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Nutri-Bulletin

Nutrition Society of Sri Lanka



nutritionsocietyofsrilanka.org

President's Message



It is my great pleasure to welcome you to **Nutri-Bulletin Issue III 2026** of the Nutrition Society of Sri Lanka (NSSL).

The month of October holds special significance for all of us in the field of nutrition as we join the global community in commemorating **World Food Day on 16 October**. This day reminds us that access to safe, nutritious and affordable food is fundamental to health, dignity and well-being.

For Sri Lanka, ensuring access to a healthy and nutritionally adequate diet remains an important priority. Despite our rich agricultural heritage, diverse traditional foods and valuable biodiversity, challenges such as the rising cost of food, changing dietary patterns, climate change, food waste, undernutrition and diet-related non-communicable diseases continue to affect our food and nutrition security.

As we mark World Food Day, let us recognise the importance of building **resilient, equitable and sustainable food systems** that promote healthy diets while making better use of our local food resources and traditional food knowledge. Nutrition professionals have a vital role in translating evidence into practical solutions, supporting informed policies, empowering communities and advocating for healthier food environments.

The Nutrition Society of Sri Lanka remains committed to promoting **knowledge sharing, research, professional development and advocacy** to advance nutrition and health in Sri Lanka.

This issue of *Nutri-Bulletin* reflects our continued commitment to sharing knowledge and strengthening the nutrition community.

I sincerely thank the Editorial Committee, contributors, reviewers, and all members of the Society for their valuable contributions.

On this World Food Day, let us renew our commitment to building a **healthier, more food-secure and nutritionally resilient Sri Lanka.**

Prof. Kumari M. Rathnayake
President
Nutrition Society of Sri Lanka

Editor's Message



As we present the third issue of Nutri-Bulletin, the global nutrition community turns its attention to **World Food Day on 16 October**, observed this year under the theme "**Innovate today. Nourish tomorrow**."

This theme resonates deeply with the realities we face in Sri Lanka. While our country is blessed with a rich agricultural heritage, diverse traditional foods and remarkable biodiversity, access to safe, nutritious and affordable diets remains a persistent challenge. Rising food prices, shifting dietary patterns, climate pressures, food loss and waste, undernutrition, and the growing burden of diet-related non-communicable diseases continue to shape our food and nutrition landscape.

World Food Day reminds us that ending hunger and ensuring healthy diets is not only a matter of production, but of innovation, equity and sustainability. Innovation does not always mean high technology alone. It also means smartly combining evidence-based approaches with local knowledge, traditional food systems, and practical solutions that work for our communities. From better use of underutilized local crops and indigenous food practices to improved food environments, nutrition education and policies that support affordable healthy diets, there is much that nutrition professionals can contribute.

At the Nutrition Society of Sri Lanka, we see our role clearly: to generate and share knowledge, support research, strengthen professional capacity, and advocate for food systems that nourish both people and the planet. This issue of Nutri-Bulletin continues that commitment by bringing together insights, reflections, and evidence relevant to our shared work.

As we mark World Food Day 2026, let us reaffirm our collective responsibility. By innovating thoughtfully today, we are drawing on science, traditional wisdom, and community engagement; we can help build more resilient, equitable, and sustainable food systems for tomorrow.

We thank our contributors, reviewers and members for their continued support, and invite all readers to engage actively with the ideas presented in this issue.

Together, let us work towards a healthier and more nutritionally secure Sri Lanka.

Dr. Thushanthi Perera
Editor
Nutrition Society of Sri Lanka

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Past President's Feature Article

'Featured Article' is a recently introduced segment to the NSSL Newsletter - An invited entry by a selected, leading expert in the fraternity. This segment was introduced to the Newsletter with the intension of further strengthening the readership of the NSSL Newsletter plus encouraging the prospective authors.

Prof. Chandima Madhu Wickramatilake, Past President kindly accepted our invitation to do the Featured Article to the NSSL Nutri-Bulletin Issue III. She offered her expertise to enlighten us on **" Look After Your Well-Being at Workplace – Five Simple Tips".**



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Prof. Chandima Madhu Wickramatilake is a Professor in Biochemistry at the Faculty of Medicine, University of Ruhuna. She holds an MBBS degree, a PhD in Medical Biochemistry, and an MSc in Food and Nutrition. She is also a Lifestyle Medicine Physician with a Diploma from the International Board of Lifestyle Medicine (DipIBLM).

With expertise spanning medical biochemistry, nutrition, and lifestyle medicine, Prof. Wickramatilake brings a multidisciplinary perspective to understanding the relationship between diet, lifestyle, and health. Her academic and professional background reflects the importance of integrating scientific evidence with practical approaches to disease prevention and health promotion.

In this issue of NutriBulletin, the official publication of the Nutrition Society of Sri Lanka, we are pleased to feature her contribution, offering readers valuable insights into nutrition and health.

Look After Your Well-Being at Workplace – Five Simple Tips



The global burden of noncommunicable diseases (NCDs) is escalating irrespective of novel drugs and the multitude of interventions. There is no difference in this trend in the local setting either. Both the prevalence and incidence of obesity, diabetes mellitus, and cardiovascular diseases (CVD) are increasing, with the alarming observation of a younger age of onset.

Unhealthy lifestyle plays a key role in the initiation and the progression of the pathophysiological process of chronic diseases. The working community seems at increased risk due to poor diet, sedentariness, and work-related stress. Therefore, the European Society of Cardiology (ESC) has prioritised prevention guidelines targeting the risk factors of CVD, especially focusing on the workforce. Busy days, endless demands, and frustrations can make you pressurised and can predispose you to NCDs. Through small tips, changing your lifestyle can make a big difference. Therefore, ESC has proposed five tips to practice at the workplace to be healthy.



1 Breaking prolonged sitting

Individuals who do desk- based work have to sit for long hours, increasing their CVD risk. Hence, it is advisable to have at least 5-10 minutes of aerobic spurts every hour of sitting; climbing the stairs instead of using elevators, walking to coworkers instead of phoning or sending messages, standing up while holding calls, walking to the water filter, printer, etc. Irrespective of whether the individual fulfils the recommended daily amount of aerobics, avoiding prolonged sitting is important in the prevention of NCDs. Short breaks allow you to handle the stress and recharge both your mind and the body before driving back into work. In addition, they ensure you empty your bladder regularly and get fresh air adequately.



FEATURED ARTICLE

2 Stay hydrated

During hectic days, we tend to miss drinking water. If you are roughly aware of the volume of water to drink daily, keeping a refillable water bottle can help you track your water intake. In the workplace, setting “water breaks” and reminders at regular intervals ensure drinking water before getting thirsty. Adequate hydration has many health benefits out of which is improving brain function plays a key role in delaying cognitive decline. Proper hydration facilitates the removal of waste from the brain, minimising the generation of harmful proteins.



3 Find Time for Lunch

Missing meals can lead to mindless snacking and overeating at the next meal. Regular meal timing is important in the prevention of NCDs while improving overall well-being. Therefore, it is important to schedule time for lunch every day during the lunch break. If possible, eating away from your workspace would let you focus on your meal and enjoy your downtime. This allows the lunch break to be a real interval and may help decrease stress and anxiety.



4 Limit Distractions

Distractions during working hours leave you with heaps of undone tasks, which ultimately builds up stress. Therefore, turning your phone on silent mode and creating ways to reduce interruptions from coworkers or family members are useful methods. Consider placing a “busy” sign on your door when you need to concentrate; this is an option to save time. Playing light music that you like would improve your efficiency and minimize distractions while relieving stress at work.



5 Practice Gratitude

Positive thinking increases optimism, elevating mood and emotional well-being, which reduces stress and increases productivity. Therefore, celebrate small wins and keep a gratitude journal where you write down all the successes every day. Encouraging coworkers to do the same would build up an encouraging atmosphere, improving mental health. To make it more practical, you can share something from your list of achievements with coworkers at the beginning of a meeting or daily in the morning to highlight progress. This creates a hopeful environment in the workplace.

These are five simple tips that can be easily implemented to improve well-being at work, improving concentration, productivity, immune system, ultimately reducing stress, injury, and chronic NCDs



FEATURED ARTICLE



Beyond the Costume: Nourishing Kandyan Dancers



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When the Drums Begin

When the first beat of the Geta Beraya echoes through the night and dancers enter beneath the glow of torches, Sri Lanka's Peraheras come vividly to life. Silver ornaments, white pleated costumes, rhythmic footwork, powerful leaps and precisely controlled movements transform a procession into an unforgettable spectacle. From religious rituals and national celebrations to international stages, Kandyan dancers carry stories and practices passed through generations. They are not simply entertainers; they are living custodians of Sri Lanka's cultural heritage.

Behind this beauty lies extraordinary effort. Repeated low stances, vigorous lower-body movements, rapid footwork, jumps, balance and core control demand muscular endurance and intense concentration.

During festival seasons, dancers may rehearse, travel between events and perform for hours or overnight in elaborate costumes, with limited opportunities to eat, drink, sleep or recover. Their art is distinctive, but their bodies still need the fuel and care required for sustained physical work.

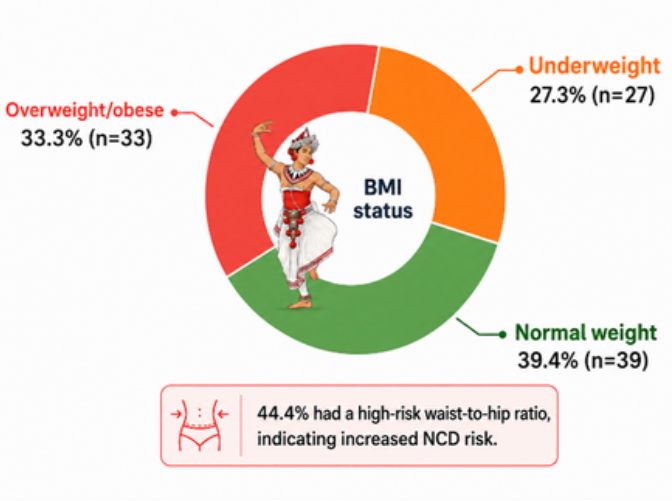
Performing Like Athletes, Yet Rarely Supported Like Them

Both dancers and athletes depend on strength, endurance, coordination, flexibility, concentration and effective recovery to perform at their best. Although Kandyan dancers are artists rather than conventional competitive athletes, their bodies face many comparable physiological demands, particularly during lengthy Peraheras and rituals that may continue for hours or overnight. Professional dance can therefore be understood as a vigorous form of physical training. Nevertheless, dancers often do not receive the same level of structured conditioning, medical monitoring, physiotherapy and individualised nutrition support available within organised sport (Koutedakis & Jamurtas, 2004). Recognising Kandyan dancers as performing athletes does not diminish the artistic, spiritual or cultural significance of their work. Instead, it acknowledges the physical care required to protect their health, support recovery and sustain their performance careers.



What We Found Behind the Performance

To look beyond the spectacle and understand the health of those who sustain this treasured tradition, we conducted a study, following ethical clearance (ECC/2026/R/016), to assess the nutritional status of 99 randomly selected professional male Kandyan dancers. The findings revealed an important concern: only 39.4% had a normal BMI, while 60.6% were either underweight or overweight/obese. This highlights nutritional challenges exist at both ends of the weight spectrum.



Furthermore, 44.4% had a high-risk waist-to-hip ratio, indicating abdominal fat distribution associated with increased risk of non-communicable diseases such as type 2 diabetes and cardiovascular disease. These findings challenge the assumption that an active appearance always reflects good nutritional health. Dancers may demonstrate exceptional stamina, strength and agility while still experiencing undernutrition, excess weight or metabolic risk. BMI alone cannot fully define health. However, considered alongside waist-to-hip ratio and food practices, these findings emphasize the need to strengthen nutrition awareness and support for the health of those who proudly carry Sri Lanka's cultural heritage forward.

The Knowledge Gap Behind the Plate

Interviews helped explain the everyday decisions behind these findings. Several dancers had only a basic understanding of nutrition and were uncertain about balanced meals, protein and performance fuelling.

"We eat whatever is available. We don't really think about whether it has enough nutrients or protein."

"We know food gives us energy, but we don't know much about balanced nutrition."

These findings are similar to those reported in other countries. Minger et al. (2026) reviewed nine studies from six countries involving 942 dancers and found that most had low-to-moderate nutrition knowledge. Many did not fully understand macronutrients, sports nutrition or the risks of eating too little. They also often obtained nutrition advice from informal sources. However, nutrition education improved both their knowledge and eating habits.

Kandyan dancers therefore need nutritional guidance on preparing affordable balanced meals, planning food for long events and choosing suitable alternatives when regular meals are delayed.



Barriers to Meeting Nutritional Needs

Adequate nutrition depends on more than knowledge. Kandyan dancers often skipped meals during lengthy festivals and overnight rituals because of limited breaks. Elaborate costumes also made eating a full meal inconvenient. One participant explained, "During festivals, we skip meals because there isn't enough time. Tea or coffee is much easier than taking off the costume and eating." Travel, financial constraints and unsuitable food at venues further increased reliance on fried and convenient foods. Before certain religious performances, dancers also avoided meat and other non-vegetarian foods as an expression of purity and respect. During these periods, affordable alternatives such as dhal, chickpeas, cowpea, green gram, soy, milk, curd, nuts and seeds can help maintain dietary variety and protein intake.

Greater Demands, Greater Nutritional Needs

Specific requirements for Kandyan dance have not yet been established, but general recommendations for adult dancers provide a useful starting point. Carbohydrate is the main fuel for moderate-to-intense movement, with approximately 3–5 g/kg of body weight per day suggested for dancers. Protein supports muscle repair after repeated jumps, low stances and prolonged performances; the recommended 1.2–1.7 g/kg/day is substantially above the 0.8 g/kg/day reference for a generally healthy adult. Fat should supply roughly 20–35% of total energy, providing concentrated fuel, essential fatty acids and fat-soluble vitamins (Sousa et al., 2013).

Repeatedly consuming less energy than the body expends can lead to low energy availability. In the short term, this may mean fatigue, poor concentration and slow recovery.



When prolonged, it can disturb hormones, immunity and bone health, impair performance and increase injury risk (Minger et al., 2026). Iron deserves attention because it supports oxygen transport and may be compromised by restricted diets or exercise-related red-cell breakdown. Vitamin C improves absorption of iron from plant foods. Calcium and vitamin D support bones and muscle function—particularly important in a discipline involving impact, jumping and repetitive loading. Supplements or protein powders may be useful when food access is genuinely limited or a deficiency is identified, but they do not replace balanced meals and should be selected with qualified professional guidance (Sousa et al., 2013).

Don't Skip—Plan Small

Regular meals provide the foundation for good performance. A balanced meal may include rice or roti, vegetables, dhal and a protein source such as fish, egg, chicken, soya meat or tinned fish, followed by fruit. Before a long performance, dancers should eat a familiar meal around two to four hours beforehand, as a large meal immediately before dressing may feel uncomfortable.



When a full meal is not possible, small portable snacks can help dancers avoid performing for hours on tea alone. Suitable choices include bananas, dates, egg or dhal roti, chickpeas, cowpea, yoghurt, milk, nuts and homemade cereal bars. After performing, dancers need both carbohydrate and protein for recovery. Simple options include banana with milk, curd with fruit, bread with egg or sardines, and rice with dhal, fish or soya meat. Commercial sports bars and liquid meals may be convenient when ordinary food is unavailable, but they are not essential.

Tea Is Not a Meal and Alcohol Is Not Recovery

Tea and coffee can improve alertness, and caffeine may have a performance-enhancing effect in some circumstances. However, repeatedly using caffeinated drinks to suppress hunger does not provide carbohydrates, protein or micronutrients. Heavy intake during overnight work may also worsen sleep, anxiety, palpitations and recovery. Dancers who use caffeine should keep the amount moderate and avoid unfamiliar high-dose products.

Some participants described alcohol after performances to ease tiredness or pain. Although it may briefly create a feeling of relaxation, alcohol can impair rehydration, sleep quality and muscle protein synthesis, delaying repair after strenuous work (Parr et al., 2014). Persistent pain is a signal for assessment and appropriate recovery, not a problem to be masked with alcohol.

Hydration Through the Night

Hydration supports stamina, concentration and temperature control. This is especially important in Sri Lanka's warm, humid climate, where long performances and heavy costumes can increase sweat loss. Dehydration can make you feel harder and contribute to fatigue, headache, light-headedness, nausea, cramps and reduced focus.

Dancers should begin performances well hydrated. Sousa et al. (2013) recommend drinking approximately 5–7 mL/kg of fluid around four hours beforehand and 150–350 mL every 20 minutes during prolonged activity, where breaks allow. Water is generally suitable for shorter sessions. For performances lasting more than an hour with heavy sweating, a carbohydrate-electrolyte drink can replace fluid, sodium and energy. Coconut water may be combined with a lightly salted snack because it contains relatively little sodium.

After performing, dancers should replace about 1.5 L of fluid for every kilogram lost. Pale-yellow urine generally indicates good hydration, while dark, low-volume urine may indicate dehydration (Fine, 2025; Sousa et al., 2013)

Building Nutrition into the Tradition

Individual advice will have limited effect unless the performance environment also changes. Dance schools, cultural institutions and event organizers can schedule food and hydration breaks, ensure drinking water and suitable meals at venues, and include nutrition in dancer education. Periodic screening by trained professionals could identify weight changes, waist-to-hip ratio, blood pressure, iron status, vitamin D or other concerns and refer dancers for care. Guidance should remain affordable, culturally acceptable and compatible with ritual observances.



Protecting the People Who Protect the Tradition

Kandyan dance survives because dancers repeatedly place their bodies in service of culture. Their nutrition should not depend on whatever food happens to be available between performances. Regular meals, portable snacks, planned hydration, sound recovery and access to qualified support can protect health without changing the meaning or beauty of the art. Caring for Kandyan dancers is ultimately an act of cultural preservation: stronger, healthier performers are better able to carry this living heritage into the future.



Acknowledgements

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Is Our Food Supply Chain Safe from Heavy Metal Contamination?



Heavy metal contamination in the global food chain represents an escalating, systemic threat to public health and international food security. Non-essential trace elements, including inorganic arsenic (iAs), cadmium (Cd), lead (Pb), and methylmercury (MeHg), possess no known physiological function in human biology. These metals exhibit persistent environmental stability, significant bioaccumulative potential, and toxicity at microgram or sub-microgram exposure levels.

This bulletin article reviews current scientific literature regarding the geochemical and anthropogenic pathways through which heavy metals enter agroecosystems, the physiological mechanisms governing crop bioaccumulation, and the acute and chronic biological risks associated with human consumption. Special emphasis is placed on vulnerable sub-populations, particularly infants and children, who face heightened risks from early-life exposure. Finally, this review evaluates state-of-the-art analytical surveillance methods and emerging agronomic and bio-remediation strategies aimed at mitigating heavy metal uptake in dietary staples.





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1. Introduction and Geo-Anthropogenic Pathways

The contamination of agricultural soils and aquatic systems by toxic trace elements is driven by a combination of geogenic processes and anthropogenic activities. Geogenically, weathering of parent rock material, volcanic activity, and natural mineral deposits release baseline levels of heavy metals into the atmosphere. However, human industrialization, urbanization, and intensive agricultural practices have dramatically accelerated the distribution and concentration of these contaminants across arable land.

Industrial operations, including non-ferrous metal mining, smelting, atmospheric emissions from coal-fired power plants, and chemical manufacturing, discharge high volumes of particulate matter and wastewater containing toxic trace elements. In agricultural ecosystems, long-term application of low-grade phosphate fertilizers introduces substantial quantities of cadmium into arable soils. Similarly, historical use of arsenical pesticides, application of contaminated sewage sludge (biosolids) as soil amendments, and reliance on untreated industrial wastewater for crop irrigation serve as major drivers of soil degradation.

Once introduced to soil and water bodies, heavy metals do not undergo microbial or chemical degradation. Instead, they undergo chemical speciation changes influenced by soil pH, redox potential (Eh), cation exchange capacity (CEC), soil organic matter (SOM) content, and root exudate chemistry. These factors govern the bioavailability of heavy metals—the fraction of total soil metal content accessible for root uptake and subsequent systemic transport throughout the plant matrix (Rai et al., 2021).

2. Mechanisms of Translocation and Crop Bioaccumulation

Understanding how plants absorb, store, and distribute heavy metals is critical for managing dietary risk. Roots absorb metals from soil pore water primarily through molecular mimicry, utilizing transport proteins designed for essential micronutrients like zinc (Zn^{2+}), iron (Fe^{2+}), and manganese (Mn^{2+}).

PATHWAY OVERVIEW: [Soil Solution: Trace Elements] ——> [Root Epidermis & Cortex (Lsi1/Lsi2, IRT1, ZIPs)] ——> [Shoot & Stem Systems (Xylem Loading)] ——> [Edible Tissues: Grains, Leaves, Fruits (Phloem Loading)]

2.1 Inorganic Arsenic (iAs) in Paddy Ecosystems

Arsenic exists in soil in multiple oxidation states, primarily as arsenate [As(V)] under aerobic conditions and arsenite [As(III)] under anaerobic conditions. Paddy rice (Oryza sativa) cultivation requires prolonged soil flooding, which creates anoxic environments. Under these conditions, iron oxyhydroxides dissolve, releasing adsorbed As(III) into the soil pore water. Root cells absorb As(III) via nodulin 26-like intrinsic membrane proteins (NIPs), specifically the silicon transporter pathways Lsi1 (influx) and Lsi2 (efflux) (Kumar et al., 2022). Because rice utilizes high amounts of silicon to strengthen structural tissues, it unintentionally transports As(III) into the roots, xylem, and developing grain panicles with high efficiency.

2.2 Cadmium (Cd) and Lead (Pb) Uptake in Horticultural Crops

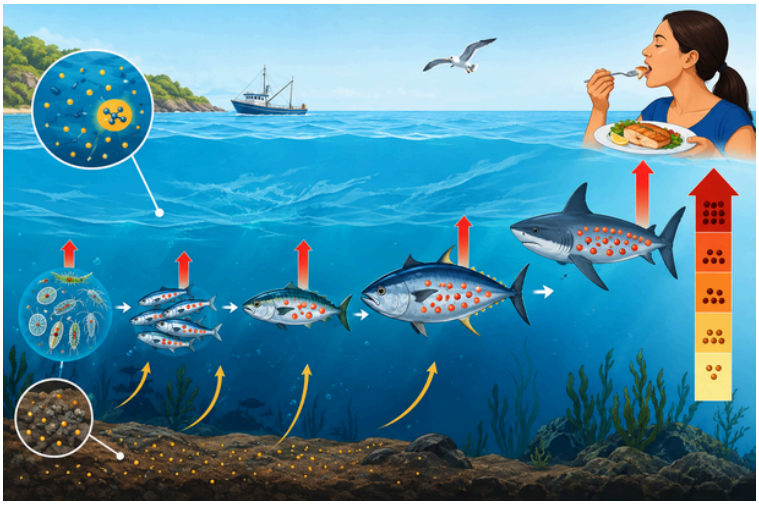
Cadmium enters root tissues via divalent cation transporters, such as the Iron-Regulated Transporter 1 (IRT1) and members of the ZIP (ZRT/IRT-like Protein) family (Ali et al., 2022).

Once inside the symplast, Cd^{2+} is loaded into xylem vessels for transpirational movement to the shoots. Fast-growing leafy green vegetables (e.g., spinach, lettuce, mukunuwenna, gotukola, kankun) exhibit high transpiration rates, leading to substantial accumulation of cadmium in edible foliar tissues. Root crops, such as carrots and radishes, sequester significant amounts of both Cd and Pb directly within parenchyma tissues.

Lead (Pb) exhibits lower root-to-shoot translocation rates than cadmium due to strong binding by cell walls and precipitation as insoluble lead phosphate complexes within the root cortex. However, crops grown in urban or near-industrial soils suffer from surface contamination via direct deposition of lead-laden airborne dust onto leaves and edible plant parts.

2.3 Biomagnification of Methylmercury (MeHg) in Marine Systems

In aquatic environments, inorganic mercury (Hg^{2+}) entering water bodies from atmospheric fallout or industrial runoff is transformed into methylmercury (CH_3Hg^+ or MeHg) by sulfate- and iron-reducing bacteria in anaerobic sediments. Unlike terrestrial uptake, where plant structures act as initial filters, MeHg bioaccumulates rapidly in planktonic organisms and biomagnifies exponentially up marine trophic levels (Zhao et al., 2023). Apex predatory marine species—including swordfish, shark, bigeye tuna, and king mackerel—accumulate MeHg concentrations in muscle tissue millions of times higher than surrounding ambient water levels, rendering seafood the dominant pathway for human dietary exposure to organic mercury.



3. Human Health Risks and Toxicological Dynamics

The biological toxicity of heavy metals stems from their ability to induce oxidative stress, replace essential metals in key enzyme complexes, disrupt cellular membrane integrity, and cause DNA damage.

