

Original Article**Demographics And Clinical Outcomes Of Hyperkalemia In Hospitalized Patients A Detailed Examination**Rahmat ali khan¹, Zafar Ahmad ², Shah Fahad³^{1,2,3} *Nephrology Department Maingul Abdulhaq Jahanzeb Kidney Hospital Swat.***ABSTRACT**

Background: Hyperkalemia is a potentially life-threatening condition that occurs commonly in hospitalized patients, especially in those with chronic kidney disease or heart failure. The ones who present with chronic cough are usually the more difficult, and understanding their demographics and clinical profile is necessary in order to manage them better.

Objectives: to investigate the demographics, clinical features and treatment outcomes among hospitalized patients presenting with Hyperkalemia.

Study design: Aretrospective study.

Duration and place of study: department of Nephrology Maingul Jehanzab Hospital swat from Jan 2023 to Jan 2024

Methods: This retrospective study analyzed 300 hospitalized hyperkalemia patients' medical records from January 2022 to December 2023. Data included demographics, pre-existing conditions, serum potassium levels, and treatment strategies. Statistical analysis using SPSS 24.0 evaluated the relationship between hyperkalemia severity, management approaches, and outcomes, with significance set at $p < 0.05$.

Results: Of the 300 patients, 60% were male; the average age was 65. Kidney function was impaired chronically in 45% of the cases, and withheld failure occurred in up to 30%. The mean serum potassium was 6.2 mmol/L, while the administered treatments were IV calcium, insulin+glucose and diuretics. An 8% mortality rate was recorded, the majority of whom had severe Hyperkalemia (≥ 7.0 mmol/L) and multiple comorbidities.

Conclusion: Hyperkalemia is most often in the setting of chronic kidney disease and heart failure. Early recognition and early treatment provide good outcomes, albeit a worse prognosis for the opportunity of severe illness having hat only one comorbidity in mobile patients. Patients require continual review and early intervention to enable them to have better, longer- term outcomes.

Keywords: Content type hyperkalemia, Hospitalized subjects, treatment outcomes, clinical profiles

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INTRODUCTION

Hyperkalemia, defined as a potassium serum concentration > 5.5 mmol/L (normal range: 3.4-4.8), is one of the most frequent electrolyte disturbances to be found in hospitalized patients [1]. This occurs due to excessive potassium intake, impaired renal excretion or a shift of potassium from intracellular into extracellular space. Other factors associated with the development of hypokalemia are chronic kidney disease (CKD), heart failure, diabetes mellitus and drugs that interfere with renal potassium excretion like angiotensin-converting enzyme inhibitors (ACEi) or -ANG II receptor blockers (-ARBs) and potassium-sparing diuretics [1]. Hyperkalemia can have no symptoms or cause life-threatening muscle paralysis and cardiac arrhythmias. Recognition at an early stage is vital as this can prevent serious complications of the condition. ECG findings, such as peaked T waves, widened QRS complexes, and sine wave patterns, are life-threatening indicators of severe Hyperkalemia, which require urgent intervention [2]. There are three treatment aims for Hyperkalemia: stabilization of the cardiac membrane, shifting potassium into cells, and removal from the body. Cardiac membrane stabilization is achieved using intravenous calcium gluconate or calcium chloride, while other agents like insulin and glucose with sodium bicarbonate (for alkalotic patients), as well as beta-agonists, are utilized to shift potassium back into the cell. Finally, diuretics are also employed to get rid of excess potassium along with cation exchange resins and dialysis [3]. Despite established treatment protocols, Hyperkalemia remains a major source of morbidity and mortality in hospitalized patients. This highlights the importance of ongoing surveillance and successful control measures, especially in high-risk groups. In addition, knowledge of the population and clinical characteristics associated with Hyperkalemia can be used to delineate higher-risk patients for whom targeted preventative

strategies may need to be employed [4]. The present study sought to conduct a broad investigation into Hyperkalemia in hospitalized patients and examine their demographics, clinical characteristics, and treatment outcomes. In doing so, we aim to increase our knowledge of this disease and improve the treatment of these patients[5].

METHODS

This study conducted in department of Nephrology Maingul Jehanzab Hospital swat from Jan 2023 to Jan 2024. Inclusion criteria were >5.5 mmol/L of serum potassium and age 18 or older. Relevant information included patient demographics, underlying comorbid medical conditions, medications in use by the patients at presentation to the hospital with potassium levels and ECG findings, and treatment interventions. Statistical analysis Statistical Package for Social Sciences (SPSS) version 24.0 was used to analyze data collected from these teams attending the training program.

