



Cost analysis of diabetic ketoacidosis treatment in tertiary care hospital

Panida Yoopetch¹, Noppcha Singweratham², Sathit Niramitmahapanya³

1.Department of Pharmacy, Rajavithi Hospital, Bangkok, Thailand

2.Faculty of Public Health, Chiang Mai University, Chiang Mai, Thailand

3.Institute of Medical Research and Technology Assessment, Nonthaburi, Thailand

Introduction

- ▶ Diabetic ketoacidosis (DKA) is a severe metabolic complication of diabetes mellitus characterized by high blood sugar levels, ketone accumulation, metabolic acidosis, and dehydration.
- ▶ It poses significant risks, including loss of consciousness and death, making prompt medical intervention critical.
- ▶ DKA is particularly common among patients with type 1 diabetes mellitus (T1DM), with reported incidence rates as high as 123 per 1,000 patient-years in some regions.
- ▶ In Thailand, the Diabetes Association reported approximately 4.4 million diagnosed diabetic patients in 2017, with an estimated 543,312 DKA cases annually, reflecting a concerning trend in prevalence.
- ▶ The cost of treating DKA is substantial; in the United States, the average hospital treatment cost per patient is estimated at 804,684 baht (approximately USD 26,541).
- ▶ Given the high burden of DKA treatment costs in Thailand, this study aims to estimate the unit costs associated with DKA treatment to inform future cost-of-illness analyses.

Objective

- ▶ Estimate Unit Costs: Determine the unit costs associated with the treatment of diabetic ketoacidosis (DKA) at Rajavithi Hospital in Bangkok, Thailand.
- ▶ Analyze Cost Components: Identify and analyze the major components of direct medical costs, including laboratory services, nursing care, drugs, and medical supplies.
- ▶ Inform Future Analyses: Provide data for future cost-of-illness analyses to help understand the economic burden of DKA in Thailand.

Methods

- ▶ This study conducted a retrospective cost analysis of diabetic ketoacidosis (DKA) treatment at Rajavithi Hospital, Bangkok, Thailand, during the fiscal year 2018.
- ▶ Ethics approval was obtained from the Rajavithi Hospital Institutional Review Board (COA 043/2566) on February 22, 2023.
- ▶ Study Setting: Rajavithi Hospital, a super-tertiary care center with 950 beds, managed approximately one million outpatient visits and 30,000 inpatient admissions in 2019.
- ▶ Data Collection: A total of 54 inpatient cases with uncontrolled diabetes (glycemic index > 250 mg/dL) were included. The micro-costing approach was employed, focusing on direct medical costs, including laboratory services, nursing, drugs, medical supplies, and equipment. Costs were expressed in 2019 US dollars (\$).
- ▶ Cost Calculation: Patient-level costs were calculated based on direct medical expenses for individual patients, utilizing hospital billing data. The analysis considered the costs of medical instruments, drugs, supplies, laboratory tests, nursing services, and other relevant expenses. Indirect costs were also noted to provide a comprehensive overview of the economic burden of DKA treatment.

References

1. Farsani, S.F., et al., Incidence and prevalence of diabetic ketoacidosis (DKA) among adults with type 1 diabetes mellitus (T1D): a systematic literature review. *BMJ open*, 2017. 7(7): p. e016587.

2. Desai, D., et al., Health care utilization and burden of diabetic ketoacidosis in the US over the past decade: a nationwide analysis. *Diabetes care*, 2018. 41(8): p. 1631-1638.

3. Drummond M.F., Stoddart G.W., and Torrance G.W., Method for the Economic Evaluation for the Economic Evaluation of Health Care Programmes. 1994, Oxford: Oxford University Press.

4. Metha, N.H. and D.J. Maher, Hospital Accounting System and Control. 1977, N.J.: Prentice-hall.

5. Shepard, D.S., et al., Analysis of hospital costs: a manual for managers. 2000: World Health Organization. 92.

Results

- ▶ Patient Demographics: A total of 54 DKA patients were included in the analysis, with a mean age of 49 years. The average length of hospital stay was 5.8 days.
- ▶ Cost Analysis: The total direct medical cost (DMC) for DKA treatment was USD 59,192.93, with an average cost of USD 1,096.17 per patient. The average overall cost, including indirect costs, was USD 1,115.90 per patient.
- ▶ Cost Composition: The major components of patient-level costs were as follows: Laboratory costs, Nursing services, Drugs and medical supplies and Medical instruments.

Name	Average cost (USD) per person	SE	Total Cost (US)	Percentage
Laboratory	335.12	28.76	18,096.59	39.63
Nursing service	368.03	20.39	10,120.77	22.16
Drug and medical supply	171.49	38.38	9,260.53	20.28
Medical Instrument	151.69	26.49	8,191.14	17.94
	Total		45,669.03	100.00

- ▶ Unit cost: DMC was USD 59,192.93, while the total indirect cost was USD 1,065.47. Consequently, the average overall cost of treating DKA per patient, incorporating both direct and indirect costs, was USD 1,115.90.

Name	Total (TDMC)	Total Indirect cost (TIC)	Total Cost	Unit Cost
Ward 1	3,354.20	60.38	3,414.58	379.40
Ward 2	2,636.87	47.46	2,684.33	335.54
Ward 3	20,778.26	374.01	21,152.27	1,057.61
Ward 4	14,439.44	259.91	14,699.35	1,336.30
Ward 5	3,416.01	61.49	3,477.49	1,738.75
Ward 6	8,985.17	161.73	9,146.90	4,573.45
Ward 7	5,582.98	100.49	5,683.48	2,841.74
Total	59,192.93	1,065.47	60,258.40	1,115.90

Discussion

- ▶ The study highlights the significant economic burden of diabetic ketoacidosis (DKA) treatment in Thailand, with an average cost of USD 1,115.90 per patient, primarily driven by laboratory services.
- ▶ The average length of hospital stay (5.8 days) aligns with international findings, while variations in treatment costs emphasize the need for targeted management strategies to reduce DKA incidence and healthcare resource utilization.
- ▶ Limitations due to the retrospective design and small sample size call for further studies to explore cost variations across different healthcare settings and populations, which can inform effective policy-making and enhance patient care outcomes.

Conclusions

- ▶ This study highlights the substantial economic burden of treating diabetic ketoacidosis (DKA) in a Thai tertiary care setting.
- ▶ The average total cost was USD 1,115.90 per patient, with laboratory services being the most significant cost component.
- ▶ The findings underscore the need for effective management strategies to reduce DKA incidence and associated treatment costs.

Acknowledgements

- ▶ We would like to express our appreciation to the staff of Rajavithi Hospital for their support, provision of data, and guidance regarding data.
- ▶ This study was funded by Rajavithi Hospital, Bangkok, Thailand. The funder had no involvement with analysis, results, conclusion, or preparation of manuscript.