Table 1. Heavy metals and their adverse effects on human health

Heavy Metal Species	Primary Target Organs / Systems	Key Biomarkers / Toxicological Effects
Inorganic Arsenic (iAs)	Vascular system, skin, lungs, urinary bladder	Generation of ROS, inhibition of pyruvate dehydrogenase, peripheral neuropathy, carcinogenesis
Cadmium (Cd)	Renal proximal tubules, skeletal structure	Disruption of Ca^{2+} homeostasis, hypercalciuria, osteomalacia (Itai-itai disease), nephrotoxicity
Lead (Pb)	Central Nervous System (CNS), hematopoietic system	Replacement of Ca^{2+} and Zn^{2+}, inhibition of δ-ALAD, cognitive deficits
Methylmercury (MeHg)	Developing brain, cardiovascular system	Disruption of neuronal migration, microtubule depolymerization, central visual field constriction

3.1 Inorganic Arsenic Toxicity

Inorganic arsenic (iAs) is classified as a Group 1 human carcinogen by the International Agency for Research on Cancer (IARC). At the cellular level, arsenite [As(III)] binds readily to sulfhydryl groups on proteins and enzymes, disrupting cellular respiration and metabolic pathways (Kumar et al., 2022). Arsenate [As(V)] acts as a phosphate analog, uncoupling oxidative phosphorylation by competing with inorganic phosphate during adenosine triphosphate (ATP) synthesis. Chronic exposure via consumption of contaminated rice and drinking water causes characteristic skin lesions (hyperkeratosis and hyperpigmentation), peripheral vascular disorders (such as Blackfoot disease), cardiovascular disease, diabetes mellitus, and increased incidence of lung, bladder, and skin cancers.

3.2 Cadmium Toxicity and Renal Dysfunction

Following gastrointestinal absorption, cadmium binds to the low-molecular-weight protein metallothionein in the liver. This Cd-metallothionein complex enters the bloodstream and filters through the glomerulus into the renal proximal tubules. Lysosomal degradation of the complex within tubule cells releases free Cd^{2+}, inducing localized reactive oxygen species (ROS) generation, cell apoptosis, and progressive tubule dysfunction (Ali et al., 2022). Because cadmium has an extraordinarily long biological elimination half-life in humans—ranging from 10 to 30 years—chronic low-level dietary intake causes cumulative damage, eventually resulting in proteinuria, impaired calcium metabolism, osteomalacia, and increased fracture risk. Cadmium toxicity appears to contribute largely to the Chronic Kidney Disease of Unknown Etiology (CKDu) in Sri Lanka and elsewhere.

3.3 Neurotoxicity of Lead and Methylmercury

Lead (Pb) interferes with critical cellular functions by competing with calcium (Ca^{2+}) and zinc (Zn^{2+}) binding sites. In the hematopoietic pathway, Pb inhibits δ-aminolevulinic acid dehydratase (ALAD), disrupting heme synthesis and contributing to anemia. Central nervous system toxicity occurs when lead crosses the blood-brain barrier via voltage-gated calcium channels, damaging astrocyte function and disrupting neurotransmitter release.

Methylmercury (MeHg) displays high affinity for sulfhydryl groups and forms a MeHg-cysteine complex that mimics the essential amino acid methionine. This structure allows MeHg to cross both the blood-brain barrier and the placenta via the LAT1 neutral amino acid transporter (Zhao et al., 2023). Within the central nervous system, it disrupts microtubule polymerization, impairs cell division, and induces widespread neuronal death, leading to sensory deficits, ataxia, and cognitive decline.



4. Special Susceptibility in Vulnerable Sub-Populations

Infants, young children, and pregnant women represent sub-populations at heightened risk for heavy metal toxicity. The physiological and metabolic differences between pediatric and adult populations amplify both exposure intensity and toxicological outcomes:

- Higher Specific Consumption Rates: Relative to their overall body mass, infants and children consume higher volumes of food and fluids than adults, resulting in greater relative doses of dietary contaminants per kilogram of body weight.
- Elevated Intestinal Absorption: The infant gastrointestinal tract exhibits higher permeability and enhanced active transport mechanisms. For instance, young children absorb up to 50% of ingested lead, compared to roughly 10% in adults.
- Immature Blood-Brain Barrier Permeability: The developing blood-brain barrier is more permeable to toxic metals, allowing substances like Pb and MeHg to accumulate more readily in central nervous system tissues during critical developmental windows.

Dietary surveys highlight elevated concentrations of iAs, Pb, and Cd in commercial rice-based baby cereals, fruit juices, and root-vegetable purees (Smith et al., 2023). Early exposure to these compounds causes subclinical, irreversible neurological damage, including lower intelligence quotient (IQ) scores, shortened attention spans, poorer academic performance, and increased risk of behavioral disorders. Because safe exposure thresholds for neurotoxins like lead have not been established for developing children, international regulatory bodies continue to re-evaluate and lower maximum residue limits (MRLs) for infant food products.

5. Analytical Methodologies for Trace Metal Surveillance

Accurate identification and quantification of heavy metals in complex food matrices require sensitive analytical instrumentation capable of detection at parts-per-billion (ppb, µg/kg) and parts-per-trillion (ppt, ng/kg) levels.

5.1 Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Inductively Coupled Plasma Mass Spectrometry (ICP-MS) remains the principal analytical technique for multi-element analysis in food safety monitoring. Sample preparation typically involves closed-vessel microwave-assisted digestion using concentrated nitric acid (HNO_3) and hydrogen peroxide (H_2O_2) to break down organic matrices. The digested sample is converted into an aerosol, introduced into an argon plasma operated at temperatures between 6000 K and 8000 K, and ionized. The resulting ions are separated based on their mass-to-charge ratio (m/z) and measured with high sensitivity (Wang et al., 2024).

5.2 Chemical Speciation via Chromatographic Coupling

Total element concentration does not always correlate directly with toxicity. For example, organic arsenic species like arsenobetaine (commonly found in marine organisms) are non-toxic, whereas inorganic forms [As(III) and As(V)] are highly hazardous.

6. Agronomic, Chemical, and Bio-Remediation Strategies

Mitigating heavy metal contamination in dietary crops requires interventions applied at the soil, field, and management levels to reduce metal bioavailability and prevent plant uptake, especially with regard to the food value chain.

6.1 Soil Amendments and Immobilization

Application of soil amendments can immobilize heavy metals in the soil matrix, rendering them insoluble and inaccessible to root systems:

- Biochar and Organic Matter: Biochar—a carbon-rich residue produced by biomass pyrolysis—increases soil cation exchange capacity and introduces functional groups (e.g., carboxyl, hydroxyl, phenolic) that bind Cd^{2+} and Pb^{2+} via surface complexation and ion exchange (Liu et al., 2024).
- Liming Materials: Applying calcium carbonate ($CaCO_3$) or calcium oxide (CaO) elevates soil pH. Higher pH increases negative surface charges on soil minerals, promoting heavy metal precipitation as insoluble hydroxide and carbonate complexes, which decreases free Cd^{2+} and Pb^{2+} in soil solution.
- Nano-Amendments: Engineered nanomaterials, including nano-hydroxyapatite, zero-valent iron nanoparticles (nZVI), and metal-organic frameworks, offer high surface areas for fast immobilization of toxic trace elements in affected soils (Liu et al., 2024).

6.2 Water Management in Paddy Systems

In rice farming, soil redox potential (Eh) can be manipulated through altered irrigation practices. Implementing Alternate Wetting and Drying (AWD) breaks up continuous soil flooding by introducing periodic aerobic drainage phases. Drying the soil raises the redox potential, oxidizing reduced iron species and causing arsenic to precipitate alongside iron oxyhydroxides. This mechanism significantly reduces iAs concentration in soil pore water during critical grain-filling stages, though water management must be carefully optimized to prevent a simultaneous increase in cadmium availability in food systems (Kumar et al., 2022).

6.3 Genetic Selection and Molecular Breeding

Developing low-accumulating crop cultivars via marker-assisted selection and genetic engineering provides a sustainable approach to reducing food chain contamination. Plant breeders have identified functional knockouts or mutations in specific transporter genes—such as OsNRAMP5 in rice—that reduce cadmium transport into root tissues without compromising yield or essential nutrient uptake (Ali et al., 2022). Combining genetic approaches with engineered soil amendments forms a robust dual-layer defense against heavy metal accumulation in food crops.



7. Conclusions and Strategic Outlook

Contamination of the global food supply by heavy metals remains a complex challenge at the intersection of environmental geochemistry, agricultural production, analytical chemistry, and public health policy. Non-essential elements like inorganic arsenic, cadmium, lead, and methylmercury move through ecological systems and agricultural matrices, posing persistent toxic risks to consumers. Mitigating these risks requires integrated global strategies:

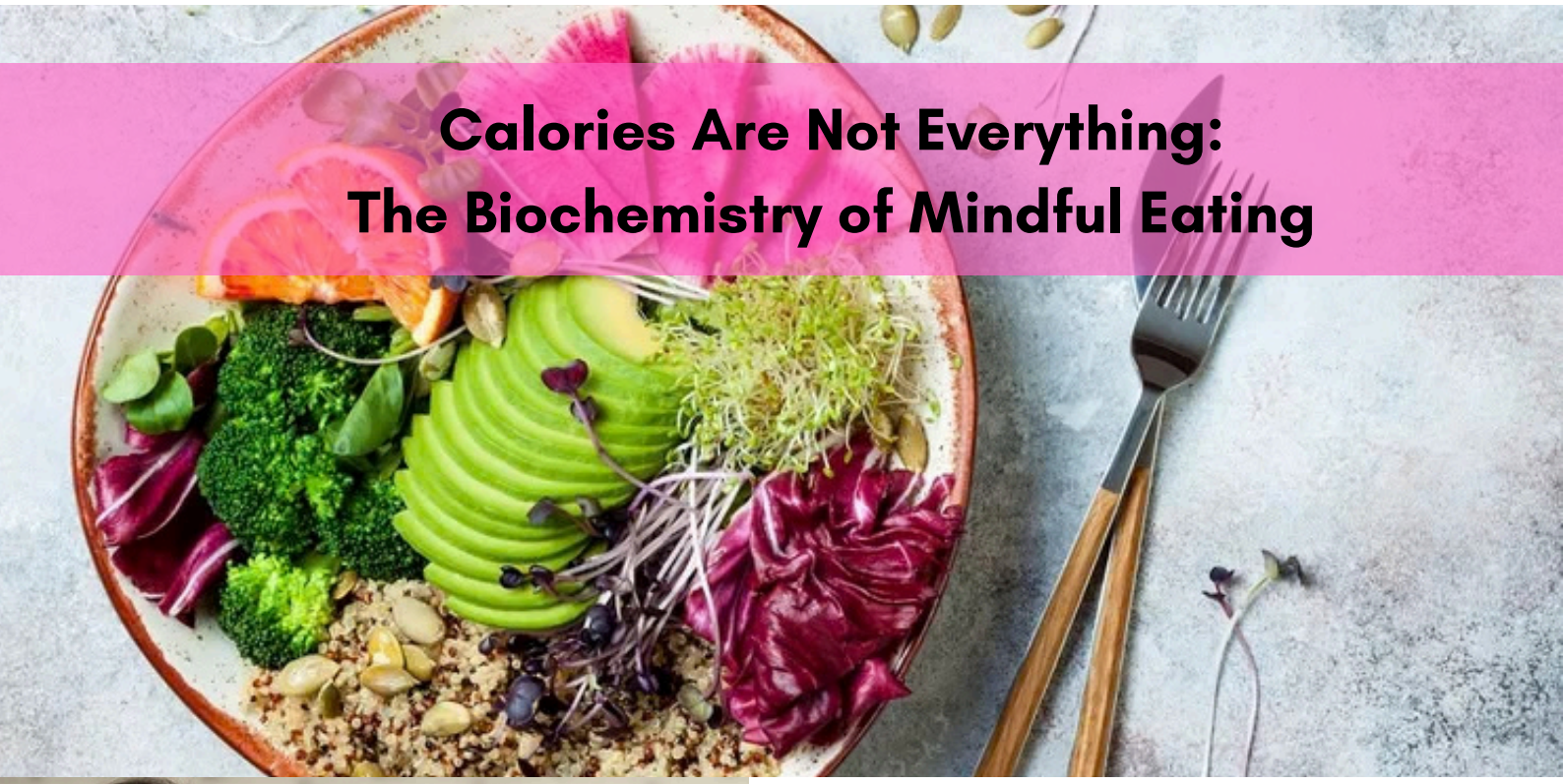
- Enhanced Regulatory Limits: Establishing and updating toxicologically supported, species-specific maximum residue limits (MRLs) for vulnerable product categories, particularly infant foods and staple grains.
- Advanced Analytical Surveillance: Expanding the use of hyphenated techniques like HPLC-ICP-MS in routine monitoring programs to ensure accurate speciation-based risk assessments.
- Agronomic Remediation: Deploying field-scale soil immobilization technologies, optimized irrigation strategies, and metal-excluder crop varieties in contaminated farming regions.
- Environmental Policy Enforcement: Enforcing stricter industrial discharge controls and improving wastewater treatment standards to prevent toxic metals from entering agroecosystems initially.

Sustained interdisciplinary cooperation among environmental scientists, agronomists, toxicologists, and regulatory agencies remains imperative to protect the food chain and lower heavy metal dietary exposures worldwide.

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Calories Are Not Everything: The Biochemistry of Mindful Eating





For years, nutrition advice has been focused on one fundamental concept: count the calories in, and count the calories out. But even for those who meticulously count calories, it is possible to feel hungry or crave certain foods. The reason for this does not lie in math; it lies in biochemistry. Each time we eat a meal, our body undergoes a complex series of biochemical reactions and processes that affect what and how much we eat. Mindful eating is the practice of focusing on eating in its full sense, without distractions, to get in tune with our bodies. This article will cover the science of hunger and satiety, explain the difference between each type of calorie and provide practical tips on how mindful eating can help improve your well-being.



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The Calorie Model and Its Limits

The model of energy balance, or "calories in and calories out," is not false; thermodynamic laws continue to apply to the human organism, and over a long period of time, energy intake and energy expenditure do determine body weight gain or loss. However, the model ignores the fact that the body is not a mechanical device but rather a dynamic biochemical system that responds differently to various types of food, to signals sent by the gut to the brain, to stress and to lack of sleep, and to changes in the gut microbiome and their impact on the energy content of consumed food. Two meals containing the same number of calories may have completely different hormonal effects, induce different sensations of satiety, and have distinct long-term impacts on appetite and metabolism.

The Hormones That Control Hunger and Fullness

Appetite is not simply a matter of willpower. It is governed by a network of hormones that communicate between the gut, fat tissue, and brain. The following table highlights the key hormones.



Table 1. Key hormones involved in hunger and satiety

Hormone	Where it comes from	What it does	What raises or lowers it
Ghrelin	Stomach lining	Signals hunger; stimulates appetite before meals	Rises when the stomach is empty; falls shortly after eating
Leptin	Fat tissue	Signals long-term energy stores; suppresses appetite	Falls with weight loss or poor sleep; chronically high in obesity, where the brain becomes less responsive to it
GLP-1	Small intestine	Slows stomach emptying; promotes fullness; supports insulin release	Rises within minutes of eating, especially after protein and fibre
PYY	Small intestine	Reduces appetite; works alongside GLP-1	Rises after meals; response is weaker after fasting, low-fibre eating
Insulin	Pancreas	Lowers blood glucose; also acts on brain satiety centres	Rises after carbohydrate-containing meals
Cortisol	Adrenal glands	Raises blood glucose; under chronic stress, increases cravings for energy-dense food.	Rises with stress, poor sleep, and irregular eating patterns

They do not work independently. The levels of ghrelin increase before meals and signal to our body to consume food; when food enters the stomach and the intestine, the levels of GLP-1 and PYY increase, and the level of ghrelin drops, eventually leading to the sensation of satiety. Leptin works over the long term by signalling to the brain how much fat is stored in the body. If eating occurs too fast, under stress or while being distracted, the signals can be ignored; people continue eating beyond the time when GLP-1 and PYY have already signalled satiety.

Gut-Brain Axis: Importance of Timing

There is constant communication between the gut and brain via vagus nerves and hormones. However, this communication is not immediate; it usually takes around twenty minutes for satiety signals to be registered by the hypothalamus, the area of the brain regulating appetite. Fast eating, which is very typical of hectic clinical work shifts, lecture days, and rushed dinners at home, allows a person to eat an unnecessarily large amount of food before the brain registers fullness. This is one of the most evident biochemical reasons why eating mindfully is important: one needs to give time for bodily regulatory mechanisms to operate properly.

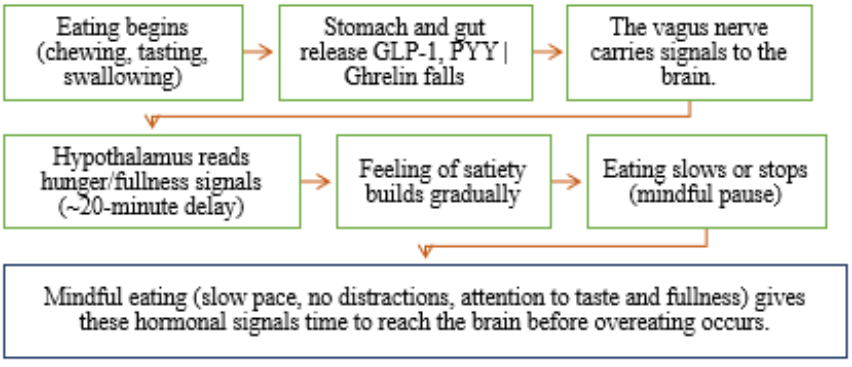


Figure 1. The gut-brain feedback loop and how mindful eating supports it

Why Not All Calories Are Equal

A calorie is an energy unit, but not all calories are treated the same way by the body. There are three biochemistry-related reasons for this.

First, there is the thermic effect of food; that is, the amount of energy required to digest and assimilate the consumed foods. This is different depending on the type of macronutrient, as demonstrated in Table 2 below. Protein consumes significantly more energy compared to fat, meaning not all of its calories are usable.

Secondly, nutrient-dense, unrefined foods will slow down gastric emptying and reduce the glucose levels in the blood, causing a consistent and long-lasting secretion of satiety hormones like GLP-1.

Ultra-processed foods, on the other hand, will be digested and absorbed quickly, are easier to overconsume, and will trigger a less intense satiety response per calorie intake.
Thirdly, the gut microflora, i.e. the billions of bacteria living in the intestines, will impact the amount of energy obtained from the food and appetite hormone signalling. Diets high in fibre and plant-based foods lead to healthy metabolic and appetite-regulating microbiota.

Table 2. Approximate thermic effect of the three macronutrients

Macronutrient	Approximate thermic effect (energy used to digest it)	Practical meaning
Protein	20-30% of its own calories	A 100-kcal portion of protein may only yield about 70-80 usable kcal
Carbohydrate	5-10% of its own calories	Whole, fibre-rich carbohydrates cost more to digest than refined ones
Fat	0-3% of its own calories	Fat is digested with very little energy expenditure

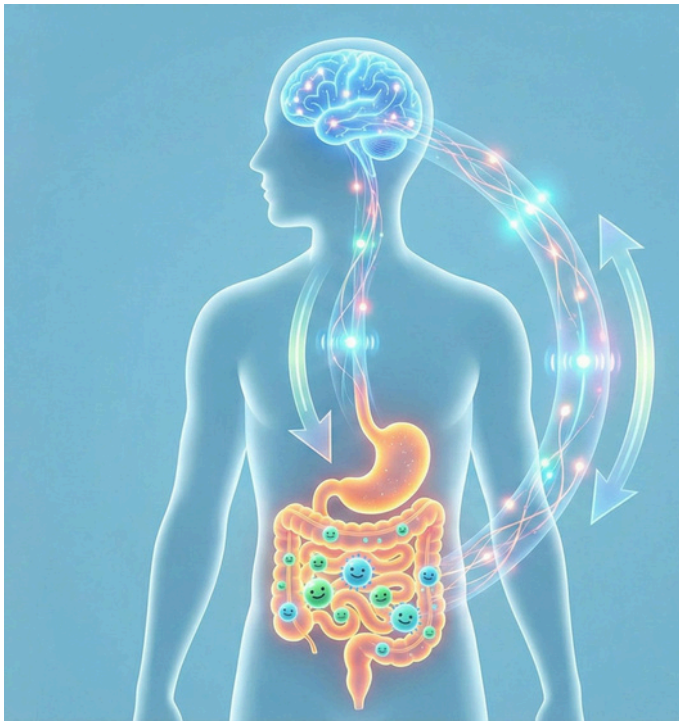


Table 3. Mindful eating practices and their underlying biochemical mechanisms

Mindful eating practice	Biochemical mechanism	Everyday benefit
Eating slowly, pausing between bites	Gives GLP-1 and PYY time (about 20 minutes) to reach the brain	Reduces the chance of eating past the point of fullness
Removing screens and distractions	Strengthens vagal signalling between gut and brain	Improves recognition of true fullness
Chewing food thoroughly	Supports the cephalic phase response (saliva, early digestive enzymes)	Improves digestion and nutrient sensing
Checking in with hunger before eating	Distinguishes true ghrelin-driven hunger from cortisol-driven stress eating	Reduces unnecessary snacking
Choosing whole, fibre- and protein-rich foods	Produces a stronger and more sustained GLP-1/PYY response than refined foods	Promotes longer-lasting satiety on fewer calories



Mindful Eating as Applied Biochemistry

Mindful eating is often described in psychological terms as awareness, non-judgement, and presence, but each practice also has a clear biochemical rationale, shown in Table 3.

Conclusions

Calorie counting still holds its place as an important starting point, but there is more to the equation than that. Hormonal and nervous pathways controlling appetite and feeling full are quite complex and react not only to the quantity of food consumed but also to how, how quickly, and under what conditions of attention. The traditional Sri Lankan way of eating consuming food using hands, enjoying slow consumption of a meal within a family, and tasting the spices and textures of dishes coincides with the biochemistry rules of satiety. In a world of rushed food and constant distractions, returning to these unhurried habits may be one of the simplest, evidence-based tools we have for healthy eating proof that, biochemically speaking, calories are not everything.

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Message from FBDGs

FBDG -1

"ADD COLOUR TO YOUR DAILY MEALS BALANCING THE CORRECT AMOUNTS"

Add rainbow colours to give variety to your daily meals.



Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook
Nutrition Division, Ministry of Health



Are We Eating Food, or Is Food Designing Our Choices?



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Every day, we make countless decisions about food. What will we eat for breakfast? Should we cook at home or order a meal? Which snack should we choose when we feel hungry? We often believe these decisions are based on personal preferences, hunger, taste, and knowledge about healthy eating. However, modern nutrition science tells us that our food choices are influenced by something much larger: the environment around us.

The question is no longer only "Are we choosing our food?" but also "How much is our food environment influencing our choices?"

From supermarket shelves carefully arranged to attract attention, to social media platforms constantly displaying food advertisements, our surroundings are continuously shaping our eating behaviours. Many food choices happen quickly and automatically, influenced by availability, affordability, convenience, emotions, social influences, and marketing strategies.

Understanding this hidden influence is important because improving nutrition is not only about teaching individuals what to eat. It is also about creating environments where healthy choices become easier, affordable, and more accessible.

Understanding the Food Environment

For many years, nutrition messages focused mainly on individual responsibility: eat more vegetables, reduce sugar intake, exercise regularly, and maintain a healthy weight. While personal responsibility remains important, this approach overlooks a major factor: the environment in which people make decisions.

A food environment refers to the physical, economic, social, and digital surroundings that influence food availability, accessibility, affordability, and desirability.

Our food environment includes:

- Supermarkets and grocery stores
- Restaurants and takeaway outlets
- School and workplace food settings
- Food advertisements and promotions
- Social media platforms
- Food delivery applications
- Government policies and regulations
- Cultural and family eating practices

For example, a person may understand the importance of eating a balanced diet but may still choose inexpensive fast food if healthier options are unavailable or unaffordable. Therefore, food choices are not simply personal decisions; they are influenced by the opportunities and limitations created by our surroundings.

The Psychology Behind Our Food Choices

Food companies understand human behaviour extremely well. Many decisions about food are influenced by psychological factors rather than hunger alone.

1. Visual appeal and packaging: Humans naturally respond to attractive colours, images, and designs. Bright packaging, health-related claims such as “natural” or “low fat,” and appealing product names can influence purchasing decisions.

Children are particularly vulnerable to these strategies because their ability to critically evaluate advertising messages is still developing.

2. Convenience and accessibility: People tend to choose foods that are easier to access. When unhealthy foods are available everywhere, near workplaces, schools, transport stations, and online platforms, they become the easier option.

A person who has limited time after work may choose a ready-made meal rather than preparing a nutritious dinner. Convenience often becomes a deciding factor in modern eating habits.

3. Price and promotions: Food prices strongly influence food choices. Discounts, special offers, and larger portion sizes can encourage consumers to purchase and consume more than they originally planned.

For example, a family may purchase a large packet of processed snacks because it appears cheaper, even though a smaller amount of healthier food may provide better nutritional value.



Supermarkets: Designed Spaces That Influence Eating

Supermarkets may appear neutral, but many aspects of store design influence consumer behaviour.
Have you noticed that fresh fruits and vegetables are often placed near the entrance? This creates a positive first impression and encourages customers to associate the store with freshness and health. However, other strategies encourage purchases of less nutritious foods.

Common examples include:

- Snacks placed near checkout counters
- Sugary cereals displayed at children's eye level
- Promotional displays at the end of aisles
- Large package sizes encouraging bulk purchases

These strategies are effective because many food decisions are made spontaneously rather than through careful planning.

A shopper who entered the store intending to buy only essential items may leave with additional snacks and beverages influenced by product placement and promotions.

The Digital Food Environment

The modern food environment is no longer limited to physical spaces. Digital platforms have created a new environment that strongly influences eating behaviour. Social media platforms, food delivery applications, and online advertisements have transformed how people discover, purchase, and consume food.

Food Delivery Apps

Food delivery services provide convenience and variety. However, they also make energy-dense foods available with just a few clicks.

Promotional discounts, personalised recommendations, and attractive food images can encourage frequent ordering.
While these services can be useful, frequent reliance on takeaway meals may contribute to higher consumption of foods that are rich in salt, sugar, and unhealthy fats.