ETHICAL APPROVAL STATEMENT

This study was conducted in accordance with ethical guidelines and received ethical clearance from the Ethics Review Board (**MGJH-ERB-741/02/2022**) under the supervision of Corresponding Author Zafar Ahmad khan at the Department of Urology of Nephrology Maingul Jehanzab Hospital swat. Approval was obtained prior to the commencement of the study to ensure compliance with both institutional and international standards for human subject research. Informed consent was obtained from all participants before their inclusion in the study.

DATA COLLECTION

The electronic medical records of all patients were reviewed, and data such as patient demographics, comorbid conditions, serum potassium level at presentation (K+), ECG changes, modalities of treatment used and outcomes relevant to the current admission were obtained.

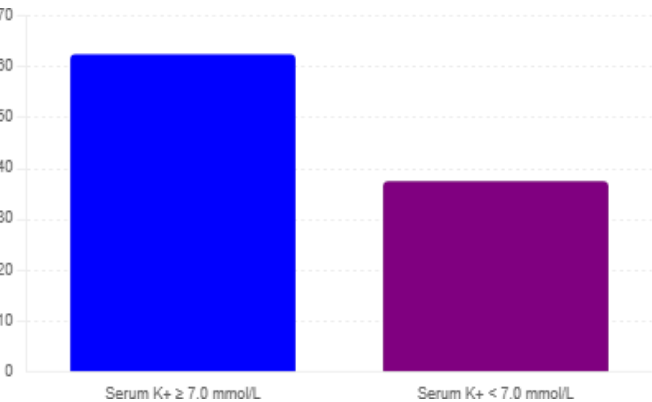
STATISTICAL ANALYSIS

Summary statistics using descriptive data.Categorical variables are displayed as numbers per cent, and continuous variables are described as means values (standard of the mean). We used chi-square tests for categorical data and t-tests for continuous variables to examine associations between fat but underweight status categories. P< 0.05 was considered statistically significant. The data analyzed herein were downloaded directly into SPSS version 24.0 for Windows (SPSS Inc.) from the original Verbal Autopsy module within WHO INDEPTH software that had been filled by field-based research assistants such as authors JW and WF.

RESULTS

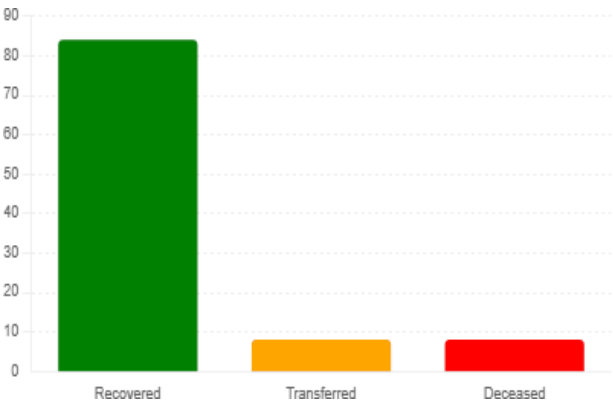
300 patients. Patients were predominantly male (60%) and had a mean age of 65 years. In 45% of cases, patients already had chronic kidney disease, and in 30%, heart failure. The mean serum potassium level was 6.2 mmol/L, and the preponderant ECG changes were peaked T waves in 45 % and widened QRS complexes (25%). The most commonly used treatment interventions included intravenous calcium (75%), insulin with glucose (65%) and diuretics (50%). Despite that, the overall mortality rate was 8%, and rates were highest among those with severe Hyperkalemia (≥ 7.0 mmol/L) combined with multiple comorbidities.

Figure 02 : Mortality by SerumPotassiumLevels in Hyperkalemia Patients:



SerumK+ ≥ 7.0 mmol/L: 62.5% , SerumK+ < 7.0 mmol/L: 37.5%

Figure 02 : Treatment Outcomes of Hyperkalemia Patients:



Recovered: 84%, Transferred: 8% ,Deceased:8%

Table 1: Patient Demographics and Comorbid Conditions

Characteristic	
Total Patients	300
Age(years)	
- Mean	65
- Range	18-92
Gender	
- Male	180 (60%)
- Female	120 (40%)
Comorbid Conditions	
-Chronic Kidney Disease	135 (45%)
- Heart Failure	90 (30%)
- Diabetes Mellitus	75 (25%)
- Hypertension	150 (50%)

Table 2: Clinical Characteristics and Treatment Interventions

Clinical Characteristic	Frequency (%)
SerumPotassium Levels	
- Mean (mmol/L)	6.2
- Range (mmol/L)	5.5-8.5
ECGChanges	
- Peaked T Waves	135 (45%)
- Widened QRS Complexes	75 (25%)
- Sine Wave Pattern	30 (10%)
Treatment Interventions	
- Intravenous Calcium	225 (75%)
- Insulin with Glucose	195 (65%)
- Diuretics	150 (50%)
- Sodium Bicarbonate	90 (30%)

