

Evaluation of the Effects of Diabetes on Children Admitted to the Pediatric intensive Care Unit (PICU); A Review Study

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The most prevalent endocrine illness in children admitted to the PICU is type 1 diabetes, which is a common chronic disease in adolescence. Despite therapy, diabetic ketoacidosis and diabetes have several complications. Difficulties such as brain injury, electrolyte imbalance, renal disorders, and cardiac complications are among them.

Introduction: The purpose of this study was to assess the impact of diabetic complications on children hospitalized to the pediatric critical care unit (PICU).

Methodology: This study is a conceptual review. The steps carried out include:

- 1- Formulation of a research question.
- 2- Searching and extracting research-related studies.
- 3- Selecting related studies.
- 4- Tabulating and summarizing information and data.
- 5- Reporting results.

Results: The results of studies showed that diabetes management in adolescents and young people with type 1 diabetes is insufficient. Mortality in diabetic ketoacidosis (DKA) among children in developed countries is reported to be 3.3 to 3%. In developing countries, the mortality rate is reported to be 13.4%. Complications include cerebral edema (as the most common and dangerous complication), shock, renal failure, sepsis, hypokalemia, hyponatremia, acute renal damage, severe hypoglycemia, neuropathy, and infection.

Keywords: Diabetes, Pediatric Intensive Care Unit, Complications regarding Diabetes

Introduction:

The prevalence of these type 1 disease increased in the past period, but data on recent incidence trends are lacking (1). According to studies, the prevalence of diabetes is increasing worldwide (2). The Pediatric Intensive Care Unit (PICU) is one of the most important units in any pediatric hospital. Studies show that more than 10,000 children are admitted to the PICU¹ each year for a variety of reasons (3). Diabetes is the most common endocrine disorder in children admitted to the PICU ward and diabetes is the second leading diagnosis after injury in hospitals (4). Some studies have reported that the incidence of diabetes in critically ill children is between 14% and 90% (5). In many patients, type 2 diabetes manifests as diabetic ketoacidosis (6). About 30% of children with DM type I are diagnosed with diabetic ketoacidosis (DKA) (7). Diagnosis of DKA is common in children and adolescents with diabetes. According to global prevalence studies, it varies between 13 and 80% (8). During DKA, several abnormal processes take place, including fluid changes, perfusion depletion, and improper pH, which cause electrolyte disturbances and affect many functions and organs of the body (9). Diabetic ketoacidosis (DKA) is a common pediatric emergency. DKA is the leading cause of morbidity and mortality in children with type I. DKA is the first clinical manifestation in newly diagnosed patients with type 1 diabetes (10).

Some studies suggest that the duration of hyperglycemia and changes in glycemic indexes are related to mortality (11). High blood sugar is also a negative predictor in children with trauma, severe head trauma and multiple organ trauma (12). Diabetic ketoacidosis and diabetes are associated with many complications despite treatment. The most common affected tissue due to cerebral edema is the brain. Due to its high mortality rate, research on DKA has focused on cerebral edema (13). The cause of death in this population is mostly due to DKA-induced cerebral edema (14). The mortality rate of children with cerebral edema in DKA is 40% (15). DKA is an acute life-threatening disease, which may be associated with acute and chronic complications such as hypokalemia, deep vein thrombosis (DVT), cerebral edema, and death (16). Complications in studies including brain damage, electrolyte imbalance, renal, cardiopulmonary, and other complications related to DKA have been reported (17-19). DKA can also lead to medium- and long-term complications of neurological dysfunction (20). *Klebsiella pneumoniae* was the leading cause of bacterial infections precipitating DKA in the hospital (21). Over a 6-year period, 247 admissions were identified. There were 171 (69%) with no infection, 44 (17.8%) with presumed viral infection, and 32 (12.9%) with bacterial infection. Urinary tract infection has a prevalence of 3% (23). Best ED practice management of pediatric DKA includes establishing a specific guideline/protocol and ensuring access to a pediatric endocrinologist. Both were identified as improvement areas in this project. Illinois EMSC has developed an educational module and provided direct feedback to all participating EDs, to improve their management of pediatric patients with DKA (24).

