosis	18 (9.7)
Duration of known diabetes (years), mean $\pm$ SD*	7.7 $\pm$ 5.0
Weight (kg), mean $\pm$ SD	72.5 $\pm$ 14.0
Systolic blood pressure (mmHg), mean $\pm$ SD	108.0 $\pm$ 17.5
Pulse (beats/min), mean $\pm$ SD	112.1 $\pm$ 14.6
Respiratory rate (/min), mean $\pm$ SD	24.5 $\pm$ 4.5
GCS, median (IQR)	15 (13–15)
Admission glucose (mg/dL), mean $\pm$ SD	432.4 $\pm$ 99.5
pH, median (IQR)	7.17 (7.07–7.26)
Bicarbonate (mmol/L), median (IQR)	12.9 (10.6–15.6)
Blood ketones (mmol/L), mean $\pm$ SD	4.6 $\pm$ 0.9
Potassium (mEq/L), mean $\pm$ SD	4.6 $\pm$ 0.7
Creatinine (mg/dL), mean $\pm$ SD	1.15 $\pm$ 0.38
HbA1c (%), mean $\pm$ SD	9.9 $\pm$ 1.6
White cell count (/ μ L), mean $\pm$ SD	14,411 $\pm$ 3,623
Precipitating factors, n (%)†	
Infection	133 (71.5)
Pneumonia	44 (23.7)
Urinary tract infection	41 (22.0)
Pulmonary tuberculosis	20 (10.8)
Diabetic foot infection	14 (7.5)
Gastrointestinal infection	10 (5.4)
Other infection	4 (2.2)
Missed diabetes treatment	103 (55.4)
First presentation of diabetes	18 (9.7)
Acute cardiac event	6 (3.2)
Pancreatitis / other physiological stress	6 (3.2)
DKA severity, n (%)	
Mild	57 (30.6)
Moderate	90 (48.4)
Severe	39 (21.0)

*Excluding 18 new diagnoses. †Categories are not mutually exclusive; 78 (41.9%) patients had both infection and missed treatment. GCS: Glasgow Coma Scale; IQR: interquartile range; SD: standard deviation.

Infection was the most frequent precipitant, identified in 133 (71.5%) patients, most commonly pneumonia (44; 33.1% of infections), urinary tract infection (41; 30.8%) and pulmonary tuberculosis (20; 15.0%). Missed diabetes treatment was documented in 103 (55.4%) patients, and 78 (41.9%) had both infection and missed treatment. Moderate DKA was the commonest severity grade (90; 48.4%), followed by mild (57; 30.6%) and severe (39; 21.0%).

All four bundle elements were completed in 56 (30.1%) patients, three in 63 (33.9%), two in 45 (24.2%), one in 18 (9.7%) and none in 4 (2.2%), giving a mean adherence of $70.0 \pm 26.1\%$. High adherence ($\geq 75\%$) was achieved in 119 (64.0%) patients. Fixed-rate intravenous insulin was the most consistently delivered element (81.2%), whereas hourly capillary glucose monitoring was the least (54.8%). (Table-II, Figure-1)

TABLE-II. Adherence to the standardised DKA management bundle within six hours of presentation (n=186)

Bundle element / measure	n (%)
IV 0.9% normal saline ≥ 1 L in first hour	139 (74.7)
Fixed-rate IV insulin infusion 0.1 units/kg/h	151 (81.2)
Potassium replacement per protocol	129 (69.4)
Hourly capillary glucose monitoring (first 6 h)	102 (54.8)
Number of elements completed	
4 (100%)	56 (30.1)
3 (75%)	63 (33.9)
2 (50%)	45 (24.2)
1 (25%)	18 (9.7)
0 (0%)	4 (2.2)
Bundle adherence (%), mean $\pm$ SD	70.0 ± 26.1
High adherence ($\geq 75\%$)	119 (64.0)
Low adherence ($< 75\%$)	67 (36.0)

Potassium replacement was clinically indicated in 140 (75.3%) patients and was given in 89 of them. IV: intravenous.

