

Prevalence of electrolyte imbalance among diabetic patients attending Kiwoko Hospital in Nakaseke district, Uganda. A cross-sectional study.

Ariho Muwanguzi Abel*, Robert Musisi, Francisco Ssemuwemba, Hasifa Nansereko, Anthony Ssekitoleko,
Jane Frank Nalubega.
Mildmay Institute of Health Sciences.

Page | 1

ABSTRACT

Background:

The study aimed to determine the prevalence of electrolyte imbalance among diabetic patients attending Kiwoko Hospital in Nakaseke District, Uganda.

Methodology:

A hospital-based cross-sectional study using quantitative methods was conducted among diabetic patients' records at Kiwoko Hospital Laboratory, Nakaseke District. Secondary data were obtained from laboratory registers and patient files. A sample of 384 records was selected using simple random sampling. Data were collected using a structured extraction checklist, pretested for validity and reliability. Information was coded and analysed using SPSS version 25, with descriptive statistics and tests of association used to determine prevalence and factors associated with electrolyte imbalance. Confidentiality was maintained throughout.

Results:

The prevalence of electrolyte imbalance among diabetic patients is 38.0% (146/384), while 62.0% (238/384) had normal electrolyte levels. Hyponatremia was the most common abnormality, affecting 58 (39.7%) patients with electrolyte imbalance, followed by hypokalemia 40 (27.4%), hyperkalemia 26 (17.8%), hypocalcemia 14 (9.6%), and other abnormalities 8 (5.5%). Regarding sex, females constituted the majority of participants, 208 (54.2%), compared with males, 176 (45.8%). Among the individual factors assessed, electrolyte imbalance was more prevalent among patients with uncontrolled blood glucose, 108/222 (48.6%), than those with controlled glucose, 38/162 (23.5%). Patients with diabetes for more than 10 years had the highest prevalence, 48/96 (50.0%), compared with 40.6% among those with 5–10 years and 28.0% among those with less than five years. Kidney disease showed a marked difference, with imbalance in 62/96 (64.6%) versus 84/288 (29.2%) without kidney disease.

Conclusion:

Electrolyte imbalance was relatively high among diabetic patients attending Kiwoko Hospital Laboratory, with hyponatremia being the most common electrolyte abnormality.

Recommendation:

Healthcare workers should strengthen routine electrolyte monitoring among diabetic patients for early detection and management of electrolyte abnormalities.

Keywords: Electrolyte imbalance, Diabetic patients, Diabetes mellitus, Hyponatremia, Kiwoko Hospital.

Submitted: July 05, 2026 **Accepted:** August 31, 2026 **Published:** October 01, 2026

Corresponding author: Ariho Muwanguzi Abel
Mildmay Institute of Health Sciences.

BACKGROUND OF THE STUDY

Electrolyte imbalance is a common metabolic complication among patients with diabetes mellitus and is associated with increased morbidity and mortality. Electrolytes, including sodium, potassium, chloride, calcium, magnesium, and bicarbonate, are essential for maintaining normal physiological functions such as fluid regulation, nerve

conduction, muscle contraction, and acid–base balance. Persistent hyperglycaemia in diabetes can disrupt these functions through osmotic diuresis, dehydration, and altered renal handling of electrolytes (World Health Organization, 2023).

Globally, studies have reported a considerable burden of electrolyte abnormalities among diabetic patients. In India,

approximately 40–60% of diabetic patients have been reported to develop one or more electrolyte disturbances, with hyponatremia, hypokalemia, and hyperkalemia among the commonly observed abnormalities. These disturbances have been associated with poor glycaemic control, dehydration, and complications of diabetes (Kumar et al., 2021).

Evidence from Nigeria has similarly demonstrated significant alterations in serum electrolyte levels among diabetic patients compared with non-diabetic individuals. Sodium and potassium disturbances were commonly observed and were attributed partly to osmotic diuresis resulting from elevated blood glucose levels.

The burden of electrolyte imbalance is particularly important among hospitalized diabetic patients because infections, dehydration, medications, diabetic ketoacidosis, and hyperosmolar hyperglycaemic states can further disturb electrolyte concentrations (Adrogué & Madias, 2018).

In Uganda, reports indicate that poor glycaemic control, delayed healthcare seeking, and diabetes-related complications contribute to the increasing burden of metabolic complications among patients with diabetes (Ministry of Health Uganda, 2022).