Due to the prevalence of diabetes and the importance of ketoacidosis and the possibility of mortality and its many complications, as well as the existence of different reports in various studies and the need for proper treatment and follow-up of patients, we came up with a study on the complications of diabetes. This study is a conceptual review.

¹Pediatric Intensive Care Unit

The steps conducted are:

- 1- Designing a research question.
- 2- Searching and extracting research-related studies.
- 3- Selecting related studies.
- 4- Tabulating and summarizing the data.
- 5- Reporting results. Children admitted to the pediatric intensive care unit (PICU) in the form of a review study.

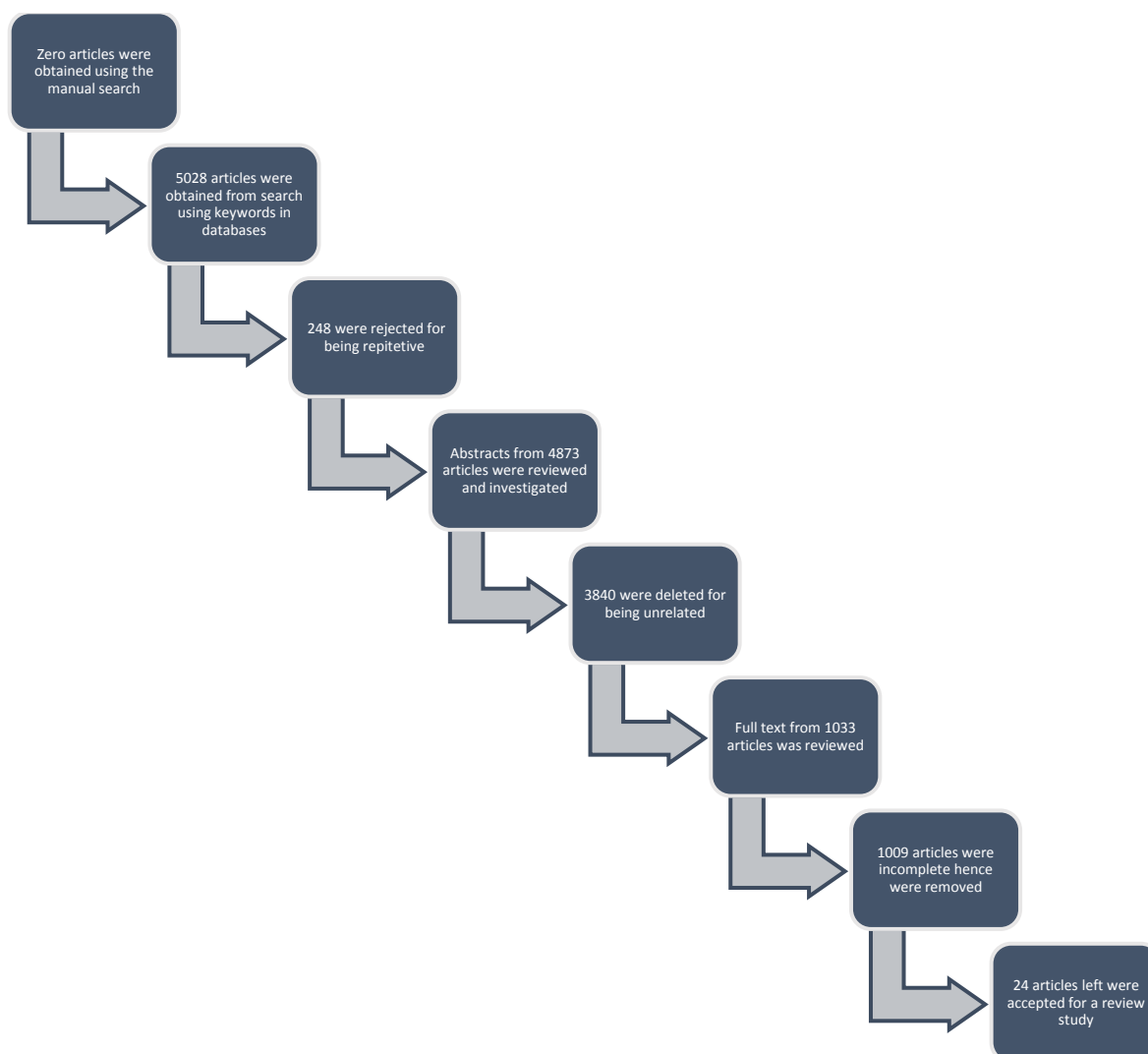
2. Search and extraction of research-related studies:

