

Clinical nursing practice in the management of critically ill patients with diabetic ketoacidosis

RESUMO | Objetivo: Descrever as práticas realizadas por enfermeiros no manejo ao paciente crítico com cetoacidose diabética (CAD). Método: Revisão integrativa de literatura realizada entre maio e junho de 2022 nas bases: Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Scientific Electronic Library Online (SciELO), Banco de Dados de Enfermagem (BDENF) e Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed). Foram selecionados para esta revisão 08 artigos. Resultados: Os resultados apontam que o enfermeiro deve estar atento aos sinais e sintomas dos fatores precipitantes causadores da CAD e, entre os portadores, promover ações para o seu controle, por intermédio de medidas como monitoramento da glicemia e o desenvolvimento de atividades educativas para o autocuidado. Este profissional deve manter a observação de forma contínua durante o tratamento. Conclusão: A cetoacidose é uma emergência glicêmica no qual torna-se necessário que o profissional de enfermagem tenha conhecimentos fundamentais a respeito dos sinais e sintomas da CAD.

Descritores: Cetoacidose diabética; Cuidados críticos; Cuidados de enfermagem.

ABSTRACT | Objective: To describe the practices performed by nurses in the management of critically ill patients with diabetic ketoacidosis (DKA). Method: Integrative literature review carried out between May and June 2022 in the following bases: Latin American and Caribbean Literature in Health Sciences (LILACS), Scientific Electronic Library Online (SciELO), Nursing Database (BDENF) and Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed). Eight articles were selected for this review. Results: The results indicate that nurses should be aware of the signs and symptoms of precipitating factors that cause CAD and, among patients, promote actions for its control, through measures such as blood glucose monitoring and the development of educational activities for the self care. This professional must maintain continuous observation during treatment. Conclusion: Ketoacidosis is a glycemic emergency in which it is necessary for the nursing professional to have fundamental knowledge about the signs and symptoms of DKA.

Keywords: Diabetic ketoacidosis; Critical care; Nursing care.

RESUMEN | Objetivo: Describir las prácticas realizadas por enfermeros en el manejo de pacientes críticos con cetoacidosis diabética (CAD). Método: Revisión integrativa de la literatura realizada entre mayo y junio de 2022 en las siguientes bases de datos: Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS), Biblioteca Científica Electrónica en Línea (SciELO), Base de Datos de Enfermería (BDENF) y Sistema de Análisis y Recuperación de Literatura Médica en Línea (MEDLINE/PubMed). Se seleccionaron ocho artículos para esta revisión. Resultados: Los resultados indican que los enfermeros deben ser conscientes de los signos y síntomas de los factores precipitantes que causan la EAC y, entre los pacientes, promover acciones para su control, a través de medidas como el monitoreo de la glucosa en sangre y el desarrollo de actividades educativas para el autocuidado. Este profesional debe mantener observación continua durante el tratamiento. Conclusión: La cetoacidosis es una emergencia glucémica en la que es necesario que el profesional de enfermería tenga conocimientos fundamentales sobre los signos y síntomas de la CAD.

Palabras claves: Cetoacidosis diabética; Cuidados críticos; Atención de enfermería.

João Felipe Tinto Silva

Nurse. Postgraduate student in Nursing in an Intensive Care Unit at Universidade Estácio de Sá (UNESA).
ORCID: 0000-0003-3662-6673

Anderson Fernandes de Carvalho Farias

Nurse. Master in Aesthetic Medicine from Esneca Business School (ESNECA).
ORCID: 0000-0002-4326-9689

Lynna Stefany Furtado Morais

Nursing Student at the Federal University of Triângulo Mineiro (UFMT).
ORCID: 0000-0002-5611-2736

Ingrid Mikaela Moreira de Oliveira

Nurse. Doctoral student in Clinical Care in Nursing and Health at the State University of Ceará (UECE). Master in Molecular Bioprospection by the Regional University of Cariri (URCA).
ORCID: 0000-0002-8901-362X

Maria Dhescyca Ingrid Silva Arruda

Nursing Student at Faculdade São Francisco da Paraíba (FASP).
ORCID: 0000-0002-9073-7844

Caroline Kroning Feijó

Nurse. Master in Nursing from the Federal University of Pelotas (UFPEL). Employee at the

Brazilian Hospital Services Company (EBSERH).
ORCID: 0000-0002-2712-8608

Emmanuella Costa de Azevedo Mello

Nurse. Master's student in Decision Models in Health at the Federal University of Paraíba (UFPB).
ORCID: 0000-0001-9747-2992

Layanne Cavalcante de Moura

Doctor. Master's student in Women's Health at the Federal University of Piauí (UFPI).
ORCID: 0000-0003-2781-1076

Márcia Laís Fontes Rodrigues Mattos

Nurse. Specialist in Obstetric and Neonatal Nursing at Faculdade Ieducare (IEDUCARE).

