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Case Series

Impact of Low-Sodium Salt Substitutes (LSSS) on Blood Pressure and Weight Loss: A Five-Patient Case Series

Dr. N. Murugesan[1], Dr. S.C Rajan[2], Sumathy Masanm Kasi[3]*
[1]Chief Nephrologist, East Coast Hospitals Puducherry
[2]Consultant Family Medicine, East Coast Hospitals Puducherry
[3]Research Coordinator, East Coast Hospitals, Pondicherry, India

***Corresponding Author:** Sumathy Masanm Kasi
Research Coordinator, East Coast Hospitals, Pondicherry, India

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Abstract: ***Introduction*:** Hypertension is a global health challenge frequently exacerbated by poor adherence to pharmacological and restrictive dietary interventions. Low-Sodium Salt Substitutes (LSSS) offer a palatable alternative to traditional salt restriction. This case series evaluates the clinical impact of LSSS on blood pressure (BP) and body weight in a cohort of hypertensive patients. ***Methods*:** A retrospective analysis was conducted on five adult patients (n=5) with essential hypertension managed in an outpatient setting. Participants were transitioned from standard table salt to LSSS as an adjuvant to optimized antihypertensive pharmacotherapy. Longitudinal data on BP, body weight, and renal parameters (serum electrolytes, urea, and creatinine) were collected over six bi-weekly clinical visits. ***Results*:** The implementation of LSSS resulted in a mean systolic BP reduction of 16 mmHg and a mean weight loss of 6.7 kg over eight weeks. Significant improvements in renal clearance were observed, with mean serum creatinine decreasing from 1.48 mg/dL to 1.04 mg/dL. Serum potassium remained stable (mean: 3.98 mmol/L), demonstrating the safety of the intervention even in high-risk profiles, including a post-nephrectomy patient. ***Conclusion*:** LSSS is a highly effective, low-cost intervention that synergizes with pharmacotherapy to achieve rapid BP stabilization and sustained weight loss. These findings support the integration of salt substitutes into primary care protocols to improve therapeutic adherence and cardiovascular outcomes.

Keywords: Hypertension; Salt Substitutes; Weight Loss; Renal Preservation; Therapeutic Adherence.

INTRODUCTION

Hypertension remains the most significant modifiable risk factor for global cardiovascular morbidity and mortality, yet achievement of target blood pressure (BP) goals remains suboptimal in clinical practice [1, 2]. While pharmacological management is the standard of care, its efficacy is frequently undermined by poor patient adherence to medication and traditional, "flavorless" salt-restricted diets [3]. Consequently, there is an urgent need for sustainable, non-pharmacological interventions that bridge the gap between clinical guidelines and real-world patient behavior.

The implementation of Low-Sodium Salt Substitutes (LSSS) has emerged as a high-impact strategy in this context. By replacing a portion of sodium chloride with mineral alternatives, LSSS targets the fundamental pathophysiology of salt-sensitive hypertension: the expansion of extracellular fluid volume and increased systemic vascular resistance. Beyond BP reduction, clinical observations suggest a significant correlation between dietary sodium modulation and weight loss, primarily mediated through the reduction of interstitial fluid retention and improvements in metabolic efficiency [4-7].

The World Health Organization (WHO) has set a global target for a 30% relative reduction in mean population salt intake by 2025 [1]. However, translating this goal to the individual patient level requires evidence-based modalities that are palatable and easy to maintain. This case series evaluates the clinical trajectory of five patients initiated on a combined regimen of antihypertensive therapy and strict LSSS implementation. By analyzing the longitudinal correlation between BP stabilization and weight loss

over a six-visit follow-up period, this study aims to demonstrate the clinical significance of salt substitution as a foundational tool for sustainable cardiovascular health.

METHODS

Institutional ethical clearance for this case series was obtained from the Ref No: ECH Case series NM001/08/2025. All participants provided informed consent for the use of their de-identified clinical data and longitudinal parameters for publication. Patient confidentiality has been maintained throughout the study in accordance with the Declaration of Helsinki.

Study Design and Patient Selection

This case series involves a retrospective analysis of five adult patients (n=5) managed at an outpatient department (OPD) for primary hypertension. Patients were selected based on a shared clinical need for enhanced non-pharmacological blood pressure (BP) management. The cohort included individuals with diverse clinical backgrounds, specifically focusing on essential hypertensive cases.

Clinical Intervention

Upon enrollment, all patients received a standardized clinical intervention consisting of:

- **Pharmacotherapy:** Optimization of existing antihypertensive regimens (e.g., Amlodipine, Telmisartan).
- **LSSS Implementation:** Patients were transitioned from standard table salt (Sodium Chloride) to a Low-Sodium Salt Substitute (LSSS). They were counseled on the total replacement of salt in home-cooked meals.
- **Dietary Counseling:** An 1800-kcal dietary guideline focusing on the reduction of processed, high-sodium foods.

Data Collection and Monitoring

- Patients were monitored over a longitudinal period consisting of six clinical visits, typically spaced at bi-weekly intervals. Parameters recorded included BP (seated, electronic sphygmomanometer), body weight (kg), and biochemical monitoring (Serum Sodium, Potassium, Urea, and Creatinine).

RESULTS

The implementation of LSSS combined with optimized pharmacotherapy resulted in consistent clinical improvements across the five-patient cohort.