First, articles were searched by the researchers, who first extracted related keywords using the MeSH strategy. Search for resources using the keywords Diabetes, Complications of Diabetes, Pediatric Intensive Care Unit in Persian databases Barekat, Iran Medex, Irandoc, Magiran, SID and using English keywords Diabetes, Complications of Diabetes, Pediatric Intensive Care Unit in Google Scholar, Scopus, science direct, PubMed, web of science databases were conducted from 2008 to 2021 in October and November 1400. These words were used separately and also as a combination of two words together and using Boolean search operators. Were. In order to increase the validity of the study findings and control the bias in data entry, the search process, selection of studies and decision-making on entering or constructing the study and evaluation of the full text of the articles were performed by two independent browsers. This process was overseen by a third party.

Inclusion criteria include all articles that have examined robotic surgery and their full text is available in Persian and English. Exclusion criteria was unrelated to the study title.

3- Article extraction based on inclusion criteria:

Using the above keywords at the end of the search, including 48 articles from Persian databases and 4980 articles from international databases and a total of 5028 studies was collected. The studies were reviewed based on inclusion criteria. The selection of related studies was done in a way that a list of titles and abstracts of all the articles in databases was prepared by the researchers at first. If after reading the title and abstract, it seemed impossible to make a decision about the study, the full text was studied. Then the related articles were independently entered into the research process and eventually 24 articles were included in the study.



4- Tabulation and summarization of data:

At this stage, after the information has been extracted, all the data will be summarized in the relevant tables based on the name of the first author, year, country, title, tools or research elements.

Table 1

Writer	Year	Country	Title	Study type	Research Tool	Findings
Abbas	2018	Pakistan	Spectrum of complications of severe DKA in children in pediatric Intensive Care Unit	Cross-sectional, descriptive	Questionnaire	Hyperchloremia and other electrolyte abnormalities, cerebral edema and AKI are the most common complication

						s of severe DKA.
Mohammad	2018	Egypt	Clinical, and Biochemical Profile of Pediatric Diabetic Ketoacidosis Patients	Cross-sectional, Descriptive.	Questionnaire	Newly diagnosed diabetics accounted for 25 (58.1%) of the patients. Infections was the most common precipitating factors. No lethal complications were reported.
Pierre Gildas	2020	Barazzaville	Severe Hypoglycemia in Hospitalized Children with Diabetic Ketoacidosis	Cross-sectional, Descriptive.	Questionnaire	Severe hypoglycemia is a lifethreatening iatrogenic complication in the management of diabetic ketoacidosis, however, few studies have described how often this complication occurs. Episodes of severe hypoglycemia occurred during the first 48 hours of hospitalization in 8 (80%) children and during the late night shift in 6

						(60%) children. Causes of severe hypoglycemia were: excessive insulin dose (60%), inappropriate infusion solution (70%), failure to properly monitor blood glucose levels (40%).
John Henry Carson	2019	USA	A Pediatric Diabetic Ketoacidosis Patient with Multisystem Complications and a Prolonged Course.	Case Report	Case Report	Although the majority of DKA patients are treated without complications, clinicians caring for such patients should anticipate a prolonged complicated course in rare instances.
Al-Fraik	2020	Libya	Demographic and Clinical Characteristics of Type I Diabetes Mellitus at Tobruck Pediatric Intensive Care Unit.	Cross-sectional, Descriptive.	Questionnaire	Type 1 diabetes has common symptoms that can be diagnosed by parents and physicians. Diagnosis of the disease prevents serious complications. A family