ORCID: 0000-0002-5202-5010

Joel Junior de Moraes

Nurse by the Educational Foundation of the Municipality of Assis (FEMA). Employee at the Hospital das Clínicas, Faculty of Medicine, Unesp and Complexo Hospitalar Unimed (Botucatu-SP).

ORCID: 0000-0002-3751-0659

Recebido em: 10/05/2022

Aprovado em: 12/07/2022

INTRODUÇÃO

D Diabetes mellitus (DM) is part of a group of metabolic diseases characterized by high blood glucose levels (hyperglycemia) resulting from defects in the secretion and/or action of insulin in food metabolism. DM is currently one of the main health problems, which refers both to the number of people affected, generating disability and mortality and to the high government investment for the control and treatment of its complications, being already the fourth cause of death in Brazil.⁽¹⁾

Diabetic ketoacidosis (DKA) is one of the main clinical emergencies related to type I diabetes mellitus (DM I), considered a potentially serious and frequent condition in emergencies and Intensive Care Units (ICU)⁽²⁾, requiring immediate care as it is associated with death and ongoing disability in young people and adults.⁽³⁻⁴⁾

About 20% to 30% of DKA occur as an initial manifestation of diabetes mellitus. The main triggering factors are infection and non-adherence to treatment. The mortality rate varies from 4.8% to 9%.⁽⁵⁾

As one of the acute complications related to type I DM, DKA is a typical example and results from profound insulin deficiency and excess of counter-regulatory hormones such as glucagon, cortisol and catecholamines. Insulin deficiency favors catabolic processes such as lipolysis, proteolysis and glycogenolysis. Lipolysis results in the release of free fatty acids (FFA), which are oxidized in the hepatic microsomal system. Through oxidation, fatty acids are converted to acetyl-CoA. When the production of acetyl-CoA exceeds the liver's capacity for use, the substance is converted into ketone bodies, whose retention in the plasma causes metabolic acidosis.⁽⁶⁾

The care process within the intensive care unit requires constant technical/scientific updating from health and nursing professionals, as well as sensitivity to the different needs of the person receiving care. Thus, it is clear that intensive care nursing must pay close attention to the signs of change in the health/disease process presented by the individual receiving care.⁽⁷⁾

Faced with such a situation, the intensive care nurse needs to recognize the clinical picture of DKA and initiate support measures to avoid complications. Attention should be paid to hypovolemic shock, electrolyte and acid-base disturbances, as the patient, when admitted to the ICU, is usually in an advanced degree of dehydration.⁽⁸⁾

In view of the above, the present study aims to describe the practices performed by nurses in the management of critically ill patients with diabetic ketoacidosis.

METHOD

This is an Integrative Literature Review (ILR). The elaboration of a study of this nature consists of the fulfillment of the steps: identification of the problem, literature search, evaluation, analysis and interpretation of data and presen-

tation of the integrative review.⁽⁹⁾

The guiding question was elaborated with the help of the PICO strategy: P= Critical patients; I= Clinical nursing practice; Co= Management of diabetic ketoacidosis. Therefore, the following guiding question was arrived at: What are the practices performed by nurses in the management of critical patients with diabetic ketoacidosis?

For the construction of this study, the searches were carried out between May and June 2022, through the electronic databases: Latin American and Caribbean Literature on Health Sciences (LILACS), Scientific Electronic Library Online (SciELO), Nursing Database (BDNF) and Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed). The inclusion criteria of the defined articles were: articles published in Portuguese, English and Spanish, available in full, without temporal cut (in order not to issue evidence related to the proposed theme), as described by Souza, Silva and Carvalho (2010, p. 105).⁽¹⁰⁾

In the searches performed, the uni-terms indexed in the Health Sciences Descriptors (DeCS) were used: Diabetic Ketoacidosis, Critical Care and Nursing Care, and the articles indexed by descriptors registered in the Medical Subject Headings (MeSH): Diabetic Ketoacidosis, Critical Care and Nursing Care, combined with each other through the Boolean operators "AND" and "OR", in the researched bases. Duplicate and literature review articles (secondary data source) were excluded.