Social Media and Nutrition Misinformation

Social media has changed the way people receive nutrition information. Today, anyone can share dietary advice, regardless of their qualifications.

Popular trends include:

- Extreme weight-loss diets
- Detox programs
- Unnecessary food restrictions
- Unproven supplements
- “Miracle” nutrition claims

Although social media can promote healthy eating awareness, misinformation can create confusion and unrealistic expectations about nutrition.
Evidence-based nutrition advice from qualified professionals remains essential in helping people make informed choices.

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The Convenience Challenge

One of the biggest changes in modern food environments is the increased availability of ultra-processed foods.
These foods are industrially manufactured and often contain high levels of:

- Added sugars
- Sodium
- Unhealthy fats
- Artificial flavours and additives

Examples include many packaged snacks, sugary beverages, instant noodles, confectionery products, and some ready-to-eat meals.

These foods are designed to be highly appealing through combinations of taste, texture, and convenience. Their widespread availability has contributed to changing dietary patterns worldwide. Frequent consumption of ultra-processed foods has been associated with increased risks of obesity and non-communicable diseases such as diabetes and cardiovascular disease.

Sri Lanka's Changing Food Environment

Sri Lanka has traditionally been known for a diet based on rice, vegetables, legumes, spices, fruits, and locally available foods. Traditional meals often provided diversity and nutritional value.

However, rapid urbanisation, changing lifestyles, and increased availability of processed foods have transformed eating patterns.

Some emerging changes include:

- Increased consumption of fast foods
- Greater dependence on packaged snacks
- Increased intake of sugar-sweetened beverages
- Growth of food delivery services
- Reduced time available for home cooking

At the same time, Sri Lanka faces a double burden of malnutrition, where undernutrition and micronutrient deficiencies coexist with increasing overweight, obesity, and diet-related diseases.

This highlights the need for approaches that address not only individual behaviour but also the wider food system.

Can We Design Healthier Food Choices?

If food environments influence our decisions, then improving nutrition requires creating healthier environments.

The goal is not to remove personal choice but to ensure that healthier choices are realistic and achievable.

Strategies include:

- Healthier schools and workplaces: Schools and workplaces can encourage better nutrition by providing affordable, nutritious meals and limiting access to unhealthy foods.
- Better food labelling: Clear nutrition information helps consumers understand what they are purchasing and supports informed decisions.
- Responsible food marketing: Reducing aggressive marketing of unhealthy foods, especially to children, can protect vulnerable populations.
- Supporting local nutritious foods: Promoting traditional Sri Lankan foods, seasonal produce, and local agriculture can support both health and sustainability.

What Can Individuals Do?

Although the environment strongly influences choices, individuals can develop strategies to support healthier eating:

- Plan before shopping: Creating a shopping list reduces impulse purchases.
- Prepare meals when possible: Home cooking allows better control over ingredients.
- ·Become a critical consumer: Question food advertisements and online nutrition claims.
- Prioritise whole foods: Include vegetables, fruits, legumes, whole grains, and minimally processed foods regularly.
- Create a healthy home environment: Keeping nutritious foods easily available makes healthy choices more convenient.



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From Individual Advice to System Change

The future of nutrition cannot rely only on telling people what they should eat. Nutrition professionals must also consider the environments that shape eating behaviours.
Dietitians, nutritionists, researchers, policymakers, educators, and communities all have a role in creating healthier food systems. The field of public health nutrition recognises that lasting improvements require action at multiple levels, from individual education to national policies. When healthy foods are affordable, accessible, attractive, and convenient, people are more likely to choose them.

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Designing a Future Where Healthy Choices Are Easier

Food does not simply appear on our plates. Behind every meal is a complex system of production, marketing, availability, culture, and economics that influences our choices.

While we believe we are freely choosing our food, our decisions are often shaped by the environments surrounding us. Recognising this influence allows us to move beyond blaming individuals and focus on creating supportive food systems.

The important question is not only:
"Are we eating food?"
but also:
"How is food shaping the way we eat?"

By designing healthier food environments, we can empower individuals, strengthen communities, and build a healthier future for generations to come.









From Seed to Sprout: Unlocking the Nutritional and Health Potential of Sprouted Grains and Legumes

Sprouted grains have gained considerable attention as a simple and potentially nutritious food source due to the biochemical changes that occur during germination. Sprouting is a natural process that requires only good-quality, viable seeds, sufficient moisture, a suitable temperature, and appropriate atmospheric conditions, without the need for sophisticated equipment. Within a few days of germination, significant metabolic changes take place in the grain, including enhanced enzyme activity, breakdown of starch into simpler sugars, alterations in protein and amino acid composition, and changes in crude fat, fiber, vitamin, and mineral contents. Furthermore, sprouting may reduce several anti-nutritional compounds, such as phytates, tannins, and oxalates, which can interfere with mineral absorption. The reduction of these compounds during germination may consequently improve the bio accessibility and utilization of essential minerals, contributing to the potential nutritional benefits of sprouts.



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What are sprouted grains and legumes?

Sprouting, also referred to as germination, is a simple biological process commonly used to enhance the nutritional quality and digestibility of seeds, grains, nuts, and legumes. The process generally involves soaking the raw material in water for several hours, often up to 24 hours, followed by draining, rinsing, and maintaining suitable moisture conditions for several days until germination occurs. Once sprouted, grains and legumes can either be consumed after cooking or dried and milled into flour for incorporation into various food products, including breakfast preparations, salads, soups, casseroles, pasta, and baked products.



Sprouts includes

- **Bean and pea sprouts: These include mung bean, kidney bean, black bean, and lentil**
- **Vegetable sprouts: These include broccoli, alfalfa, and mustard green**
- **Nuts and seed sprouts: These include pumpkin seed, sesame seed, and sunflower seed sprouts**
- **Sprouted grains: These include wheatgrass and quinoa sprouts**

Lower Antinutrient Content Improves the Absorption of Vitamins and Minerals

Antinutrients are naturally occurring compounds that can interfere with the digestion and absorption of essential nutrients in the body. Compounds such as phytic acid, lectins, and protease inhibitors are particularly abundant in grains and legumes and may reduce the bioavailability of minerals and proteins when consumed in high amounts. This can be of particular importance for individuals whose diets rely heavily on plant-based foods, especially grains and legumes. Sprouting or germination provides a simple and effective method for reducing the concentration of these antinutritional compounds and improving nutrient bioavailability. During germination, enzymatic activity increases and contributes to the degradation of antinutrients. Studies have reported that sprouting can substantially reduce phytic acid levels, with reductions of up to 81%, while lectins and protease inhibitors may also decrease considerably. The reduction of these compounds can enhance the absorption and utilization of important nutrients, particularly protein and essential minerals such as iron, zinc, calcium, magnesium, and manganese. Therefore, sprouting can improve the nutritional quality of grains and legumes by increasing the proportion of nutrients that are potentially available for absorption and utilization by the human body.

Sprouted Grains and Weight Management

Sprouted grains and legumes may be beneficial as part of a balanced diet for individuals aiming to manage their body weight. They are generally rich in dietary fibre, which is digested slowly and can promote a prolonged feeling of fullness, thereby helping to reduce hunger and unnecessary food intake. In addition, their relatively high protein content may contribute to increased satiety and help control overall calorie consumption. Evidence from observational studies also suggests that greater consumption of whole grains and legumes is associated with healthier body-weight indicators. For example, regular consumption of beans has been linked with lower body weight, smaller waist circumference, and a reduced likelihood of obesity. Similarly, higher intake of whole grains has been associated with lower body mass index (BMI) and reduced waist circumference among both children and adults (Albertson et al., 2016). Thus, incorporating sprouted grains and legumes into a balanced diet may support satiety, healthy eating patterns, and effective weight management, although sprouted foods should be considered as part of an overall healthy dietary pattern rather than as a standalone weight-loss treatment.



Sprouted Grains and Blood Sugar Control

Sprouted legumes and whole grains are rich sources of dietary fibre, which may play an important role in maintaining healthy blood glucose levels. Dietary fibre can slow the digestion and absorption of carbohydrates, resulting in a more gradual release of glucose into the bloodstream and helping to minimize rapid fluctuations in blood sugar levels. Studies have suggested that regular consumption of sprouted legumes and whole grains may contribute to improved glycemic control. For instance, research involving individuals with impaired blood glucose regulation reported that consumption of sprouted brown rice for several weeks significantly reduced blood glucose levels compared with the consumption of white rice. Similarly, studies involving large populations have indicated that regular legume consumption is associated with lower fasting blood glucose concentrations. These findings suggest that incorporating sprouted grains and legumes into a balanced diet may support better blood sugar regulation, particularly through their fibre content and other beneficial nutritional components.



Sprouted Grains and Heart Health

Sprouted grains and legumes may contribute to cardiovascular health because of their rich nutritional profile, particularly their fibre, protein, vitamins, minerals, and other bioactive compounds. Regular consumption of legumes and whole grains has been associated with a lower risk of cardiovascular diseases, including coronary heart disease and stroke. Studies have shown that individuals who consume legumes regularly may have a reduced risk of coronary heart disease compared with those who consume them less frequently (Aune et al., 2016). Likewise, higher consumption of whole grains has been linked to a lower risk of both coronary heart disease and stroke. These foods may also support heart health by helping to maintain healthy cholesterol levels, particularly by contributing to improved lipid profiles (Behall, et al., 2006). In addition, their consumption may assist in maintaining normal blood pressure, thereby reducing the workload and strain placed on the heart. Therefore, incorporating sprouted grains and legumes into a balanced diet may be a beneficial dietary approach for supporting cardiovascular health and reducing some major risk factors associated with heart disease.

Versatility and Dietary Applications of Sprouted Grains

In addition to their potential nutritional benefits, sprouted grains and legumes are versatile foods that can be easily incorporated into a wide range of dietary preparations. They can be cooked and added to soups, stews, dips, risottos, and other meals, while raw sprouts can provide a fresh texture and added nutritional value to salads. Sprouted grains and legumes can also be dried and milled into flour, which can be used as an ingredient in bread, cakes, biscuits, and other baked products. However, consuming sprouted grains and legumes in their minimally processed, whole-food form is generally preferable to relying on highly processed commercial products such as chips and crackers. Such processed foods may contain high levels of sodium, additives, and other less desirable ingredients, while extensive processing may reduce some of the beneficial nutritional and functional properties associated with whole sprouted foods. Therefore, incorporating whole sprouted grains and legumes into everyday meals provides a simple, flexible, and nutritious approach to improving dietary quality.

Risks Associated with Consuming Sprouts

Although sprouts are considered nutritious foods, their consumption may pose a risk of foodborne illness, particularly infections caused by bacteria such as Escherichia coli (E. coli) and Salmonella. Sprouting requires warm and humid conditions, which provide an ideal environment for the growth and multiplication of microorganisms. During cultivation, contamination may occur if the seeds or irrigation water come into contact with animal waste or other sources of pathogenic microorganisms. There is also a possibility of contamination during harvesting, processing, packaging, and handling, especially when appropriate hygiene and sanitation practices are not maintained. The risk can be further increased when sprouts are consumed raw, as they do not undergo a cooking process that could destroy harmful bacteria. Therefore, proper seed selection, hygienic production practices, safe handling, appropriate storage, and adequate cooking are important measures for reducing the potential food-safety risks associated with sprouted grains and legumes.

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Message from FBDGs

FBDG -3

"EAT AT LEAST FIVE VARIETIES OF VEGETABLES AND FRUITS EVERYDAY"



Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook
Nutrition Division, Ministry of Health

When the Scale Stops Moving

Understanding the Weight-Loss Plateau



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You have been following your meal plan,staying active and watching the numbers on the scale gradually fall. Then, after weeks or months of progress, the scale seems to stop moving.

You eat the same foods. You continue exercising. You may even become more careful with your meals. But your weight remains almost unchanged.



Have you reacheda weight-loss plateau?

If so, you are not alone. Plateaus are a common and expectedpart of long-term weight management. More importantly, they do not necessarily mean that your efforts have stopped working.

Why does weight loss slow down?

Weight loss is not a perfectlylinear process. As body weight decreases, the body's energy requirements also change. A person who weighs less generally needsfewer calories to maintain theirbody and performthe same activities. This means that the calorie deficit that produced weight loss at the beginning of a programme may becomesmaller over time. There is also another piece to the puzzle: metabolic adaptation.

During weight loss,the body respondsto reduced energyavailability by becomingmore energy efficient. Resting energy expenditure can decrease, and changes in appetite and hunger can make maintaining the original dietarypattern more challenging. Some people may also lose a proportion of their lean mass during weight loss, which can slow the metabolism and further reduce energy expenditure.

In other words, your body has changed, and the plan that worked for your previous body weight may need to change with it.

Sometimes, the plateauisn't actually a plateau

Before making major changes to a diet, it is important to look beyond the number on the scale. Body weight naturally fluctuates from day to day. Changes in sodium intake,carbohydrate intake, bowel movements, menstrual cycle-relatedfluid changes, stress,sleep and exercisecan all influence body water.

For example, a new or more intenseresistance training programme can temporarily increasewater retention as the muscles recover.The result? You may be losing body fat while the scale temporarily refuses to cooperate. It won't show any reduction on the scale.
This is why a single weigh-intells us very little.

Looking at the weighttrend over severalweeks, rather than reacting to individual measurements, gives a much clearer picture of what is actually happening.

The "calorie creep"effect

Another common reason for a plateauis surprisingly simple.The original caloriedeficit may have gradually disappeared.

This does not necessarily mean someone is overeating or “cheating.” A little extracooking oil; A slightly largerportion of rice;A few more bites whilepreparing dinner; A sweetened coffee;A snack during the weekend; Restaurant meals that are difficult to estimate. Each change may seem insignificant, but togetherthey can make a meaningful difference to daily energy intake.

As time passes, dietaryhabits can also become less precise. This is completely human, and it is one reason that reassessing the current diet is often more useful than simply cutting calories further.

What about exercise?

Physical activity matters too. As people lose weight, the same physicalactivity generally requires slightly less energy. At the same time, dieting can sometimes lead to unconscious reductions in everyday movement. We may take fewer steps,sit for longer,or simply move less withoutrealising it.

This is why structured exercise is only one part of the picture. Daily movement matters too. Walking more, takingthe stairs, standingregularly and maintaining normal activity throughout the day can all contribute to total energy expenditure.



So, what should you do?

A plateauis a reason to review,not to panic. Start by looking at the bigger picture.

- Are your portions still the same?
- Have snacks or weekendmeals increased?
- Are cooking oils, saucesand drinks beingaccounted for?
- Has your daily step count changed?
- Are you sleeping adequately?
- Could fluid retention be masking recent fat loss?

If a genuine plateauhas been confirmed, the next step does not have to be a drastic caloriereduction. A small adjustment to energy intake or physical activity may be sufficient.

At the same time, adequate protein intake and resistance training should remain important components of the plan, particularly when the goal is to preserve lean mass during weight loss.

Don't let the scalebecome the only measure of success. One of the biggest mistakesin weight management is assuming that progress only counts when the numberon the scale decreases.

- What if your waist circumference is decreasing?
- What if your strengthhas improved?
- What if your body composition has changed?
- What if your blood glucose, blood pressure, fitnessor eating habits have improved?

These are meaningful outcomes too.

For people who participate in resistance training,body recomposition can make the scale particularly misleading. Fat mass may decrease while lean mass is maintained or increased, resulting in little change in total body weight.

So sometimes, the better questionis not: “How much weighthave I lost?” but rather: “What has changed in my body and health?”
A plateau is information, not failure

Weight management is not a straight line from one number to another. It is a dynamic process influenced by energy intake,energy expenditure, appetite, behaviour, sleep, stress,body composition and physiological adaptation.
A plateau simply tells us that something has changed.

Instead of responding with extreme restriction or giving up altogether, use the plateauas an opportunity to reassess the plan.

- Review the data
- Look at the trends
- Protect your muscles
- Maintain movement
- Make small, sustainable adjustments

And remember: the goal is not to lose weight as quickly as possible. The goal is to builda way of eating and living that you can maintain long after the weight-loss phase is over.
So the bottom line is: A weight-loss plateau is not the end of progress. Your body changes as you lose weight, and your nutrition and activity needs can change with it. When the scale stops moving, pause, reassess and adjust rather than assuming that you have failed.
Progress may slow down; But that doesn't mean progress has stopped.

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Nourishing Through Cancer: Managing the Side Effects of Cancer Treatment Through Nutrition





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Malnutrition is a common feature in cancer patients and is the consequence of both the presence of the tumor and the medical and surgical anticancer treatments. Malnutrition negatively impacts quality of life and treatment toxicities, and it has been estimated that up to 10-20% of cancer patients die due to the consequences of malnutrition rather than the tumor itself. Thus, nutrition plays a crucial role in cancer care.

Nutritional issues should be taken into account from the time of cancer diagnosis, within a diagnostic and therapeutic pathway, and should be running in parallel to antineoplastic treatments. However, worldwide, cancer-related malnutrition is still largely unrecognized, underestimated, and undertreated in clinical practice.



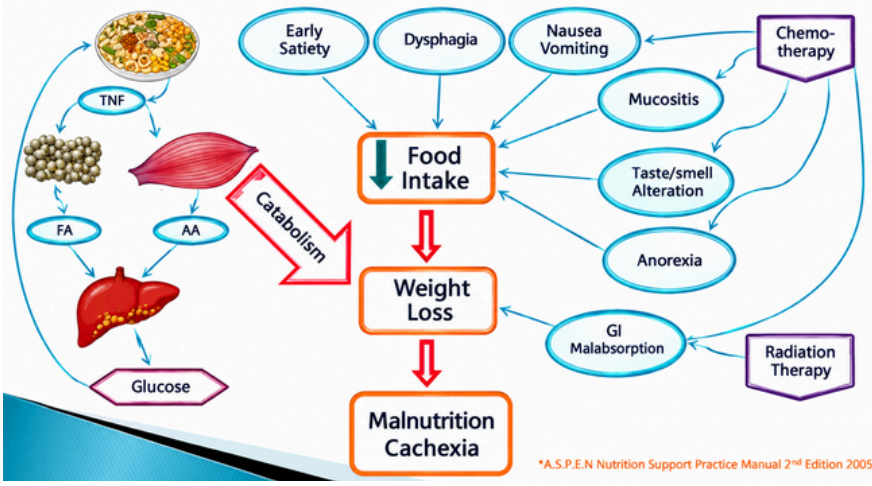


Figure 1. Nutritional alterations in cancer
Source: ASPEN Nutrition Support Manual 2005

Nutritional issues throughout cancer include; Cancer Cachexia, Anorexia, Nauea/Vomiting, Mucositis, Diarrhea, Dysgeusia, Xerostomia. Patients with cancer are at significant risk of developing cancer-associated cachexia and anorexia syndrome. It is a multifactorial condition characterized by ongoing loss of skeletal muscle and/or fat that cannot be fully reversed by conventional nutritional support and which leads to progressive functional impairment.

Table 1. Physiological Changes Related to Aging, Cancer, and Treatment-Related Symptoms/Side Effects, and Their Impact and Consequences on Nutrition in Patients with Cancer

Physiological Changes Related to Aging	Disease and Treatment-Related Symptoms and Side Effects	Social/Psychological/Spiritual Impacts and Consequences
Sensory impairments Decreased sense of taste Decreased sense of smell Decreased sense of thirst	Chemotherapy and radiotherapy of the head and neck regions Altered sense of taste Xerostomia Mucositis Pain Nausea/vomiting	Limited access to food Decreased ability to purchase and prepare food Decreased appetite Difficulty chewing Poor diet Lacking essential nutrients Inflammation Malnutrition Lack of interaction with others at mealtimes Social isolation—loneliness Family conflicts Depression Anxiety Stress Economic issues Impaired IADL Impaired ADL Decreased mobility CACS Sarcopenia
GI changes Delayed/slower gastric and bowel motility	Dyspepsia: gastric/duodenal ulcer/reflux esophagitis Decreased level of gastric acid: eg, alcoholism Constipation/ileus: serotonin antagonists, opiates Diverticulosis/diverticulitis Chemotherapy: colitis-ileitis, diarrhea, malabsorption Medications: antibiotics, antidepressants, dopamine antagonists	
Oral health/dental problems	Chemotherapy and radiotherapy of the head and neck regions Altered sense of taste Xerostomia Mucositis Pain Nausea or vomiting	
Decreased physical activity	Fatigue caused by cancer and/or treatment Arthrosis Obesity Osteopenia Dementia Sarcopenia	
Sarcopenia Decreased lean body mass	Decreased physical activity Cancer cachexia and anorexia syndrome Chronic nonmalignant conditions: COPD, CHF, ESRD Dementia/neurologic disorders	

Abbreviations: ADL, activities of daily living; CACS, cachexia and anorexia syndrome; CHF, chronic heart failure; COPD, chronic obstructive pulmonary disease; ESRD, end-stage renal disease; IADL, instrumental activities of daily living.

Cancer treatment induces multiple gastrointestinal (GI) side effects, with 81% of patients experiencing symptoms at some point during their treatment. These symptoms vary in incidence and severity, arising from chemotherapy and radiation-induced apoptosis. Tissue damage, surgery and immunotherapy-induced inflammation, and alterations in endocrine signaling are among the other causes.

Nutritional management of cancer patients includes key components and strategies. First, the nutritional status needs to be assessed through regular monitoring. Here, it is necessary to evaluate weight, muscle mass, and overall nutritional status. Nutritional Screening Tools like the Patient-Generated Subjective Global Assessment (PG-SGA) tool can be used to assess nutritional risk.

To maintain nutritional status, it is necessary to preserve lean body mass by preventing muscle loss and maintaining body strength by ensuring adequate protein intake. It is necessary to ensure adequate caloric intake to meet the increased energy needs due to cancer and its treatments.

Incorporating foods rich in antioxidants (e.g., fruits and vegetables) and essential nutrients (e.g., vitamins A, C, D, E, and zinc) to strengthen the immune system plays a key role in nutritional management of cancer.

Managing the side effects of cancer treatment through nutrition is crucial for maintaining a patient's overall health and quality of life. Different treatments, such as chemotherapy, radiation, and surgery, can cause various side effects that impact nutritional intake and status.

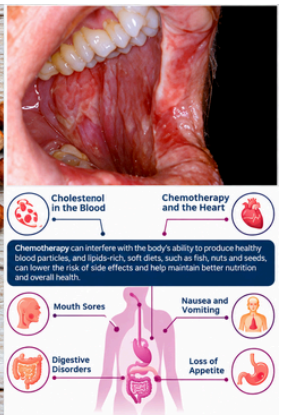
Here are nutritional strategies to manage some common side effects:

1. Mucositis

Associated pain is the main source of cancer treatment-related pain.

- Take Soft, non-fibrous, non-acidic foods
- Avoid hot foods
- ·Liquids to prevent dehydration
- High kcal/high protein milkshakes can be helpful





2. Nausea and Vomiting:

- Encourage small, frequent meals
- Eat small, low-fat meals the morning of the first treatment and avoid fried, greasy, and favorite foods for several days following the treatment

- Stay away from foods with strong odors that can trigger nausea
- Choose bland, easy-to-digest foods like crackers, toast, and soup.



3. Loss of Appetite

- Consume nutrient-dense snacks such as nuts, cheese, yogurt, and smoothies.
- Focus on foods that are visually appealing and have pleasant aromas to stimulate appetite.
- Use liquid nutritional supplements if solid foods are unappealing.

4. Mouth Sores and Difficulty Swallowing

- Choose soft, moist foods like mashed potatoes, scrambled eggs, and smoothies.
- Avoid spicy, acidic, or rough-textured foods that can irritate the mouth.
- Maintain good oral hygiene to prevent infections and further irritation.
- Use oral nutritional supplements to ensure adequate nutrient intake.

5. Diarrhea

- Eat low-fiber foods like white rice, bananas, applesauce, and toast.
- Drink plenty of fluids, including oral rehydration solutions, to prevent dehydration.
- Limit dairy products and caffeine, which can exacerbate diarrhea.
- Consider probiotics to restore healthy gut bacteria.

6. Constipation

- Include high-fiber foods such as fruits, vegetables, whole grains, and legumes.
- Drink plenty of fluids to stay hydrated
- Engage in regular physical activity to stimulate bowel movements.



7. Taste Changes (Dysgeusia):

- If food tastes metallic, use plastic utensils and avoid canned foods; use high-protein non-meat sources (peanut butter, cheese, soy, poultry); use more highly spiced and flavorful foods
- Cold or room-temperature foods may be more palatable than hot food.

8. Fatigue

- Eat a balanced diet with a mix of proteins, carbohydrates, and fats to maintain energy levels.
- Consume small, frequent meals and snacks to keep energy levels stable.
- Stay hydrated, as dehydration can worsen fatigue.
- Limit sugary foods that can cause energy spikes and crashes.

9. Dry Mouth (Xerostomia)

- Drink water, clear broths, and herbal teas regularly throughout the day.
- Eat hydrating foods like fruits (watermelon, oranges) and vegetables (cucumbers, lettuce).
- Limit intake of caffeinated and alcoholic beverages that can contribute to dehydration.



10. Neutropenia: a common side effect of cancer treatment

- Patients with neutropenia are at a higher risk of infections, making dietary precautions crucial to reduce exposure to harmful bacteria, viruses, and other pathogens.
- Strictly follow food safety guidelines (e.g., hand hygiene, washing)
- Cooking thoroughly, avoiding raw or undercooked foods

By focusing on these strategies in nutritional management, cancer patients can better manage treatment side effects, maintain their nutritional status, and improve their overall well-being during and after cancer treatment.

