OPEN ACCESS

ISAR Journal of Medical and Pharmaceutical Sciences

Volume 3, Issue 12, 2025 | Page: 28-30

Abbriviate Title- ISAR J Med Pharm Sci

ISSN (Online)- 2584-0150

https://isarpublisher.com/journal/isarjmps

Case Report: Blood pressure management using low-sodium, high-potassium, high-magnesium alkaline salt

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Article History

Received: 03.09.2025

Accepted: 15.11.2025

Published: 19.12.2025

Abstract: -

Purpose: Hypertension is a major modifiable risk factor for cardiovascular morbidity and mortality. While pharmacological management is standard, dietary modification, specifically reducing sodium and increasing potassium/magnesium intake, is a critical, sustainable component of long-term control. This case report aims to document the short-term reduction and long-term management of severe hypertension in a patient using an alkaline salt substitute (low sodium, high potassium, high magnesium) as a non-pharmacological intervention.

Case Description: A 62-year-old female with a 3-year history of hypertension presented with headache and dizziness. Her vital signs revealed severe hypertensive urgency (BP 230/110 mmHg) without evidence of acute end-organ damage (normal EKG, clear chest X-ray, no focal neurological deficits). Initial blood pressure reduction was achieved using sublingual nifedipine 10mg, which reduced the mean arterial pressure (MAP) by approximately 25% within 24 hours (180/90 mm Hg after 24 hours). The long-term management strategy was then transitioned to sustained dietary modification.

Intervention/Outcome: Following initial stabilization, the patient was transitioned to a regimen incorporating a low-sodium, high-potassium, high-magnesium alkaline salt substitute. The goal of this non-pharmacological intervention was to achieve sustained blood pressure control and prevent recurrence of hypertensive urgency.

Conclusion: This case report highlights that factors such as medication non-adherence (irregular or missed doses), even in a patient with previously controlled blood pressure, can precipitate a hypertensive urgency. While initial management necessitates prompt pharmacological stabilization (as evidenced by the need for sublingual nifedipine), the long-term sustainability of blood pressure control is significantly enhanced by non-pharmacological interventions. Specifically, the introduction of a low-sodium, high-potassium, high-magnesium alkaline salt substitute proved to be a feasible, effective, and sustainable dietary strategy for maintaining long-term blood pressure control and preventing recurrent acute hypertensive episodes.

Keywords: salts, essential hypertension, sodium-restricted, dietary, high potassium.

Cite this article:

Murugesan, N., Rajan, S. C., Kasi, S. M., (2025). Case Report: Blood pressure management using low-sodium, high-potassium, high-magnesium alkaline salt. *ISAR Journal of Medical and Pharmaceutical Sciences, 3*(12), 28-30.

Introduction

Hypertension is a global public health crisis, affecting approximately 45% of the adult population worldwide and serving as the major modifiable risk factor for cardiovascular and renal disease. Inadequate blood pressure (BP) control is a key contributor to this alarming trend.[1] Current clinical guidelines prefer the term "asymptomatic markedly elevated blood pressure" over "hypertensive urgency" to describe severe BP elevation (e.g., BP 180/120 mmHg) without acute, life-threatening end-organ damage.[2] While these conditions necessitate pharmacological management to achieve controlled BP reduction over 24-48 hours, patient compliance with lifelong drug therapy remains a significant challenge.

Non-pharmacological interventions, particularly dietary modifications focusing on reduced sodium and increased potassium/magnesium intake, are strongly advocated as essential, sustainable strategies to complement drug therapy and mitigate the risks associated with non-adherence. [3]

This case report describes the successful long-term management of asymptomatic severe hypertension. We document a patient who, following initial pharmacological stabilization, achieved sustained blood pressure control through the dietary substitution of standard table salt with a low-sodium, mineral-enriched (high-potassium and high-magnesium) alkaline alternative.

Case Presentation

A 62-year-old female of South Indian origin, with a medical history significant for chronic hypertension, presented to the Nephrology Outpatient Department on September 4, 2025, complaining of a severe, constant, dull occipital headache and accompanying nausea. The patient disclosed a history of non-adherence to her prescribed antihypertensive medication.Upon initial assessment, her vital signs confirmed a hypertensive crisis: Blood Pressure: 220/110 mmHg (standing) and 230/100 mmHg (supine), Heart Rate: 88 beats/min.Temperature: 98°F (Afebrile).

A comprehensive systemic physical and neurological examination was largely unremarkable, demonstrating that the patient was conscious and oriented. There were no signs of acute end-organ damage, such as pulmonary crackles, cardiac gallops, or focal neurological deficits.

Initial laboratory investigations indicated a mild compromise in renal function:Urea: 24 mg/dL, Creatinine: 1.1 mg/dL, eGFR: 55 mL/min/1.73m², consistent with Stage 3 Chronic Kidney Disease (CKD). Electrolytes (Sodium 143 mEq/L, Potassium 4.3 mmol/L) and TSH (1.28) were within normal limits.

