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Newsletter

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Message from the President

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Enhancing Nutritional Literacy: Welcome to the Latest Edition of Our Newsletter

Dear Members of the Nutrition Society of Sri Lanka,

I am thrilled to welcome you to the latest edition of our newsletter. As the President of the Nutrition Society of Sri Lanka, I am deeply honored to lead such a vibrant and dedicated group of professionals in the field of nutrition and public health. Our society's commitment to enhancing nutritional understanding and literacy across Sri Lanka is a journey that we undertake together, and this newsletter is a key component of our collective efforts.

Our Vision and Commitment

Our mission to improve nutritional literacy is not only ambitious but also essential for the well-being of our communities. We are dedicated to debunking myths and correcting false beliefs that often hinder health and wellness. By promoting healthier dietary habits and encouraging regular physical activity, we are proactively setting the stage for a healthier nation. This newsletter serves as more than just a communication tool; it is an integral part of our educational outreach, aiming to guide and inform the public towards making healthier choices.

In every issue, we strive to provide a platform for sharing the most current research and information in the field of nutrition. This space is designed for networking and collaboration, where professionals from various sectors, including academia, clinical practice, and industry, come together to share their knowledge and drive common goals forward. My personal passion for guiding individuals in their dietary and health decisions underscores my belief in the transformative power of our society and this newsletter in fostering a healthier, more informed population.
Call for Contributions

We strongly encourage each of you to contribute your research, insights, and experiences to this newsletter. Your active participation not only enriches our content but also ensures that our society remains at the forefront of nutritional science. By pooling our collective knowledge and expertise, we can continue to lead the way in nutrition education and advocacy, setting benchmarks and pioneering initiatives that resonate across the country and beyond.

Reflecting on Our Achievements

This past year has been a landmark period for our society. We have embarked on numerous initiatives aimed at promoting healthy eating and advancing nutrition education throughout Sri Lanka. Our annual scientific sessions stood as a testament to our commitment to collaboration and advancement in nutrition education and research. These sessions provided a dynamic platform for sharing knowledge, fostering partnerships, and sparking innovations that continue to benefit our society and the communities we serve.

The impact of these sessions has been far-reaching, catalyzing new projects and research that align with our vision. We have seen an increase in collaborative research papers, community outreach programs, and policy advocacy efforts that are shaping the landscape of nutrition in Sri Lanka.

Upcoming Initiatives and Events

Looking ahead, the Nutrition Society of Sri Lanka has several exciting plans in the pipeline. We are on the brink of launching a series of workshops and training programs designed to provide vital nutritional education to the public. These programs are crucial, especially at a time when health literacy is more important than ever. They are tailored to help the public address and overcome their nutritional challenges, thereby improving their understanding of health and nutrition.

These upcoming events include:

-**National Nutrition Awareness Workshop Series:** A set of workshops aimed at educators, healthcare providers, and community leaders to enhance their capacity to promote nutritional literacy.
-Public Health Nutrition Campaigns: Initiatives focused on underserved communities to address malnutrition and provide sustainable solutions.
-Research Symposiums: Opportunities for emerging researchers to present their findings and engage with seasoned experts in the field.

Your Role in Our Journey

I extend my heartfelt best wishes to all of you for these upcoming events and initiatives. Your involvement and active participation are key to our success. I am confident that together, we will make significant strides in improving the nutrition sector of our country, in line with our vision of enhancing nutritional literacy and transforming health behaviors.

I want to express my gratitude for your continued support and active participation in our society's activities. Your commitment and dedication are what make our work possible. I am genuinely excited about the future and what we will achieve together in our efforts to promote a healthier, more nutritionally aware Sri Lanka.

Let us continue this journey with optimism and determination, knowing that each step we take is a step towards a healthier nation. I look forward to your contributions, your ideas, and your unwavering support as we move forward.

Thank you once again for being an integral part of the Nutrition Society of Sri Lanka. Here's to a future where our collective efforts lead to lasting improvements in the health and well-being of our population.

Best regards,

Prof. Ananda Chandrasekara
President,
Nutrition Society of Sri Lanka

Editorial
| On Cloud Nine ...

Udara Dassanayake
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Undoubtedly, nutrition is an inalienable and an integral part of human health and development. For example, nutrition is central to achievement of the United Nation's Sustainable Development Goals (SDGs) of the 2030 Agenda - And at least 12 of the 17 SDGs include indicators relevant for nutrition.