						<p>history of type 1 diabetes is very common and may be related to genetic factors. The results of the current study showed The DKA is less prevalent in the study country (Libya) than in other Middle Eastern countries. There are several factors associated with the duration and severity of the disease, including: environmental, racial, cultural, and genetic factors that may play a role. In this study, most patients with type 1 diabetes admitted to PICU were discharged and there was one death due to uremic encephalopat</p>
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						<p>hy. Most admissions were due to high blood sugar. Hypoglycemia was the most common complication in diabetic patients.</p>
Khoshnevisasl	2015	Iran	<p>Predisposing Factors, Complications and Prognosis of the Patients with Diabetic Ketoacidosis Admitted to Zanzan Hospitals.</p>	<p>Cross-sectional, Descriptive.</p>	<p>Questionnaire</p>	<p>The most frequent symptoms were nausea and vomiting and the most frequent symptoms were dehydration (94.1%) and tachypnea (88.2%). Regarding laboratory results, 49% of patients depicted hypokalemia, 25.5% hypoglycemia, 17.6% hyponatremia, 11.8% hypernatremia, and 9.8% hyperkalemia. Cerebral edema was the major mortality factor in our study. Therefore, prevention and treatment of</p>

						cerebral edema is recommended.
Leila Khajavi	2017	Iran	Association of dysglycemia with mortality in children receiving parenteral nutrition in pediatric intensive care unit.	Cross-sectional, descriptive .	Questionnaire	The aim of this study was to assess the effect of parenteral nutrition dysglycemia on clinical outcomes among critically ill children in pediatric intensive care unit (PICU). Results of the study presented hyperglycemia and glucose variability are strong predictors of mortality in pediatrics receiving parenteral nutrition.
Giza	2019	Greece	Permanent damage of the sciatic nerve in an 8-year-old girl with newly diagnosed type 1 diabetes			Neuropathy, a complication of type 1 diabetes (T1D), is a heterogeneous group, and chronic polyneuropathy is the most common form in adults.

BAALAA JI	201 8	India	Predictors and Outcome of Acute Kidney Injury in Children with Diabetic Ketoacidosis.	Cross-sectional, Descriptive.	Questionnaire	Majority of children with AKI and DKA, recover with hydration. Hyperchloremia at 24 hours had independent association with AKI, although cause-effect relation could not be ascertained.
Wintergert	201 2	Ukraine	Association of Hyperglycemia, Glucocorticoids, and Insulin Use with Morbidity and Mortality in the Pediatric Intensive Care Unit.	Cross-sectional, Descriptive.	Questionnaire	We retrospectively evaluated the degree of hyperglycemia as well as its correlation with glucocorticoid and insulin use and assessed its association with hospital length of stay (LOS) and mortality. This study preceded the initiation of a standard glycemic control protocol. Hyperglycemia was prevalent in the PICU and was associated with

						increased morbidity, as characterized by increased LOS and increased mortality. Glucocorticoid use was prevalent among patients exhibiting hyperglycemia. Insulin use was uncommon.
Giri	2021	India	Are we ignoring coexisting rhabdomyolysis as an important aggravating factor for acute kidney injury among childhood diabetic ketoacidosis?	Cross-sectional, Descriptive.	Questionnaire	Rhabdomyolysis was common among our cohort of cDKA with AKI and was associated with high morbidity and mortality. Rapid flux in electrolytes and osmolality may be important precipitating factors. We recommend larger prospective studies exploring the importance of rhabdomyolysis among cDKA with AKI.
Eliotte Hirschberg	2008	Hungary	Alterations in glucose	Cohort	Cohort	We found a relationship

			homeostasis in the pediatric intensive care unit: Hyperglycemia and glucose variability are associated with increased mortality and morbidity			between blood glucose level and PICU patient outcomes. The relationship is similar to that found in adults and raises the question whether attention to control of blood glucose will improve outcomes in critically ill children.
Gordillo	2016	USA	Hyperglycemia and acute kidney injury in critically ill children.	Cohort	Cohort	We found that the prevalence of hyperglycemia was 89% in the retrospective cohort and 86% in the prospective cohort. We conclude that in critically ill children, hyperglycemia is associated with AKI and longer PICU stays.
Burns	2010	England	Pediatric intensive care admissions for acute diabetes complications.	Cross-sectional, Descriptive.	Questionnaire	The majority of admissions were for ketoacidosis (87%), with more female