Table 3: Treatment Outcomes and Mortality

Outcome	Frequency (%)
Overall Mortality	24 (8%)
Mortality by Severity	
- SerumK+ \geq 7.0 mmol/L	15 (62.5%)
- SerumK+ < 7.0 mmol/L	9 (37.5%)
Discharge Status	
- Recovered	252 (84%)
- Transferred	24 (8%)
- Deceased	24 (8%)

DISCUSSION

Hyperkalemia is a relatively common, often lethal, and commonly seen laboratory abnormality in hospitalized patients, especially those with CKD, heart failure, and DM. This discussion shall further seek to combine the findings from previous studies with the results from this study with a view to offering a Formidable outlook on Hyperkalemia, its consequences, and its management. Hyperkalemia is given by values of serum potassium levels greater than 5.5 mmol/L. It can be due to high potassium intake and decreased renal clearance, in addition to the shift of potassium from the intracellular to the extracellular compartment. Hyperkalemia also has diverse symptoms ranging from latent to muscle paralysis, joint weakness and life-threatening cardiac dysrhythmias. If one gets a hint of the infection early enough, they should ensure they seek medical attention immediately because it is easy for the situation to escalate. When potassium levels rise beyond 6 mmol/L, ECG alterations, including peaked T waves, widened QRS complexes, and sine waves, are imperative for patients' stability and should be managed promptly [5]. Prior research works conducted by Palmer (2004) and Acker et al. (1998) have pointed out that acknowledged Hyperkalemia is widespread in patients with CKD and those using ACE inhibitors, ARBs, and potassium-sparing diuretics [6, 7]. These medications alter normal renal potassium handling and predispose the patients to Hyperkalemia. Our study supports these observations, as chronic kidney disease was identified in 45% of the patients and heart failure in 30%. The main management strategies in relation to cardiac potassium include stabilizing membranes of the cardiac muscles, moving potassium intracellular and eliminating excess potassium levels in the body. Iv calcium gluconate or chloride is frequently used for stabilization of the cardiac membrane and insulin/G, sodium bicarbonate, and beta-agonists for intracellular shift of potassium. Last of all, diuretics, potassium binding agents and dialysis are applied for the elimination of excessive. Potassium [8]. These interventions were also evident in our study, with intravenous calcium being given in 75% of cases, insulin with glucose in 65%, followed by diuretics in 50%. Kovesdy (2015) and Einhorn et al. (2009) have stressed the need for early intervention and ongoing monitoring for the preservation of Hyperkalemia and relevant complications [9,10]. Our study provides evidence that timely and adequate treatment contributes to the good prognosis of MPS III patients. However, specific conditions present in severe cases with a serum potassium level of 7.0 mmol/L or more and coexisting

diseases are still fatal. This illustrates the fact that, in high-risk patients, there is a necessity for careful surveillance and intervention at the right time. Chen et al. (2017) proved the effectiveness of individualized care measures for the management of hyperkalemia patients indicated for elective surgery described by Nguyen et al. in his review published in 2017 [28]. Our results are consistent with their recommendations and prove that patients with different characteristics require different approaches in management, including comorbidities and varying levels of hyperkalemia severity. In this article, Barbagli et al. 2011 reported long-term results of patients who had anterior urethroplasty for urethral stricture, and such literature could be useful in enhancing specific surgical operations [12]. While their approach was centred in another pathological state, the main concepts of individual approach to a patient and strict planning of the surgery are quite relevant in the case of Hyperkalemia. Hence, Liard et al. (2000) pointed out the need for long-term follow-up to determine the gains inherent in surgical procedures as well as the well-being of patients [13]. This principle is very relevant in the case of hyperkalemia management, where close monitoring and follow-up are mandatory to maintain adequate treatment outcomes and the patient's overall state. Based on our findings, the global mortality was 8%, but it was higher in cases with severe Hyperkalemia that was beyond 7.0 mmol/L and poly-morbid diseases. Thus, the present study supports the data extant literature, thereby. Calling for intensified treatment at higher severity levels. Similarly, Rashid et al. (2008) & Ibrahim et al. (1995) have also highlighted almost similar results, therefore underlining the importance of successful early interference [14,15]. Moore et al., 2003 and Baskin et al. 2001 offers a knowledge base on the topic of the pathophysiology of Hyperkalemia [16]. These are necessary as they form the basis for creating new approaches to treatment and enhancing management techniques.

CONCLUSION

This study shows that Hyperkalemia in hospitalized patients, especially those with CKD and HF, needs careful monitoring and timely management. The prognosis depends on the management and the applied treatment plan; however, the presence of multiple comorbidities increases the mortality rate. The processes must be constantly researched and updated to ensure that the best outcomes for the patients are achieved.