The Nutrition Society of Sri Lanka (NSSL) is the learned society for nutrition. Our aim is to establish the links between professionals in the field of nutrition, in order to promote the science of nutrition and its application to the health of the population in the country. We encourage continuous nutrition education and training in the country, so as to promote the highest possible level of research and practical innovations.

The newsletter of the NSSL provides an ideal platform for the enthusiastic nutrition professionals, researchers and students who are passionate about improving the public health through nutrition. We devote ample space for the ardent authors to share their new findings, innovative practices and thought-provoking discussions in the field of nutrition and dietetics - Your contributions will inspire and inform our members, as well as the broader community.

The NSSL is **on cloud nine**, on its accomplishments - It is with great pleasure and pride that the NSSL releases this edition of the NSSL newsletter, in parallel to the National Nutrition Month, 2024 - An important month in the National calendar, in terms of promoting better nutrition among the population.

On a concluding remark, I'm **on cloud nine** - A very special gratitude goes to all the authors contributed to the NSSL newsletter so far, which helped in significant improvement in the metrics of our newsletter, ensuring that we stay competitive, updated and relevant, plus a pronounced surge in continuous and new submissions to the newsletter. Lastly, on behalf of the NSSL, herewith extending the invitation to all the prospective authors, to bring about a stronger drive to thought-provoking discussions in the field of nutrition and dietetics - Let's keep the momentum together, to continue to be **on cloud nine**; The forum is open for you ...

Ceylon Cinnamon: Much more than a spice

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Ceylon cinnamon or true cinnamon in native to Sri Lanka. Inner bark of the evergreen tree *Ceylon zeylanicum* is used in producing the cinnamon. Ceylon cinnamon belongs to the family *Lauraceae* which consisted of about 250 species and subspecies. Ceylon cinnamon and Cassia are the most prominent species in the international market. It is believed that Cassia is originated from the regions of China, Vietnam, Java, Indonesia and India. 'Ceylon Cinnamon' is referred to as "sweet cinnamon" and "true cinnamon" is considered to be the superior to Cassia species. Coumarine a potent hepatotoxic and carcinogenic material quite abundant in Cassia species. However, the content of coumarine in Ceylon cinnamon is very low compared to that of Cassia species.

Ceylon cinnamon produced in Sri Lanka is considered to be the highest grade pure cinnamon. Further, Sri Lanka is the world largest producer and exporter of the pure cinnamon to the world. Cinnamon is produced as sticks, quills, quillings, featherings, cinnamon powder and cinnamon oil (leaf and bark oil). Quills are solely produced in Sri Lanka by a characteristic technology unique to the country. Ceylon cinnamon is graded in to four as Alba, Continental, Mexican and Hamburg based on the diameter of the quill and most expensive type is the quills of Alba grade with 6 mm diameter. Ceylon cinnamon is unique in its quality, colour, flavor and aroma hence used in the food industry particularly in bakery products, Asian foods, tea, pharmaceuticals and cosmetics worldwide. Out of that, cinnamon powder, cinnamon oil and tablets made out of cinnamon are considered as value added products and are exported to the foreign countries.

Cinnamon has been used as a traditional culinary for centuries. In addition to that, cinnamon has been considered as a treatment for ailments such as indigestion, diarrhea, obesity and some types of cancers in the traditional medicine. However, now there is a growing evidence of potential health benefits such as anti-inflammatory properties, anti-hypertensive effects, anti-microbial activity, blood glucose lowering, reducing the cardiovascular disease incidence, boosting cognitive functions and reducing the risk of colon cancer.

Antioxidant profile of Cinnamon

Flavanoids, cinnamaldehyde, eugenol and linalool are a few of the antioxidants present in the cinnamon. Those compounds have shown to mimic the activity of endogenous antioxidant enzymes such as superoxide dismutase and glutathione. Cinnamon bark extracts were effective in increasing the plasma total antioxidant capacity and reducing the lipid peroxidation of healthy

adults. Further, antioxidant compounds present in the cinnamon have demonstrated to contribute in regulating the plasma glucose and lipids through their protective actions.