						<p>admissions than males (56% vs. 44%). Forty per cent of the diabetes admissions were aged 11-15 years. There were five deaths (1.5%), all female. Acute diabetic complications, particularly in adolescent females, are becoming a more common reason for admission to pediatric critical care. The overall mortality rate for diabetes-related critical care hospitalizations was low. Early detection of new instances, increased awareness of the illness, and improved management of current diabetes patients might eliminate the</p>
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						need for costly critical care.
Kumar Kanwal	2012	India	Clinical Profile of Diabetic Ketoacidosis in Indian Children			Both boys and girls were impacted in the same way. Newly diagnosed diabetes accounted for more than half of all DKA hospitalizations. Nearly two-thirds of the patients had severe DKA. Renal failure, cerebral edema, and sepsis all had a role in the poor result.
Lauren E. Marsillio.	2015	USA	Hyperglycemia at the Time of Acquiring Central Catheter-Associated Bloodstream Infections Is Associated With Mortality in Critically Ill Children.	Cohort	Cohort	In addition to other risk factors for ICU mortality, hyperglycemia at the time of acquiring central catheter-associated bloodstream infections was independently associated with ICU mortality (adjusted odds ratio, 1.9; 95 percent CI, 1.1-6.4; p =

						0.03) after controlling for severity of illness and interventions (vasopressor use and severity of organ dysfunction)
Burcul	2019	Croatia	Characteristics of Children with Diabetic Ketoacidosis Treated in Pediatric Intensive Care Unit.	Cross-sectional, Descriptive.	Questionnaire	A total of 82 patients were included in the study. Those with NT1D were treated in the PICU more often, and two of them developed cerebral edema. Dehydration was the most common clinical symptom, with 95 percent of patients having it at the time of admission. 41.5 percent of patients had a reduced degree of awareness, with the majority of them being somnolent.
Poovazhagi	2015	India	Factors associated with mortality in children with diabetic ketoacidosis DKA	Cross-sectional, Descriptive.	Questionnaire	Overall mortality in children with DKA ranges from 0.15 percent to

						0.35 percent in industrialized nations such as Canada, the United States, and the United Kingdom, and from 3.4 percent to 13.4% in underdeveloped countries such as India, Pakistan, and Bangladesh. In DKA, cerebral edema is the leading cause of death. In industrialized nations, the prevalence of cerebral edema ranges from 0% to 5.5 percent but in poor countries, it is claimed to range from 24 percent to 26 percent.
Shiva	2018	Iran	INVESTIGATION OF DIABET KETOACIDOSIS TREATMENT IN PEDIATRIC HOSPITAL Tabriz	Retrospective.	Questionnaire	The mean glucose and potassium reductions throughout therapy were 171.270mg/dl and 0.71meq/L, respectively. Hypokalemi

						<p>a was found in 39 of the patients. The average increases in sodium and bicarbonate were 2.4 1.1 and 7.272.5 meq/L, respectively. The average time for individuals to recover from DKA was 14.76.2 hours. There were no deaths in our research. Cerebral edema was observed in 4 (1.52%) of the patients.</p>
Mohsen Reisi.	2021	Iran	Correlation between Stable Hyperglycemia and Mortality in Children Admitted to the Pediatric Intensive Care Unit of Imam Hossein Hospital.	Cross-sectional, Descriptive.	Questionnaire.	<p>Mortality was found to be 5.7 percent in hyperglycemic individuals and 6.8 percent in normal glycemic children. In terms of mortality rate, there were no statistically significant changes ($P = 0.499$). The mean PRISM²</p>