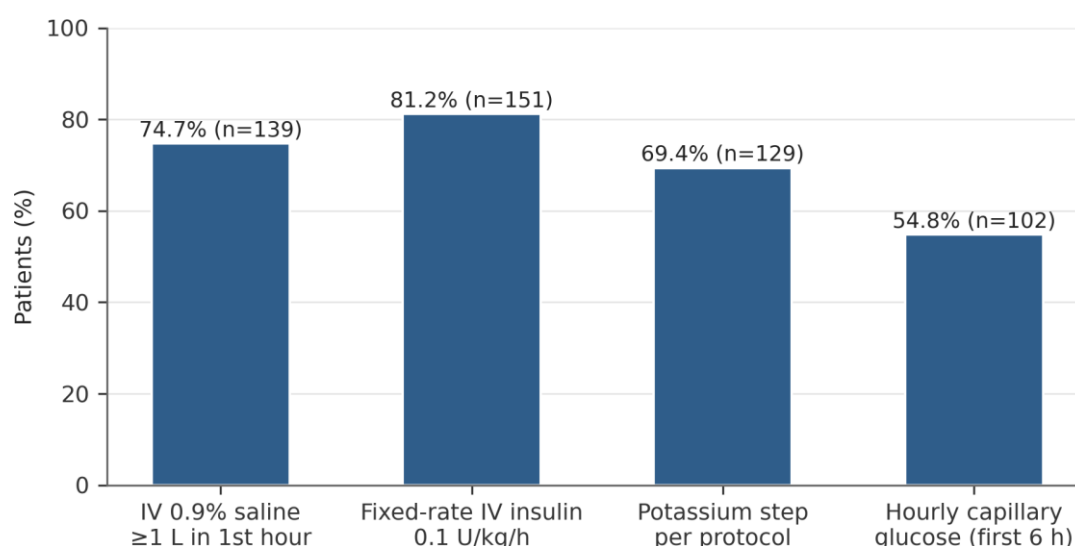


FIGURE-1. Adherence to individual elements of the DKA management bundle within six hours (n=186)

Overall, 58 (31.2%) patients required ICU admission, the mean hospital stay was 6.1 ± 2.5 days and 20 (10.8%) patients died. Among survivors, the mean time to DKA resolution was 24.3 ± 8.2 hours. Deaths occurred at a median of day 3 (range 1–5) and were attributed to sepsis (8; 40.0%), refractory shock (6; 30.0%), a cardiorespiratory complication (1; 5.0%) and other in-hospital causes (5; 25.0%). Severity was strongly associated with time to resolution, length of stay, ICU stay and ICU admission (all $p < 0.001$), but not with mortality ($p = 0.547$). (Table-III)

TABLE-III. In-hospital outcomes according to DKA severity (n=186)

Outcome	Mild (n=57)	Moderate (n=90)	Severe (n=39)	Total (n=186)	p-value
Time to resolution (h), mean $\pm$ SD*	18.7 $\pm$ 6.4	24.6 $\pm$ 6.9	32.2 $\pm$ 6.9	24.3 $\pm$ 8.2	<0.001 ^a
Hospital stay (days), mean $\pm$ SD	5.0 $\pm$ 2.1	6.0 $\pm$ 2.3	7.9 $\pm$ 2.5	6.1 $\pm$ 2.5	<0.001 ^a
ICU stay (days), mean $\pm$ SD	0.2 $\pm$ 0.5	0.5 $\pm$ 1.1	2.2 $\pm$ 1.7	0.8 $\pm$ 1.3	<0.001 ^a
ICU admission, n (%)	7 (12.3)	22 (24.4)	29 (74.4)	58 (31.2)	<0.001 ^b
In-hospital mortality, n (%)	4 (7.0)	11 (12.2)	5 (12.8)	20 (10.8)	0.547 ^b

*Survivors only (n=166: mild 53, moderate 79, severe 34). ^aKruskal–Wallis test; ^bPearson chi-square test. ICU: intensive care unit.