Anti-diabetic effects

Glycaemic control is the central focus of diabetes management. Good glycaemic control can either delay or prevent the diabetes related comorbidities. Cinnamon has shown to impart the blood glucose lowering effects by its bioactive compounds such as proanthocyanidins and phenolic compounds. Further, formation of advanced glycation end products can be blocked by the proanthocyanidins which is important in preventing the diabetes related complications. There is ample amount of animal studies with the use of rat models have shown to improve the insulin sensitivity, glycated haemoglobin, postprandial plasma glucose and fasting plasma glucose levels. Similar effects were also demonstrated in the human studies but the use of Ceylon cinnamon is very limited in those.

Anti-atherogenic effects

There are only a few human studies showed a significant improvement in fasting plasma lipids with the consumption of Ceylon cinnamon. Most of the studies have conducted with the use of cassia species and animal models. Cassia species has shown reductions in fasting plasma lipids in individuals with type 2 diabetes. In one of the animal studies conducted with the use of Ceylon cinnamon on diabetes induced rats, consumption of water extract showed reductions in atherogenic LDL cholesterol level was observed in addition to the improvements in blood glucose and food intake.

Anti-hypertensive effects

Cinnamon has demonstrated anti-hypertensive effects in short term and long term consumption. Cinnamon intake has improved the blood pressure of individuals with pre-diabetes and type 2 diabetes and the reduction of systolic blood pressure and diastolic blood pressure were 5 mmHg and 2.6 mmHg respectively. Although the exact mechanism by which cinnamon exerts the potential anti-hypertensive effects is not well established, suggested mechanisms are by the Cinnamaldehyde and other bioactive compounds present in cinnamon. Cinnamaldehyde is believed to be involved in relaxing the blood vessels, inhibiting the vasoconstrictors such as angiotensin II, dopamine, vasodilation and improving nitric oxide production.

The way forward

Our study conducted at the Human Investigation Unit, Department of Applied Nutrition to see the effect of Ceylon cinnamon on blood pressure of the pre-hypertensive males with the boiled water infusion of Ceylon cinnamon powder showed reductions of systolic blood pressure by 12 mmHg and diastolic blood pressure by 10 mmHg. Further, significant reductions were observed in fasting plasma LDL cholesterol and triacylglycerol levels. Plasma total antioxidant capacity, activities of erythrocyte glutathione peroxidase and super oxidase dismutase activities were shown to be improved after consuming the boiled water extracts for 8 weeks. In addition, lipid peroxidation markers were significantly reduced in the pre-hypertensives after following the boiled water infusions of Ceylon cinnamon.

Although the exact mechanisms of reducing blood pressure, improving lipid profile and antioxidant status by the cinnamon are not established yet, potential anti-hypertensive, anti-inflammatory and anti-hyperglycaemic effects shown in both animal and human studies indicate the need for further exploration. The sustainability and durability of the beneficial effects exerted by cinnamon have to be further studied. In addition, the safety and tolerability aspects have to be investigated and established in long term studies.

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Cancer Risk with Red & Processed Meat: What You Need to Know

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Meat is a vital component of the human diet, providing high-quality protein. In addition to providing a substantial amount of protein and fat, meat also contains essential vitamins and nutrients, such as iron (Fe), zinc (Zn), vitamin A, and vitamin B. Due to its appealing flavour and essential nutrients, global meat consumption has increased with improved living conditions (Ma & Qi, 2023).

Red meat and processed meat: Red meat is any raw mammalian muscle meat, such as beef, veal, pork, or lamb, which may have been minced or frozen. Meat that has been transformed through salting, curing, fermentation, smoking, or other processes to improve preservation or flavour is referred to as processed meat. Processed meats primarily consist of pork or beef, though they may also include other meats like poultry, and offal such as liver (International Agency for Research on Cancer, 2018).

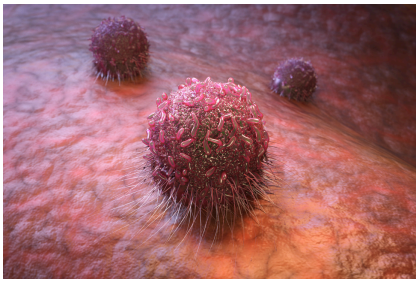
Many studies suggest that consuming more red meat may not be good for human health. According to multiple epidemiological and pathological research, there is a positive association between red meat consumption (RMC) and the risk of cancer (Ma & Qi, 2023). Eating red meat raises the chances of getting colon and rectum cancer. There's also some evidence suggesting it might be connected to breast, stomach, and pancreatic cancer.