²Pediatric risk of mortality (PRISM)

						score for patients with normal glycemia was 7.03 5.18, whereas the score for individuals with hyperglycemia was 7.36 6.37.
Babiker	2021	Saudi Arabia	Frequency and Risk Factors of Diabetic Ketoacidosis in a Specialized Children's Hospital, Riyadh: A Cross-Sectional Study.	Cross-sectional, Descriptive.	Questionnaire	In our study, most DKA patients had a known case of type 1 diabetes. And lack of insulin was the main cause of DKA. Most of them were 14-10 years old and most of them were female, which led to an increase in hospitalization. In addition to awareness campaigns to prevent DKA as an initial recommendation, intervention strategies should also be targeted at known high-risk groups for type 1

						diabetes, such as adolescents.
Yaneva	2016	Belgium	Risk factors for cerebral edema in children and adolescents with diabetic ketoacidosis.	Cross-sectional, Descriptive.	Questionnaire	CO was found in 22 (8.6%) of the 256 people who took part in the study. One of these patients (5%) died, while two others (9%) survived with neurological sequelae. CO was found to be substantially linked to severe DKA.
Uday	2014	UK	REVIEW OF GLYCAEMIC CONTROL, COMPLICATIONS AND OUTCOME FOLLOWING TRANSFER TO ADULT SERVICES IN ADOLESCENTS AND YOUNG ADULTS WITH CHILDHOOD ONSET TYPE 1 DIABETES MELLITUS.	Interventional.	Questionnaire	Diabetes control in adolescent and young adults with type 1 diabetes is inadequate and is not affected by transfer to adult services, despite a reduction in the number of clinic attendance. The rate of microvascular complications in this group is relatively high,

						although advanced complications were evident only in a minority. Future work is needed to improve glycaemic control in young people with diabetes to encourage engagement and develop new strategies for self-management.
Weissbach	2018	Israel	Acute Kidney Injury in Critically Ill Children Admitted to the PICU for Diabetic Ketoacidosis	Retrospective	Questionnaire	Compared with the patients without acute kidney injury, the acute kidney injury group was characterized by higher mean admission serum levels of sodium, lactate and glucose. There was no between-group difference in length of PICU stay or hospitalization. Kidney injury was documented

						at discharge in four patients with acute kidney injury (16.7%), all stage 1; all had normal creatinine levels at the first clinical outpatient follow-up. All 82 patients with diabetic ketoacidosis survived.
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Results:

The essential data was extracted for writing after reading the summary and full text of articles relevant to the study subject. The author's name, year, location, research type, sampling method, data collecting tool, and findings were all required for each study. Subsequently, the information gleaned from the papers was organized and reported in the form of a review article.

Discussion:

Despite a decrease in clinic attendance, diabetes management in teen and young adults with type 1 diabetes is insufficient, and transfer to adult treatment has little effect. This group has a significant risk of microvascular complications, albeit advanced problems were only seen in a small percentage of cases. Glycemic control in young individuals with diabetes must be improved in the future to promote involvement and create new self-management tools (25)

Noyes J, Crofton measured capillary HOB hourly by NPT (Abbott Optium meter, analytical range 0-6.0 mmol/L), venous blood gases 4 hourly, and venous HOB 4 hourly by laboratory enzymatic method and tested all urine passed for ketones. Two possible ICP end-points were compared: A, pH > 7.3 followed by two successive NPT HOB measurements <1 mmol/L, and B, pH > 7.3 and urine ketone free (our current end-point) (26)

In developed countries, children with diabetic ketoacidosis (DKA) have a mortality rate of 0.3–3 percent. According to the scant statistics available from undeveloped nations, death rates as high as 13.4% have been observed. In South India, a prospective research was done to determine the variables that contribute to increased mortality in children with DKA. A total of 118 episodes of DKA in children hospitalized to a pediatric tertiary care institution in Chennai were studied. Risk variables included clinical presentation, laboratory data at admission, parameters throughout therapy, and complications (27)

Patients with and without CO were compared in terms of demographics, biochemical data, and treatment measures. CO was found in 22 (8.6%) of the 256 people who took part in the

study. One of these patients (5%) died, while two others (9%) survived with neurological sequelae (28)