The study aimed to determine the prevalence of electrolyte imbalance among diabetic patients attending Kiwoko Hospital in Nakaseke district, Uganda.

METHODOLOGY

Study design.

The study employed a hospital-based cross-sectional study design using quantitative methods of data collection. Secondary data review was used to obtain information from existing laboratory records and patient files. The design was appropriate because it enabled the researcher to determine the prevalence of electrolyte imbalance and identify factors associated with electrolyte imbalance among diabetic patients at a specific point in time (Polit & Beck, 2021).

Study area.

The study was conducted at Kiwoko Hospital located in Nakaseke District in Central Uganda. Kiwoko Hospital is a private not-for-profit health facility that provides laboratory, inpatient, outpatient, diabetic care, and emergency services. The laboratory performs several diagnostic investigations, including electrolyte analysis, blood glucose testing, renal function tests, and other biochemical investigations important in diabetic patient management. The hospital was selected because it receives a large number of diabetic patients from Nakaseke District and neighbouring districts.

Study population.

The study population consisted of records of diabetic patients attended to at Kiwoko Hospital Laboratory during the study period.

Inclusion criteria.

The study included:

- Records of diabetic patients available at Kiwoko Hospital Laboratory.
- Records with complete electrolyte investigation results.
- Records of patients aged 18 years and above.

Exclusion criteria.

The study excluded:

- Records with incomplete information.
- Duplicate patient records.
- Records without electrolyte test results.

Sample size determination.

The sample size was determined by using the Kish and Leslie formula (1965) for sample size determination.

$$n = \left| \frac{Z^2 p (1-p)}{d^2} \right|$$

Where

n represents the desired sample size,

Z is the statistical level at 95% Confidence Interval,

P is the estimated prevalence of electrolyte imbalance, and

d is the allowable error of 0.5%

Assuming a prevalence of 50% because of limited local data:

$$n = \frac{Z^2 p (1-p)}{d^2} = \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2} = 384 \text{ patient records.}$$

Therefore, a sample size of 384 patient records was used in the study.

Sampling technique.

Simple random sampling technique was used to select patient records from the laboratory registers and patient files.

Sampling procedure.

Laboratory registers and patient files of diabetic patients were reviewed to identify records meeting the inclusion criteria. Eligible records were assigned numbers and selected randomly until the required sample size was obtained.

Research variables.

Dependent variable.

- Prevalence of electrolyte imbalance among diabetic patients

Independent variables.

- Age
- Sex
- Duration of diabetes
- Blood glucose level
- Medication use
- Alcohol consumption
- Smoking status
- Presence of kidney disease
- Diabetic complications

Data collection tools.

Data were collected using a structured data extraction checklist developed by the researcher. The checklist was used to obtain information from laboratory registers and patient files.

Quality control.

To ensure validity and reliability of data:

- The data extraction checklist was pre-tested before actual data collection.
- Only complete patient records were included in the study.
- Laboratory records were cross-checked with patient files for consistency.
- Data were checked daily for completeness and accuracy.
- Close supervision was maintained throughout the data collection process.

Data collection procedure.

An introductory letter was obtained from the institution and presented to the administration of Kiwoko Hospital to seek permission to conduct the study. After approval, laboratory registers and patient records were accessed. Relevant information regarding electrolyte results and associated factors was extracted using the data extraction checklist.

Piloting of the study.

The data extraction checklist was pre-tested at a nearby health facility before the actual study to ensure clarity, consistency, and suitability of the tool. Corrections and adjustments were made where necessary.

Data analysis and presentation.

Collected data were checked for completeness, coded, and entered into Microsoft Excel before being exported to Statistical Package for Social Sciences (SPSS) version 25 for analysis.

Descriptive statistics such as frequencies, percentages, tables, pie charts, and bar graphs were used to summarize the data. The prevalence of electrolyte imbalance was presented in percentages. Associations between individual factors and electrolyte imbalance were analysed. Findings were presented in tables, figures, and narratives.

Ethical considerations.

Permission to conduct the study was obtained from the institution and the administration of Kiwoko Hospital. Confidentiality of patient information was maintained throughout the study by using codes instead of patient names. Information obtained from records was strictly used for academic purposes only. Only authorized persons had access to the collected data.

RESULTS

Socio-demographic characteristics of respondents.