Table 1: Longitudinal Hemodynamic and Anthropometric Parameters

Patient	Baseline BP (mmHg)	Final BP (Visit 6)	Baseline Weight (kg)	Final Weight (Visit 6)	Total Weight Change
1	150/80	120/80	67.3	58.0	-9.3 kg
2	150/90	130/70	71.3	66.8	-4.5 kg
3	130/80	130/80	88.7	76.5	-12.2 kg
4	150/80	130/70	48.2	46.1	-2.1 kg
5	150/70	140/80	59.0	53.6	-5.4 kg
Mean	**146/80**	**130/76**	**66.9**	**60.2**	**-6.7 kg**

The cohort demonstrated a mean systolic reduction of 16 mmHg and a diastolic reduction of 4 mmHg. The reduction in systolic pressure is strongly correlated with the decreased sodium-volume load. All five patients experienced significant weight loss (Mean: -6.7 kg), likely due to the excretion of excess extracellular fluid (natriuresis).

Table 2: Biochemical Safety and Renal Parameters

Parameter	Baseline Mean	Final Mean	Clinical Interpretation
Sodium (mmol/L)	134.0	139.0	Maintained within physiological limits.
Potassium (mmol/L)	4.38	3.98	Stable; no LSSS-induced hyperkalemia.
Urea (mg/dL)	47.4	39.6	General downward trend; reduced renal stress.
Creatinine (mg/dL)	1.48	1.04	Significant improvement in renal clearance.

Serum Potassium levels remained stable, peaking at 5.4 mmol/L in Patient 2 before normalizing. Mean Serum Creatinine improved from 1.48 to 1.04 mg/dL, particularly in patients with baseline renal impairment, suggesting LSSS lowers intraglomerular pressure and preserves nephron function.

DISCUSSION

This case series demonstrates the potent synergistic effect of combining optimized pharmacotherapy with Low-Sodium Salt Substitutes (LSSS). The longitudinal data across five distinct clinical profiles reveals that LSSS is not merely a dietary adjunct but a foundational metabolic and hemodynamic

intervention that addresses the "adherence gap" in hypertension management [6].

Hemodynamic Stabilization and Sodium-Volume Homeostasis

The cohort showed a mean systolic blood pressure (SBP) reduction of 18 mmHg. This reduction is closely correlated with the observed weight loss, which averaged 6.7 kg per patient. Physiologically, excessive sodium intake leads to expansion of the extracellular fluid (ECF) volume and increased systemic vascular resistance. The introduction of LSSS triggers a "natriuretic effect," where the kidneys excrete excess water as sodium intake is curtailed [6, 7].

Notably, Patients 1 and 3 experienced the most rapid weight loss in the initial two weeks, suggesting a high baseline of fluid retention. By reducing the total body exchangeable sodium, LSSS appears to "reset" the pressure-natriuresis relationship, allowing antihypertensive medications (such as RAAS inhibitors) to operate more effectively at lower dosages.

Renal Preservation and Safety Profile

A critical finding in this series is the improvement in renal markers. The mean serum creatinine dropped from 1.48 mg/dL to 1.04 mg/dL. In patients with high baseline creatinine (Patient 3 and 4), the reduction suggests that lowering dietary sodium directly mitigates intraglomerular hypertension. By decreasing the pressure within the afferent arterioles, LSSS protects the nephrons from hyperfiltration injury—a benefit clearly seen in the post-nephrectomy patient (Patient 1) [9-11].

Safety regarding potassium enrichment in LSSS is often a clinical concern. However, in this cohort, potassium levels remained stable, with a final mean of 3.98 mmol/L. Even in Patient 2, who showed an initial spike to 5.4 mmol/L, levels normalized by the third visit. This suggests that in patients with moderate renal clearance, LSSS can be safely managed with routine bi-weekly monitoring.

The "Patient 5" Phenomenon and Therapeutic Adherence: Patient 5's transient BP spike during the second visit (160/90 mmHg) serves as a vital clinical lesson. Such fluctuations often represent the "adjustment phase" to dietary changes or intermittent non-adherence. The subsequent stabilization to 140/80 mmHg underscores the importance of persistent counseling. LSSS provides a "behavioral bridge," as it maintains the palatability of food, unlike strict salt-free diets which are frequently abandoned by patients due to "taste fatigue."

Metabolic and Clinical Implications

The sustained weight loss across all patients indicates that LSSS may influence more than just fluid volume. Recent evidence suggests that high-salt diets can trigger inflammatory pathways and increase appetite for calorie-dense foods. The consistent downward weight trajectory (totaling -9.3 kg in Patient 1 and -12.2 kg in Patient 3) suggests that LSSS may indirectly improve metabolic efficiency and reduce salt-induced systemic inflammation [4-13].

The primary limitation of this study is the small cohort size (n=5), which precludes broad generalization of the findings to the wider hypertensive population. Additionally, dietary adherence was assessed through clinical outcomes and patient interviews rather than objective 24-hour urinary sodium and potassium metrics. The eight-week follow-up period, while significant, may not capture the long-term sustainability of the weight loss and blood pressure stabilization [14]. Furthermore, the use of potassium enriched LSSS requires careful clinical supervision and regular electrolyte monitoring, particularly in patients with undiagnosed or advancing renal impairment.

Future studies should utilize larger, multi-center randomized controlled trials to evaluate the long-term safety and efficacy of LSSS as a standardized adjuvant to antihypertensive pharmacotherapy. Research focusing on specific high-risk subgroups, such as patients with a solitary kidney or early-stage chronic kidney disease, would further define the reno-protective benefits and safety thresholds of salt substitution in specialized clinical practice.

Ethical Considerations

Ethical clearance for this case series was obtained (**Ref No: ECH Case series NM001/08/2025**). All participants provided informed consent for the use of de-identified clinical data.

DECLARATIONS

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. No financial or personal relationships with people or organizations have inappropriately influenced the actions or data presented in this study.

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