Electrolyte Abnormalities in Diabetic Patients: A Systematic Review.

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INTRODUCTION

Diabetes is a leading global cause of mortality and morbidity, affecting over 11% of the population, and is the leading cause of end-stage renal disease. Diabetic emergencies commonly seen within the emergency department and prehospital environment include Diabetic Ketoacidosis (DKA) and Hypoglycaemia. These conditions can result in severe dehydration and acidosis, which is associated with electrolyte disturbances, including dyskalaemia (hyperkalaemia, hypokalaemia), and dysnatraemia (hyponatraemia, hypernatremia. Diabetic emergencies are frequently encountered by Emergency Medical Services (EMS), where early recognition and management may influence outcomes.

Limited data exists regarding the demographic characteristics of the intersection between diabetic emergencies and electrolyte disturbances, highlighting a gap in our understanding of their clinical and demographic profiles.

AIM

In patients presenting to EMS or ED:

1. What is the frequency of electrolyte disorders (hyper/hypokalaemia, hyper/hyponatraemia) in patients with diabetes (and/or an associated diabetic emergency
2. What is the frequency of diabetes (and/or an associated diabetic emergency) in patients presenting with hyper/hypokalaemia and hypo/hypernatraemia.

Secondary outcomes will review patient demographics and mortality rates in these groups of patients.

METHODS

- A systematic search of CINAHL, Medline, and Scopus was conducted in accordance with PRISMA guidelines.
- Inclusions were published after 2000, conducted in the emergency department or by emergency medical services, and patients presented with at least one of the following conditions: hyperkalaemia/hypokalaemia, hyper/hyponatraemia, or either diabetes or an associated diabetic emergency.
- Each stage was completed by two authors, with a third and fourth engaged to resolve conflicts.
- Studies were assessed using JBI critical appraisal tools by two authors.
- The 15 studies were separated into two subgroups: (1) patients with diabetes and the frequency of electrolyte disorders, and (2) patients with electrolyte disorders and the frequency of diabetes.

Data Extraction

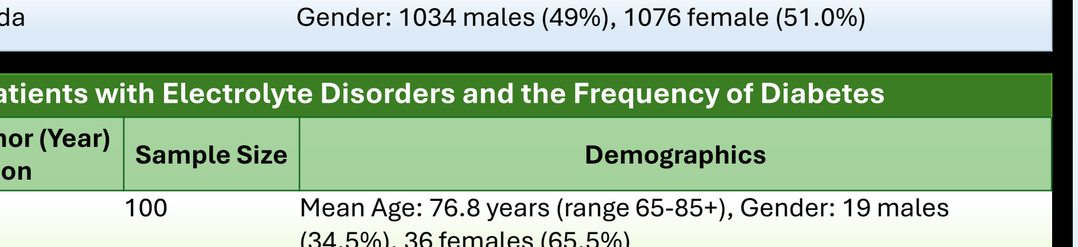
Patients with Diabetes and the Frequency of Electrolyte Disorders

Primary Author (Year) Location	Sample Size	Demographics
Alhamdani (2024) Saudi Arabia	156	Mean Age: 7.84 <5 = 51, >5 = 105 Gender: 84 males (54.5%) , 70 females (45.5%)
Arora (2010) Los Angeles, USA	54	Age (mean) 40.2 (SD 12.1; 19 - 63) Gender: Not reported
Batwa (2022) Saudia Arabia	53	Mean Age: 8.51 years, <5 =9, >5 = 44 Gender: 28 males (52.8%), 25 females (47.2%)
Dragila (2022) Croatia	52	Age median 34 (18-85 years) Gender: 23 males (44.2%), 29 females (55.8%)
Jang (2015) USA	537	Not reported
Kang (2015) Korea	219	Mean age: 71.0 ± 10.7 years Gender: 90 males (41%), 129 females (59%)
Wong (2016), Canada	40	Age: Median 34.5 years (IQR: 28.8-52.3) Gender: 24 male (60%), 16 female (40%)
Ye (2023) Alberta, Canada	2,110	Median age: 59.4 years Gender: 1034 males (49%), 1076 female (51.0%)

Patients with Electrolyte Disorders and the Frequency of Diabetes

Primary Author (Year) Location	Sample Size	Demographics
Akman (2022) Turkey	100	Mean Age: 76.8 years (range 65-85+), Gender: 19 males (34.5%), 36 females (65.5%)
Gurbuz (2024) Turkey	399	Mean Age: 65.4 years Gender: 177 males (44.4%), 222 females (55.6%)
Kuo (2021) Taiwan	1382	Mean age: 67.9 years Gender: 793 males (57%), 589 females (43%)
Lim (2023) Singapore	135	Mean age: 67.1 years, Gender: 67 males (49.6%) 68 female (50.4%)
Llorens (2023) Spain	13,368	Age: 79 median (73-86) Gender: 6885 male (51.5%) 6483 women (48.5%)
Makinouchi (2022) Japan	87	Median age: 73 years (range: 57-83), Gender: 33 male (38%), 54 female (62%)
Zhang (2024) China	90	Average age: 71.1 years SD 14.8, Gender: 48 male (53.3%), 42 female (46.6%)