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Sri Lankan Rice Beyond Basic Nutrition: Exploring Its Anticancer Potential







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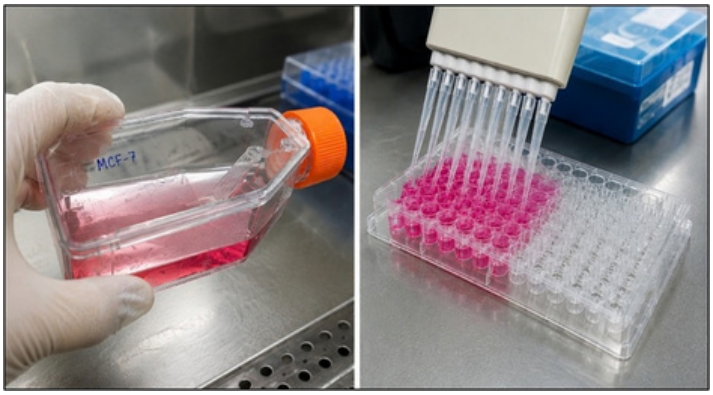
Rice (Oryza sativa L.) is the staple food in Sri Lanka and has been cultivated across the country for centuries, contributing to a remarkable diversity of traditional and newly improved rice varieties. In addition to its importance as a primary source of dietary energy and nutrients, rice contains a wide range of biologically active phytochemicals, particularly within the bran layer. These include phenolic acids, flavonoids, anthocyanins, and other antioxidant compounds that have been associated with diverse biological activities, such as antioxidant, anti-diabetic, anti-hypertensive, anti-lipidemic, anti-Alzheimer, anti-inflammatory, and chemo-preventive effects. Consequently, rice bran has attracted increasing scientific interest as a potential source of naturally occurring bioactive compounds with applications in functional foods and health-promoting interventions.

Cancer is one of the leading causes of morbidity and mortality worldwide, creating a continuing need for the identification of novel and effective anticancer agents. In recent years, considerable research attention has been directed toward naturally derived phytochemicals because of their structural diversity and potential to exert anticancer effects through multiple cellular and molecular mechanisms. Plant-based foods rich in phenolic compounds and other secondary metabolites are therefore increasingly being investigated as promising sources of functional ingredients with potential cancer-preventive and therapeutic properties.

Although Sri Lankan rice varieties are recognized for their nutritional value and functional attributes, their potential anticancer properties remain largely under-investigated. Systematic evaluation of the cytotoxicity of rice bran from diverse Sri Lankan varieties may provide valuable insights into the relationship between varietal phytochemical composition and anti-cancer activity. Therefore, the present study was undertaken to investigate the cytotoxic potential of bran extracts obtained from twenty-six selected Sri Lankan rice varieties against five human cancer cell lines representing major cancer types, namely breast, liver, colorectal, gastric, and lung cancers. The study aimed to identify Sri Lankan rice varieties with promising cytotoxic activity and assess the potential of their bran as a source of bioactive compounds for anticancer research and functional food development.



A total of 26 Sri Lankan rice varieties were selected for the study, comprising 15 new improved varieties namely, Bg 300, Bg 352, Bg 358, Bg 94-1, At 362, Bg 359, At 353, Bg 357, Bg 360, Bg 379-2, Ld 368, Bw 272-6b, Bg 403, Bg 366, and At 307 and 11 traditional varieties namely, Suwandal, Kuruluthuda, Pachchaperumal, Kahawanu, Kalu Heeneti, Sudu Heeneti, Goda Heeneti, Madathawalu, Dik Wee, Pokkali, and Masuran. The selected germplasm represented both red and white pericarp rice types, thereby providing a diverse range of Sri Lankan rice varieties for comparative evaluation.



Rice bran was separated from the corresponding rice grains and subjected to 70% ethanol extraction to recover a broad range of potentially bioactive phytochemicals. The resulting extracts were concentrated and subsequently freeze-dried to obtain stable crude bran extracts for biological evaluation.

The in *vitro cytotoxic* potential of the rice bran extracts was assessed using the sulforhodamine B (SRB) colorimetric assay, a widely used method for evaluating cellular growth and viability. Five human cancer cell lines representing major cancer types were selected: MCF-7 (breast cancer), HepG2 (liver cancer), Caco-2 (colorectal cancer), AGS (gastric cancer), and A549 (lung cancer).

As an initial screening step, all 26 rice bran extracts were tested at 250 and 500 µg/mL following 24, 48, and 72 hours of exposure. Extracts exhibiting comparatively stronger cytotoxic effects were subsequently selected for detailed concentration-dependent analysis. These extracts were evaluated over a broader concentration range of 31.25–500 µg/mL, enabling the determination of the half-maximal effective concentration (EC_{50}) and providing a more comprehensive assessment of their potency.

Through this systematic screening approach, the study aimed to identify Sri Lankan rice varieties with promising anticancer-associated cytotoxic activity and to determine whether the observed effects varied according to rice variety, extract concentration, exposure duration, and cancer cell type. The findings provide an important basis for further investigation of the bioactive constituents responsible for the cytotoxic effects of Sri Lankan rice bran.



Key Findings

The rice bran extracts exhibited significant in vitro cytotoxic activity against all five human cancer cell lines, although the magnitude of the response varied considerably depending on the rice variety, cancer cell type, extract concentration, and incubation period. In general, the cytotoxic effects increased with increasing extract concentration and extended exposure time, indicating a dose and time-dependent response. Overall, the tested rice bran extracts demonstrated moderate cytotoxic activity across the cancer cell lines evaluated compared with the standard anticancer drug. These findings demonstrate that Sri Lankan rice bran contains bioactive constituents capable of influencing the viability and proliferation of diverse cancer cell types.

A notable difference was observed between rice grain color groups. Red rice varieties exhibited greater cytotoxic activity than white rice varieties, suggesting that the pigmentation-associated phytochemical composition of red rice bran may contribute to its enhanced biological activity. The higher abundance and diversity of phenolic compounds, flavonoids, anthocyanins, and other phytochemicals commonly associated with pigmented rice may, at least in part, account for this observation. However, further phytochemical and mechanistic studies are required to establish the specific compounds responsible for the observed cytotoxic effects.

Among the varieties evaluated, Goda Heeneti emerged as the most promising variety, demonstrating comparatively strong cytotoxic activity against MCF-7 breast cancer, Caco-2 colorectal cancer, AGS gastric cancer, and A549 lung cancer cells. Several other traditional rice varieties, including Pokkali, Masuran, and Dik Wee, also demonstrated notable cytotoxic effects across multiple cancer cell lines. In particular, Masuran exhibited pronounced activity against HepG2 liver cancer cells. Meanwhile, Pachchaperumal and Bw 272-6b showed comparatively strong cytotoxic activity, particularly against MCF-7 breast cancer cells.

Overall, the findings showed that traditional Sri Lankan red rice varieties may represent a valuable and relatively underexplored source of bioactive compounds with potential anticancer properties. Among the varieties investigated, Goda Heeneti, Pokkali, Masuran, and Dik Wee were identified as particularly promising candidates for further research. The observed differences among varieties and cancer cell types also highlight the importance of rice genotype and phytochemical composition in determining biological activity.



Research Significance and Future Directions

This study provides important evidence supporting the potential of Sri Lankan rice bran as a source of naturally occurring bioactive compounds with anticancer-associated activity. The findings are particularly significant given that the anticancer potential of Sri Lankan rice has received extremely limited scientific investigation despite the country's rich diversity of traditional rice germplasm.

Further research is going on to characterize and identify the specific phytochemicals responsible for the observed cytotoxic effects, elucidate their underlying cellular and molecular mechanisms, and determine their selectivity toward cancer cells relative to normal cells. Comprehensive studies addressing bioavailability, safety, synergistic interactions among bioactive compounds, and in vivo efficacy are also essential to establish their potential for future applications. Such investigations could contribute to the development of functional food ingredients and nutraceutical products based on locally available Sri Lankan rice resources.

Research Collaboration, Funding, and Acknowledgements

The research was conducted collaboratively at the Faculty of Technology, University of Colombo, and the Institute of Biochemistry, Molecular Biology and Biotechnology (IBMBB), University of Colombo. Financial support for this research was provided by the Sri Lanka Council for Agricultural Research Policy (SLCARP Grant: NARP-IIMDR/23/UC/T/01).

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Prof. W. K. S. M. Abeysekera served as the Principal Investigator, with Prof. G. A. S. Premakumara, Prof. W. P. K. M. Abeysekera, and Prof. S. R. Samarakoon serving as Co-Investigators. Rice samples for the study were provided by the Rice Research and Development Institute (RRDI), Bathalagoda, with Dr. D. M. J. B. Senanayake contributing as a research collaborator.

The ongoing isolation and structural elucidation of bioactive compounds identified from the promising rice bran extracts are being conducted in collaboration with Qilu University of Technology, China. This international collaboration, established by Prof. W. K. S. M. Abeysekera under the supervision of Prof. Jinqian Yu, strengthens the study by facilitating the comprehensive characterization and identification of compounds potentially responsible for the observed cytotoxic activity.

The research team gratefully acknowledges the valuable contributions, expertise, and institutional support provided by all collaborators and participating institutions throughout the study.

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Message from FBDGs

FBDG -4

" EAT FISH OR EGG OR LEAN MEAT WITH PULSES AT EVERY MEAL"









Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook Nutrition Division, Ministry of Health

Can High Blood Sugar Increase Cancer Risk? What You Need to Know?



Blood glucose levels are normally maintained within a narrow range through a process known as glucose homeostasis, which balances glucose production, storage, utilization, and hormonal regulation. Hyperglycemia, or elevated blood glucose levels, occurs when this balance is disrupted, leading to persistently high blood sugar concentrations. While hyperglycemia is commonly associated with diabetes, growing evidence suggests that it may also contribute to the development and progression of certain cancers. Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. Research indicates that hyperglycemia can create a favorable environment for cancer development by supplying excess energy to rapidly growing cancer cells. Studies have linked uncontrolled blood sugar levels to an increased risk of several cancers, particularly pancreatic, breast, and endometrial cancers. Factors such as insulin resistance, abnormal glucose metabolism, oxidative stress, and obesity further strengthen this association. Therefore, maintaining healthy blood glucose levels may play an important role not only in preventing diabetes-related complications but also in reducing cancer risk.





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How Uncontrolled Blood Sugar May Increase the Risk of Certain Cancers

Pancreatic Cancer

People with diabetes have a significantly higher risk of developing pancreatic cancer. Studies have shown that many pancreatic cancer patients experience glucose intolerance or diabetes, suggesting a strong relationship between elevated blood sugar levels and the disease. Increased blood glucose and free fatty acid levels may create conditions that support cancer growth and progression.

Breast Cancer

Hyperglycemia has been identified as an important risk factor for breast cancer progression. Abnormal glucose metabolism, elevated insulin levels, and oxidative stress can create a biological environment that favors the growth and spread of breast cancer cells. Although high blood sugar does not directly cause breast cancer, it may contribute to conditions that promote tumor development.

Endometrial Cancer

Poor blood sugar control has also been associated with an increased risk of endometrial cancer. Factors such as obesity, diabetes, and insulin resistance contribute to the development of this cancer. These findings highlight the importance of maintaining healthy blood glucose levels, particularly among women at risk.

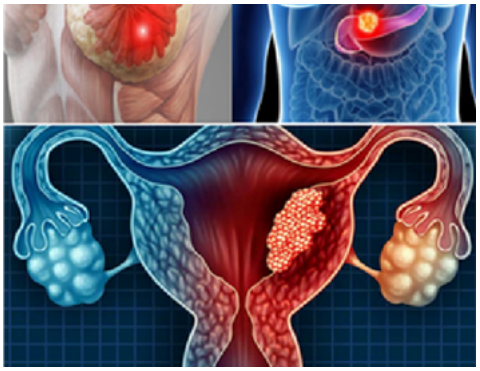


Table 1. Evidence from Research :

1.Pancreatic Cancer and High Blood Sugar Patient Studies (Clinical Evidence)	In a study of 105 pancreatic cancer patients, those with high blood sugar showed: larger tumor size, Increased lymph node metastasis, faster disease progression
Cell Line Studies	Pancreatic cancer cells exposed to high glucose showed: Increased cell growth Enhanced invasion ability
Mouse/Animal Models	High glucose conditions in animal models led to: Increased tumor growth, Greater metastatic spread
Overall Effect	Hyperglycemia may also suppress immune function, allowing more aggressive tumor behavior.
2. Breast Cancer and High Blood Sugar Patient-Based & Clinical Observations	Clinical studies suggest that hyperglycemia is associated with: Faster tumor progression Increased inflammatory response
Cell Line Studies	High glucose exposure leads to: Increased cancer cell proliferation Higher oxidative stress Enhanced angiogenesis (blood vessel formation)
Mouse/Animal Models	Animal studies show: Accelerated tumor growth Increased tumor vascularization
Additional Finding	Animal studies show: Accelerated tumor growth Increased tumor vascularization Additional Finding Hyperglycemia reduces the effectiveness of certain Breast cancer treatments
3. Endometrial Cancer and High Blood Sugar Patient Studies (Large Population Data)	A study of 88,107 postmenopausal women found: Diabetes is linked with increased risk of endometrial cancer
	Meta-Analysis (Multiple Patient Studies) Review of 22 studies (7,698 cases) showed: Women with diabetes have a significantly higher risk of developing endometrial cancer
	Cell Line Studies High glucose conditions cause: Increased cell growth Enhanced migration and invasion

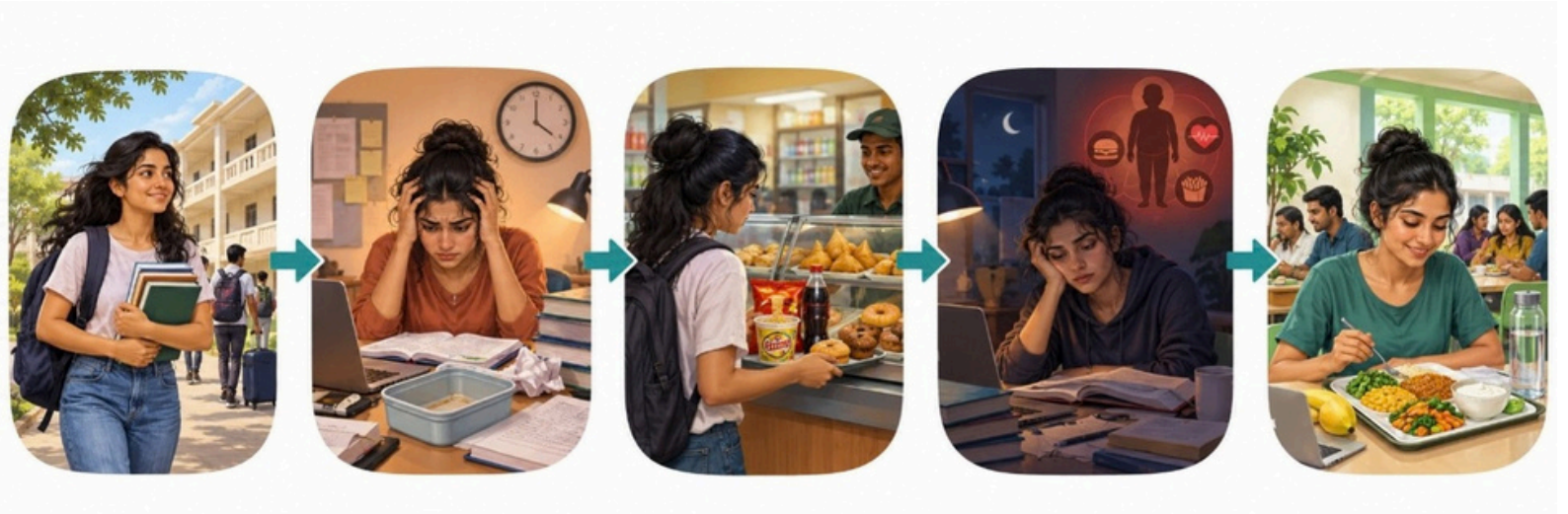
Conclusion

Evidence from clinical studies, population data, and experimental models suggests that hyperglycemia may contribute to the development and progression of certain cancers, including pancreatic, breast, and endometrial cancers. Patients with elevated blood glucose levels often show more aggressive disease features, while cell and animal studies confirm that high glucose promotes cancer cell growth, invasion, and metastasis. Although high blood sugar does not directly cause cancer, it appears to create a biological environment that supports tumor development through mechanisms such as insulin resistance, inflammation, oxidative stress, and altered metabolism. Therefore, maintaining normal blood glucose levels may play an important role in reducing cancer risk and limiting disease progression.

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The Hungry Mind Paradox: Why Educated Students Still Need Better Food Choices

When academic ambition meets limited time, limited money, and limited food options, healthy eating can become one of the first sacrifices. Universities have an important role in ensuring that student success is supported by affordable and nourishing food.



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A university education is often seen as a pathway to knowledge, opportunity, and a brighter future. Students learn to analyze and solve complex problems, communicate professionally, and make informed decisions in their fields. Yet, for many undergraduates and postgraduates, one very basic part of life becomes difficult to manage after entering university: that is "eating well".

This is not because students are unaware of the importance of nutrition. Many of them know the importance of balanced meals, as primary and secondary educations are given plenty of knowledge in this field. However, knowledge alone does not always lead to healthy practice. A student who leaves home for higher education enters a new food environment shaped by time pressure, academic workload, accommodation conditions, cost, convenience, and the food available on or near campus.

For many students, especially those living far away from home, the university canteen or nearby food outlets become the main source of daily meals. During busy semesters, assignments, practical sessions, examinations, clinical placements, laboratory work, and part-time employment can make food planning feel impossible. A packet of short eats, instant noodles, a sweetened drink, a pastry, or a fast-food meal may appear to be the easiest solution. These choices are quick, affordable in the short term, and readily available. Unfortunately, when such choices become routine, they may gradually shape unhealthy food patterns and lifestyle habits that continue well beyond university life.

This is the **"hungry mind paradox": students are working hard to build their intellectual future, but the food environment around them may make it difficult to protect their physical future.**



Moving away from home changes more than an address

Home food environments often provide a structure that students do not fully recognize until they leave. Meals may be prepared by parents or guardians. Rice, vegetables, pulses, fish, eggs, fruit, curd, milk, or home-cooked snacks may be available as part of everyday life. Mealtimes may be regular, and family members may encourage students to eat.

Once students move into hostels, boarding places, rented rooms, or shared accommodation, this structure can change abruptly. Some may have no access to cooking facilities. Others may have a shared kitchen but lack time, refrigeration, equipment, or money to buy and prepare food regularly. Postgraduate students may additionally balance research deadlines, teaching responsibilities, or family duties. As a result, meals may become irregular. Breakfast is often skipped. Lunch may be delayed because of practical classes or queues at the canteen. Evening meals may be replaced by bakery products, instant food, fried snacks, or food delivery because students are studying late or feel too tired to cook. As a result, meals may become irregular.

Academic stress can shape food choices

University life can be exciting, but it can also be emotionally and academically demanding. Examinations, deadlines, competition, financial pressures, homesickness, lack of sleep, and uncertainty about the future may contribute to stress. Stress does not affect everyone in the same way. Some students lose their appetite while others eat more frequently or crave foods that are sweet, salty, fried, or highly palatable.

During examination periods, students may depend heavily on tea or coffee, sweetened beverages, energy drinks, biscuits, instant noodles, and fast foods. These foods may provide a quick sense of energy or comfort, but they do not always provide sustained nourishment. A meal pattern based mainly on refined carbohydrates and sugary foods may lead to fluctuations in energy and concentration. Skipping meals may cause headaches, fatigue, irritability, poor attention, or overeating later in the day.

Nutrition should not be presented as a magical solution to academic stress. A balanced meal cannot remove the pressure of an examination or a research deadline. However, regular nourishing meals can support energy levels, hydration, concentration, mood, sleep, and general wellbeing. Food is one part of a wider student support system that should also include adequate rest, physical activity, social support, counselling services, and realistic academic planning.

The long-term cost of short-term convenience

A student may feel that eating habits during university are temporary: “I will eat properly after graduation,” or “I will improve my lifestyle once I get a job.” However, habits formed during young adulthood can become deeply established and can continue into professional life. The concern is not about one occasional fast-food meal or one missed breakfast; rather, the concern is about repeated patterns that gradually become normal.

A poor diet with high salt, added sugar, and ultra-processed foods may increase future risk of being overweight and obese, hypertension, type 2 diabetes, cardiovascular and liver disease, and other diet-related health conditions. Students are not protected from these risks simply because they are young, educated, or academically successful. In fact, students in demanding programmes may be particularly vulnerable to prolonged sitting, late-night studying, irregular meals, inadequate sleep, and dependence on convenience foods.

Healthy eating should not be a privilege

One of the most important issues is affordability. Healthy foods are often described as expensive, while fried snacks and highly processed foods are assumed to be cheaper. In reality, nutritious choices can be affordable when food services plan well, use local ingredients, reduce waste, and make healthier items consistently available.

Sri Lanka has many nutritious, locally available foods that can be adapted for student meals and snacks. These include chickpeas, cowpea, green gram, boiled maize, kurakkan-based preparations, whole-grain roti, vegetables, leafy greens, fruit, curd, unsweetened yoghurt, eggs, fish, peanuts, sesame, manioc, sweet potato, and other yams. A healthy snack does not have to be expensive, imported, or fashionable. It needs to be appealing, safe, filling, reasonably priced, and easy to eat between classes.



A call for healthier campuses - University canteens are part of the learning environment

University canteens are not merely food outlets. They directly influence students’ daily food choices. When healthy options are expensive, unattractive or unavailable, students are likely to choose the more convenient alternatives. Hence, similar attention should be given to university canteens as to lecture halls, laboratories, libraries, digital learning platforms, and research facilities.

Further, universities should use the canteen as a practical space for nutrition education. Clear notices, posters, menu labels, and brief messages can explain the benefits of healthier food choices, such as improved energy, concentration, and long-term health. This will help students from all disciplines, including business, IT, engineering, and health sciences, to make more informed food choices in their daily university life.



Healthy campus food is not a luxury. It is an investment in student wellbeing, academic engagement, and long-term health. The solution is not to lecture students about healthy eating but to provide a few practical alternatives in making nutritious, affordable, appealing food available for students when needed.

What students can do

Sri Lanka needs graduates who are knowledgeable, creative, productive, and healthy. Students do not need to follow a perfect diet. Small, realistic changes can make a difference. They can carry a simple snack such as fruits, boiled vegetables, chickpeas, peanuts, or curd for long days. They can try to avoid skipping breakfast regularly, choose water more often than sweetened beverages, include a source of protein in their daily diet and also add colour to their meals by choosing vegetables and greens as part of a healthy lifestyle.

Most importantly, students should avoid "all-or-nothing" thinking. An occasional fast-food meal does not make a person unhealthy. What matters is the overall pattern of food choices over time.



Message from FBDGs

FBDG -5

"HAVE FRESH MILK OR ITS FERMENTED PRODUCTS"

- **Drink fresh milk**
- **Eat fermented milk products such as curd and yoghurt**



FBDG -7

"EAT A HANDFUL OF NUTS OR OILY SEEDS DAILY"

- **Nuts such as peanuts, cashew, as well as oily seeds such as gingelly, pumpkin seeds give you healthy fat**



Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook Nutrition Division, Ministry of Health



Nutritional Strategies for Optimizing Injury Recovery in Athletes





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Fueling the body to repair, rebuild, and return to sport

Injury is not simply a physical problem. It is a physiological challenge that places increased demands on the body. When an athlete sustains a muscle, tendon, ligament, or bone injury, the body immediately begins a complex process of inflammation, tissue repair, remodelling, and restoration of function. Rehabilitation exercises provide the mechanical stimulus required for recovery, but nutrition provides many of the substrates and energy needed to support these processes For this reason, nutrition should be considered an integral component of sports injury rehabilitation rather than an optional addition to physiotherapy or strength and conditioning. Adequate energy, protein, carbohydrate, micronutrients, fluids, and appropriately selected foods can help preserve lean tissue, support tissue synthesis, maintain immune function, and facilitate participation in rehabilitation. Conversely, inadequate nutritional intake, particularly inadequate energy availability, may compromise recovery and increase the risk of prolonged injury or recurrent injury (Close et al., 2019; Giraldo-Vallejo et al., 2023).

Why does nutrition matter during injury?

The nutritional requirements of an injured athlete differ from those of an athlete who is training normally. Although physical activity may be temporarily reduced, the physiological demands of healing remain substantial. Following injury, the body increases protein turnover and initiates inflammatory and regenerative processes. Depending on the injury and rehabilitation stage, this may involve synthesis of new collagen, muscle proteins, bone matrix, extracellular matrix components, and other structural tissues.

One of the most common mistakes during rehabilitation is substantially reducing food intake because training volume has decreased. Athletes may think that consuming fewer calories is appropriate because they are no longer exercising at their normal intensity. However, excessive energy restriction can interfere with tissue repair and promote loss of skeletal muscle.

Energy availability is particularly important. Low energy availability occurs when dietary energy intake is insufficient relative to the energy required for exercise and normal physiological function. Persistent low energy availability is associated with a broad range of health and performance consequences and is a major component of Relative Energy Deficiency in Sport (REDs) (Mountjoy et al., 2023). Therefore, injured athletes should avoid unnecessary dietary restriction and instead aim for an individualized energy intake that supports both reduced activity and the metabolic demands of recovery.



Proteins: The building block of recovery

Protein is arguably the most important macronutrient to consider during injury rehabilitation. Amino acids derived from dietary protein provide the substrates required for muscle protein synthesis and the formation and remodelling of connective tissues.