Patients with high bundle adherence achieved DKA resolution significantly faster than those with low adherence (22.8 $\pm$ 7.8 vs 26.9 $\pm$ 8.4 hours; mean difference 4.1 hours, 95% CI 1.6–6.7; p = 0.002 by t-test and Mann–Whitney U test). Baseline age, pH, bicarbonate, GCS, glucose and creatinine were comparable between the two groups (all p > 0.19), and severity distribution did not differ (p = 0.188). After adjustment for DKA severity and age, high adherence remained independently associated with a 4.8-hour shorter time to resolution (95% CI 2.8–6.9; p < 0.001). ICU admission, ICU stay, hospital stay and mortality did not differ significantly between the groups. (Table-IV)

TABLE-IV. Comparison of outcomes between high and low bundle adherence groups (n=186)

Outcome	Low adherence <75% (n=67)	High adherence $\geq$ 75% (n=119)	Effect (95% CI)	p-value
Time to resolution (h), mean $\pm$ SD*	26.9 $\pm$ 8.4	22.8 $\pm$ 7.8	MD 4.1 (1.6 to 6.7)	0.002 ^a
Time to resolution (h), median (IQR)*	27.0 (21.8–33.3)	22.0 (17.0–27.8)	—	0.002 ^b
Adjusted difference in resolution (h)†	Reference	–4.8	–6.9 to –2.8	<0.001 ^c
Hospital stay (days), mean $\pm$ SD	6.1 $\pm$ 2.4	6.1 $\pm$ 2.5	MD –0.05 (–0.80 to 0.70)	0.777 ^b
ICU stay (days), mean $\pm$ SD	0.6 $\pm$ 1.1	0.9 $\pm$ 1.4	MD –0.28 (–0.68 to 0.12)	0.174 ^b
ICU admission, n (%)	17 (25.4)	41 (34.5)	OR 1.55 (0.79 to 3.01)	0.199 ^d
In-hospital mortality, n (%)	7 (10.4)	13 (10.9)	OR 1.05 (0.40 to 2.78)	0.920 ^d

*Survivors only (low n=60, high n=106). †Multiple linear regression adjusted for DKA severity and age. ^aIndependent-samples t-test; ^bMann–Whitney U test; ^clinear regression; ^dPearson chi-square test. MD: mean difference; OR: odds ratio (high vs low adherence).

Time to resolution fell progressively as more bundle elements were completed, from 28.0 hours with one element to 21.1 hours with all four (Spearman ρ = –0.28, p < 0.001). (Figure-2) At the level of individual elements, protocol-guided potassium replacement (23.2 vs 26.9 hours; p = 0.006) and hourly glucose monitoring (22.7 vs

26.2 hours; $p = 0.007$) were each associated with faster resolution, whereas early saline ($p = 0.053$) and fixed-rate insulin ($p = 0.731$) were not.

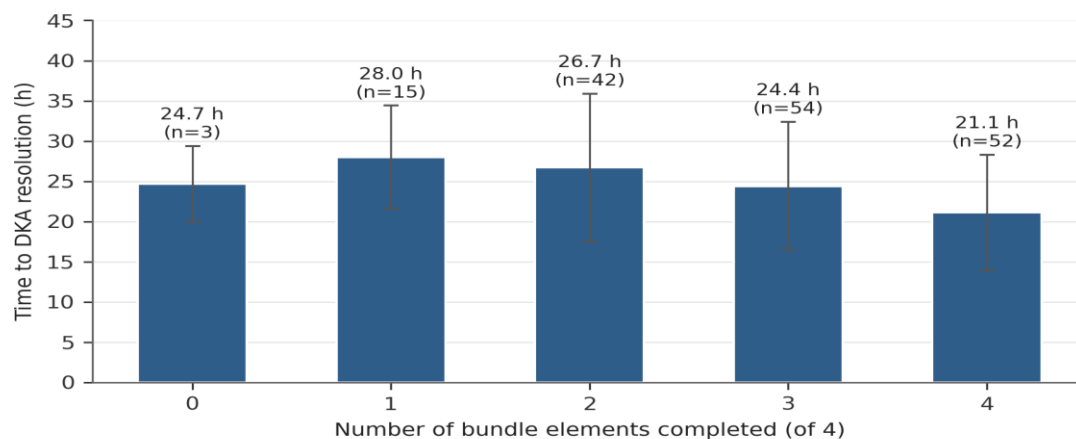


FIGURE-2. Mean ($\pm$ SD) time to DKA resolution according to the number of bundle elements completed among survivors (n=166)