Management and Long-Term Outcome

The differentiation between a hypertensive emergency and urgency was paramount in guiding acute management. Given the presence of severe headache and nausea combined with critically elevated blood pressure (up to 230/100 mmHg) but the absence of acute, life-threatening target-organ damage (e.g., flash pulmonary edema, acute neurological deficits), the diagnosis was confirmed as Hypertensive Urgency secondary to poor medication adherence. Immediate management focused on a safe, gradual blood pressure reduction using oral agents. Sublingual Nifedipine 10 mg was administered, resulting in a satisfactory BP reduction to 160/90 mmHg within 30 minutes. Following this acute stabilization, the patient was hospitalized for two days to optimize the therapeutic plan. The maintenance regimen involved sustained release Nifedipine 10 mg alongside intensive patient counselling on adherence and key non-pharmacological interventions. These interventions included strict dietary salt and fluid restriction, with the patient transitioning to a Low Sodium Salt Substitute (LSSS) rich in potassium and magnesium. The in-hospital BP trends showed stabilization, ranging from 180/90 to 172/90 mmHg on Day 1, and further to 170/90 to 166/88 mmHg on Day 2, allowing for safe discharge.

Post-discharge follow-up involved a structured 12-week telephonic monitoring program that required the patient to track daily morning and evening BP measurements and body weight. This yielded crucial data demonstrating the sustained success of the multidisciplinary approach. Over the 12 weeks, the weekly mean systolic blood pressure decreased significantly from 168 mmHg (Week 1) to 132 mmHg (Week 12). Concurrently, the patient achieved substantial weight reduction from 72kg (Week 1) to 62.0 kg (Week 12), reinforcing the impact of the dietary and lifestyle modifications. This sustained clinical improvement allowed for a controlled pharmacological de-escalation. The dosage of Nifedipine was progressively reduced from 20-10-20 mg daily (Weeks 1–5) to 20mg -0-20 mg (Weeks 6–9), and finally to a lower maintenance dose of 10-0-10mg (Weeks 10–12). The long-term outcome confirms that addressing patient non-adherence and integrating robust non-pharmacological support are key to resolving hypertensive urgency and achieving long-term, sustained normotensive control.

Discussion

Prioritizing Adherence and Non-Pharmacological Strategy in Hypertensive Urgency

The critical outcome of this case—the rapid resolution of hypertensive urgency and sustained long-term BP control—underscores the need to distinguish between hypertensive urgency and emergency. This differentiation is paramount, as the management of urgency demands a safe, gradual reduction of blood pressure using oral agents, preventing the risks of overly aggressive BP lowering that characterize emergency protocols. However, both the authors Abbas H et al,2022 and Byun H et al 2021 claims that the most compelling takeaway is the profound impact of addressing the underlying etiology: patient non-adherence affirms.[4,5]. And Judd SE et al 2012 and Neal B et al 2021confirms in their study that hypertensive urgency is precipitated by non-adherence, the most effective long-term management strategy is not merely increasing medication but aggressively integrating non-pharmacological interventions (NPIs) and patient education. [8,9]

The Case for Non-Pharmacological Measures as First-Line Prevention

While acute stabilization with Nifedipine was necessary to mitigate immediate risk, the sustained success achieved over the 12-week follow-up was driven by NPIs, particularly dietary modification. This case provides a compelling argument for why physicians must elevate NPIs from supplementary advice to a core pillar of management, especially in cases of CKD or non-adherence.

Enabling Pharmacological De-escalation: The significant reduction in the patient's mean SBP (from 168 mmHg to 132 mmHg) and the accompanying 10 kg weight loss over 12 weeks created a favorable physiological environment that allowed for the progressive de-escalation of Nifedipine dosage. This benefit—the ability to reduce lifetime drug burden—is a powerful patient motivator and a strategic goal for managing chronic conditions.

Lifetime Sustainability: Medication non-adherence is a pervasive issue. Advocating for sustainable lifestyle modifications addresses the root behavioral cause, offering patients long-term control rather than a perpetual reliance on dose escalation. The success demonstrated here highlights that sustained lifestyle change can be a more durable "cure" for recurrent urgency than polypharmacy.

The Role of Low Sodium Salt Substitute (LSSS) in Long-Term Efficacy

A core non-pharmacological element in this patient's success was the adoption of a Low Sodium Salt Substitute (LSSS), which replaces sodium chloride with potassium and magnesium salts. (6-9) This single modification provided a dual benefit that significantly aided in decreasing blood pressure:

Benefit	**Mechanism**	**Impact on Patient**
Sodium Restriction	Directly reduces intravascular volume and vasoconstriction.	Primary BP-lowering effect.
Potassium Supplementation	Promotes natriuresis (sodium excretion) and counteracts the vasoconstrictive effects of sodium [1].	Secondary BP lowering and cardiovascular protection [2].
Palatability and Feasibility	Allows the patient to maintain the palatability of their diet without compromising adherence to salt restriction.	Significantly improves long-term adherence to dietary restriction, making the lifestyle change feasible.

For patients with early-stage renal compromise, such as this patient with stage 3 CKD, the use of LSSS is particularly beneficial. While careful monitoring of potassium levels is necessary in CKD, the general use of potassium-enriched salt substitutes has been shown to reduce cardiovascular risk and lower BP without major adverse effects, even demonstrating feasibility in low- and middle-income countries [6-8]. This approach offers a palatable and practical bridge between stringent dietary requirements and real-world compliance, making the non-pharmacological intervention not just scientifically sound but clinically achievable.

In conclusion, this case underscores a vital message for physicians: while drugs stabilize the crisis, long-term, sustained outcomes are achieved by aggressively advocating for and supporting non-pharmacological measures, particularly the long-term use of modified salt substitutes. This strategy not only manages hypertension but also empowers patients toward a lifetime of reduced medication and improved cardiovascular health.

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