Immobilization or substantial reductions in physical activity can produce muscle atrophy. At the same time, the injured athlete may experience reduced sensitivity of skeletal muscle to anabolic stimuli. Consequently, maintaining an adequate protein intake becomes particularly important when normal training is interrupted.

For healthy exercising individuals, a daily protein intake of approximately 1.4–2.0 g/kg body mass/day is generally considered sufficient to support adaptation to exercise (Jäger et al., 2017). During injury rehabilitation, the athlete's requirements should be individualized according to body composition, injury severity, rehabilitation demands, energy intake, and the amount of muscle mass at risk.

Rather than consuming most protein in a single meal, distributing protein throughout the day may provide repeated stimulation of muscle protein synthesis. A practical strategy is to include a high-quality protein source at each major meal and snack. Approximately 20–40 g of high-quality protein per meal, or around 0.25–0.40 g/kg per feeding, can be used as a practical target for many athletes, depending on body size and total daily requirements (Jäger et al., 2017).

Good dietary sources include eggs, fish, chicken, lean meat, dairy products, soy, legumes, lentils, and other protein-rich foods. Protein supplements such as whey or plant-based protein powders may be useful when food intake is impractical, but they should complement rather than replace a balanced diet.

Importantly, protein alone cannot compensate for inadequate total energy intake. When an athlete is consuming insufficient calories, amino acids may be used as an energy source rather than being optimally directed toward tissue synthesis. Therefore, adequate energy intake and adequate protein intake must be considered together (Close et al., 2019).



Carbohydrates: More than an energy source

Carbohydrates are frequently reduced when an injured athlete stops or decreases training. However, eliminating or severely restricting carbohydrate intake is generally unnecessary.

Carbohydrates provide energy for rehabilitation sessions and support glycogen availability. They can also contribute to maintaining adequate total energy intake. During injury rehabilitation, carbohydrate requirements should be adjusted according to the athlete's activity level, but carbohydrates should remain part of a balanced diet.

Whole-food carbohydrate sources such as rice, oats, potatoes, whole-grain products, fruits, vegetables, and legumes can provide carbohydrates together with vitamins, minerals, fibre, and other bioactive compounds.

Carbohydrate intake may be particularly important when the athlete continues to perform resistance training, aerobic exercise, or sport-specific rehabilitation. As rehabilitation progresses and training volume increases, carbohydrate requirements should increase accordingly.

Healthy fats and the role of omega-3 fatty acids

Dietary fat is another important component of recovery. Fats provide energy and essential fatty acids and facilitate absorption of fat-soluble vitamins.

Sources of unsaturated fats, including fatty fish, nuts, seeds, avocado, olive oil, and other plant-based oils, can form part of a balanced recovery diet. Fatty fish such as salmon, sardines, and mackerel provide the omega-3 fatty acids EPA and DHA.

Omega-3 fatty acids have attracted considerable interest because of their potential effects on inflammation, muscle metabolism, and recovery. However, athletes should be cautious about interpreting these findings as evidence that high-dose supplementation will accelerate healing. The inflammatory response is not inherently harmful; it is an essential component of normal tissue repair. Therefore, the goal should not be to eliminate inflammation but to support an appropriate physiological response.

A food-first approach that provides a variety of unsaturated fats is generally preferable. Supplementation should be considered on an individual basis, particularly when dietary intake is inadequate.



Micronutrients: Small amounts, important functions

Although vitamins and minerals are required in relatively small quantities, deficiencies can negatively influence physiological processes relevant to injury recovery.

Vitamin D and calcium

Vitamin D and calcium are particularly important for athletes recovering from bone stress injuries or fractures. Calcium is required for bone mineralization, while vitamin D contributes to calcium homeostasis and skeletal health. Vitamin D also has roles in muscle function and immune regulation.

Athletes with inadequate sunlight exposure, restricted diets, or other risk factors may be vulnerable to vitamin D insufficiency. However, routine high-dose supplementation is not appropriate for everyone. Assessment and supplementation should be based on individual circumstances and, where indicated, clinical testing.

Iron

Iron is essential for oxygen transport, energy metabolism, and several cellular processes. Iron deficiency can negatively affect exercise capacity and recovery, particularly in athletes with high physiological demands.

Athletes who experience persistent fatigue, reduced exercise tolerance, or other symptoms associated with possible iron deficiency should seek appropriate medical assessment rather than beginning high-dose iron supplementation without confirmation of deficiency.



Vitamin C and other antioxidant nutrients

Vitamin C is involved in collagen synthesis and therefore has a biologically plausible role in connective tissue repair. Fruits and vegetables provide vitamin C together with numerous other compounds involved in normal physiological function.

However, more is not necessarily better. High-dose antioxidant supplementation may interfere with some exercise-induced cellular adaptations, and evidence does not support indiscriminate use of large doses of antioxidant supplements. A diet rich in fruits and vegetables is generally the preferred strategy.

Recent reviews of nutritional strategies during musculoskeletal rehabilitation highlight the importance of adequate energy, protein, carbohydrate, and micronutrient intake rather than relying on a single nutrient or supplement (Giraldo-Vallejo et al., 2023).



Collagen and connective-tissue recovery

Collagen supplementation has received increasing attention in sports nutrition, particularly in relation to tendon and ligament health. Collagen and gelatin provide amino acids, including glycine and proline, that are relevant to collagen structure. Some research suggests that collagen or gelatin supplementation, particularly when combined with vitamin C and appropriate mechanical loading, may influence markers associated with collagen synthesis or joint-related outcomes. However, the evidence remains less conclusive than the evidence supporting adequate energy and protein intake.

A 2024 systematic review and meta-analysis reported potentially beneficial effects of collagen peptide supplementation in areas including joint function, pain, and aspects of recovery, although findings were not uniformly positive and the optimal dose and timing remain uncertain (Bischof et al., 2024).

Therefore, collagen should be viewed as a potential adjunct to rehabilitation rather than a replacement for rehabilitation. Tendons and ligaments require progressive mechanical loading to stimulate appropriate adaptation. Nutrition can support this process, but supplementation cannot substitute for a well-designed rehabilitation programme.



Hydration: An often-overlooked component

Hydration is another important part of injury recovery. Adequate fluid intake supports blood volume, cardiovascular function, temperature regulation, nutrient transport, and normal physiological processes.

Athletes recovering from injury may underestimate their hydration requirements because they are training less. However, hydration remains relevant during rehabilitation, particularly when sessions are performed in hot and humid environments.

Fluid requirements vary according to body size, environmental conditions, sweat rate, exercise duration, and dietary intake. When substantial fluid losses occur, sodium replacement can also become important. The International Olympic Committee's consensus recommendations emphasize that recovery from exercise-induced fluid losses involves not only water but also appropriate sodium, carbohydrate, and protein intake (Racinais et al., 2023).

A practical strategy is to monitor changes in body mass around training sessions and to develop individualized hydration strategies rather than relying solely on thirst.



Should athletes continue taking supplements?

Although the sports supplement industry is extensive and offers a wide range of products marketed to support athletic performance and recovery, supplementation should not serve as the foundation of an injury recovery programme. Optimal recovery primarily depends on meeting fundamental nutritional requirements, including adequate total energy availability, sufficient high-quality protein intake to support tissue repair and muscle protein synthesis, appropriate carbohydrate intake to replenish glycogen stores and meet metabolic demands, and adequate intake of essential micronutrients involved in immune function, collagen synthesis, bone health, and other physiological processes. In addition, maintaining sufficient hydration and electrolyte balance is essential for supporting cellular function and overall recovery. These nutritional requirements should be achieved through a varied and nutrient-dense diet that provides a broad spectrum of essential nutrients. Only when these fundamental nutritional needs are adequately addressed should specific dietary supplements be considered, preferably based on individual requirements and supported by scientific evidence.

The International Olympic Committee has emphasized that supplements should undergo a risk–benefit assessment because evidence of efficacy varies considerably between products. In addition, contamination of supplements with prohibited substances represents an important concern for competitive athletes subject to anti-doping regulations (Maughan et al., 2018). Therefore, athletes should avoid purchasing products simply because they are marketed as “recovery boosters,” “anti-inflammatory,” or “muscle healing” supplements.



Nutrition through different stages of rehabilitation

Nutrition should change as the athlete progresses through rehabilitation.

Acute stage

Immediately following injury, the priority is to maintain adequate energy and protein intake while supporting normal physiological processes. Extreme calorie restriction should be avoided. Meals should include high-quality protein, vegetables and fruits, appropriate carbohydrate sources, healthy fats, and adequate fluids.

Rehabilitation Stage

As structured exercise begins, protein distribution becomes increasingly important. Adequate carbohydrate should be provided around rehabilitation sessions, especially when exercise volume increases. The athlete should maintain sufficient energy availability to support both healing and physical activity.

Return-to-Sport Stage

As the athlete returns to sport-specific training, nutritional requirements progressively approach or may exceed pre-injury requirements. Carbohydrate availability becomes increasingly important as training intensity and duration increase, while adequate protein continues to support muscle repair and adaptation.

Nutrition should therefore be periodized alongside rehabilitation and training, rather than remaining static throughout the recovery process.

The Bigger Picture: Nutrition and rehabilitation

The strongest approach to sports injury recovery is multidisciplinary. Physiotherapists, sports physicians, strength and conditioning professionals, sports dietitians, coaches, and athletes should work together to individualize the rehabilitation process. Nutrition should be aligned with the type of injury, rehabilitation stage, training load, body composition goals, dietary preferences, and medical considerations. Evidence from the sports nutrition literature indicates that nutritional strategies can support rehabilitation, but they should be understood as part of a larger recovery system rather than isolated treatments (Close et al., 2019; Giraldo-Vallejo et al., 2023). Ultimately, food does not replace physiotherapy—but good nutrition can help the body respond to physiotherapy more effectively.

Key Take-Home Messages

- Do not dramatically reduce food intake simply because training has decreased.
- Maintain adequate energy availability throughout rehabilitation.
- Prioritize sufficient high-quality protein distributed across the day.
- Keep carbohydrates in the diet and adjust intake according to rehabilitation and training demands.
- Choose nutrient-dense foods rich in vitamins, minerals, and antioxidants.
- Pay particular attention to vitamin D, calcium, iron, and other micronutrients when deficiency is suspected.
- Stay adequately hydrated and replace electrolytes when necessary.
- Collagen may have a supportive role in connective-tissue rehabilitation, but evidence is still developing.
- Do not rely on supplements as a substitute for a balanced diet.
- Coordinate nutrition with physiotherapy, progressive loading, adequate sleep, and appropriate training.

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Acetic Acid and Human Metabolism: Can Vinegar Support Blood Sugar and Lipid Health?



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Vinegar has been used in food and folk medicine for thousands of years, but modern research is now uncovering why it may matter for metabolic health. Its principal organic acid is acetic acid, and it is emerging as a promising dietary compound that can help temper blood sugar spikes and nudge the body toward burning fat rather than storing it. Here is what the evidence tells us.

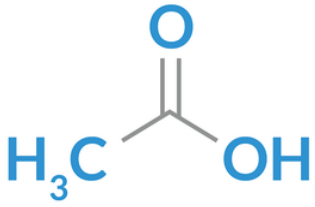
Why metabolic health matters?

The global burden of metabolic disease has reached unprecedented levels. Type 2 diabetes mellitus (T2DM) affects hundreds of millions of adults worldwide, and obesity impacts more than one billion people. Furthermore, non-alcoholic fatty liver disease has become the most prevalent chronic liver disorder, mainly in high-income countries. These conditions share a common root in insulin resistance and together place enormous strain on health systems. As they continue to rise, there is an urgent need for accessible, low-cost strategies that can improve blood glucose control and lipid balance.

Alongside medicines and lifestyle changes, dietary bioactive compounds have drawn attention for their ability to influence metabolic risk through real physiological mechanisms while remaining widely available. Acetic acid is the main organic acid in vinegar, and it has a long history of use in ancient Egyptian, Greek, and Chinese traditions. Furthermore, it has reported effects on glucose regulation and lipid metabolism.

What acetic acid is, and what it does in the body?

Acetic acid (CH_3COOH) is a short-chain carboxylic acid that shifts, depending on pH, between a membrane-permeable form and its acetate anion. Once absorbed, it is rapidly converted to acetyl-CoA by acyl-CoA short-chain synthetases. This conversion raises the intracellular AMP-to-ATP ratio and switches on AMP-activated protein kinase (AMPK). Through AMPK, acetate can influence how the liver makes fat, burns fatty acids, and produces glucose (Moffett et al., 2020; Chen et al., 2016).



Vinegar typically contains 2–5% acetic acid at a pH of about 2.6 to 3.2. Acetic acid is absorbed more quickly from a vinegar solution than when it is locked within plant cell structures, because there is no physical barrier to diffusion. Absorbed acetate then travels through the portal circulation to tissues throughout the body (Moffett et al., 2020).

Effect 1: Steadier blood sugar

Digesting carbohydrate is a multi-step process: salivary and pancreatic α-amylase break starch into smaller sugars, brush-border disaccharidases in the intestine split these into absorbable units, and glucose is then taken up across the gut lining. Acetic acid interferes with this chain at several points.



Slowing the digestive enzymes

Pancreatic α-amylase works best at neutral to alkaline pH, and a drop below 4.0 is enough to inactivate it, exactly the acidic environment vinegar creates in a carbohydrate-rich meal. In one study, seven vinegar types (apple cider, balsamic, brown rice, distilled white, malt, nipah palm, and red wine) showed concentration-dependent inhibition of α-amylase, α-glucosidase, and pancreatic lipase. Interestingly, acetic acid content correlated only weakly with amylase inhibition, suggesting that co-occurring compounds such as phenolic acids act synergistically with it. All the vinegars also inhibited pancreatic lipase, the enzyme responsible for breaking down up to 70% of dietary fat, connecting these effects to lipid and body-weight regulation (Yasmin et al., 2021).

Slowing stomach emptying

A second, distinct pathway is the delay of gastric emptying, which extends the time carbohydrates are exposed to digestion and flattens the post-meal glucose curve. Bread enriched with a related organic acid delayed gastric emptying and cut the post-meal glucose response by roughly 37% and the insulin response by about 40%, while also increasing satiety (Liljeberg & Björck, 1996). Adding 1.68 g of acetic acid to a meal raised satiety and lowered blood glucose early after eating, with the effect strongest alongside cinnamon, though the response depended on the food matrix (Mettler et al., 2009).

The clinical bottom line

Taking about two teaspoons of vinegar with a complex-carbohydrate meal has been reported to reduce post-meal blood glucose by around 20% in healthy adults. The effect is greatest with starchy foods such as bread, rice, and potato dishes, and is more reliable when vinegar is taken before or with the meal rather than afterward, because the acid needs to be present while carbohydrate is actively being digested (Santos et al., 2019).

Effect 2: A shift in fat metabolism

In the liver, converting acetate to acetyl-CoA raises the AMP/ATP ratio and activates AMPK. Once active, AMPK works through two complementary arms. It upregulates PPARα, boosting the machinery of fatty acid oxidation, and it suppresses the lipogenic regulators SREBP-1c and ChREBP while directly switching off acetyl-CoA carboxylase, the committed first step of fat synthesis. In hepatocyte studies, acetate raised the AMP/ATP ratio several-fold and cut intracellular triglyceride content by up to 35% (Li et al., 2013).

Animal and human evidence supports this picture: plasma acetate levels reached after drinking vinegar appear sufficient to activate AMPK in the liver, helping reduce body fat and serum triglycerides (Kondo et al., 2009). The net result across these mechanisms is lower liver and circulating triglycerides, less expansion of fat tissue, and a shift toward a more fat-burning, less fat-storing state. These lipid benefits are most reliable at roughly 15 to 30 mL of vinegar per day over eight weeks or longer.



What does this mean clinically?

Type 2 diabetes

Pooled analyses report clinically meaningful reductions in fasting blood glucose and HbA1c, with each 1 mL/day increment of apple cider vinegar linked to about a 1.255 mg/dL fall in fasting glucose, with effects most pronounced above 10 mL/day and over eight weeks or more (Arjmandfard et al., 2025; Valdes et al., 2021). Vinegar has been shown to enhance the glucose-lowering effect of metformin without replacing it (Abid et al., 2020), and benefit appears greatest in people with higher baseline glucose.

Obesity and metabolic syndrome

The strongest human evidence comes from a double-blind, placebo-controlled trial in obese adults, where daily acetic acid significantly and dose-dependently reduced body weight, BMI, visceral fat, waist circumference, and triglycerides (Kondo et al., 2009). A separate trial in adults with metabolic syndrome reported improvements across several components at once, including glucose, cholesterol, and blood pressure (Aslam et al., 2021).

Cardiovascular risk

Vinegar taken before a meal tripled forearm muscle blood flow, raised skeletal-muscle glucose uptake by 35%, lowered post-meal insulin by 33%, and reduced post-meal triglycerides by 48% in people with impaired glucose tolerance; changes linked to AMPK-dependent signalling (Mitrou et al., 2015). Preclinical work also points to reduced inflammatory markers and protection of cardiac tissue (Bounihi et al., 2017).

How to use it, based on the evidence?

- Take it with meals rich in complex carbohydrates such as bread, rice, or potato dishes.
- Consume it before or during the meal rather than afterward, so it is present while carbohydrates are being digested.
- For lipid and body-composition benefits, the evidence points to roughly 15–30 mL of vinegar per day sustained over eight weeks or more.

What we still do not know?

The evidence, while encouraging, comes with real caveats. Long-term human trials are almost absent; most studies run only four to twelve weeks, and improvements were seen to reverse within four weeks of stopping vinegar, hinting that continued use may be needed. Many trials carry a high or unclear risk of bias, partly because vinegar's distinctive taste and smell make proper blinding difficult. No trial has measured plasma acetate, so the link between the dose consumed and the acetate actually reaching tissues remains uncharacterized. Much of the mechanistic detail comes from animal and cell models rather than human tissue; it is not fully clear whether whole vinegar (with its phenolic compounds) outperforms pure acetic acid, and most participants have been from a narrow set of populations, chiefly Iranian and Japanese.

The key takeaway

Dietary acetic acid acts through coherent, mutually reinforcing mechanisms: it slows carbohydrate-digesting enzymes and gastric emptying to blunt post-meal glucose, and it activates AMPK to shift the liver away from making fat and toward burning it. Clinically, this translates into reproducible reductions in fasting glucose, HbA1c, triglycerides, total cholesterol, body weight, and visceral fat, with the firmest evidence for glucose control in type 2 diabetes and for body composition in obesity. Vinegar is best seen as a physiologically rational, low-cost adjunct, not a replacement for established metabolic health strategies. Confirming its long-term value will require larger, longer, and more diverse randomized controlled trials.



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Ultra-Processed Foods





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For years, it was thought that UPFs simply correlated with poor health because they were often higher in calories, sugar,and fat. However,modern research shows that even when you account for calories and macronutrients, the excessive consumption of UPFs independently increases disease risk.



Understanding Ultra-Processed Foods

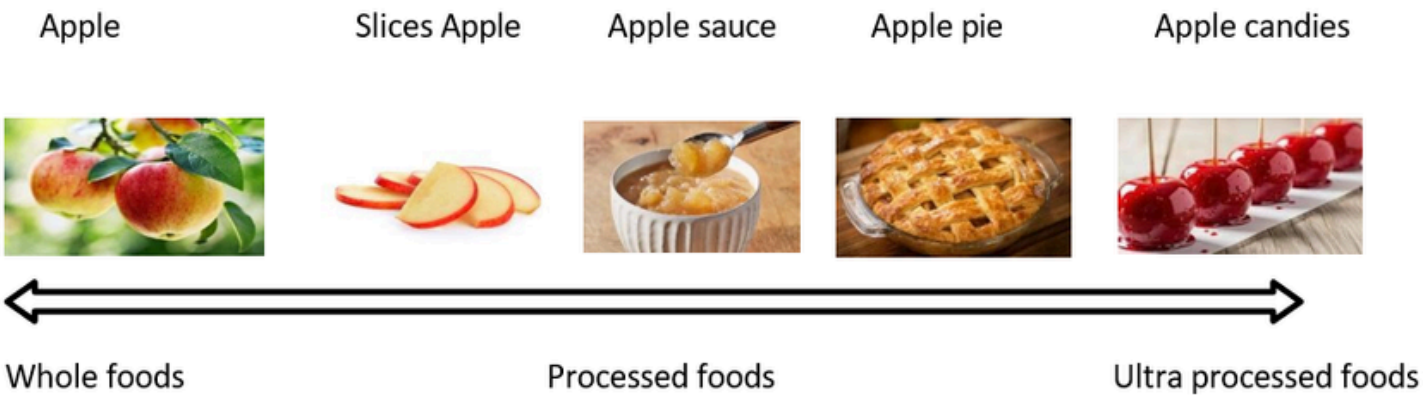
Ultra-processed foods (UPFs) refer to a specific category of industrially produced products that have undergone extensive modification from their original state. While almost all food is processed in some way, such as freezing, pasteurizing, or canning, ultra-processed foods are operationally distinct becausethey are primarily made from substances extracted from foods (like fats, starches, and proteins) rather than the whole foods themselves.

The Nova Classification System

The Nova classification, which was designed by researchers at the University of SãoPaulo, is the most extensively utilized framework for determining foods based on the extent of industrial processing they undergo. This system structures edible substances into four differentiated categories: unprocessed or minimally processed foods, which are whole foods like fresh fruits, vegetables, eggs, and meat; processed culinary foods, such as oils, butter, sugar, and salt, which are derived from natureto season and cook Group 1 foods;processed foods, which are simpleproducts like cannedvegetables, cheese, and freshly baked bread made by addingculinary ingredients to whole foods; and ultra-processed foods,defined as industrial formulations typically containing five or more ingredients.

These ultra-processed products often include substances rarely used in home kitchens, such as emulsifiers, flavorings, and colorants, and are engineered to be hyper-palatable and highly profitable.

Food processing is a spectrum



Why They Are Harmful to Health?

Ultra-processed foods are oftendescribed as "predigested" because industrial processing changes the food structure, which causes the body to absorb them significantly and leads to quick spikes and drops in bloodsugar. These food productsare typically high in sodium,added sugars, and saturatedfats while beingdepleted of essential nutrients like fiber,vitamins, and minerals.A comprehensive "umbrella review" published in The BMJ found consistent evidence connecting high consumption of these foods to 32 different adverse health Impacts. The evidence was particularly strong for mortality, comprising higher risks of all-cause and heart disease-related death; cardiometabolic health, with significant associations with obesity, type 2 diabetes, and high blood pressure; mental health, showing convincing links to anxiety and common mental disorders as well as highly suggestive links to depression; and an increased risk of cancers,specifically colorectal and breast cancers.

How to Identify and Limit Ultra-Processed Foods

To reduce your intake of ultra-processed foods, wellness experts recommend several practical strategies, starting with reading the ingredients label to identify long lists of additives, chemical names, or unpronounceable words that would not typicallybe found in a home kitchen. Another useful clue is the "best if used by" date, as products with shelf lives extended for years often contain industrial preservatives indicating they are ultra-processed. When shopping, focusing on the perimeter of the grocery store can help you find more unprocessed whole foods. You can also make nutritious swaps, such as replacing soda with water or unsweetened tea, choosing plain oats or whole-grain cereals over sweetened varieties, and opting for fresh fruit instead of packaged desserts. Finally, preparing meals from scratch at home is one of the most effective ways to limit cosmetic additives and ensure you know exactly what is going into your food.

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Traditional Siddha Dietary Practices: Ancient Wisdom for Modern Healthy Living



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Can Our Traditional Food Wisdom Help Us Stay Healthy?

Diabetes, hypertension, obesity, cardiovascular diseases and other noncommunicable diseases (NCDs) are becoming increasingly important health challenges worldwide. Changes in dietary patterns, increased consumption of processed foods, excessive intake of refined carbohydrates, and sedentary lifestyles have contributed to this growing burden.
At the same time, there is increasing interest in preventive nutrition—using everyday food choices and lifestyle practices to maintain health and reduce disease risk.

Interestingly, many principles of healthy living can be found within our own traditional food culture. Siddha medicine has long emphasized the close relationship between food, lifestyle and health. The well-known principle "Unavae Marunthu, Marunthae Unavu" Food is Medicine, Medicine is Food—emphasizes that food is not merely a source of nutrients but also an important factor in maintaining health and preventing disease.



According to Siddha principles, inappropriate food habits may disturb the balance of Vatham, Pitham and Kabam, collectively referred to as the Uyir Thathukkal. Therefore, traditional dietary recommendations consider not only what we eat, but also how much we eat, how food is prepared, when we eat, and whether a particular food is appropriate for the individual and season.
Modern nutrition and scientific research now provide opportunities to explore these traditional practices using contemporary evidence.

Six Traditional Practices with Modern Relevance

A review of selected classical Siddha texts together with scientific literature identified several dietary practices that may have relevance to modern nutrition and preventive healthcare.

1.Choosing Food According to Individual and Seasonal Needs

Siddha dietary principles emphasize appropriate food selection according to food qualities, quantity, individual suitability and seasonal conditions.

Modern nutrition also recognizes that there is no single diet suitable for everyone. Nutritional requirements vary according to age, physiological condition, activity level and health status.
The traditional emphasis on moderation, suitability and variety therefore provides an interesting perspective for today's nutrition-conscious society.

Rather than asking only, "Is this food healthy?", we can also ask:
"Is this food appropriate for me, in this quantity, at this time?"