On univariable logistic regression, only HbA1c was significantly associated with in-hospital mortality (OR 1.41 per 1% rise; 95% CI 1.03–1.94; $p = 0.032$); non-survivors had a higher mean HbA1c than survivors ($10.6 \pm 1.7\%$ vs $9.8 \pm 1.6\%$). In the protocol-specified multivariable model, none of age, GCS, severity, creatinine or bundle adherence independently predicted mortality (model $\chi^2 = 5.03$, $p = 0.540$; Hosmer–Lemeshow $p = 0.357$). (Table-V)

TABLE-V. Logistic regression analysis of factors associated with in-hospital mortality (n=186; deaths=20)

Variable	Univariable (95% CI)	OR	p-value	Multivariable (95% CI)	OR	p-value
Age (per year)	1.03 (1.00–1.06)		0.074	1.03 (1.00–1.06)		0.068
GCS (per point)	0.95 (0.74–1.22)		0.663	1.06 (0.63–1.77)		0.837
Severity: moderate vs mild	1.85 (0.56–6.10)		0.316	2.16 (0.58–8.06)		0.250
Severity: severe vs mild	1.95 (0.49–7.77)		0.345	2.95 (0.22–39.49)		0.414
Creatinine (per mg/dL)	1.04 (0.30–3.55)		0.954	0.70 (0.17–2.88)		0.620
High bundle adherence ($\geq 75\%$)	1.05 (0.40–2.78)		0.920	1.00 (0.36–2.74)		0.995
HbA1c (per 1%)	1.41 (1.03–1.94)		0.032	—		—

Multivariable model (variables pre-specified in the study protocol): $\chi^2 = 5.03$, $df = 6$, $p = 0.540$; Nagelkerke $R^2 = 0.054$; Hosmer–Lemeshow $p = 0.357$. With 20 events the model is exploratory. OR: odds ratio; CI: confidence interval; GCS: Glasgow Coma Scale.

DISCUSSION

This prospective study describes the profile and outcomes of DKA in a large public-sector emergency department in Karachi and is, to our knowledge, the first from such a setting in Pakistan to measure bundle adherence prospectively. Three findings stand out: DKA predominantly affected middle-aged adults with type 2 diabetes and was precipitated mainly by infection and missed treatment; only 30.1% of patients received all four core interventions within six hours; and each additional element delivered was associated with faster metabolic recovery, independent of severity.

Two-thirds of our patients had type 2 diabetes and the mean age was 49 years, a profile similar to the Karachi cohort of Ahmed et al., in which 84% had type 2 diabetes,⁸ and to Tanzanian emergency department data (63.2%).⁵ By contrast, type 2 diabetes accounted for only 23.2% and 35.8% of cases in recent Indian and Ethiopian series.^{14,15} This shift is consistent with the scale of the type 2 diabetes epidemic in Pakistan³ and with the high mean HbA1c in our cohort, which reflects chronic insulin deficiency in poorly controlled type 2 diabetes.¹ Clinicians should therefore not regard type 2 diabetes as protective against DKA, particularly during intercurrent illness.

Infection (71.5%) and missed treatment (55.4%) were the principal precipitants, frequently occurring together. Kiran et al. reported infection in 62.7% and non-compliance in 77.5% of adults in North India,⁶ while non-compliance was the leading trigger in Peshawar (54%),⁷ Lahore,¹⁶ Ethiopia (51.5%, largely because of unaffordability)¹⁷ and Saudi Arabia (63.2%).¹⁸ The notable contribution of pulmonary tuberculosis (10.8% of all patients) is in keeping with Pakistan's position among the countries with the highest tuberculosis burden