Table 1: Socio-demographic characteristics of participants

VARIABLE	Category	Frequency (n)	Percentage (%)
Age	18–30	58	15.1
	31–40	82	21.4
	41–50	104	27.1
	51–60	90	23.4
	Above 60	50	13.0
Sex	Male	176	45.8
	Female	208	54.2

The study findings showed that the majority of diabetic patients were females, 208 (54.2%), while males were 176 (45.8%).

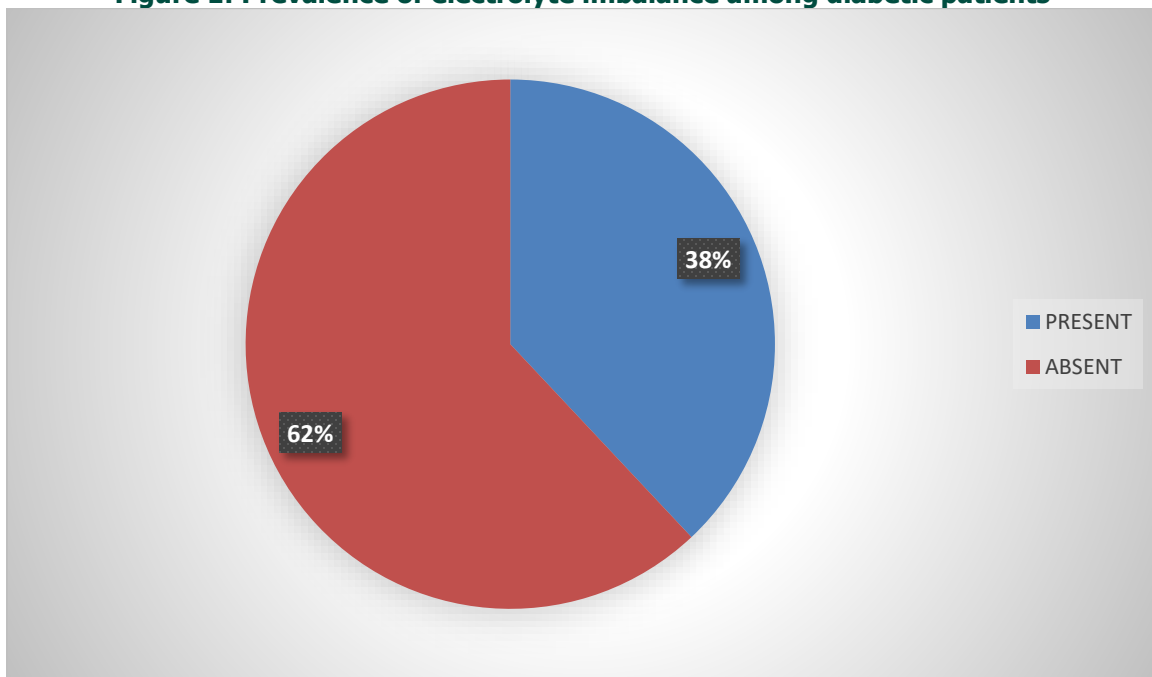
Prevalence of electrolyte imbalance among diabetic patients

Table 2: Prevalence of electrolyte imbalance among diabetic patients

Electrolyte imbalance status	Frequency (n)	Percentage (%)
Present	146	38.0
Absent	238	62.0
Total	384	100