2. Cooking in Earthen Vessels

Cooking in traditional earthen vessels has been part of South Asian food culture for generations. Clay has distinctive thermal properties that allow relatively gradual and uniform heat distribution. This may help preserve moisture, flavour and some characteristics of cooked food compared with certain rapid, high-temperature cooking approaches However, this should not be interpreted as meaning that all food cooked in clay vessels is automatically healthier. The nutritional quality of a meal depends on the ingredients, cooking method, quantity and overall dietary pattern. Nevertheless, traditional cookware provides an interesting example of how food culture and food science can intersect.

3. Water Stored in Copper Vessels

Another traditional practice is storing drinking water in copper vessels. There is scientific interest in this practice because copper possesses antimicrobial properties. Copper ions can interfere with the survival of certain microorganisms. Experimental research has demonstrated reductions in some diarrhoeagenic bacteria following storage of water in copper vessels (Preethi Sudha et al., 2012).

This provides a fascinating example of a traditional practice for which a potential scientific mechanism has been demonstrated. However, copper vessel use should not replace safe water sources, sanitation or hygienic water-storage practices. Excessive copper exposure can also be harmful. Therefore, appropriate use is important.

4.Why Were Meals Traditionally Served on Banana Leaves?

For many Sri Lankans, serving a meal on a banana leaf is more than a cultural tradition—it is also an environmentally friendly practice.
Banana leaves contain naturally occurring phytochemicals, including polyphenolic compounds. Research has investigated their antioxidant properties, while the use of leaves as serving materials can also reduce dependence on disposable plates and other materials. But there is an important nutritional lesson here:

A banana leaf does not make an unhealthy meal healthy.
The major nutritional value comes from the foods placed on it.
The practice nevertheless reminds us that traditional food culture can incorporate cultural, environmental and potentially functional aspects at the same time.



5. Eating Behaviour: Slow Down and Be Mindful

Healthy eating is not only about what we eat.
Siddha dietary principles also give importance to eating behaviour. Traditional eating with the hands involves tactile interaction with food before consumption. Sensory experiences associated with eating—including sight, smell, taste and touch—can contribute to physiological preparation for food intake.
Similarly, sitting calmly while eating may encourage more controlled eating and greater awareness of the meal.
In today's busy lifestyle, many people eat while using mobile phones, watching television or working. This can make us less aware of how much and how quickly we are eating.

Perhaps one of the simplest traditional lessons we can rediscover is:
Sit down. Slow down. Pay attention to your food.
Mindful eating does not require expensive equipment, special foods or complicated diets.

6. Fermented Foods and the Gut

Traditional diets contain a variety of fermented foods, including curd and other fermented preparations.
Modern nutrition research has highlighted the relationship between fermented foods, microorganisms and the gastrointestinal system. Some fermented foods contain live microorganisms that may contribute to the diversity and function of the gut microbial community.

The gut microbiota is increasingly recognized as an important component of human health, with relationships to digestion, immune function and metabolism (Sonnenburg & Bäckhed, 2016).

However, not every fermented food should automatically be considered a probiotic food. The microorganisms, fermentation process, food composition and quantity consumed all influence potential effects.

Therefore, traditional fermented foods are valuable foods to investigate scientifically rather than foods to which unsupported health claims should be attached.

What About Ghee and Meal Sequence?

Traditional dietary practices also describe the appropriate use of foods such as ghee and the sequence in which foods may be consumed.

Dietary fat can influence gastric function, satiety and nutrient absorption. At the same time, the quantity of fat consumed remains important.
This reflects an important principle found in traditional dietary systems:

Balance is more important than excess.

Even foods that provide nutritional or physiological benefits need to be consumed in appropriate amounts according to individual needs.

Fasting: An Ancient Practice Under Modern Investigation

Fasting is another traditional practice that has attracted considerable attention in contemporary nutrition science.
Modern research into fasting and time-restricted eating has investigated possible effects on glucose regulation, insulin sensitivity, energy metabolism and inflammatory pathways (Longo & Panda, 2016).

However, fasting should not be viewed as a universally appropriate practice.
Individual health status, nutritional requirements, age, medications and physiological conditions must be considered. People with medical conditions or specific nutritional needs should seek appropriate professional advice before undertaking restrictive fasting practices.
Thus, traditional fasting provides an important research area, but scientific evidence and individual suitability should guide its application.

Does Science Support Traditional Siddha Dietary Practices?

The answer is not simply yes or no.
The scientific evidence varies considerably between practices.
Some traditional practices have experimental or observational evidence supporting possible mechanisms. For example, copper has demonstrated antimicrobial activity, fermented foods have become an important area of gut-microbiota research, and fasting is being investigated for its metabolic effects.
Other practices, particularly some Siddha-specific recommendations regarding food selection and seasonal dietary practices, have comparatively limited direct clinical evidence.
This distinction is important.
Traditional use is valuable—but traditional use alone does not prove clinical effectiveness.
Scientific research can help us understand which practices are beneficial, which require modification, and which need further investigation.

Bringing Tradition and Modern Nutrition Together

Traditional knowledge should not be viewed as a replacement for modern scientific evidence. Similarly, traditional practices should not be dismissed simply because they originated before modern scientific methods existed.

Instead, we can ask scientific questions about traditional practices:

- What is the biological mechanism?
- Does the practice produce measurable health benefits?
- For whom is it appropriate?
- What amount or duration is suitable?
- What are the potential risks?

Answering these questions requires collaboration among Siddha medicine, nutrition, food science, microbiology, physiology and clinical research.
Future research should include standardized methods, well-designed clinical studies and long-term evaluation of effectiveness and safety.

A Traditional Approach to a Modern Problem

Healthy eating does not always mean abandoning traditional foods and adopting unfamiliar dietary trends.
Sri Lankan food culture already includes many valuable practices: locally available foods, seasonal ingredients, traditional cooking methods, fermented foods and culturally familiar eating habits.
We can preserve the useful elements of this heritage while applying modern nutritional knowledge.

Some simple steps include:

- Choose a variety of minimally processed foods.
- Include adequate vegetables, fruits and dietary fibre.
- Maintain appropriate portion sizes.
- Limit excessive intake of highly processed foods and refined carbohydrates.
- Include suitable traditional fermented foods.
- Practise mindful eating.
- Maintain adequate physical activity.
- Consider individual nutritional requirements.
- Use traditional practices appropriately and safely.

From “Food is Medicine” to Preventive Nutrition
The Siddha principle “Unavae Marunthu, Marunthae Unavu” offers a powerful reminder that prevention can begin with everyday choices.
Traditional Siddha dietary practices bring together food selection, preparation, storage, meal timing, eating behaviour and lifestyle regulation. Several of these practices show compatibility with contemporary concepts such as functional nutrition, gut health, food safety and metabolic health.
At the same time, scientific evaluation is essential to distinguish practices supported by evidence from those that remain hypotheses or traditional knowledge.
Perhaps the most valuable lesson is not that every ancient practice has already been scientifically proven.
It is that our traditional food culture contains questions worth investigating and practices worth preserving where evidence supports them.

Ancient wisdom can provide the inspiration. Modern science can provide the evidence. Together, they can contribute to healthier and more sustainable living.



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Message from FBDGs

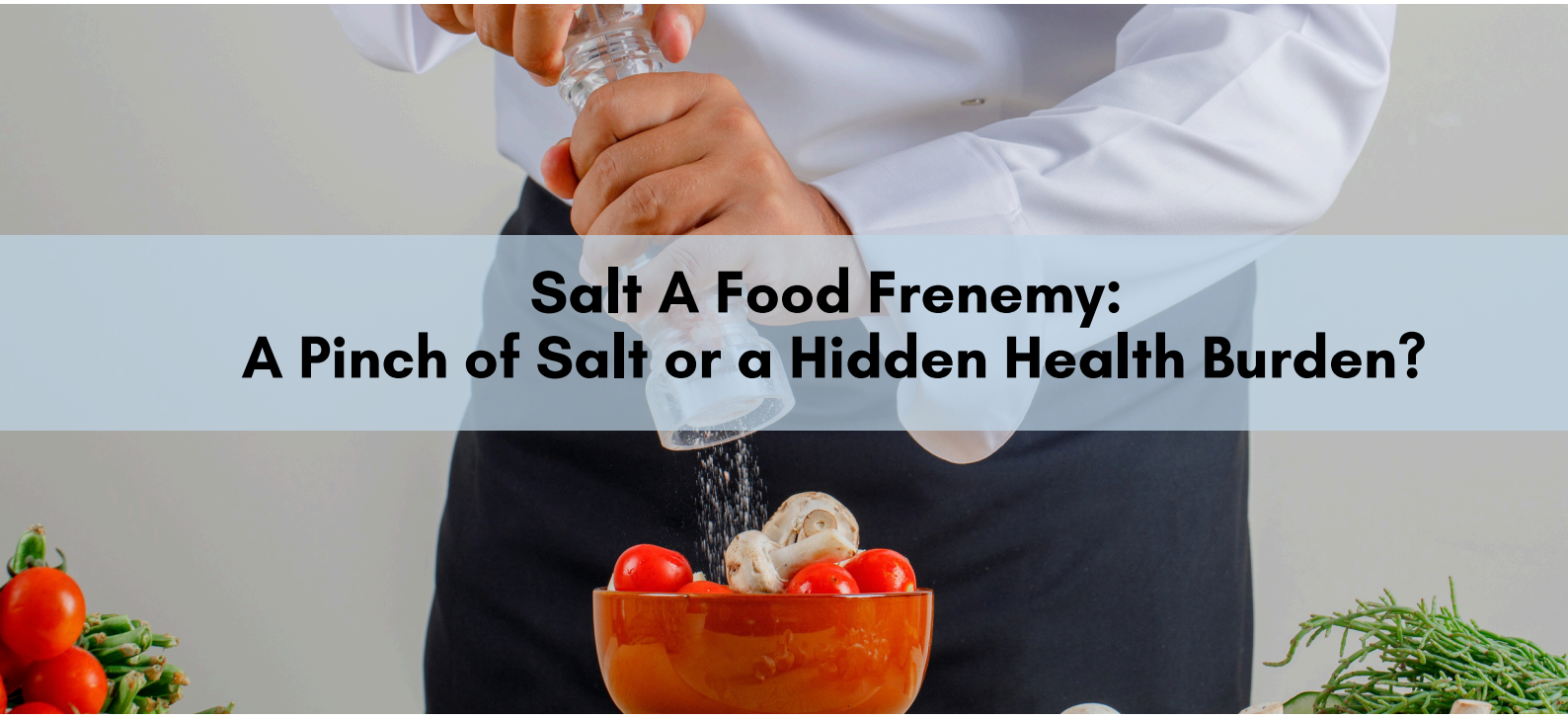
FBDG -9

"DRINK 8-10 GLASSES OF WATER DAILY TO KEEP YOUR BODY HYDRATED AND HEALTHY."

- **Water is the best drink to relieve the thirst.**
- **Water has an advantage over fruit juices, artificially sweetened soft drinks/carbonated drinks and sweetened dairy drinks as it has no calories.**



Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook
Nutrition Division, Ministry of Health



Salt A Food Frenemy: A Pinch of Salt or a Hidden Health Burden?



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Rushing to the nearest convenience store for a quick snack?

You browse through the instant-food aisle, picking up a packet of cassava chips, dry crackers, instant noodles and a bottle of ketchup. Nothing out of the ordinary, right? But what if this everyday combination is quietly adding far more sodium to your diet than you realise?

The salt shakeris not the only culprit; Much of the sodium in our diets is hidden in processed and packagedfoods, often without us noticing (World Health Organization, 2023).

Salt: essential, but not unlimited

Sodium, commonly consumed as salt, is an essential nutrientthat helps maintain fluid balance and supports nerve function (World Health Organization, 2023).

However, consuming more sodium than thebody needs can raise blood pressure and increase the risk of cardiovascular and other health conditions (World Health Organization, 2023). Non-communicable diseases (NCDs) are long-term conditions that are not transmitted from person to person and include conditions such as cardiovascular disease, kidney disease and certain cancers.



You browse through the instant-food aisle, picking up a packet of cassava chips, dry crackers, instant noodles and a bottle of ketchup. Nothing out of the ordinary, right? But what if this everyday combination is quietly adding far more sodium to your diet than you realise? The salt shaker is not the only culprit; much of the sodium in our diets is hidden in processed and packaged foods, often without us noticing (World Health Organization, 2023).



The salt shakerisn't the only source

A Sri Lankan study examining commonly consumed foods found substantial differences in sodium levels between products. High sodium concentrations were detected in foods such as potatochips, instant noodlesand pasta, processed meat, flavoured papadam, mixtures, sauces and dairy products (Jinadasa & Jayasinghe, 2018).

The amount of sodium can also vary between products within the same food category depending on the flavour, brand and manufacturer. For example, the study found differences between papadam varieties and between chicken ham and dried Maldivesfish (Jinadasa & Jayasinghe, 2018). This means that the food choice itself and the brand selected can influence sodium intake.

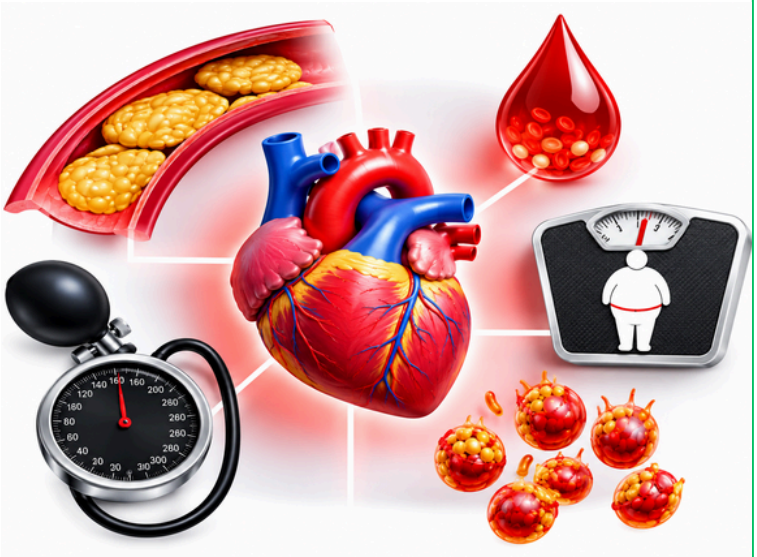
Processed foods: convenient, but at what cost?

Research conducted in Sri Lanka has highlighted the contribution of commonly consumed industrially processed foods, including bread, biscuits and dried fish, to dietary salt intake (Jayatissa et al., 2021). The research also examinedthe relationship between salt reduction and iodine intake, highlighting the need to balance sodium reduction with adequate iodine nutrition. Convenience may save time, but it can also make hidden sodium harder to notice.

NCDs: the bigger picture

NCDs place a substantial burden on individuals, families and health systems. Highsodium intake contributes to raised blood pressure, which is an important risk factor for cardiovascular disease, stroke and kidney disease(World Health Organization, 2023; Ghimire et al., 2021).

For countries such as Sri Lanka, the consequences extend beyond individual health.Long-term management of NCDs can increase healthcare expenditure and place financial and emotional pressures on patients and families.



One spoonful. One habit. One difference.

Research among Sri Lankan adults and adolescents has shown an important gap between knowing the risks and knowing how much salt is actually being consumed. Although most participants recognised the adverse health effects of excessive salt intake, only about 40% knew the recommended daily limit. Almost half of adults also believed that they were consuming the "right amount" of salt despite evidenceof higher consumption (Jayatilleke et al., 2020).
Knowing that salt is harmful is not the same as knowing where it is hiding.

Why awareness matters!

Reducing sodium is not simply a matter of telling people to "use less salt." Salt also influences the flavour and palatability, the overall taste and acceptability of food, making reduction challenging for both consumers and food manufacturers. Research shows that sodium contributes to saltinessand other sensory characteristics of food, which can affect consumer acceptance (Liem et al., 2011). This is why public awareness matters. People need practical information about how much salt they consume, where it comes from--and how to make lower-sodium choices without sacrificing the enjoyment of food.
Research involving university students in six countries, including Sri Lanka, also identified substantial gaps in knowledge about salt and iodine. Only 6.5% of the 2,459 participants knew the correct salt recommendation, while 34% were unaware of the type of salt they used (Marakis et al., 2021).

Food marketing: are our choices really our own?

The food environment can also influence dietary choices. Research examining television marketing of food and non-alcoholic beverages in Sri Lanka found that advertisements for potentially unhealthy products frequently used persuasive techniques, including celebrity endorsements, famous sports personalities, cartoon characters and family-oriented messages to attract children and adolescents (Samarakoon et al., 2022). When unhealthy choices are made attractive, awareness has to be just as powerful. This highlights the importance of public education, responsible food marketing and appropriate monitoring and regulation of unhealthy food promotion.





Sri Lanka's response: reducing salt without losing iodine

Sri Lanka has taken steps towards reducing population salt intake while protecting iodine nutrition. The 2023 Food (Iodization of Salt) Regulations require food-grade salt intended for human consumption to be iodized under the regulations. Following amendments, these regulations came into operation on 1 July 2026. (Ministry of Health and Mass Media, 2025).

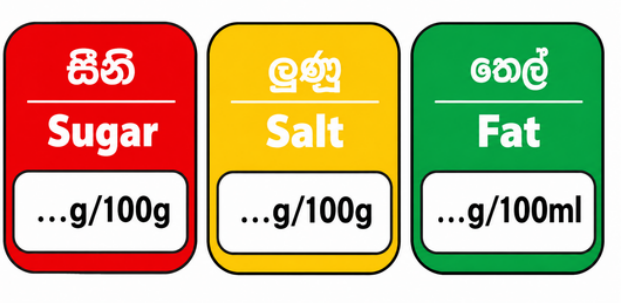


Why iodize salt if we are tryingto reduce it?

Because reducing the amount of salt consumed does not remove the body's need for adequate iodine. The goal is therefore not to eliminate salt completely, but to reduce excessive sodium intake while ensuring that the salt used for human consumption provides adequate iodine.(Knowles et al., 2023; Marakis et al., 2021).

Can a label change what we buy?

Sri Lanka has used colour-coded labelling for sugar, salt and fat in solid and semi-solid foods since the Food (Colour Coding for Sugar, Salt and Fat) Regulations 2019, which came into operation in June 2019. (Ministry of Health, 2019).



However, a label is useful only if consumers understand and use it.

A Sri Lankan study of 369 consumers in Ampara found that 97.2% reported reading food labels before purchasing, yet 56.7%did not know about the traffic-light labelling system (Maduwearachchi et al., 2023).

More recent nationwide researchprovides a different picture: among 2,569 Sri Lankan participants surveyed between November 2022 and April 2023, 89.8% recognised the traffic-light system, and more than 80% correctly identified the red, amber and green codes for sugar, salt and fat. (Wijesinghe et al., 2025).

So, the real question is not simply: "Do you read the label?"
It is: "Do you understand what the label is telling you?"

The solution isn't simply "eat less salt"

WHO identifies several evidence-based approaches to sodium reduction, including reformulating foods to contain less sodium, increasing access to lower-sodium options, front-of-pack labelling and behaviour-change communication. (World Health Organisation, 2026). For individuals, this meanschoosing more fresh or minimally processed foods, checking sodium information on packaged foods, limiting high-sodium sauces and instant products, and gradually reducing added salt.

Sri Lanka's Food-Based Dietary Guidelines also adviselimiting salty foods and added salt, limiting processed and ultra-processed foods, and reading labels on packaged food and beverages (Nutrition Division, Ministry of Health, 2021).

For manufacturers, it means reformulating products without compromising consumer acceptance. For policymakers, it means creating an environment in which the healthier choice is easier to identify and access.

The real enemyis not salt itself—it is excess without awareness.

Salt remains an essential part of human nutrition, and iodization continues to play an important role in preventing iodine deficiency. Yet excessive sodium intake has become a population-level concern, particularly as processed and packaged foods become increasingly embeddedin everyday diets.Sri Lanka's experience demonstrates that reducing sodium requires more than individual responsibility: it requires food reformulation, effective regulation, meaningful labelling and sustained public education. Recent Sri Lankan evidence also suggests that awareness of salt recommendations can influence consumption patterns, indicating that improving nutrition literacy may be an important component of long-term sodium reduction. So, the next time you reach for a packet of cassava chips or instant noodles, pause before opening it,

Do you know how much sodium is inside?
Do you understand the label? And are you choosing the food or is the food environment choosing for you?

The smallest changemay begin with something as simple as reading before reaching.

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Message from FBDGs

FBDG -7

"LIMIT SALTY FOOD AND ADDING SALT TO FOOD"

- **Take less than one tea spoon (5 g) of iodized salt per person per day**
- **Limit salty food**





Does Diet Directly Cause Disease?

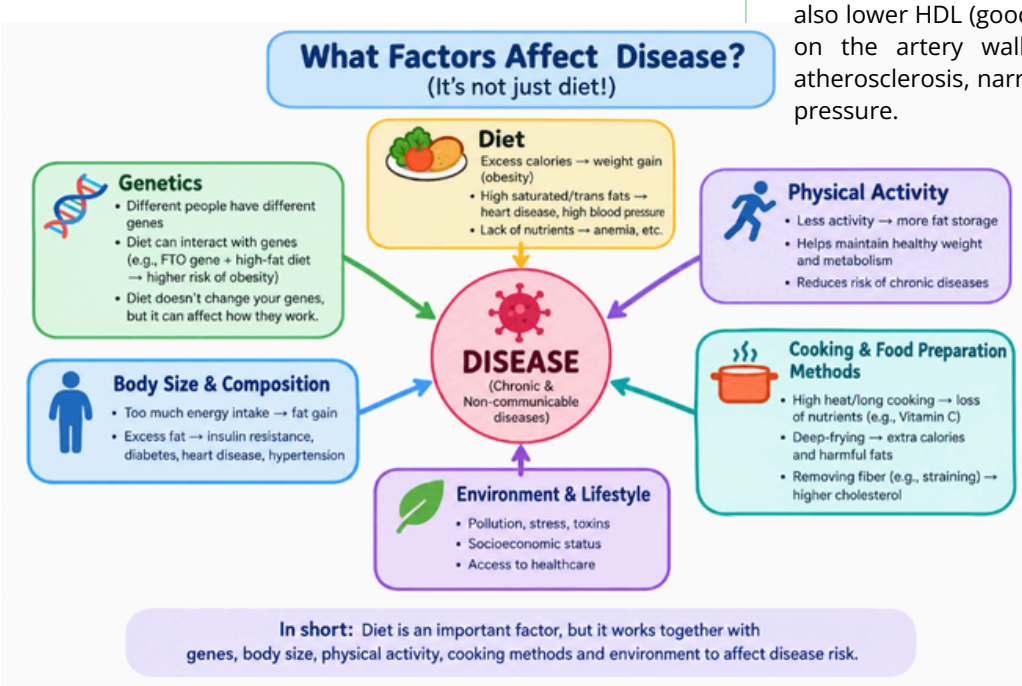


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The statement 'Does diet directly cause disease' is partially correct, but it is combined with other factors such as genetics and environmental factors. Not a normal, healthy diet, but a bad diet can cause some deficiencies, and finally it can cause a disease. Most of the clinical examples prove this scenario.

Diet is a key factor that contributes to genetic factors in causing diseases, and diet decides body size, which affects the metabolic differences that cause diseases. The body composition or body weight of a person is managed by diet and physical activities. For example, if a person has more energy than the required energy level, the excess energy will be deposited in the adipose tissues as fat and cause non-communicable diseases such as cardiovascular disease, diabetes, obesity, and hypertension.

A diet with a high amount of saturated fats and trans unsaturated fats is a major cause of heart-related diseases. Furthermore, consuming excess saturated and trans fats negatively affects blood lipid levels by raising LDL (bad) cholesterol, while trans fats also lower HDL (good) cholesterol. This excess LDL gets deposited on the artery walls, creating plaque. This condition, called atherosclerosis, narrows the blood vessels and causes high blood pressure.



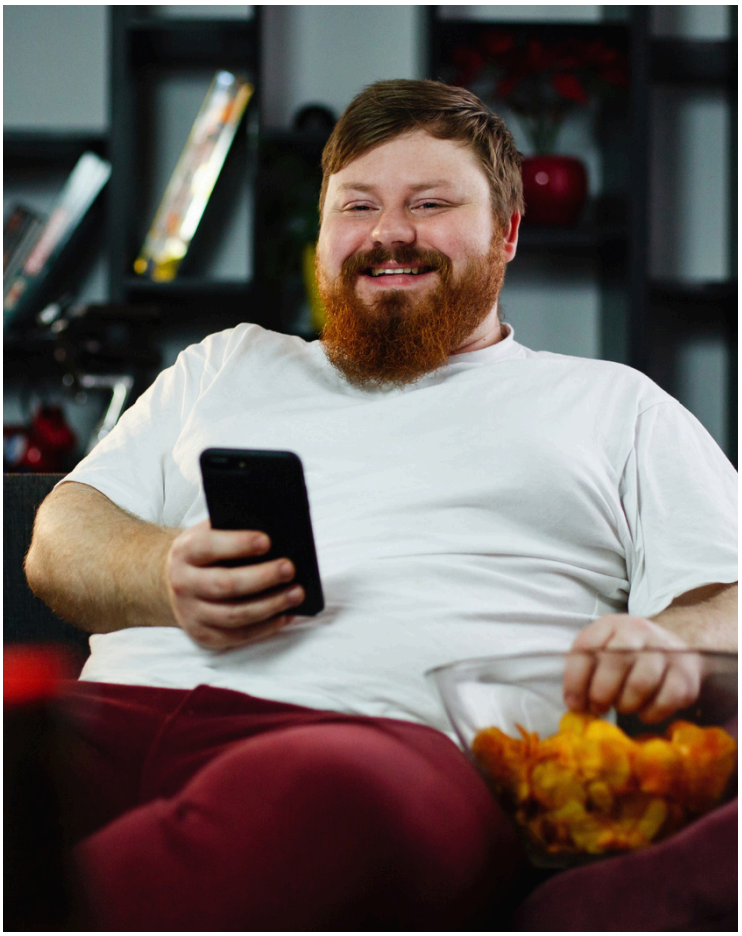


Not only that, diet links with genetic factors to contribute to diseases. This nutrigenomics is another factor which cause diseases. People are born with different genetic variations; these variations interact with diet to cause disease. For example, if a person is born with variations in the FTO gene, dietary habits such as eating a high-fat diet and highly refined carbohydrates greatly increase the risk of getting obesity compared to someone without those genetic variations (For example, these diets affect the FTO SNP, which increases the risk of getting obesity).