worldwide,¹⁹ and supports routine screening for tuberculosis in patients with DKA and respiratory features. Reliable insulin supply and patient education on sick-day rules remain the most direct preventive measures. Severe DKA was present in 21.0% of patients, compared with 31% in Peshawar⁷ and 14.5% in Buraidah.¹⁸ Severity was the strongest determinant of recovery: resolution time rose from 18.7 hours in mild to 32.2 hours in severe DKA, and three-quarters of severe cases required ICU care. Alharbi similarly identified severity as the primary determinant of prolonged recovery.¹⁸ Our in-hospital mortality of 10.8% is comparable to that reported from India (11.6%)¹⁴ and Ethiopia (11.4%),¹⁷ and to the 12.5% seen in Karachi patients with DKA alone,⁸ but higher than the pooled Ethiopian estimate of 7%.⁴ Much higher rates have been reported from ICU-based and referral cohorts in Karachi (28.8%),¹⁰ Lebanon (18.4%),²⁰ Tanzania (36.8%)⁵ and North India during the COVID-19 pandemic (39.6%).⁶ Seventy percent of our deaths were due to sepsis or refractory shock and occurred early, which again points to infection rather than the metabolic derangement itself as the main driver of death.⁶ In contrast to other series, admission GCS, creatinine and severity did not predict mortality in our cohort, whereas GCS below 8, raised creatinine and hypokalaemia were independent predictors in India, Ethiopia and Karachi.^{10,14,17} Few of our patients had profound coma, and with only 20 deaths the study had limited power to detect such associations. Higher HbA1c was the only variable associated with death, suggesting that chronic poor glycaemic control and its attendant comorbidity carry prognostic weight beyond the acute presentation. Adherence to the bundle was suboptimal. Although most patients received fixed-rate insulin, almost one-third did not receive potassium replacement according to protocol and nearly half were not monitored hourly. This is concerning because more than half of DKA patients presenting to this department are hypokalaemic on arrival,¹¹ and both international guidelines emphasise potassium replacement before or alongside insulin and frequent bedside monitoring.^{1,9} Gaps in these steps are likely to reflect nursing workload, the availability of glucometer strips and potassium, and the absence of a written order set rather than a lack of knowledge. High adherence shortened time to resolution by approximately five hours after adjustment for severity, with a clear gradient across the number of elements delivered. The elements most strongly linked to faster recovery were potassium replacement and hourly monitoring, both of which enable safe, uninterrupted insulin infusion and timely titration. Comparable gains have followed structured protocols elsewhere: an electronic order set reduced median resolution time from 12.6 to 10.6 hours and shortened hospital stay,¹² and a two-bag fluid order set reduced the time to anion gap closure from 16.9 to 12.7 hours.²¹ Since balanced crystalloids and normal saline do not differ in time to resolution,²² it is the reliability of the process, rather than the choice of fluid, that appears to matter most. Bundle adherence was not associated with ICU admission or mortality in this study, unlike the retrospective Karachi cohort in which compliance below 70% independently predicted death.¹⁰ That study included 802 patients with a far higher mortality, providing much greater power, whereas our bundle captured only the first six hours of care and our deaths were predominantly septic. Sicker patients may also have been more likely to receive protocolised care, masking any benefit. The shorter resolution time is nonetheless clinically relevant in a crowded emergency department, as faster transition to subcutaneous insulin frees monitored beds, and structured order sets have also been shown to shorten hospital stay without compromising safety.¹² This study has some limitations. It was conducted at a single centre over four months, which may limit generalisability. The total emergency department census was not recorded, so the incidence of DKA could not be calculated. Being observational, residual confounding by indication cannot be excluded despite adjustment. Time to resolution was available only for survivors, the bundle assessed the first six hours alone, and the small number of deaths (20) limited the power and stability of the multivariable mortality model. Multicentre studies with larger samples, longer follow-up and evaluation of an implemented order set are recommended.

CONCLUSION

DKA at our centre mainly affected adults with type 2 diabetes and was precipitated by infection and missed treatment, with an in-hospital mortality of 10.8%. Only 30.1% of patients received the complete management bundle, yet high adherence was independently associated with faster DKA resolution. Protocolised order sets with emphasis on potassium replacement and hourly monitoring should be implemented in public-sector emergency departments.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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