Through the search parameters in the electronic databases, about the proposed theme, 176 scientific studies were found, and only 26 studies were selected, 13 met the inclusion criteria previously established, and of these, 05 were excluded based on the exclusion criteria, leaving 08 articles for composition and analysis of the study. The flowchart with the details of the research steps is shown below in figure 1.

RESULTS

From the adaptation of an extraction instrument ⁽¹¹⁾, a synthesis of the included articles was made. Data extraction captured the following information: title; year of publication; authors; published journal and main findings, described in table 1.

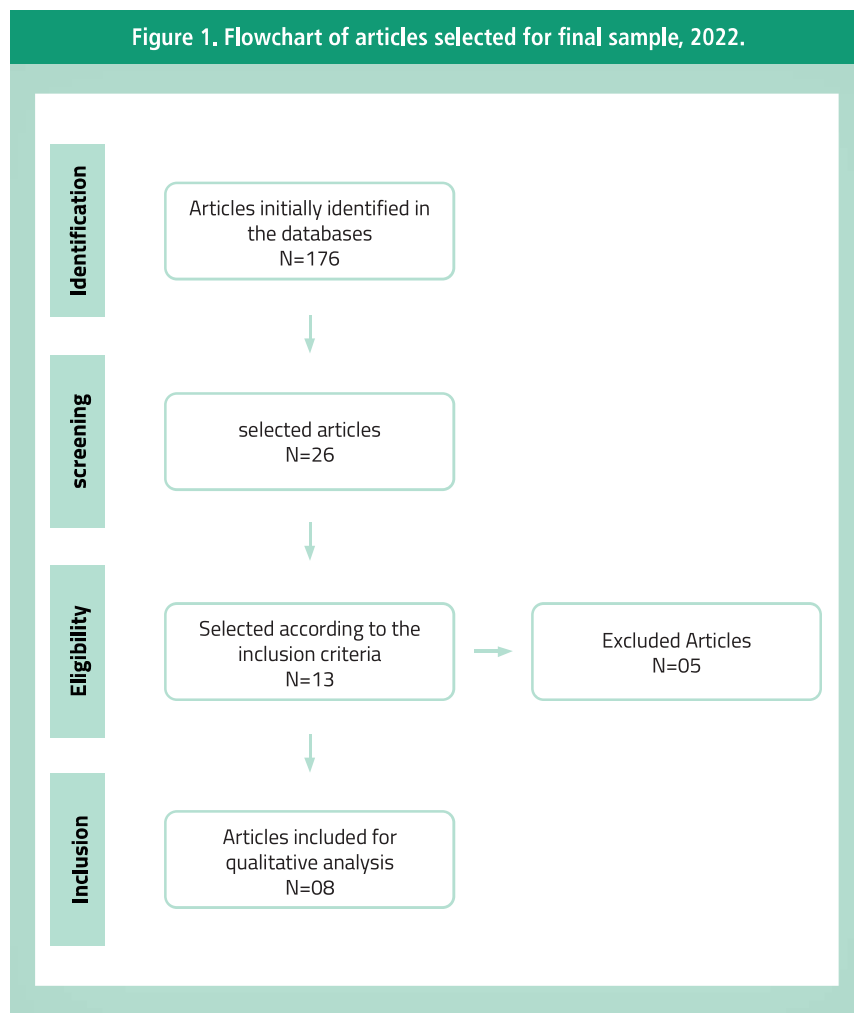
Table 2 below highlights the main actions performed by nurses in the care of critically ill patients with DKA, according to the findings in the selected studies.

DISCUSSION

The articles analyzed report the main subsidies in clinical nursing practice in the care of critically ill patients with diabetic ketoacidosis, addressing the primary care that must be based on scientific knowledge.

The survey of research related to the role of nurses in assisting clients with DKA is of paramount importance, since the acute, hyperglycemic complications of diabetic patients still represent an important public health problem in emergency units. In particular, DKA, which is registered as one

Figure 1. Flowchart of articles selected for final sample, 2022.



Source: Elaborated by the authors, (2022).

Table 1. Distribution of selected references by title, authors/year, method and main findings, 2022.