Furthermore, removing dietary fibers during food processing, like juice preparation by straining and refining grains, takes away fiber's protective benefits. Fiber helps to lower blood cholesterol levels in the body. Removal of fibers leads to higher levels of LDL cholesterol levels further increases the risk of getting diabetes and cardiovascular diseases.

In addition to dietary patterns and genetic factors, physical activity significantly affects disease risk. Physical inactivity or a sedentary lifestyle can lead to a positive energy balance, and excess energy is converted to fat and stored in adipose tissues. This further increases leptin intolerance, where normal hunger and satiety control is lost and increases the intake of food by obese people (Leptin is a hormone made by fat cells to control hunger and satiety).

Therefore, diet alone does not directly cause diseases. Disease risk is multifactorial and interacts with diet, physical activity, and genetic or metabolic factors. Ultimately, the relationship between diet and disease is mediated by the host factors and overall lifestyle choices.





When Nutrition Goes Viral: Navigating Nutrition Misinformation In The Digital Age



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Today, our society is becoming increasingly digitalized, with people relying on digital platforms and AI tools for many aspects of their daily lives. Social media platforms such as TikTok, YouTube, Facebook, and Instagram, as well as AI-based tools, have become popular sources of health and nutrition information.

The new trend is for people to seek advice about nutrition and diet through these digital platforms, often without verifying the credibility or reliability of the information. This has become a major public health concern, not only in Sri Lanka but globally. Exposure to inaccurate or misleading nutrition information can contribute to unhealthy dietary practices, inappropriate food choices, and nutrient deficiencies among populations.

Therefore, the challenge is no longer simply having access to information but knowing which information to trust and how to distinguish evidence-based nutrition advice from misinformation.

Why does nutrition misinformation spread?

One of the main reasons nutrition misinformation spreads is the influence of social media influencers. Many influencers target the general public using attractive, simple, and emotionally appealing messages, often without providing scientific explanations or reliable evidence. They may have large and highly engaged audiences, which allows nutrition-related content to spread rapidly.

Before-and-after stories, personal testimonials, and claims of achieving dramatic results within a very short period can easily attract people's attention. Many people are looking for quick and simple solutions to achieve their nutritional or health goals, making these messages particularly appealing.



Another concern is that some individuals provide nutrition advice without appropriate qualifications or professional training in nutrition. Their followers may trust and follow these recommendations simply because they are presented confidently or have received many views, likes, and comments, rather than because they are supported by scientific evidence. In some cases, following inappropriate nutrition advice from social media may lead to adverse health effects.

In addition, some influencers promote commercially available products, supplements, or specific diets without adequate evidence of their effectiveness or safety. Although some of their followers may be well educated, they may not have sufficient knowledge of nutrition to critically evaluate these claims.

Ultimately, people often trust what they see repeatedly on social media rather than taking the time to verify the evidence behind the information. This combination of attractive content, large audiences, quick-result promises, commercial interests, and limited nutrition literacy creates an environment in which nutrition misinformation can spread very rapidly.



Commonly misleading nutrition claims today

The following highlights common misleading nutrition claims on social media.

1. "Detox" Diets

"Detox" diets are short-term dietary plans that claim to remove harmful toxins, promote weight loss, and improve health. They may involve fasting, severe food restriction, juice-only diets, herbal supplements, or colon cleansing. Although some people may experience temporary weight loss or feel better, these effects are more likely related to reduced energy intake and changes in food choices rather than toxin removal. There is limited scientific evidence that commercial detox diets are necessary or effective for eliminating toxins.



2. "Carbohydrates are bad" or "You should avoid carbohydrates"

A common social-media message is that carbohydrates are unhealthy, cause weight gain, or should be eliminated. Their health effects depend on the amount, type, food source, overall dietary pattern, and individual nutritional requirements. Whole grains, fruits, vegetables, and pulses provide carbohydrates along with fibre, vitamins, minerals, and other beneficial nutrients.

For people with diabetes, carbohydrate intake should be appropriately planned rather than completely eliminated. Similarly, carbohydrates are an important energy source for athletes and physically active individuals. Importantly, the health effects of low-carbohydrate diets also depend on the foods used to replace carbohydrates. Therefore, reducing carbohydrates alone does not automatically make a diet healthier.

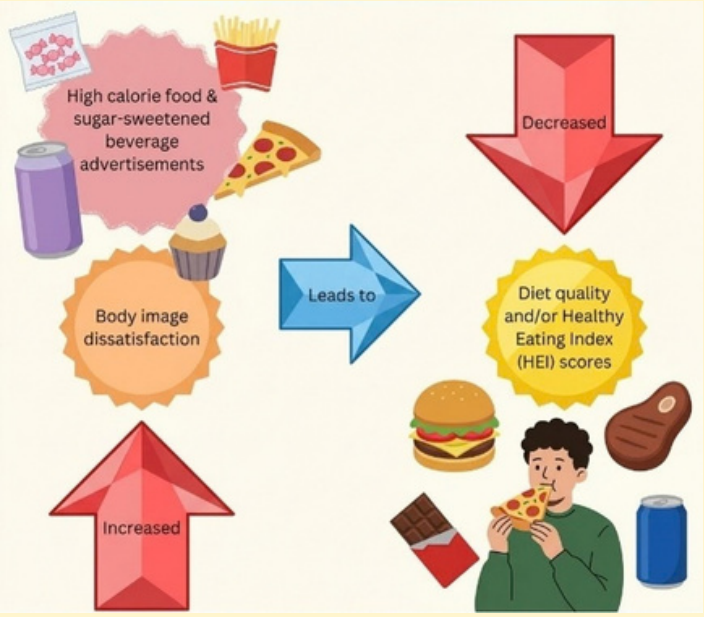


Figure 1. Social Media and Healthy Eating Index. (Moffitt, L., & Thomas, M. S.,2025)

3. "Miracle" foods

Another common form of misinformation is the promotion of miracle foods. Miracle food is not a scientific or medical term but is commonly used in marketing and social media to describe foods claimed to have exceptional health benefits without sufficient scientific evidence. For example, social media may claim that a particular food "cures diabetes," "melts belly fat," "detoxes the body," "prevents all cancers," "boosts immunity instantly," "lowers blood pressure naturally," or "reverses fatty liver." Although individual foods can contribute to a healthy diet, no single food should be presented as a universal cure or solution for a disease.

4. Supplements promoted as "cures"

Dietary supplements are also frequently promoted as treatments or cures for diseases. Influencers may promote vitamins, minerals, herbal products, or other supplements with claims that they can cure conditions such as diabetes, fatty liver disease, or kidney disease. However, being a natural or essential nutrient does not automatically make a supplement an effective treatment or safe at high doses. The U.S. FDA identifies claims such as "miracle cures," "secret ingredients," and "guaranteed results" as warning signs of health-related scams. Therefore, supplements should not replace evidence-based medical or nutritional care.

5. Rapid weight-loss claims

Social media frequently promotes messages such as "Lose 10 kg in one month," "Lose belly fat without exercise, or "Get your dream body in two weeks." Such claims can create unrealistic expectations and encourage highly restrictive diets. Healthy weight management generally requires sustainable changes in eating habits, physical activity, sleep, and other lifestyle factors. A dramatic short-term change in body weight does not necessarily represent healthy or sustainable fat loss.



6. "One diet works for everyone"

Social media may present a particular diet as the best diet for everyone. However, nutritional requirements differ according to age, sex, body composition, physical activity, health conditions, medications, cultural food practices, economic circumstances, and individual preferences. Therefore, a dietary approach suitable for one person may not be appropriate for another. There is no single diet that is universally suitable for everyone.

7. Misinterpretation of scientific studies

Nutrition misinformation can also arise from the misinterpretation or oversimplification of scientific research. A social-media post may take one study and claim that "scientists prove carbohydrates are harmful" without explaining the study population, dietary pattern, limitations, or whether the findings demonstrate association or causation. Research on low-carbohydrate diets also indicates that overall dietary quality and the foods replacing carbohydrates are important. Therefore, nutrition claims should be interpreted within their scientific context. In the digital age, nutrition literacy and critical evaluation of evidence are essential for making informed dietary decisions.

How can nutrition misinformation affect health?

As I mentioned earlier, many people follow diet plans that become popular on social media without checking whether they are scientifically supported or appropriate for their nutritional needs. Following misleading nutrition advice can have several negative effects on health.

1. Unnecessary dietary restriction

One major consequence is unnecessary or excessive dietary restriction. For example, people may eliminate carbohydrates for weight loss after following "low-carb" or "zero-carb" diets promoted on social media. However, they may not understand how to replace the energy and nutrients provided by carbohydrate-containing foods. Excessive restriction can lead to inadequate energy and nutrient intake, reduced dietary diversity, fatigue, poor physical performance, muscle loss, and nutrient deficiencies. Removing a food or nutrient does not necessarily make a diet healthier.

2. Nutrient deficiencies

Another consequence is nutrient inadequacy caused by poorly planned dietary restriction. Social-media advice may encourage people to eliminate food groups without considering suitable nutrient-rich alternatives. For example, carbohydrate-restricted diets may reduce intakes of thiamine, folate, magnesium, calcium, iron, and iodine (Churuangsuk et al., 2019).

Similarly, poorly planned vegan or elimination diets may increase the risk of inadequate vitamin B12, calcium, iodine, zinc, selenium, and vitamin D intake (Schüpbach et al., 2017). However, these dietary patterns are not necessarily unhealthy when properly planned.



3. Delayed medical treatment

Health misinformation can encourage people to rely on unproven dietary remedies or supplements instead of seeking appropriate medical care. This is particularly concerning when a person has a serious underlying condition. A systematic review and meta-analysis of 34 studies involving more than 1.27 million patients found that a four-week delay in cancer treatment was associated with increased mortality across several treatment settings (Hanna TP et al., 2020).



4. Financial burden from unnecessary supplements

Social media is increasingly used to promote dietary supplements, and reviews have identified unsubstantiated health claims and inappropriate or excessive supplement use as concerns (Emma C. Gauch et al., 2025). A US study using data from 60,538 households also documented expenditure on weight-loss, muscle-building, and sexual-function supplements that were not medically recommended, demonstrating a potential financial burden (S. Bryn Austin et al., 2017).

5. Potential worsening of existing health conditions

Finally, inappropriate nutrition advice may be particularly harmful for people with existing diseases. Taking supplements instead of prescribed medicines, or combining supplements with medications, can cause adverse effects or alter drug absorption, metabolism, or effectiveness. The FDA warns that some supplements can interact with medicines and that problems may occur when supplements are used instead of medications (FDA, 2023).

What can dietitians and nutritionists do?

In the digital age, dietitians/nutritionists have an increasingly important role as information navigators, helping individuals make sense of the large volume of nutrition information available online.

- **Evaluate the credibility of nutrition claims.**

Dietitians/nutritionists can help individuals assess who is providing the information, whether credible sources are cited, and whether the claim is supported by scientific evidence.

- **Differentiate evidence-based information from personal experiences.**

Personal success stories and testimonials can be appealing, but an individual experience does not establish that a diet or food will produce the same outcome for everyone. Dietitians/nutritionists can explain the difference between personal experience and scientifically established evidence.



- **Translate science into understandable language.**

Scientific nutrition research can be complex. Dietitians/nutritionists can interpret research findings and communicate them in clear, practical language without exaggerating or oversimplifying the evidence.

- **Develop realistic dietary practices.**

Rather than promoting extreme restrictions or "quick fixes," dietitians/nutritionists can help individuals develop sustainable eating patterns that consider nutritional adequacy, preferences, culture, lifestyle and health needs**.**

- **Build confidence in informed food choices.**

Ultimately, dietetic care can empower people to critically evaluate nutrition information and make informed food choices rather than simply following the latest online trend.

- **Promote scientifically developed online apps.**

Dietitians/nutritionists should promote scientifically developed and evidence-based nutrition apps among the public. This can help people access reliable nutrition information and use digital tools with greater confidence and less risk of being misled by inaccurate information.

- **Support policies to address misleading social-media information**

Dietitians and nutritionists can contribute to developing policies and guidelines to reduce misleading nutrition information on social media and protect the public from misleading or potentially harmful nutrition claims.

In Sri Lanka, social media increasingly influences how people obtain and understand nutrition information. People are exposed to international dietary trends alongside traditional Sri Lankan eating patterns. For example, someone may shift from a traditional rice-and-curry diet to an internet-promoted restrictive diet without considering whether it is appropriate for their nutritional needs, lifestyle, or whether it can be followed safely and sustainably over the long term.



Social media and digital platforms are not inherently harmful sources of nutrition information. Many qualified nutrition and dietetics professionals use these platforms to communicate evidence-based information and make nutrition knowledge more accessible. However, not all online information is accurate, even when shared by qualified individuals. The public should therefore ask: Who is providing the information? What evidence supports the claim? Is it consistent with established scientific knowledge? Is it appropriate for my nutritional needs?

Ultimately, the goal should be to help people navigate digital nutrition information safely, identify credible sources, and make informed dietary decisions based on evidence rather than trends. Improving digital nutrition literacy can help protect public health while enabling social media to support evidence-based nutrition education.

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GLP-1
A New Era in Metabolic Health

Once known primarily to endocrinologists and diabetes specialists, this naturally occurring hormone is now featured in news headlines, social media discussions, and everyday conversations because of the clinical success of GLP-1-based medications in managing type 2 diabetes and obesity. However, the growing popularity of these medicines has also generated misconceptions, with many people associating GLP-1 solely with weight-loss injections while overlooking the fundamental role of this medication in normal human physiology.

GLP-1, or glucagon-like peptide-1, is far more than the target of a new class of medications. It is an essential hormone that helps regulate appetite, blood glucose, digestion, and energy balance. Understanding how GLP-1 functions provides valuable insights into the treatment of metabolic diseases and the importance of healthy dietary patterns in supporting metabolic health.

This article explores the biology of GLP-1, its physiological functions, the therapeutic advances associated with GLP-1 receptor agonists, and how traditional dietary practices, particularly those familiar to Sri Lankans, may naturally support healthy GLP-1 responses.



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What is GLP-1?

Despite its physiological importance, endogenous GLP-1 has a very short half-life. It is rapidly broken down by the enzyme dipeptidyl peptidase-4 (DPP-4) within minutes of its release.

This discovery paved the way for two important therapeutic approaches: DPP-4 inhibitors, which prolong the action of endogenous GLP-1, and GLP-1 receptor agonists, which mimic its effects but remain active for a much longer duration.

What Does GLP-1 Do?

GLP-1 coordinates several organs to maintain glucose homeostasis and to regulate energy intake. One of its primary functions is stimulating insulin secretion from pancreatic β-cells in response to elevated blood glucose levels. Simultaneously, it suppresses glucagon secretion from α-cells, reducing glucose production by the liver. Together, these actions help prevent excessive increases in blood glucose levels following meals.

In addition to its effects on the pancreas, GLP-1 slows gastric emptying, allowing food to leave the stomach gradually. This slower digestion contributes to a more gradual increase in blood glucose levels and prolongs the feeling of fullness after eating.

GLP-1 also acts directly on appetite-regulating centers in the brain, reducing hunger while enhancing satiety. Consequently, individuals tend to consume fewer calories without consciously restricting their food intake.

Emerging evidence further suggests that GLP-1 exerts beneficial effects beyond glucose regulation. Clinical studies have demonstrated cardiovascular and renal benefits in selected patient populations, and ongoing research continues to investigate its potential role in conditions such as metabolic dysfunction-associated steatotic liver disease (MASLD), neurodegenerative diseases, and substance-use disorders.

Collectively, these diverse physiological actions explain why GLP-1 has become one of the most important therapeutic targets in metabolic diseases.

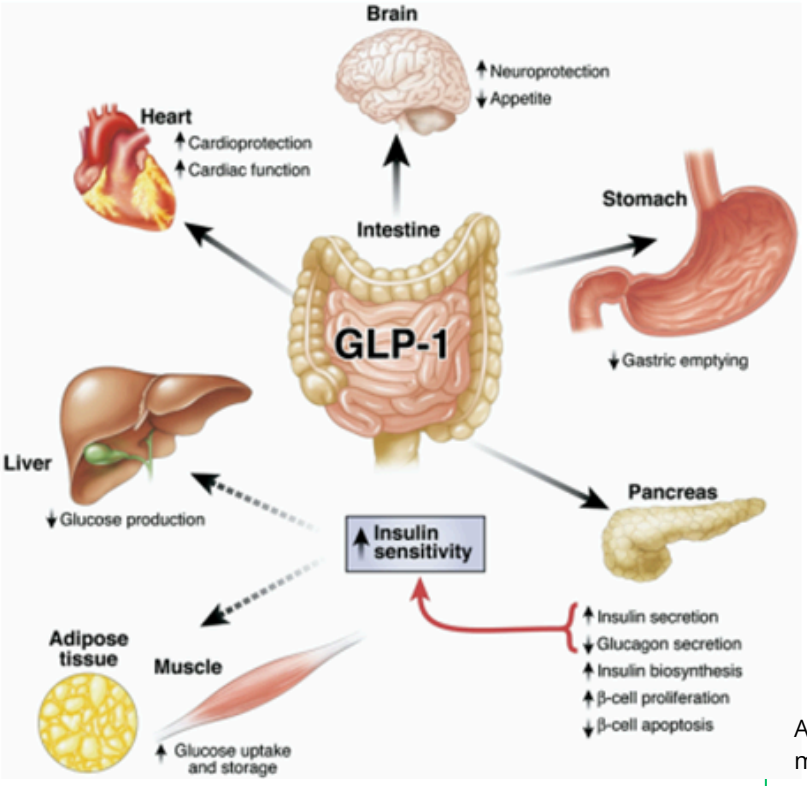


Figure 1: Functions of GLP -1
Source: Baggio LL, Drucker DJ. Biology of incretins: GLP-1 and GIP. Gastroenterology. 2007 May;132(6):2131-57. doi: 10.1053/j.gastro.2007.03.054. PMID: 17498508

Can Sri Lankan Foods Naturally Support GLP-1 Secretion?

The growing popularity of GLP-1 medications should not overshadow the important physiological principle that our bodies naturally produce GLP-1 after eating. Although no food contains GLP-1, the composition of a meal can influence the amount of hormone released and how effectively it contributes to satiety and blood glucose regulation.

Many foods that have traditionally been part of Sri Lankan cuisine contain nutrients known to support healthy metabolic function. However, contemporary dietary patterns have changed considerably, with greater reliance on refined grains, highly processed foods, and sugar-sweetened beverages. In addition, some individuals may not consume adequate amounts of high-quality protein and dietary fibre, both of which play important roles in appetite regulation, glycemic control, and overall metabolic health.

Whole grains such as red rice and kurakkan (finger millet) provide dietary fibre and complex carbohydrates that are digested more slowly than refined grains. This slower digestion supports a more gradual postprandial glucose response and may promote greater GLP-1 secretion compared with highly refined carbohydrate sources.

Adequate dietary protein is equally important. Protein is one of the most potent nutritional stimulators of endogenous GLP-1 release and promotes satiety through multiple physiological pathways.

Similarly, legumes including parippu (lentils), green gram (mung bean), cowpea and chickpeas are rich in plant protein and fibre, nutrients known to enhance satiety and improve glycemic control, while fish, eggs, and dairy products can further improve the overall protein quality of the diet. Incorporating these foods into balanced meals may support appetite regulation while helping individuals meet their daily protein requirements.

Vegetables and leafy greens commonly consumed in Sri Lanka, such as gotukola, mukunuwenna, and murunga leaves, contribute additional fibre and micronutrients while increasing meal volume without substantially increasing energy intake. Traditional plant foods including polos (young jackfruit), ripe jackfruit and del (breadfruit) also contain dietary fibre and resistant starch, particularly when prepared using minimally processed methods. Resistant starch escapes digestion in the small intestine and is fermented by beneficial gut microorganisms in the colon, producing short-chain fatty acids that may further stimulate GLP-1 secretion through interactions with intestinal L-cells.

Although the physiological increase in GLP-1 following healthy meals is much smaller than that achieved with GLP-1 receptor agonist medications, these natural responses occur repeatedly throughout life and contribute to long-term metabolic health. Therefore, preserving traditional dietary patterns rich in whole grains, legumes, vegetables, fruits, and minimally processed foods remains an important strategy for supporting healthy glucose regulation and appetite control.

GLP-1 Medicines: A New Era in Metabolic Health

Scientific advances over the past two decades have transformed our understanding of GLP-1 into a foundation for highly effective therapies for metabolic disease.

Several GLP-1 receptor agonists, including liraglutide, semaglutide, and dulaglutide, have demonstrated substantial benefits in improving glycemic control among individuals with type 2 diabetes. More recently, tirzepatide, which activates both glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 receptors, has shown even greater efficacy for weight reduction and glucose management in many patients.

These medications mimic the physiological actions of GLP-1 while remaining active in the body for extended periods. Patients often experience improved blood glucose control, reduced appetite, delayed gastric emptying, and clinically significant weight loss. Large cardiovascular outcome trials have also demonstrated reductions in major adverse cardiovascular events among selected high-risk individuals receiving several GLP-1 receptor agonists.

Despite these benefits, GLP-1 medications are not appropriate for everyone. Treatment decisions should always be individualized, considering the medical history, clinical indications, potential risks, and cost. Like all prescription medicines, these should be initiated and monitored under the supervision of qualified healthcare professionals.

Are There Side Effects?

As with most medications, GLP-1 receptor agonists may cause adverse effects in some patients. Gastrointestinal symptoms are the most frequently reported, particularly in the early stages of treatment. Nausea, vomiting, diarrhea, constipation, abdominal discomfort, and reduced appetite are relatively common but often improve as treatment continues.

Rapid weight loss may also lead to reductions in lean body mass if adequate dietary protein intake and resistance exercise are not maintained. Healthcare professionals should therefore emphasize comprehensive lifestyle management alongside pharmacotherapy.

Rare but potentially serious adverse effects require careful clinical assessment, highlighting the importance of ongoing medical supervision throughout treatment.

Myths and Misconceptions

The rapid rise in public interest has inevitably generated several misconceptions about GLP-1.
One common misunderstanding is that GLP-1 medications eliminate the need for healthy eating. In reality, dietary quality is fundamental to long-term metabolic health, regardless of whether medication is prescribed.

Another misconception is that everyone seeking weight loss should receive GLP-1 therapy. These medications are intended for individuals who meet specific clinical criteria, and lifestyle interventions remain the cornerstone of obesity prevention and management.

It is equally important to recognize that healthy foods do not replicate the pharmacological effects of GLP-1 receptor agonists. While dietary patterns can naturally stimulate endogenous GLP-1 secretion, the magnitude and duration of these effects differ substantially from those produced by medications.

Therefore, balanced public education is essential to ensure that enthusiasm for these therapies does not overshadow the continuing importance of evidence-based nutrition.

Why GLP-1 Matters for Sri Lanka

Sri Lanka, like many other countries, is experiencing a growing burden of overweight, obesity and type 2 diabetes. Population aging, urbanization, reduced physical activity, and increased consumption of highly processed foods have contributed to a steady rise in metabolic disorders, placing considerable pressure on healthcare systems.



Against this backdrop, GLP-1-based therapies represent an important advancement in clinical care. However, prevention remains equally important. Nutrition professionals have a vital role in promoting dietary patterns that support metabolic health across the lifespan.

Traditional Sri Lankan meals, characterized by adequate protein, whole grains, legumes, vegetables, fruits, and moderate portions of minimally processed foods and fermented foods, offer nutritional qualities that align closely with modern recommendations for preventing chronic disease. Preserving and adapting these dietary traditions within contemporary lifestyles may represent one of the most sustainable approaches to improving population health.

Looking Ahead

Research on GLP-1 continues to expand at an extraordinary pace. Beyond diabetes and obesity, investigators are exploring its potential applications in cardiovascular disease, chronic kidney disease, metabolic dysfunction-associated steatotic liver disease, neurodegenerative disorders, and even addiction medicine.

At the same time, advances in nutrition science are improving our understanding of how dietary components, gut microbiota and gastrointestinal hormones interact to regulate metabolism. This growing body of knowledge reinforces an important principle: nutrition and medicine should be viewed as complementary rather than competing approaches to health care.

Takeaway

GLP-1 has transformed both our understanding of human physiology and the clinical management of metabolic disease. As a naturally occurring hormone, it plays a central role in the regulation of appetite, glucose homeostasis, and energy balance. As a therapeutic target, it has revolutionized the treatment of type 2 diabetes and obesity, offering hope to millions of patients worldwide.

Nevertheless, medications alone cannot replace the foundation of good health. Healthy dietary patterns, regular physical activity, adequate sleep, and other positive lifestyle behaviors remain essential components of long-term metabolic well-being.