Although a study showed that the incidence of cerebral edema in children with DKA is low, it has a high mortality rate (24%) and high morbidity (35%) (29) In one study, complications seen in diabetic children included hyperchloremia, hypokalemia, hyponatremia, cerebral edema, shock, acute renal injury, arrhythmia, and thrombotic purpura, thrombocytopenic myocarditis, and ARDS. Hyperchloremia and other electrolyte abnormalities, cerebral edema and AKI were the most common complications of DKA (30). Another study depicted that newly diagnosed diabetics accounted for 58.1% of patients. These patients had longer hospital stays. Nausea, vomiting, polydipsia and polyuria were more common in these patients. There was a significant relationship between hypokalemia and clinical symptoms as well as between low bicarbonate and the severity of acidosis. No mortality occurred and infection was the most common irritant (31).

Severe hypoglycemia occurred in 8 (80%) of the children within the first 48 hours of the hospitalization, and in 6 (60%) of the children during the late night shift. Excessive insulin dosage (60 percent), unsuitable infusion solution (70 percent), and inability to adequately monitor blood glucose levels were the leading causes of severe hypoglycemia (40 percent). Age 5 years ($p = 0.00004$; OR = 42.0 [95 percent CI: 6.3 - 279]) and severe malnutrition ($p = 0.002$; OR = 10.9 [95 percent CI: 2.4 - 48.6]) were both risk factors for severe hypoglycemia. Four of the eight (11.6%) infants who died had severe hypoglycemia ($p = 0.01$; OR = 8.8 [95 percent CI, 1.7-44.8]). Conclusion: Because of the severity and relevance of severe hypoglycemia, risk factors must be controlled (32) In a single young child, we demonstrated many unusual consequences of DKA. Although the majority of DKA patients are treated without issues, doctors who care for them should expect a protracted and complex course in rare cases (33) Patients from Libya made up 95 percent of the total, with 59 percent coming from outside Tobruck. At the time of onset, the average age was 6.7 years old. 47 percent had a positive family history of IDDM, and 63 percent had previously been admitted to a PICU. Weight loss was the most common symptom in 42% of patients, followed by polyuria, polydipsia, and vomiting in 37%, DKA in 31.5 percent, and abdominal discomfort in 16 percent (34) Fifty-one individuals with diabetic ketoacidosis were included in this research. Children were 6.63.9 years old on average. Nausea and vomiting were the most common symptoms, while dehydration and tachypnea were the most common indicators (94.1 percent) (88.2 percent). Hypokalemia, 25.5 percent hypoglycemia, 17.6 percent hyponatremia, 11.8 percent hypernatremia, and 9.8 percent hyperkalemia were seen in 49 percent of patients. Finally, 48 patients were released, with three of them dying from cerebral edema. Conclusion: The leading cause of death in our research was cerebral edema. As a result, cerebral edema should be avoided and treated as soon as possible (35) Only three people died in the 'only hypoglycemia' group (N=22). The amounts of macronutrients administered by parenteral feeding were not significantly different across the four blood glucose groups. Hyperglycemia and glucose fluctuation are major predictors of death in children receiving parenteral nutrition, according to the findings of this study (36) A case report study showed that neuropathy is a diverse range of complications in type 1 diabetes (T1D), with chronic polyneuropathy being the most frequent form in adults. T1D was discovered in an 8-year-old girl who was hospitalized with acute diabetic ketoacidosis. She was treated with intravenous

fluids and insulin before being started on numerous daily subcutaneous insulin injections (37) Hydration helps the majority of children with AKI and DKA recover. Although a cause-effect relationship could not be established, hyperchloremia at 24 hours exhibited an independent correlation with AKI (38)

Hyperglycemia was shown to be prevalent in 89 percent of the retrospective cohort and 86 percent of the prospective cohort. AKI was linked to a high glycemia level. Peak glycemia was found to have a statistically significant relationship with hospital and PICU stays, respectively. In participants with and without hyperglycemia, urine NGAL and plasma NGAL were not significantly different, with $P=0.99$ and $P=0.85$, respectively. Vasopressor users had a lower estimated glomerular filtration rate and increased glycemia, respectively, with $P=0.01$ and $P=0.04$ (39)