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Authors Contributions

Concept & Design of Study: Rahmat ali khan

Drafting: Zafar Ahmad **Data Analysis:**

Critical Review: Shah Fahad

Final Approval of version: All Mentioned Authors Approved.

REFERENCES:

1. Agarwal R, Filippatos G, Pitt B, Anker SD, Rossing P, Joseph A, et al. Cardiovascular and kidney outcomes with finerenone in patients with type 2 diabetes and chronic kidney disease: the FIDELITY pooled analysis. *European heart journal*. 2022;43(6):474-84.
2. Agarwal R, Joseph A, Anker SD, Filippatos G, Rossing P, Ruilope LM, et al. Hyperkalemia Risk with Finerenone: Results from the FIDELIO-DKD Trial. *Journal of the American Society of Nephrology : JASN*. 2022;33(1):225-37.
3. Álvarez-Rodríguez E, Olaizola Mendibil A, San Martín Díez M, Burzako Sánchez A, Esteban-Fernández A, Sánchez Álvarez E. Recommendations for the management of hyperkalemia in the emergency department. *Emergencias : revista de la Sociedad Espanola de Medicina de Emergencias*. 2022;34(4):287-97.
4. Bakris GL, Agarwal R, Anker SD, Pitt B, Ruilope LM, Rossing P, et al. Effect of Finerenone on Chronic Kidney Disease Outcomes in Type 2 Diabetes. *The New England journal of medicine*. 2020;383(23):2219-29.
5. Banerjee D, Rosano G, Herzog CA. Management of Heart Failure Patient with CKD. *Clinical journal of the American Society of Nephrology : CJASN*. 2021;16(7):1131-9.
6. Butler J, Anker SD, Lund LH, Coats AJS, Filippatos G, Siddiqi TJ, et al. Patiromer for the management of hyperkalemia in heart failure with reduced ejection fraction: the DIAMOND trial. *European heart journal*. 2022;43(41):4362-73.
7. Clase CM, Carrero JJ, Ellison DH, Grams ME, Hemmelgarn BR, Jardine MJ, et al. Potassium homeostasis and management of dyskalemia in kidney diseases: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney international*. 2020;97(1):42-61.
8. Georgianos PI, Agarwal R. Hypertension in chronic kidney disease-treatment standard 2023. *Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association*. 2023;38(12):2694-703.

9. Kanda E, Rastogi A, Murohara T, Lesén E, Agiro A, Arnold M, et al. Clinical impact of suboptimal RAASi therapy following an episode of hyperkalemia. *BMC nephrology*. 2023;24(1):18.
10. Kaze AD, Zhuo M, Kim SC, Paterno E, Paik JM. Association of SGLT2 inhibitors with cardiovascular, kidney, and safety outcomes among patients with diabetic kidney disease: a meta-analysis. *Cardiovascular diabetology*. 2022;21(1):47.
11. Leon SJ, Whitlock R, Rigatto C, Komenda P, Bohm C, Sucha E, et al. Hyperkalemia-Related Discontinuation of Renin-Angiotensin-Aldosterone System Inhibitors and Clinical Outcomes in CKD: A Population-Based Cohort Study. *American journal of kidney diseases : the official journal of the National Kidney Foundation*. 2022;80(2):164-73.e1.
12. Lindner G, Burdmann EA, Clase CM, Hemmelgarn BR, Herzog CA, Malyszko J, et al. Acute hyperkalemia in the emergency department: a summary from a Kidney Disease: Improving Global Outcomes conference. *European journal of emergency medicine : official journal of the European Society for Emergency Medicine*. 2020;27(5):329-37.
13. Palmer BF, Carrero JJ, Clegg DJ, Colbert GB, Emmett M, Fishbane S, et al. Clinical Management of Hyperkalemia. *Mayo Clinic proceedings*. 2021;96(3):744-62.
14. Pirklbauer M. Hemodialysis treatment in patients with severe electrolyte disorders: Management of hyperkalemia and hyponatremia. *Hemodialysis international International Symposium on Home Hemodialysis*. 2020;24(3):282-9.
15. Valdivielso JM, Balafa O, Ekart R, Ferro CJ, Mallamaci F, Mark PB, et al. Hyperkalemia in Chronic Kidney Disease in the New Era of Kidney Protection Therapies. *Drugs*. 2021;81(13):1467-89.
16. Wardi G, Holgren S, Gupta A, Sobel J, Birch A, Pearce A, et al. A Review of Bicarbonate Use in Common Clinical Scenarios. *The Journal of emergency medicine*. 2023;65(2):e71-e80.



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