In Sri Lanka, where traditional dietary practices have long emphasized whole grains, legumes, vegetables, and other minimally processed/fermented foods, the GLP-1 story offers an encouraging reminder that modern scientific discoveries often reinforce the value of longstanding nutritional wisdom. By combining evidence-based nutrition with advances in medicine, healthcare professionals can help individuals achieve healthier lives and contribute to addressing the growing burden of metabolic disease.



Hidden Hunger: The Silent Impact of Micronutrient Deficiencies



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Hidden hunger refers to a lack of essential vitamins and minerals in the diet, even when a person consumes enough calories to meet their energy needs. It commonly involves deficiencies in key micronutrients such as iron, iodine, and vitamin A. In simple terms, a person may eat enough food but still miss the nutrients their body needs to stay healthy, grow, and function properly. World Health Organization (WHO, 2021) reported that over 2 billion people are globally affected by hidden hunger, particularly iron, Vitamin A and Iodine. Intake of essential vitamins and minerals is really important to human health and development.

Avoiding consuming these vitamins and minerals will lead to severe health issues. Meeting the zero hunger goal in 2030 is one of the seventeen sustainable development goals. Foods that are high in energy but low in nutrients are becoming more widely available, more affordable, and more popular than nutrient-dense fruits, vegetables, and whole grains. Not only does the amount of food we eat matter, but so does its quality.



What are micronutrients?

Micronutrients are defined as vitamins and minerals. Vitamins are important for energy production, blood clotting and immune responses. At the same time, minerals impact growth and development, bone health and fluid balance.



Types of essential micronutrient deficiencies

1. Iodine deficiency

Iodine is an important mineral in the human body to synthesize thyroid hormones, including thyroxine, which is a metabolism-regulating substance. The iodine content of plant foods depends on the soil or environment. Seaweed has a high content of iodine. Some animal-based food products, eggs, milk and cereals contain small amounts of iodine. Iodine deficiency is diagnosed by the presence of goitre, which means swelling of the thyroid gland.



2. Vitamin A deficiency

Vitamin A is important for normal body growth and tissue repair. Vitamin A has great function on immune and visual systems. It is in the form of retinol derived from a variety of foods such as milk, eggs and fish. Blindness caused by vitamin A deficiency (VAD) has played a major role in making communities and the world more aware of how serious this problem is. VAD remains the main cause of preventable blindness in children.



3. Iron deficiency

Iron deficiency is one of the most common nutritional deficiencies, especially among young children and premenopausal women. Since iron is essential for haemoglobin production, a lack of iron can cause iron-deficiency anaemia, leading to smaller red blood cells with less haemoglobin. Common symptoms include tiredness, weakness, pale skin, and shortness of breath. In children, iron deficiency can affect growth, development, behaviour, and learning, while severe anaemia during pregnancy can increase the risk of complications and maternal health problems.

Causes of hidden hunger?

1. Poor diet diversity

Most of the people are relying of limited variety of foods, including rice, maize or processed foods. This leads to a chance of missing out on some important nutrients.

2. Low consumption of fruits and vegetables

Commonly, vegetables and fruits are rich in vitamins (A, C, and minerals) and minerals (iron, potassium, and magnesium). Even though people fail to consume enough.

3. Food processing and modern food culture

Ultra-processed food products, fast foods (burgers, pizza and fried chicken), high sugary foods (doughnuts, cake, soft drinks and bakery products). These food products will fill the stomach, but they are low in essential nutrients.

4. Soil depletion and poor farming practices

Overuse of chemical fertilizers and intensive farming will reduce the nutrient content of crops and produce nutrient-poor foods.

5. Poverty and limited access to nutritious foods

Increasing prices of foods, low income, and less availability of nutrient-rich foods will prevent people from getting a balanced diet.

6. Increased nutrient needs

In some cases, people need more minerals and vitamins, such as during pregnancy, breastfeeding, childhood, illness or recovery from disease. If the intake of diet doesn't meet the adequate needs, hidden hunger will occur.

7. Food insecurity and climate change

Droughts, floods and changing weather patterns also affect yield of crops and the availability of enough food. It increases the prices of food products.





5. Poor maternal and reproductive health
It reflects an increased risk of complications during pregnancy and childbirth. Higher maternal mortality due to severe anaemia. Birth defects and preterm birth are also consequences of poor maternal health.

6. Mortality
Increased risk of death, especially among infants, young children, and pregnant women. Chronic disease risk. Greater susceptibility to non-communicable diseases later in life. Poor nutritional status contributes to the "double burden of malnutrition," where deficiency coexists with overweight or obesity.

7. Social and economic consequences
Hidden hunger reduces adults' productivity and work capacity and increases healthcare costs due to related diseases. It also lowers educational attainment and lifetime earning potential, thereby perpetuating the cycle of poverty and malnutrition across generations.

Effects of hidden hunger

1. Poor growth and development
Children are affected by stunted growth and impaired physical development in children. Low birth weight and poor pregnancy symptoms. Delayed puberty and reduced bone development due to vitamin D and Calcium deficiency.

2. Weakened immune response
It leads to many health issues such as severe infections, fever, and long-term illness.

3. Cognitive and neurological effects
Impaired brain development and lower IQ in children (e.g., iodine, iron, folate). Poor concentration, memory, and learning ability. Poor school performance.

4. Nutrient-specific health conditions
·Iron deficiency leads to anaemia, fatigue, weakness, and reduced work capacity.
·Vitamin A deficiency leads to night blindness, xerophthalmia, and irreversible blindness.
·Iodine deficiency leads to goitre, hypothyroidism, and cretinism.
·Vitamin D and calcium deficiencies lead to rickets in children, osteomalacia and osteoporosis in adults.
·Folate deficiency leads to neural tube defects in newborns such as spina bifida.

- Vitamin B12 deficiency leads to anaemia and nerve damage.
- Zinc deficiency leads to delayed wound healing, hair loss, and poor growth.

How can we overcome hidden hunger?

1. Supplementation
It is a direct solution for overcoming micronutrient deficiencies where they can be diagnosed and managed properly. For example, globally, anaemia and pregnancy outcomes have significantly improved when women of reproductive age are given iron and folate supplements. In other cases, without a reliable diagnostic method, it is challenging to determine who is most at risk of zinc insufficiency for a targeted supplementation strategy, and it is also challenging to track the effectiveness of zinc intervention programs.

Supplementation to alleviate hidden hunger is not feasible at the population level because of its high cost, reliance on the population's compliance, and ability to reach the most vulnerable. Supplements may offer a temporary fix for an individual, but they do not address the long-term issue of a diet deficient in nutrients.

2. Food fortification
The addition of micronutrients to food both during processing and right before consumption (e.g., multiple micronutrient powders) is referred to as food fortification. Adding iodine to salt has been one of the most effective fortification methods used worldwide. Due to iodine's critical involvement in thyroid hormone synthesis, iodine shortage has serious health effects, including stunted growth and impaired cognitive development. Iodine fortification of salt is required in many nations; according to UNICEF, 86% of households worldwide use it.

E3. Biofortification
Enhancing a food's micronutrient content through crop breeding programs, agronomic techniques (such as adding nutrient-rich fertiliser), or a combination of the two is known as biofortification. Biofortification is a promising option when other methods fail. It provides an affordable and practical way to help vulnerable groups get more essential micronutrients. After developing a biofortified plant, farmers can share the seeds widely and grow them each year.

4. Increasing dietary diversity
Dietary diversity is a measurement of the variety of foods from various food groups that a person consumes over a specific time period. Understanding dietary patterns is crucial for developing a strategic plan to fight hidden hunger since a diet's diversity reduces the likelihood that it will be inadequate in terms of micronutrient provision.

5. Double agricultural productivity and incomes of small-scale food producers
Encouraging productivity in agricultural lands as volume of production per labour unit. Providing subsidies to local farmers to encourage their involvement in farming activities. It will be helpful to the increasing global population in future to meet the demand.

6. Sustainable food production system with climate-smart agriculture system
Increase the proportion of agricultural area under productive and sustainable agriculture.

Hidden hunger is a form of malnutrition that occurs when the body does not get enough essential vitamins and minerals, even when a person consumes enough food or calories. It may not always be visible, but over time it can affect growth, immunity, energy levels, learning, and overall health.

Hidden hunger can be reduced by eating a varied and balanced diet that includes fruits, vegetables, whole grains, legumes, nuts, seeds, and other nutrient-rich foods. In some situations, fortified foods or supplements may also help meet nutritional needs. Improving nutrition awareness and making healthy foods more accessible and affordable are also important in preventing hidden hunger.

Overall, overcoming hidden hunger requires more than simply eating enough food; it means ensuring that the food we eat provides the essential nutrients needed for a healthy life.

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Ahara Vidhi Vidhana: The Ayurvedic Art of Eating for a Healthy Life





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Since the ancient Vedic period, food (Anna/Ahara) has been regarded as essential for the growth, nourishment and survival of all living beings. The well renowned Ayurveda classic, Charaka Samhita describes foods consumed in correct way consider as the basis of life, contributing health, strength, intelligence, happiness and nourishment. Ahara Vidhi Vidana concept in Ayurveda, is not only a scientific method to maintain physical health but also for better mental health which results into proper digestion of food which in turn promotes health and prevents many diet- related disorders.



A 6000 -years- old Ayurveda medicine gives food prime importance, considering it the first of the three pillars (Trayopasthambha) of life, along with sleep (nidra) and self-control (brahmacarya). It was regarded as the Mahabhaishajya (ultimate medicine) due to promote health in both diseased and normal people.

Hippocrates, 2500 years ago, emphasized the therapeutic value of food through the principle, “Let food be thy medicine and medicine be thy food” (Lucock, 2004). Thus, both Ayurveda and modern medicine recognize food as fundamental to maintaining health and supporting recovery from disease.

Health depends not only on the quantity and quality of food but also on how it is consumed. Ayurveda classifies food according to factors such as season, age, constitution, purpose, and suitability to ensure a balanced diet. The principles governing what, when, where, and how food should be consumed are known as Ahara Vidhi Vidana. Ayurveda also emphasizes the balance of Dosha (bodily humours), Dhatu (body tissues), Mala (waste products) and Agni (digestive fire), which together support Swastha (health), Ojas (immunity) and Bala (strength). Their imbalance can lead to various diseases.

The General Rules of Ahara Vidhi Vidana

- **Ushnam Bhunjita (Consuming hot food)**

Consuming warm food helps in retaining the taste of food, stimulates the digestive fire, and undergoes digestion very easily. Foods consume in hot helps to normalize proper movement of Vata dosha and reduce the increase of Phlegm (Kapha dosha). In Ayurveda, Vata dosha is considered as the air inside the body and flatus, respiration and air in the stomach, which cause proper digestion and metabolism, are part of Vata dosha itself. Food consumed cold will result in anorexia, decreased digestive fire, nausea, and distension of the abdomen which caused by vitiation of Vata- kapha doshas.



Foods that are extremely hot are also not advisable; they can cause intoxication, burning sensation, excessive thirst, bleeding disorders and loss of strength.

- **Snigdham Bhunjita (Consuming food that is Unctuous)**

Unctuous food is advised because it will be delicious, and it will increase the subdued power of digestion, strengthen the sense organs, and enhance growth, strength, and complexion of the body. The food consumed dry without getting moistened remains as a hard mass, causing improper digestion and absorption, resulting in indigestion (Ajirna).



- **Maatraavat Bhunjita (Consuming food in proper quantity)**

Maatra refers to the proper quantity of food that can be digested without disturbing the normal functioning of the body. It supports healthy digestion, maintains the balance of the Tridoshas (Vata- Pitta- Kapha), promotes proper bowel movement and longevity. Heavy foods (Guru) should be consumed only to half- satiety or less, while even light foods (Laghu) should not be eaten beyond satiety level, as excess intake may cause indigestion and abdominal heaviness. One should always eat either half or one third of the stomach and leave the rest for liquid and other bodily humours. (Sukla A. 2017) Eating too little may cause depletion of strength and complexion, whereas excessive intake can produce Ama (toxic metabolic byproducts) and contribute to various metabolic disorders.

- **Jirne Bhunjita (Consuming food after digestion of previously consumed food)**

Food should be consumed only after the previous meal is digested, when appetite and digestive fire are active, after attending to the natural urges of flatus, urine, and faeces.

At this time, eructation is clear, Doshas are in their proper locations, bodily channels (Srotas) are open, air inside the body (Vata dosha) moves normally, supporting proper digestion and assimilation. Food consumed at this appropriate time promotes longevity without adversely affecting the bodily tissues (Dhatus). A healthy person should eat twice daily—morning and evening. Eating between meals is contraindicated to allow proper digestion. Food should not be consumed within 3 hours of the previous meal, as this period is required for the formation of Rasadhatu, which correlates to the essence of food consisting with nutrients after digestion. Eating during this time may hinder the process and cause diseases.

- **Viryaaviruddham Bhunjita (Consuming food that is not contraindicated in Potency)**

Virya is the power responsible for any action; no action can occur without it. The substances having opposite Viryas when used in combination are known as Virya Viruddham; for example, Shita Virya (cold potency) milk is consumed with a substance having Ushna Virya (hot potency), sour fruits. Components in the diet that are contrary to the body elements tend to disagree with the system and cause diseases, especially skin diseases.

- **IshteDeshe Ishta Sarvopakaranam Bhunjita (Consuming food in places that are pleasant to the mind and with the required cookery)**

This concept in Ayurveda majorly affects with psychological status of person as it says, eating at one's favourite place with the desired accessories, one is not afflicted with psychological trauma. Even when food is taken in proper quantity, negative emotions such as fear, anger, shyness, or jealousy make a person misinterpret good hygienic food as unhygienic and result in Ajirna (indigestion).

The renowned Ayurveda text Sushruta Samhita, mentions that specific guidelines regarding the place and methods for having food include consuming food in a beautiful and auspicious place having a pleasant smell, well covered in order to provide protection from dust and other organisms and without unwanted people with large list of utensils required for preparation, serving, storage, and dining for specific kinds of food. All these factors influence the psyche as well as affect hygiene.

- **Naatidrutam Bhunjita (Not consuming food too fast)**

If someone eats food hurriedly, it will enter the wrong passage, will not move properly, and will get located in improper places. Besides this, the person will not be able to appreciate the good quality or identify any defects of food, including hair or any other foreign materials mixed with the food. Eating too quickly causes the food not to be chewed properly and to rapidly bypass all places throughout the digestive tract within a shorter period, causing the functions expected to happen at those particular areas. It leads to indigestion and malabsorption.

Psychologically, for good digestion, the appreciation of the qualities of food such as smell, taste, and sight is needed. It helps in inciting appetite, hampers salivation and secretion of digestive enzymes, and leads to proper digestion, metabolism and absorption of nutrients.

- **Naativilambitam Bhunjita (Not consuming food too slowly)**

By consuming food very slowly, one does not get satisfaction or satiation, may eat more, food becomes cold and is irregularly digested due to irregular contact of digestive fire will result in the formation of Ama, which is considered in Ayurveda medicine as the seed for many diseases.

- **Ajalpan Ahasan Tanmana Bhunjita (Not speaking or laughing while having food)**

One should consume food without talking (Ajalpan), laughing (Ahasan) and without concentration of mind (Tanmana), which can produce movement of food in an abnormal passages and cause complications just like food taken hurriedly.

- **Aatmaanam Abhisameekshya Samyak Bhunjita (Consuming food after due consideration of self)**

Food should always be consumed with due consideration to oneself, knowing well about the suitability or the unsuitability of the food components to the self. Thus, one should consume food only after proper self-consideration and make modifications according to their conditions.



Disscussion

Consuming a diversified, balanced and healthy diet helps to prevent malnutrition in all its forms and range of non-communicable diseases. It will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally-available foods and dietary customs.

Four Basic principles of what constitutes a healthy diet;

- Adequacy: meet micronutrient and macronutrient need without exceeding.
- Balance: total energy intake is balanced with energy expenditure.
- Moderation: limited intake of foods that may be detrimental to health.
- Diversity: inclusion of a wide variety of nutritious foods within and across food groups.

Ayurveda framework, food should be consumed soon after cooking when it is warm, as nutrients are already partially broken down and easy to digest. Eating warm, freshly prepared meals reduces foodborne pathogens and enhances enzymatic digestion. Prepared foods should be consumed neither rapidly nor very slowly for better digestion and absorption.

By adding oil and ghee, the foods can be converted to unctuous, which makes food easy to swallow and pass through the digestive tract. Also, healthy fats and oils in appropriate amount needs for energy, to absorb vitamins, and to protect our heart and brain health. The quality such as; hot, unctuous, light and heavy etc. and quantity (Matravat) of foods are very important factors considered to be digested in due time without disturbing the normalcy of body. Food incompatibility can impair the power of digestion, produce toxic byproducts, intolerances, microbiome disruption and obstruct the channels of body not allowing adequate nourishment.

Mindful eating in a pleasant setting may reduce overeating, increase secretion of happy hormones (serotonin, dopamine, etc.) and support metabolic regulation. Personalized diet (Ātmānam Abhisamīkṣya) based on a person's genetic and metabolic profiles align with latest nutrigenomics concept. Food's appearance, taste, smell, and texture influence appetite-related neural signals, while the hypothalamus helps regulate food intake.





Conclusion

The Ayurvedic concept of Ahara extends beyond mere food or calorie intake. It includes the method, quality and quantity of food, determined according to an individual's digestive capacity (Agni). As food passes through the digestive system, it generates sensory signals that interact with the brain and nervous system, influencing digestion and metabolism. Therefore, Ahara Vidhi Vidhana plays an important role in maintaining both physical and mental health. Future research may help to study whether these eating principles have an impact on the proper functioning of the gut-brain axis, healthy gut microbiome, and align with modern nutrigenomics to promote health.



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Message from FBDGs

FBDG -14

"ALWAYS READ LABELS OF PACKAGED FOOD AND BEVERAGES"



Source: Food-Based Dietary Guidelines (FBDG) Practitioner's Handbook
Nutrition Division, Ministry of Health

From Farm Waste to Functional Foods: Valorizing Agro-Processing Side Streams in Sri Lanka



The global food system faces a profound paradox: while millions experience nutritional insecurity, over one-third of all food produced for human consumption is lost or discarded across the value chain. In Sri Lanka, an agrarian nation undergoing rapid economic transformation, this issue is particularly critical. Agricultural processing industries generate substantial quantities of biomass residues ranging from rice bran, sesame seed cakes, and coconut testas to fruit peels, seeds, and bagasse that are routinely treated as low-value waste or disposed of in landfills. However, modern food science offers a paradigm shift. Rather than viewing these side streams as environmental burdens, advanced technological interventions allow us to reframe them as untapped reserves of functional ingredients and bioactive compounds.Valorizing agro-processing side streams presents a transformational pathway toward a circular economy, bridging the gap between sustainable waste management and improved public health across the island.



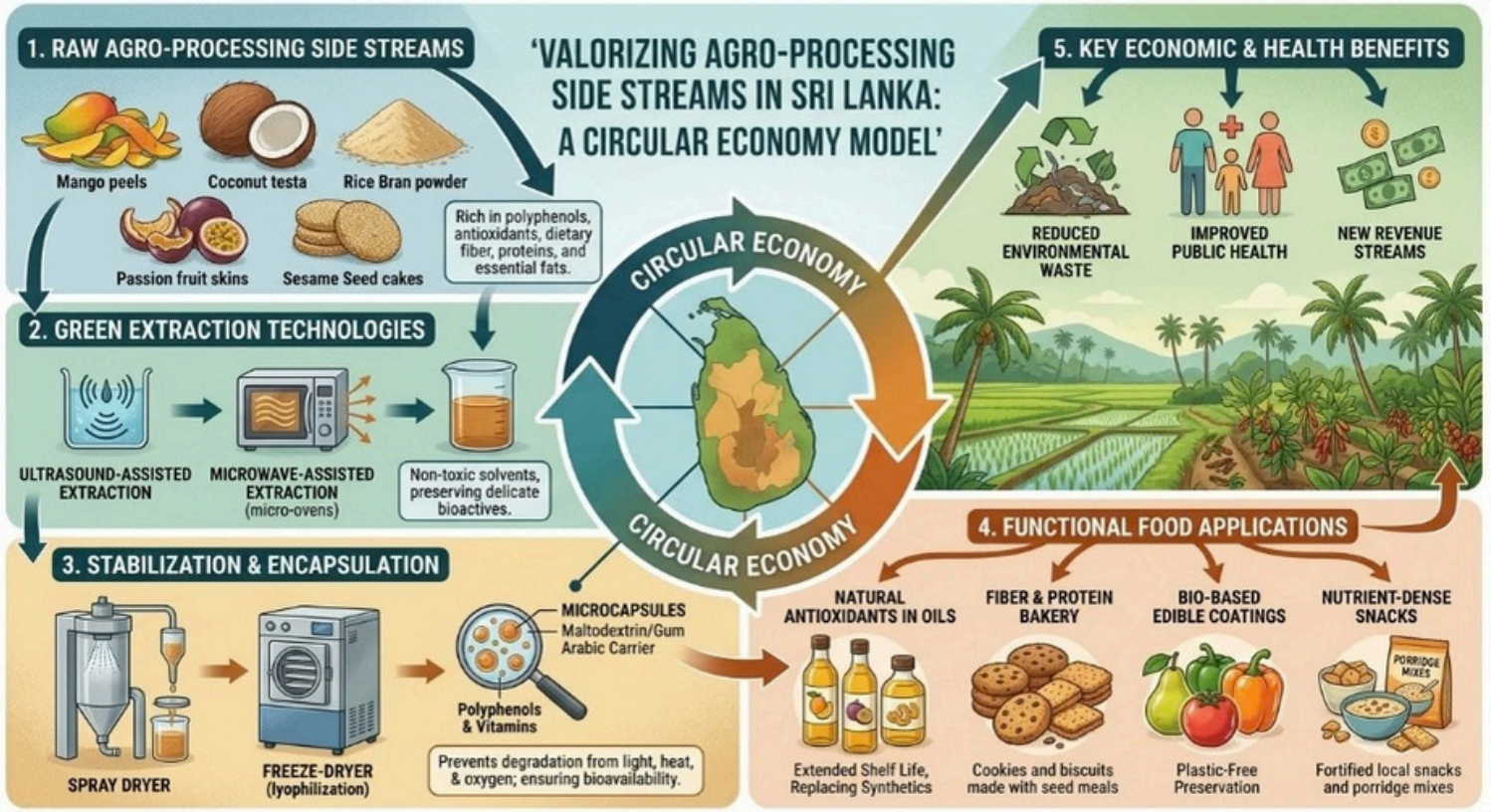
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The scale of bio-resource loss within Sri Lanka's domestic processing sector is considerable. Tropical fruit processing industries, which focus heavily on mango, pineapple, papaya, and passion fruit, generate waste fractions often exceeding 50% of the total raw fruit mass. These side streams, predominantly comprising skins, seeds, and fibrous pulp, are densely packed with naturally occurring phytochemicals, including polyphenols, flavonoids, carotenoids, dietary fibers, and essential fatty acids. For instance, fruit peels often harbor significantly higher antioxidant concentrations than the edible pulp itself, evolved by the plant to serve as a natural physiological shield against environmental stress and pathogens.

Similarly, cereal and oilseed processing side streams, such as stabilized rice bran and seed expeller cakes, are exceptionally rich in plant-based proteins, soluble fibers, and lipophilic antioxidants. Discarding these biological materials not only exacerbates local organic waste management challenges but also represents a severe loss of valuable dietary nutrients that could otherwise combat micronutrient deficiencies and non-communicable diseases.

Translating raw agricultural waste into high-value functional food ingredients requires scalable, bio-oriented technological strategies. The foundational step lies in green extraction technologies such as ultrasound-assisted, microwave-assisted, or enzymatic extractions, which isolate delicate bioactive molecules without relying on toxic industrial solvents. Once isolated, however, these bioactive extracts encounter real-world stability challenges: polyphenols and vitamins are inherently sensitive to light, elevated temperatures, oxygen exposure, and Gastrointestinal pH variations. To overcome these limitations, encapsulation techniques such as spray drying and freeze-drying (lyophilization) have emerged as essential mechanisms. By trapping labile antioxidant compounds within food-grade carrier matrices like maltodextrin, gum arabic, or native starches, researchers can convert liquid agricultural extracts into free-flowing, shelf-stable, microencapsulated powders. These microcapsules protect fragile bioactives during processing and storage, ensuring controlled release within the human digestive system.

The practical applications for these valorized compounds within the food manufacturing landscape are vast and highly promising. Encapsulated fruit peel polyphenols, for instance, serve as effective natural antioxidants when incorporated into edible vegetable oils, oil-in-water emulsions, and lipids, effectively delaying lipid oxidation and extending shelf life without synthetic preservatives.



Furthermore, fiber- and protein-rich seed meals can be formulated into functional bakery items, convenient local snacks, or nutrient-dense porridge mixes designed to lower the glycemic index and support gut health. Applying natural biopolymers from waste fractions to form protective bio-based coatings on fresh, perishable produce provides an eco-friendly alternative to single-use plastic packaging while extending post-harvest durability.

Unlocking the full potential of agro-processing side streams in Sri Lanka requires bridging the gap between laboratory research and commercial scale. Establishing strong linkages among academia, local food processors, agricultural banks, and policymakers is essential to build scalable processing infrastructure. Developing low-cost, decentralized drying and extraction facilities near agricultural hubs can minimize logistics costs and prevent the rapid spoilage of raw biomass before processing. By transitioning from a linear "take-make-dispose" system to a circular food technology model, Sri Lanka can significantly reduce environmental impact, generate new economic revenue streams, and deliver functional foods that improve community health and nutritional resilience.

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