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### Acute Complications in Pediatric Patients with Diabetes Admitted with Isolated Diabetic Ketoacidosis, Isolated Hyperglycemic Hyperosmolar State, and Mixed Hyperosmolar Diabetic Ketoacidosis

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# Acute Complications in Pediatric Patients with Diabetes Admitted with Isolated DKA, Isolated HHS, and Mixed Hyperosmolar DKA

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## Background

Diabetic ketoacidosis (DKA), hyperglycemic hyperosmolar state (HHS), and mixed DKA and HHS (hyperosmolar DKA) are hyperglycemic emergencies for which children with diabetes mellitus (DM) are admitted to the hospital. To date, there is little evidence to guide the management of pediatric diabetic patients with hyperosmolarity. The objective of this study is to compare the in-hospital complications at our institution in patients who have isolated DKA to those with a component of hyperosmolarity.

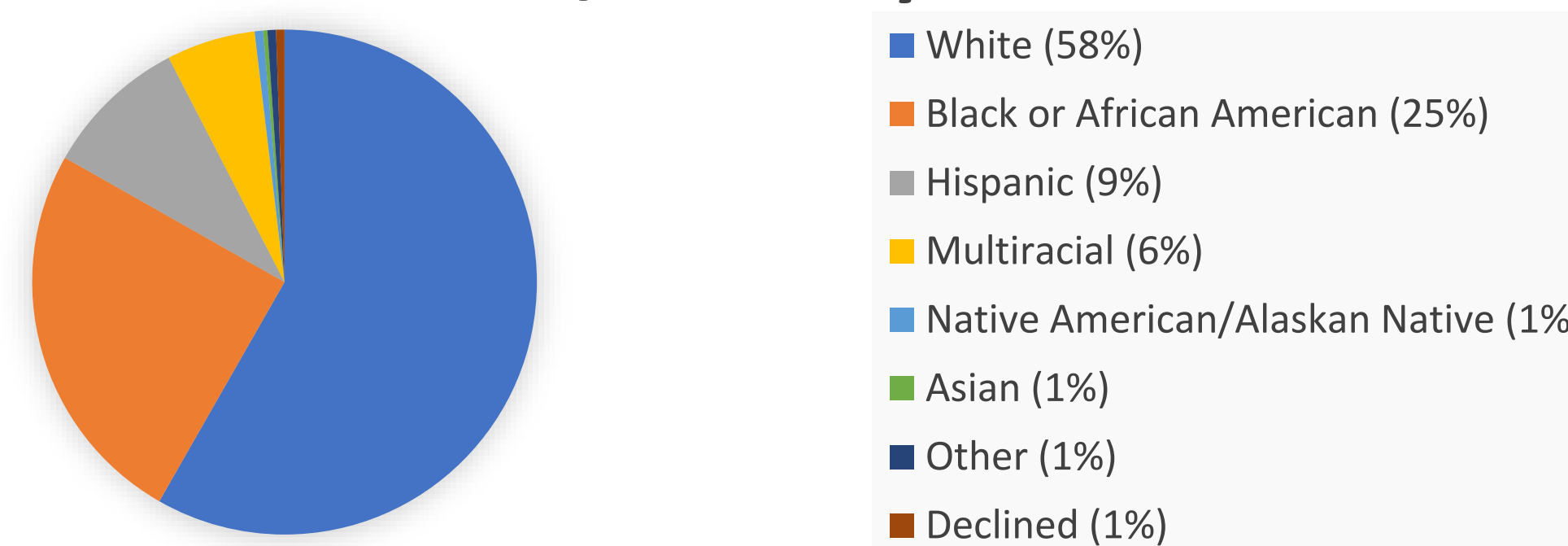
## Methods

- Reviewed 369 medical records from 01/2019 through 12/2020.
- Children admitted to tertiary care facility with DKA (serum bicarbonate  $\leq 16$  mEq/L) and/or HHS (blood glucose  $\geq 600$  mg/dL and osmolality  $\geq 320$  mOsm/kg).
- Patients transferred from an outside facility were excluded.
- Isolated HHS combined with hyperosmolar DKA for analysis.
- Acute kidney injury (AKI) defined as an elevated creatinine level for age.
- Altered mental status (AMS) defined by physician documented AMS in exam, Glasgow Coma Scale  $< 15$ , administration of hypertonic saline or mannitol, or head CT obtained.
- P-values generated via two-sample Wilcoxon rank-sum (Mann-Whitney), Fisher's exact, or chi-square tests.
- All analyses conducted using Stata/SE 15.1.