Page | 4

Figure 1: Prevalence of electrolyte imbalance among diabetic patients



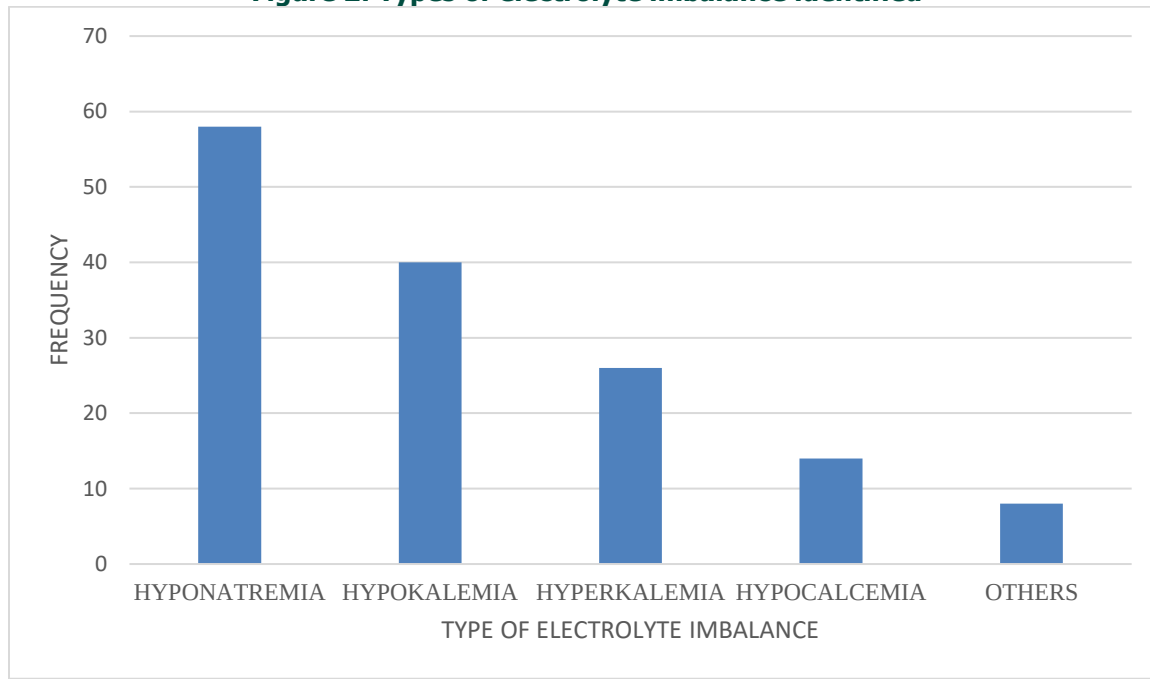
The study findings revealed that 146 (38.0%) diabetic patients had electrolyte imbalance while 238 (62.0%) had normal electrolyte levels. This indicates that electrolyte imbalance was common among diabetic patients attending Kiwoko Hospital.

Table 3: Types of electrolyte imbalance identified

electrolyte imbalance	Frequency	Percentage
Hyponatremia	58	39.7 %
Hypokalemia	40	27.4 %
Hyperkalemia	26	17.8 %
Hypocalcemia	14	9.6 %
Others	8	5.5 %
Total	146	100

Hyponatremia was the most common electrolyte imbalance identified among diabetic patients, 58 (39.7%), followed by hypokalemia, 40 (27.4%).

Figure 2: Types of electrolyte imbalance identified



DISCUSSION

The study findings revealed that the prevalence of electrolyte imbalance among diabetic patients attending Kiwoko Hospital was 38.0%. This implies that electrolyte imbalance is a common metabolic complication among diabetic patients.

The findings are in agreement with Tusa et al. (2019) in Ethiopia, who reported a high prevalence of electrolyte disturbances among diabetic patients attending referral hospitals. The similarity in findings may be due to poor glycemic control, dehydration, and inadequate routine electrolyte monitoring among diabetic patients in both settings.

The study further identified hyponatremia as the most common electrolyte abnormality among diabetic patients. This finding is consistent with Kumar et al. (2021), who found that sodium imbalance was the leading electrolyte disturbance among diabetic patients in India. The possible explanation for this similarity is that persistent hyperglycemia causes osmotic diuresis, leading to excessive sodium loss through urine.

The prevalence observed in this study may also be associated with delayed healthcare-seeking behavior, poor treatment adherence, and diabetic complications such as nephropathy. Electrolyte imbalance among diabetic patients may result in severe complications including cardiac arrhythmias, muscle weakness, confusion, and coma if not properly managed.

Conclusion

The study concluded that electrolyte imbalance is common among diabetic patients attending Kiwoko Hospital Laboratory, with a prevalence of 38.0%. Hyponatremia was identified as the most common electrolyte abnormality among diabetic patients.

Recommendation

- Healthcare workers should strengthen routine electrolyte monitoring among diabetic patients for early detection and management of electrolyte abnormalities.
- Kiwoko Hospital Laboratory should ensure continuous availability of electrolyte testing reagents and laboratory supplies.
- Health education should be provided to diabetic patients on the importance of regular medical review and electrolyte testing.

Acknowledgement

I would like to express my sincere gratitude to Almighty God for the gift of life, strength, wisdom, and guidance throughout my academic journey and during the completion of this research study.