ARTICLE	TITLE	AUTHORS/YEAR	METHOD	MAIN FINDINGS
A1 ⁽¹²⁾	Evaluation of diabetic ketoacidosis in patients hospitalized in an adult intensive care unit of a teaching hospital in the Northwest region of Paraná (Avaliação de cetoacidose diabética em pacientes internados em uma unidade de terapia intensiva adulta de um hospital escola da região Noroeste do Paraná)	Neckel TO, et al. / 2021	Cross-sectional retrospective study	Correctly analyze the laboratory parameters of patients allowing for the correct diagnosis of diabetic ketoacidosis, as well as assisting the treatment and thus enabling the rapid recovery of patients with DKA, reducing hospitalization days and costs.
A2 ⁽¹³⁾	Diabetic ketoacidosis: update on management	Evans K, 2019	Qualitative study	The management of DKA has changed over the past decade, and national guidelines have been introduced to help standardize care, disseminate best practices, and reduce mortality and morbidity.



A3 ⁽¹⁴⁾	Diabetic ketoacidosis in adults: update on an old complication (Cetoacidose diabética em adultos: atualização de uma complicação antiga)	Barone B, et al. / 2007	Qualitative study	The authors review pathophysiological mechanisms, diagnostic criteria, and therapeutic options for the disorder in adults, as well as its possible complications.
A4 ⁽¹⁵⁾	Clinical and Regulatory Protocol for the management of decompensated diabetes mellitus in adults/elderly (Protocolo Clínico e de Regulação para abordagem do diabetes mellitus descompensado no adulto/idoso)	Santos JC, 2012	Qualitative study	DKA, the hyperosmolar hyperglycemic state (HHS) and hypoglycemia are the most serious acute complications that can occur during the course of DM1 and DM2 and therefore deserve some conceptual considerations.
A5 ⁽¹⁶⁾	Knowledge of the nursing team in the complications of diabetes mellitus in emergency (Conhecimento da equipe de enfermagem nas complicações do diabetes mellitus em emergência)	Oliveira DM, et al. / 2014	Qualitative study	Nursing professionals have knowledge about the care of acute complications of diabetes, but there are limitations regarding the routine practice of care.
A6 ⁽⁸⁾	(O manejo da cetoacidose em pacientes com Diabetes Mellitus: subsídios para a prática clínica de enfermagem)	Grossi SAA, 2006	Qualitative study	Contact with the diabetes nursing team is necessary for the treatment of any intercurrent diseases and other therapeutic adjustments.
A7 ⁽¹⁷⁾	The Study of Different Clinical Pattern of Diabetic Ketoacidosis and Common Precipitating Events and Independent Mortality Factors	Mahesh MG, et al. / 2017	Prospective and descriptive study	The most common precipitating factors were infections and poor adherence to antidiabetic treatment observed in 57 (52%) and 23 (21%) cases, respectively.
A8 ⁽¹⁸⁾	Descriptive study of ketoacidosis treated in the emergency department of a hospital in the Community of Madrid using the Savana Manager tool (Estudio descriptivo de las cetoacidosis atendidas en urgencias de un hospital de la Comunidad de Madrid mediante la herramienta Savana Manager)	Moreno-Ruiz I, et al., / 2019	Observational study	The length of hospital stay was not related to the severity of ketoacidosis. Conclusions: DKA is a serious complication that affects both type 1 and type 2 diabetic patients, with a high percentage of hospital and ICU admissions, although with low mortality in our country..

Source: research carried out by the authors (2022).

of the major acute complications resulting from hyperglycemia. ⁽¹²⁾

According to Evans (2019) ⁽¹³⁾ the main causes of DKA are: decreased or missed doses of insulin, illness or infection, pregnancy, insulin pump problems or diabetes without proper treatment, substance use, food transgression, acute stress and association of other medications. Thus, the correct intervention in these factors can be fundamental for the prevention of DKA. ⁽¹⁴⁾

In the period before DKA, there are manifestations related to metabolic decompensation, such as

polyuria, polyphagia, polydipsia, tiredness, anorexia, nausea and vomiting, worsening hydration, headache, malaise, paresthesia and abdominal pain. In this sense, with the progression of DKA, there may be changes in the level of consciousness, although coma only occurs in about 10% of patients. And still have hypoglycemia, hypokalemia and hyperglycemia. ⁽¹⁴⁻¹⁵⁾

Therefore, nurses must be aware of the signs and symptoms of the precipitating factors that cause DKA and, among patients, promote actions for its control, through measures such as blood glucose monitoring and the

development of educational activities for self-care, approaching the diabetic patient and also their family on the necessary conducts to achieve glyce-mic control. ^(8,16)