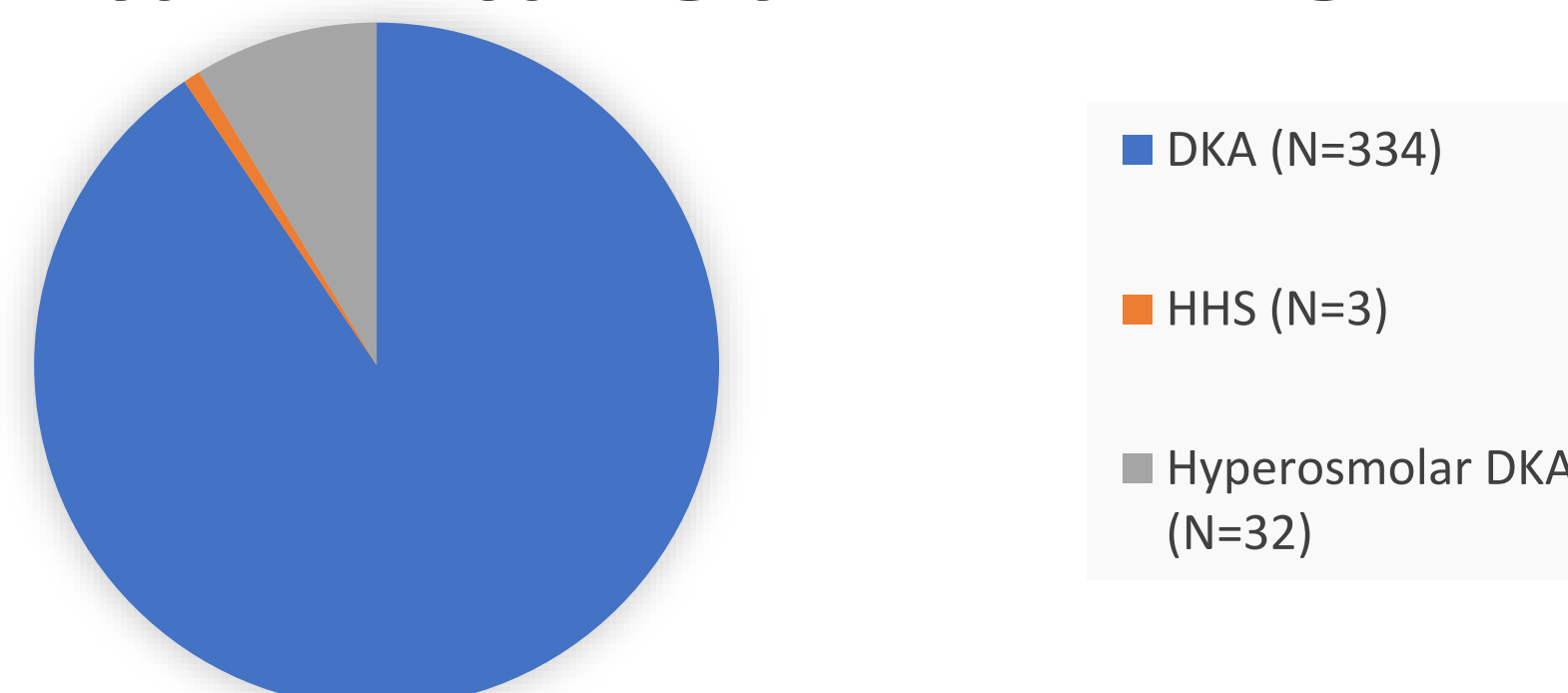
## Demographics & Characteristics

- Average age of admission 14 years (IQR=11.2,16.8), 60% female, 69% new onset diabetes mellitus, and 96% T1DM.
- Average osmolality calculated at admission was 299 (IQR=292,306) in isolated DKA group and 327 (IQR=322,334) in hyperosmolar group ( $p < 0.001$ ).
- Criteria for admission to the Pediatric Intensive Care Unit (PICU):
  - Children  $\leq 5$  years with serum bicarbonate  $\leq 10$  mEq/L
  - Children  $> 5$  years with serum bicarbonate  $\leq 5$  mEq/L, significantly elevated BUN, altered mental status, or significant risk for cerebral edema