I extend my heartfelt appreciation to the administration and lecturers of Mildmay Institute of Health Sciences for the

knowledge, guidance, and academic support offered to me throughout my course of study.

Special thanks go to my supervisor for the professional guidance, encouragement, constructive criticism, and tireless support rendered during the preparation of this research report.

I also wish to thank the administration and staff of Kiwoko Hospital for allowing me to conduct the study in their facility and for their cooperation during data collection.

My sincere appreciation also goes to my parents, family members, classmates, and friends for their moral, financial, and emotional support throughout the study period.

Finally, I thank all the respondents who willingly participated in the study for their cooperation and valuable information, which made this research successful.

List of abbreviations

ADA - American Diabetes Association

DKA - Diabetic ketoacidosis

HHS - Hyperosmolar hyperglycaemic state

IDF - International Diabetes Federation

MoH - Ministry of Health

SPSS - Statistical Package for the Social Sciences

WHO - World Health Organization

Source of funding

The study received no external funding.

Conflict of interest

The authors declare no conflict of interest.

Data availability

Data are available upon request from the author.

Author contributions

AM: conceptualization, methodology, investigation, writing original draft.

RM: data curation, validation, supervision.

HN: data curation, visualization.

FS: validation, supervision.

AS: data curation, formal analysis.

JFN: supervision, validation.

Informed consent

Written informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the purpose of the study, procedures involved, potential risks and benefits, and their right to withdraw at any time without penalty.

Author biography

Ariho Muwanguzi Abel: a student pursuing a diploma in medical laboratory.

Robert Musisi: research supervisor at Mildmay School of Allied Health Sciences.

Hasifa Nansereko: research supervisor at Mildmay School of Allied Health Sciences.

Francisco Ssemuwemba: research supervisor at Mildmay School of Allied Health Sciences.

Anthony Ssekitoaleko: research supervisor at Mildmay School of Allied Health Sciences.

Jane Frank Nalubega: research supervisor at Mildmay School of Allied Health Sciences.

References

1. Adrogué, H. J., & Madias, N. E. (2000). Hyponatremia. *The New England Journal of Medicine*, 342(21), 1581–1589. <https://doi.org/10.1056/NEJM200005253422107>
2. Engwa, G. A., Eme, M. O., & Okon, I. E. (2018). Assessment of serum electrolytes, renal function and associated risk factors among patients with type 2 diabetes mellitus. *Journal of Clinical and Diagnostic Research*. <https://www.jcdr.net/ReadXMLFile.aspx?id=11673>
3. Eshetu, B., Worede, A., Shimelis, A. F., Girma, M., & Hadgoue, R. (2023). Assessment of electrolyte imbalance and associated factors among adult diabetic patients attending the University of Gondar Comprehensive Specialized Hospital, Ethiopia: A comparative cross-sectional study. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. <https://doi.org/10.2147/DMSO.S404788>
4. Ministry of Health. (2026). *Integrated diabetes management guidelines for Uganda: The comprehensive version*. Ministry of Health, Republic of Uganda.
5. Sonkar, S. K., Parmar, K. S., Ahmad, M. K., Sonkar, G. K., & Gautam, M. (2021). An observational study to estimate the level of essential trace elements and its implications in type 2 diabetes mellitus patients. *Journal of Family Medicine and Primary Care*, 10(7), 2594–2599. <https://doi.org/10.4103/jfmpe.jfmpe.2395.20>
6. Tusa, B. S., Geremew, B. M., & Tefera, M. A. (2020). Health-related quality of life and associated factors among adults with and without diabetes in Adama city, East Shewa, Ethiopia, 2019; using generalized structural equation modeling. *Health and Quality of Life Outcomes*,

- 18, 83. <https://doi.org/10.1186/s12955-020-01337-9>
7. World Health Organization. (2023). *Report of the WHO discussion group for people living with*

diabetes: Virtual meeting, 30–31 March 2023.
World Health Organization.
<https://iris.who.int/bitstream/handle/10665/374810/9789240081451-eng.pdf>

PUBLISHER DETAILS

SJC PUBLISHERS COMPANY LIMITED



Category: Non Government & Non profit Organisation

Contact: +256 775 434 261 (WhatsApp)

Email: info@sjpublisher.org or sjcpublishers@gmail.com

Website: <https://sjpublisher.org>

Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa