Consensus on the Use of Potassium-Enriched Low-Sodium Salt Substitutes (LSSS) as a Public Health Intervention in India

Introduction

Cardiovascular disease (CVD) and hypertension are major public health challenges worldwide, including in India (1). High dietary sodium and low potassium intake are associated with increased risks of hypertension and CVD (2). The average salt intake is 8-11 grams per day in India, which is almost twice the WHO-recommended daily limit of 5 g salt per day (<2000 mg of sodium) (3,4). We also know that potassium intake among Indians is low (3,5,6). Therefore, reducing population-level sodium consumption and increasing potassium intake are recommended evidence-based approaches to reduce the burden of high blood pressure, stroke, heart attack, and other CVDs (7,8).

The majority of sodium intake in India (approximately 80%) comes from discretionary salt (4). Therefore, strategies that reduce household level sodium intake are critical in population-level sodium intake reduction and help India achieve its stated goal of reducing sodium intake by 30%. Replacing regular salt with potassium-enriched low-sodium salt substitutes (LSSS) is one such intervention that is effective not only in reducing sodium intake but also in increasing potassium consumption, lowering blood pressure, and reducing the risk of stroke and other cardiac events, thereby saving lives (9,10).

The Salt Substitute and Stroke Study (SSaSS), a multicentre, clinical trial conducted in China, showed that, as compared to regular salt, potassium-enriched LSSS with about 75% sodium chloride and 25% potassium chloride, reduced the stroke rate by 14%, major cardiovascular events by 13%, and premature death by 12% when followed-up for 5 years (9). Another randomized controlled trial (RCT) from rural India reported that participants who received LSSS showed a reduction in systolic blood pressure by 4.6 mm Hg (10). Modelling studies estimate that the implementation of LSSS at the national level could prevent 8-14% of cardiovascular deaths annually (11). Apart from these benefits, the use of LSSS is reported to have minimal effect on life threatening hyperkalemia (9).

Objectives of the consensus conference

The George Institute India, in collaboration with Resolve to Save Lives (RTSL), organized a consensus conference titled *"Bridging Evidence and Practice: A Consensus Conference on the Use of Low-Sodium Salt Substitutes as a Public Health Intervention"* on 02 December 2025. The conference aimed to review the global evidence and build consensus on the use of potassium-enriched low-sodium salt substitutes (LSSS) focussing on the effectiveness, efficacy, and safety of LSSS. It also explored potential pathways toward implementation of LSSS use in India at population-level for the prevention and management of hypertension and cardiovascular diseases.

The conference brought together leading cardiologists, nephrologists, researchers, physicians, public health experts and nutritionists from across India to evaluate the available evidence from a clinical perspective. Discussions were informed by the latest World Health Organization (WHO) guidelines on the use of LSSS, with an emphasis on developing context-specific recommendations and identifying next steps relevant to the Indian setting. In order to reach a consensus, a Delphi survey was conducted.

To inform policy and programmatic decision-making, the Delphi consensus conference systematically captured expert opinion to establish agreement on the efficacy, effectiveness, safety, and adoption of potassium-enriched LSSS as a public health intervention in India.

Methods

A Delphi process was conducted as part of the consensus conference. The Delphi technique is a structured scientific method used to facilitate group communication and generate insights into current or emerging challenges, particularly in settings where evidence may be limited (12). In medical and clinical research, Delphi studies commonly employ rank-order questions, rating scales, or open-ended questions and are frequently used to assess the level of consensus among experts (12).

For the purpose of building consensus on the use of LSSS and review of evidence, a modified Delphi methodology was used to achieve expert consensus through the structured rating of predefined statements. The Delphi approach was chosen for its strength in synthesizing expert judgment in areas where empirical evidence is available but requires contextual interpretation for policy and programmatic application.

To inform policy and programmatic decision-making, the Delphi consensus conference systematically captured expert opinion to establish agreement on the efficacy, effectiveness, safety, and adoption of potassium-enriched LSSS as a public health intervention in India.

Development of statements

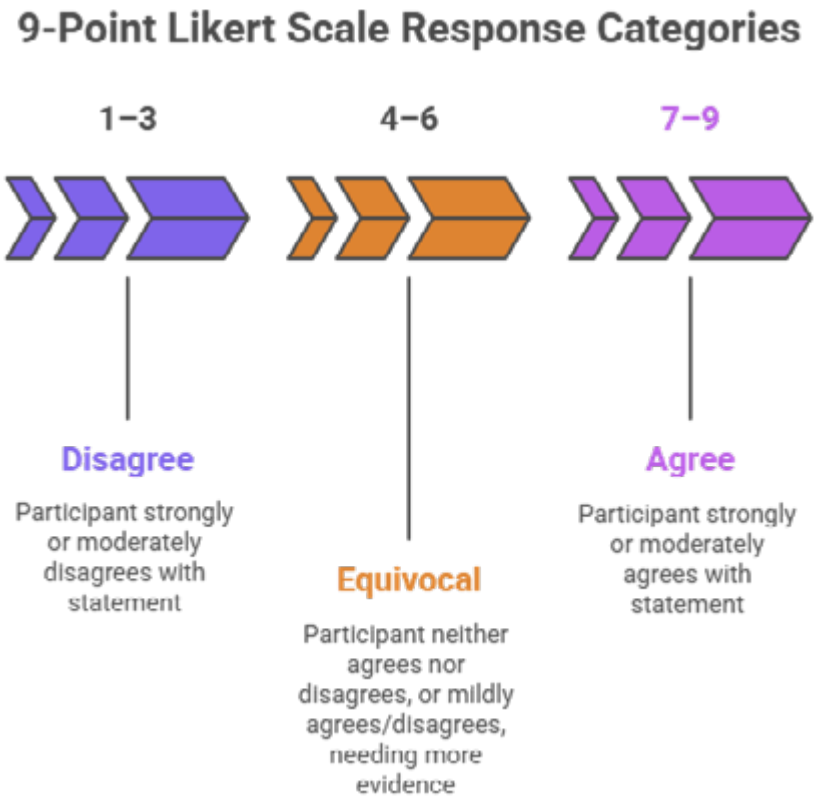
The consensus statements were developed through a review of evidence from systematic reviews and meta-analyses of trials evaluating low-sodium salt substitutes (LSSS), findings from large-scale effectiveness studies, guidance from the World Health Organization and national sodium reduction policies, and India-specific considerations related to dietary patterns and health system contexts.

Statements were grouped under four domains:

1. Efficacy (impact on blood pressure and CVD outcomes)
2. Effectiveness (real-world applicability and population-level impact)
3. Safety (risk of hyperkalemia and use in special populations)
4. Adoption and Implementation (acceptability, affordability, regulation, and scalability)

Rating scale:

Participants rated each statement using a 9-point Likert scale:



Recommendations

We, the undersigned clinical, public-health, nutrition and dietetics experts and researchers understand the established role of high dietary sodium intake as a leading risk factor for hypertension and other cardiovascular diseases and recommend replacing regular table salt (100% sodium chloride) with low-sodium salt substitutes (LSSS) containing potassium chloride for the general population and patients with hypertension.

This is a cost-effective, evidence-based intervention that prevents cardiovascular events and premature deaths. The WHO endorsed this recommendation in January 2025, and multiple organizations, including the George Institute for Global Health India and the Resolve to Save Lives, have been actively supporting implementation.

The consensus statements are presented under 4 headings:

1. Effectiveness, efficacy, and safety of low-sodium salt substitutes (LSSS)
2. Public health and policy recommendations
3. Recommendations for implementation
4. Recommendations for research

Effectiveness, efficacy, and safety of low-sodium salt substitutes (LSSS)

1. We agree that switching from regular iodized salt to potassium-enriched LSSS can significantly lower the risk of heart disease in both the general population and people with high blood pressure. The benefits of LSSS are derived from both sodium reduction and potassium supplementation, with potassium providing most of the benefits.

2. We recommend LSSS for patients with hypertension as routine adjunctive intervention unless contraindicated (advanced CKD, use of potassium supplements, or potassium-sparing diuretics) (13,14)

3. For people with CKD, we recommend using LSSS in a stratified manner. Adults with early CKD (e.g., stages 1–3, eGFR ≥30 mL/min/1.73 m²) who do not have baseline hyperkalemia and are not taking potassium-sparing diuretics or potassium supplements may reasonably use LSSS in place of regular salt. We recommend that elderly patients, patients with diabetes, and those receiving ACE inhibitors/ARBs not be routinely excluded from using LSSS, as current evidence does not support such exclusion (15,16,17).