In the research conducted by Weissbach, it was prominent that acute kidney injury was not uncommon in children with diabetic ketoacidosis hospitalized in the PICU. However, it was usually mild and not associated with longer hospitalization or residual kidney injury (40) Rhabdomyolysis was common among our cohort of cDKA with AKI and was associated with high morbidity and mortality. Rapid flux in electrolytes and osmolality may be important precipitating factors. We recommend larger prospective studies exploring the importance of rhabdomyolysis among cDKA with AKI (41)

Hyperglycemia was common in the PICU, and it was linked to increased morbidity, as measured by length of stay and fatality. Patients with hyperglycemia were more likely to use glucocorticoids. Insulin therapy was not widely used (42)

Another study found a link between high blood sugar and the outcome of PICU hospitalization, as is the case in adults. Blood sugar control improves outcomes in pediatric patients admitted to intensive care units (43) The most common reason for admission was ketoacidosis (87%) with more females than males (56 percent vs. 44 percent). Diabetes hospitalizations from 11 to 15 years old accounted for 40% of the total. There were five fatalities (1.5%), all of them were female. Acute diabetes complications are becoming an increasingly prevalent reason for admission to pediatric critical care, especially in teenage girls. Diabetes-related critical care hospitalizations had a low overall death rate. Early diagnosis of new cases, increased knowledge of the condition, and better management of present diabetic patients might reduce the need for expensive critical care (44) In the same way, both boys and girls were affected. More than half of all DKA hospitalizations were due to newly diagnosed diabetes. DKA was seen in nearly two-thirds of the individuals. The dismal outcome was caused by renal failure, cerebral edema, and sepsis (45) In addition to other risk factors for ICU mortality, hyperglycemia at the time of acquiring central catheter-associated bloodstream infections was independently associated with ICU mortality (adjusted odds ratio, 1.9; 95 percent CI, 1.1-6.4; $p = 0.03$) after controlling for severity of illness and interventions (vasopressor use and severity of organ dysfunction) (46)

The other research involved a total of 82 patients. Those with NT1D were admitted to the PICU more often, and two of them had cerebral edema as a result of their treatment. The most prevalent clinical symptom was dehydration, which was present in 95 percent of patients at the time of admission. The bulk of the patients were somnolent, with 41.5 percent having a decreased level of alertness (47)

Shiva investigated the mean glucose and potassium reductions throughout therapy were 171.270mg/dl and 0.71meq/L, respectively. Hypokalemia was found in 39 of the patients. The average increases in sodium and bicarbonate were 2.4 1.1 and 7.272.5 meq/L, respectively. The average time for individuals to recover from DKA was 14.76.2 hours. There were no deaths in our research. Cerebral edema was observed in 4 (1.52%) of the patients (48) Hyperglycemic children had a mortality rate of 5.7 percent, whereas normal glycemic children had a mortality rate of 6.8 percent. There were no statistically significant changes in the mortality rate ($P = 0.499$). Patients with normal glycemia had a PRISM score of 7.03 5.18, whereas those with hyperglycemia had a score of 7.36 6.37 (49)

Babiker found that the majority of DKA patients in their research had type 1 diabetes. DKA was mostly caused by a shortage of insulin. The majority of them were between the ages of 14 and 10, and the majority of them were female, resulting in an increase in hospitalization. Intervention measures should be aimed at identified high-risk populations for type 1 diabetes, such as teenagers, in addition to awareness campaigns to avoid DKA as an initial approach (50)

Conclusion:

According to diabetes management research in teenagers and young adults, type 1 diabetes is a chronic condition that necessitates close outpatient services and is insufficient. In affluent nations, children with diabetic ketoacidosis (DKA) have a mortality rate of 3.3 to 3%. The mortality rate in poor nations is stated to be 13.4%. Shock, renal failure, sepsis, hypokalemia, hyponatremia, acute renal damage, severe hypoglycemia, polyuria and polydipsia, persistent vomiting, abdominal discomfort, rhabdomyolysis, neuropathy, and sequelae are the most frequent and hazardous complications. It plays a vital role. Although some research has found that hyperglycemia has no influence on mortality, it has been linked to an increase in morbidity in the majority of investigations.

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