Cohort by Gender



Results

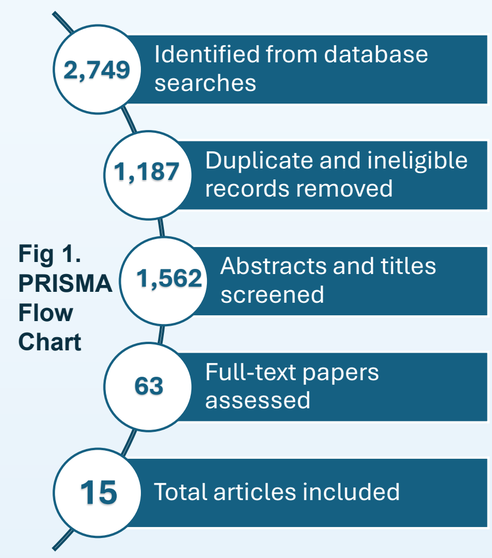
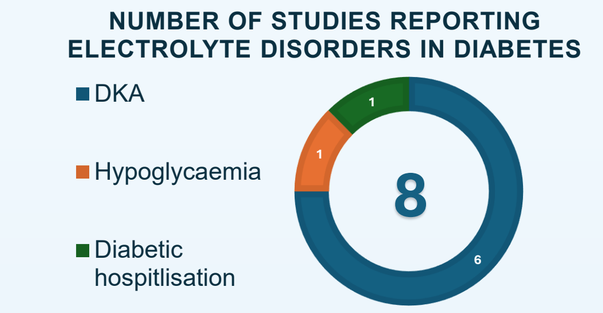
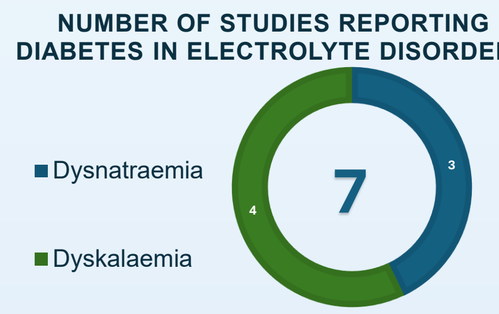
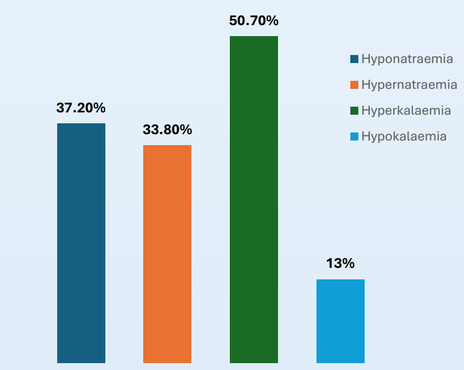


Fig 1. PRISMA Flow Chart



Eight studies focused on patients with diabetes and **seven** on patients with electrolyte disturbances.

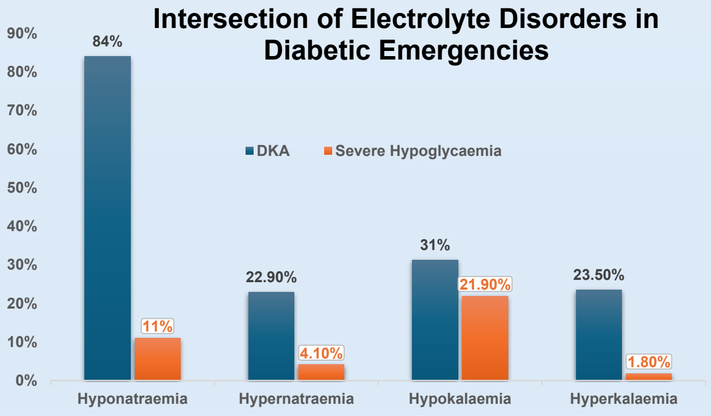




Electrolyte abnormalities were frequently observed in diabetic emergencies:

- Hypokalaemia was observed in up to 38% of patients with DKA [1-4]
- Dysnatraemia was identified in up to 40.4% [2, 5, 6]
- Diabetes was observed in patients presenting with electrolyte disturbances, especially hyperkalaemia (*M* = 57%) and hyponatraemia (*M* = 37.2%) [6-10]

- Severe electrolyte abnormalities were associated with increased ICU admissions, prolonged hospital stays, and higher mortality rates [11, 1, 6]
- Hyperkalaemia was associated with a mortality rate of up to 34.6% in diabetic patients [9], and hyponatraemia with 34.9%[10]



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Conclusion

- This systematic review examined the relationship between diabetes and electrolyte abnormalities.
- Dysnatraemia and dyskalaemia were frequently observed in DKA. The presence and severity of these disturbances were associated with increased hospital admissions, ICU requirements, and mortality.
- Diabetes was commonly identified as a comorbidity in patients presenting with electrolyte disturbances, especially hyperkalaemia and hyponatraemia. The findings also highlighted that the severity of electrolyte disturbances may be a more important predictor of adverse outcomes than their presence alone.
- There is limited representation of prehospital settings, and this represents a gap in the literature, particularly given the role of paramedics in early recognition and management of diabetic emergencies and electrolyte disturbances.

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