4. We understand that the benefits of LSSS are derived from both sodium reduction and potassium supplementation. Analysis of the SSaSS data suggests that approximately 75% of the blood pressure-lowering effect was attributable to increased potassium rather than to sodium reduction alone (18). We also observe that the recent CKD guidelines point out that evidence for strict long-term potassium restriction in CKD is weak and that higher dietary potassium may be protective in early CKD (19,20).

Public health and policy recommendations

1. We recommend that LSSS be integrated into national NCD prevention strategies. This is supported by the high population burden of hypertension (affects 28% of adults in India and contributes to 10% of all deaths) (21). Only 2.9-6.6% of Indians meet the recommended sodium-to-potassium ratio. The SSiIS trial has demonstrated the feasibility of salt substitution (70% NaCl/30% KCl) in rural hypertensive patients (22,23).

2. We recommend that FSSAI should update standards and labelling rules to recognise potassium-enriched, iodised LSSS as an approved "edible salt" category, requiring a clear label aligned with scientific evidence that provides appropriate caution for those at risk, without being overly restrictive for the general population that stands to benefit from the use of LSSS.

3. Given that approximately three-fourths of sodium intake in India comes from discretionary salt used in home cooking, we recommend that LSSS primarily target household consumption. This differs from high-income countries, where processed foods account for most sodium intake. Population-level substitution in homes, community kitchens, and mid-day meal programmes offers the highest potential impact (24).

4. We recommend that LSSS be iodised at appropriate concentrations to maintain adequate population iodine intake while reducing sodium. The iodisation should follow the WHO recommendation (adjusting iodine fortification levels based on salt intake—for example, if intake is reduced to 5 g/day, iodine should be fortified at approximately 39 mg/kg salt) (25).

Recommendations for implementation

1. We agree that implementation remains a key challenge to widespread adoption of LSSS. We recommend that LSSS become a core component of national sodium reduction strategies and receive policy endorsement. The national NCD and hypertension guidelines should recommend routine use of LSSS in place of regular salt for the general adult population, with well-defined contraindications (advanced CKD, potassium-sparing drugs, potassium supplements, known hyperkalemia). FSSAI should update standards and labelling rules to recognise potassium-enriched, iodised LSSS as an approved "edible salt" category, requiring a clear label aligned with scientific evidence that provides appropriate caution for those at risk, without being overly restrictive for the general population that stands to benefit from the use of LSSS.

2. We also agree that LSSS must be physically and economically accessible. The production capacity needs to increase, with salt manufacturers supported in securing potassium supplies, adapting technology, and maintaining iodisation. Affordability is a major barrier. Potassium-enriched salts are typically priced roughly twice as much as regular iodised salt and are concentrated in urban markets. Fiscal instruments, such as reducing GST and providing production subsidies, can narrow the price gap.

3. We agree that the behaviour change strategies require creating familiarity, trust, and demand. Social marketing campaigns should focus on simple, concrete messages: "same saltiness, less sodium, lower blood pressure," backed with visuals and endorsements from clinical and public health leaders and celebrities. Women's groups, ASHAs, self-help groups, and local champions should be co-opted to demonstrate cooking with LSSS and address myths about potassium and CKD.

4. We suggest that health professionals should be appropriately educated so that LSSS becomes a routine part of hypertension counselling, with simple screening questions to identify those who should avoid potassium-enriched products and clear instructions for everyone else to switch all household salt to LSSS.

5. We also recommend that governments should support public procurement for school mid-day meals, ICDS, PDS rations, hospital kitchens, railways, and large institutional canteens to build volume and normalise use. Food industry reformulation policies should require partial replacement of sodium chloride with potassium salts in packaged foods and restaurant meals, especially in high-salt categories such as snacks, instant mixes, and condiments.