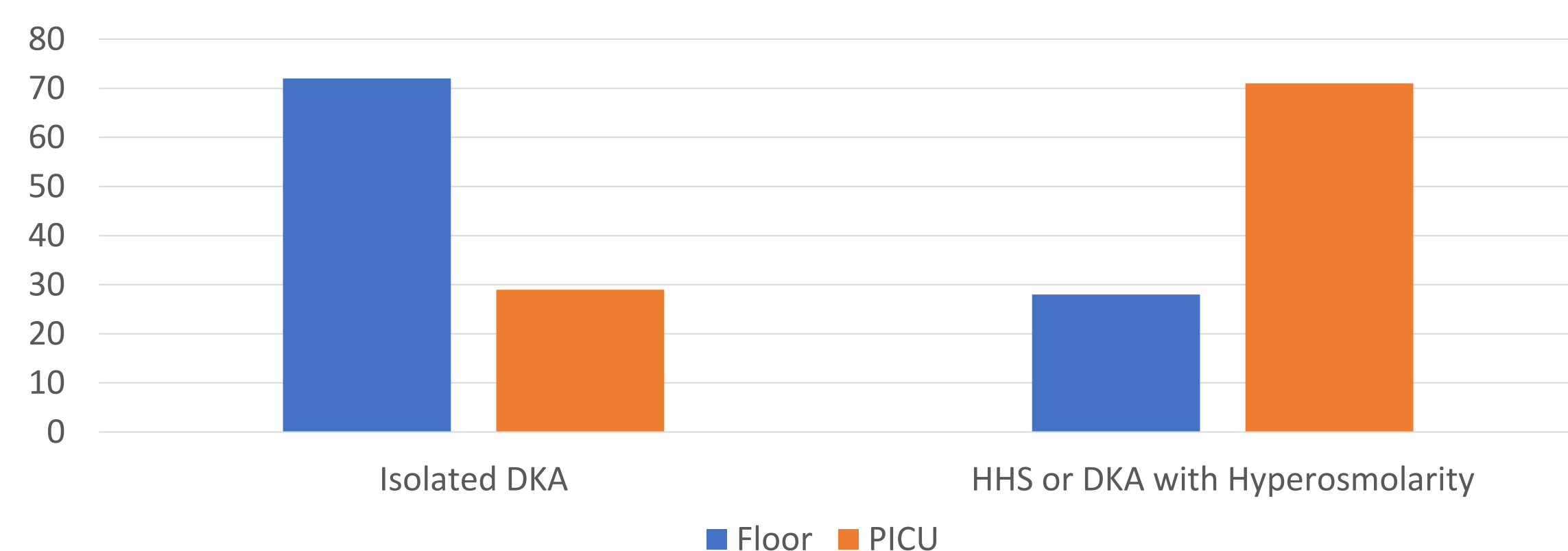
### Race/Ethnicity



### Type of Hyperglycemic Emergencies



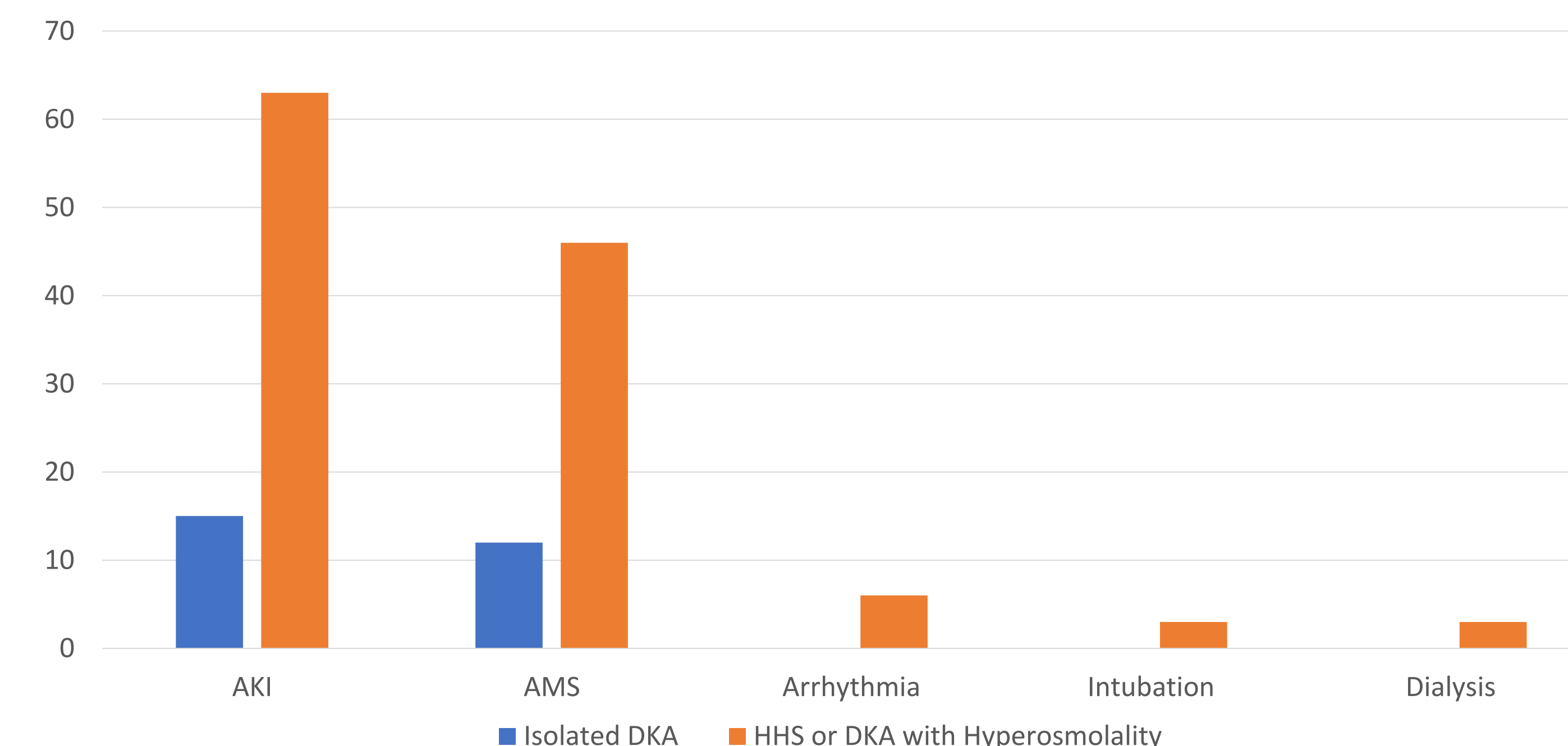
### Admission Disposition (%)



## Results

- Average length of stay was longer for hyperosmolar group (37.4 hours, IQR=24.6,63.5) compared to isolated DKA group (26.5 hours, IQR=20.2,41.3;  $p < 0.0021$ ).
- One patient with hyperosmolar DKA had complications of intubation, dialysis, and rhabdomyolysis.
- No patients with malignant hyperthermia.

### Complication Rates



## Conclusions

In children with DM, hyperosmolarity increases acute complications compared to isolated DKA. Given the small number of patients with hyperosmolarity, data on a larger scale is needed. Our findings will be useful to guide interventional studies and identify ways to prevent acute complications.