The priority nursing care in nursing care in situations of ketoacidosis and severe hypoglycemia, blood glucose testing is evidenced as a priority action and obtaining venous access as the first nursing action. The identification of the situation as a first step also emerges, verification of the breathing pattern as a priority, evaluation of signs and symptoms, monitoring of vital signs, collection of blood gas analysis

and also the installation of oxygen.^(8,16)

The nurse is the professional who has the first contact with the patient, through data collection for risk classification, observing the history of the disease, capillary blood glucose, to evaluate vital signs, medications used, presence of ketone breath, being essential in the observance of signs and symptoms suggestive of DKA.⁽¹⁷⁾ With regard to nursing interventions in DKA, the main objective is to prevent ketogenesis, hypoglycemia, hyperglycemia, dehydration and acid-base imbalances.⁽⁸⁾

In this scenario of an individual with DKA, the nurse must maintain continuous observation during treatment, and must ensure good hydration, as it contributes to stimulating the maintenance of tissue perfusion and the elimination of excess glucose from the body. You should also perform fluid balance and assess the condition of hyperglycemia (tachycardia, sweating, drowsiness), monitor heart rhythms, assess the level of consciousness and breathing pattern.⁽¹⁷⁾

When the patient's recovery is perceived, the nurse reassess the precipitating factors of diabetic ketoacidosis and teaches the patient and family about strategies to avoid relapses. When indicated, the nurse initiates a referral for home care, aiming to ensure the patient's recovery. Thus, it is necessary that the interaction between the nurse, the patient and the family be guided by sensitivity, listening to the needs presented by the subjects and talking about the most appropriate therapy for each case.⁽¹⁸⁾

The research carried out found as limitations the lack of studies that addressed the routine practice of the aforementioned nursing care, as well as the failure by nurses and nursing technicians to record the care provided and the scarce use of protocols for hypoglycemia existing in the ins-

TABLE 2. Main findings in the analyzes carried out on the main conducts performed by nurses in the care of critically ill patients with DKA, 2022.

Main conducts performed by nurses in the care of critically ill patients with DKA

Know the causes of DKA

Identify the clinical manifestations/signs and symptoms of DKA

Work with the patient and family in order to educate for the prevention of DKA episodes

Carry out the glucose meter test according to medical advice

Guide the performance of tests for ketones in urine or blood if there is persistent hyperglycemia (≥ 300 mg/dl or 250 mg/dl, in selected cases, especially in the presence of intercurrent diseases, such as infections)

Continuously monitor the patient's vital signs

Perform electrolyte replacement and/or sodium bicarbonate, according to medical advice

Perform peripheral venous access in the patient (large caliber) for administration of intravenous medications and/or volume replacement

Install and strictly control the initial hydration prescribed by the doctor with the aim of replacing losses and eliminating excess glucose

Monitor signs of hypoglycemia such as sweating, tachycardia, drowsiness, disorientation, among others.

Evaluate hemodynamic monitoring rigorously

Monitor and record inflows and outflows of liquids. Analyzing the need to use an Indwelling Bladder Catheter (IBC)

Monitor electrocardiographic changes

Notify physician when glucose drops to 250 to 300mg/dl;

Guide the pathological process to the patient and family, helping on the importance of self-care

Source: Results found and extracted from the referenced studies A8, A12, A13, A14, A15, A16, A17 and A18.

tutions, pointing out the need for research that addresses such gaps. In addition, studies with a qualitative research approach did not allow a generalization regarding the care provided by nurses to patients with CAD.

CONCLUSION

O estudo possibilitou evidenciar que a cetoacidose é considerada uma emergência glicêmica tornando-se indispensável que o profissional enfermeiro tenha conhecimentos técnicos-científicos a respeito dos sinais e sintomas da CAD, com o intuito de

restabelecer a saúde do paciente, evitando maiores complicações, além de mais, diminuir as taxas de morbimortalidade. Diante disso, a realização de cuidados como reposição volêmica contribui grandiosamente para a assistência realizada. Através dos estudos analisados, torna-se possível contribuir para o meio científico, instigando na elaboração de estudos que possam oferecer subsídios afim de orientar tanto os profissionais, estudantes, o paciente, a família e as instituições de ensinos que formam os profissionais quanto os gestores. 🐦

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