Research recommendations

1. We recommend quantifying the effectiveness of LSSS in high-risk groups through trials that test effectiveness while reporting safety outcomes, which may be most appropriate given the ethical challenges of studies focused mainly on determining safety

2. We suggest conducting dedicated trials or prospective observational studies of carefully monitored LSSS use in CKD stages 4–5, dialysis, transplant recipients, and elderly patients on RAAS inhibitors, explicitly powered to detect hyperkalemia, arrhythmias, and hospitalisations

3. We also suggest conducting modelling studies using Indian CKD prevalence, drug-use patterns, and lab data to estimate benefit–risk trade-offs and to refine contraindication language for national guidelines

4. We recommend conducting cluster trials and qualitative studies comparing different delivery models and to map and identify acceptable solutions in diverse regions.

5. We recommend assessing economics, equity, and market dynamics of scaling up LSSS in the Indian market

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This consensus statement is endorsed by the following experts:

S.No.	Name	Designation	Institution
1.	Dr.. Ambuj Roy	Professor, Department of Cardiology	AIIMS, New Delhi
2.	Dr. Arpana Iyengar	Professor	Dept. of Paediatric Nephrology, St. John's Academy of Health Sciences
3.	Prof. Bruce Neal	Executive Director	The George Institute for Global Health Australia
4.	Dr. CS Surya Goud	Scientist C	NIN, ICMR, Hyderabad
5.	Dr. Edwin Fernando	Professor and Head of Nephrology	Stanley Medical College, Chennai
6.	Ms. Edwina Raj	Chief Dietitian	Aster, Bangalore
7.	Ms. Garima Sharma	Consultant	The George Institute for Global Health, India
8.	Dr. Manika Sharma	Principal Advisor, Food Policy	Resolve to Save Lives India
9.	Dr. Meenakshi Sharma	Ex Scientist G, NCD Division	ICMR, Delhi
10.	Dr. N Gopalakrishnan	Member Secretary	Transplant Authority of Tamil Nadu
11.	Dr. P. Raghavendra	Scientist C	NIN, ICMR, Hyderabad
12.	Dr. Ramakrishna Prasad	Chair	National Centre for Primary Care Research & Policy at Academy of Family Physicians of India (AFPI)
13.	Dr. Roopa Shivashankar	Scientist E	ICMR, Delhi
14.	Prof. Sailesh Mohan	Deputy Director	Centre for Chronic Disease Control Delhi
15.	Prof. Sandeep Mahajan	Prof, Nephrology, AIIMS	AIIMS, New Delhi

S.No.	Name	Designation	Institution
16.	Ms. Sandhya Pandey	GM and Chief Dietitian	Department of Clinical Nutrition and Dietetics Medanta Hospital Gurugram
17.	Dr. Satyavir Yadav	Associate Professor, Department of Cardiology	AIIMS, New Delhi
		Secretary	Cardiological Society of India (Delhi branch)
18.	Dr. S B Bansal	Secretary	Indian Society of Nephrology
19.	Dr. Sirimavo Nair	Professor, Dept. of Food and Nutrition	The Maharaja Sayajirao University of Baroda, Gujarat
20.	Dr. Sourabh Sharma	Associate Professor Nephrology	Vardhman Mahavir Medical College and Safdarjung Hospital
21.	Dr. Suparna Ghosh-Jerath	Program Head, Nutrition, Food Policy	The George Institute for Global Health, India
22.	Dr. Syed Imran Farooq	Executive Director	Resolve to Save Lives India
23.	Dr. Thout Sudhir Raj	Research Fellow, Health Systems Science	The George Institute for Global Health, India
24.	Dr. Vinay Rathore	Nephrologist	AIIMS, Raipur
25.	Dr. Ravichandran Rajan	Director	Sapiens Health Foundation
26.	Dr. Sachdev Meenakshi	Dietician	Tamil Nadu Govt Multi Super Specialty Hospital Chennai Member, National Commission for Allied and Healthcare Profession, (Govt.of India), Nutrition Science Professional Council
27.	Dr. Vijay Kher	Chairman	Epitome Kidney and Urology Institute and Lions Hospital
28.	Mr. Vivek Asreker	Technical Advisor - Sodium Reduction	IPE Global Limited
29.	Prof. Vivekanand Jha	Executive Director	The George Institute for Global Health, India

The George Institute for Global Health India

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