Colorectal Cancer: Red and processed meat consumption have been studied as risk factors for colon cancer in a larger number of cohort studies. Long-term consumption of red and processed meat raises the risk of colon cancer by 20–30%. Further, it is associated with a high mortality rate (Sivasubramanian et al., 2023). The study in Sri Lanka identified frequent consumption of red meat as a significant risk factor for colorectal cancer (Samarakoon et al., 2018).

There are certain theories for the pathogenesis behind the associations between colorectal carcinoma and red meat. For example, the gut microbiomes influence the relationship between colorectal cancer and diet. Certain theories suggest that the link between red meat and colorectal cancer is due to the cooking of red meat at a higher temperature, which eventually leads to the formation of heterocyclic amines (Sivasubramanian et al., 2023).

Breast Cancer: Large prospective cohort studies conducted on the relationship between red meat consumption and developing breast cancer have demonstrated that the consumption of red meat is significantly associated with an overall increase in cancers as well as an increase in the risk of developing breast cancer (Diallo et al., 2017). The direct association between red meat and developing breast cancer has been indicated in two meta-analyses by Wu et al. (2016) and Guo et al. (2015), in which both demonstrated a positive relationship between increased breast cancer risk and red meat as well as processed meat. Anderson et al. (2018) reported that processed meat consumption might be associated with a higher risk of breast cancer compared to red meat, and this association was significant in postmenopausal females compared to premenopausal females.

The correlation between the consumption of red and processed meat and the risk of breast cancer has been explained by several mechanisms, which include carcinogenic byproducts that form during high-temperature cooking of red meat, the presence of fat, heme iron, and the animal sugar molecule N-glycolylneuraminic acid that can cause inflammation, oxidative stress, and tumor formation, and in certain countries, the presence of hormone residues from exogenous hormones used to promote the growth of beef cattle (Sivasubramanian et al., 2023).



Gastric Cancer: Red and processed meats are considered a hidden risk factor for stomach cancer. Studies show a significant association between red meat consumption and the development of gastric cancer. Kim et al. (2019) demonstrated that consumption of red and processed meat is linked to an increased risk of gastric cancer. According to Song et al. (2014), the highest level of red meat consumption is linked to a 37% increased risk of stomach cancer.

It has been identified that heme iron, which is abundantly found in red meat, is a risk factor for gastric cancer. This is attributed to its contribution to the endogenous production of carcinogenic N-nitroso compounds (NOCs) and its ability to cause oxidative stress and DNA damage, which lead to the creation of DNA adducts (Sivasubramanian et al., 2023).

Pancreatic Cancer: Studies have found a positive association between red meat consumption and pancreatic cancer risk. According to Taunk et al. (2016), the risk of pancreatic cancer significantly increased with the consumption of total meat, red meat, and high-temperature cooked meat. Petrick et al. (2020) identified that total red meat was linked to a 65% increased risk of developing pancreatic cancer, although the findings were not statistically significant. Further, Heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs), which are present in red meat, have been strongly associated with the risk of pancreatic cancer. PAH, which is a type A carcinogen, is primarily associated with smoking and cooking methods such as grilling and barbecuing (Sivasubramanian et al., 2023).

In conclusion, eating red and processed meat is linked to an increased risk of various types of cancer, including colorectal, gastric, pancreatic, and breast cancer. To mitigate the risk of cancer associated with red and processed meat consumption, individuals can limit the consumption of red and processed meats and instead focus on incorporating a variety of other protein sources into their diet and avoid high-temperature cooking methods such as grilling, frying, or barbecuing, which may produce carcinogenic compounds.

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Treading Towards a Healthy School Food Environment

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In Sri Lanka, adolescents make up nearly 17% of the population, navigating the critical transitional period between puberty and adulthood. As, they are at the peak of their growth in terms of both physiological and cognitive development, meeting the recommended amount of nutrients is essential. However, underweight (26.9%), stunting (13.7%), overweight and obesity (9.7%), and anemia (8.8%), are still prevalent nutritional problems among Sri Lankan adolescents (Jayatissa et al., 2019).

A myriad of factors including the availability of energy-dense, nutrient-poor foods and child-oriented marketing contribute majorly to unhealthy food consumption patterns among children.

The school food environment has been identified as an ideal setting for manipulating children's food choices, as they spend an important part of their time in it and consume one-third to one-half of their daily meals at school.

The school food environment refers to all the spaces, infrastructure and conditions inside and around the school premises where food is available, obtained, purchased and/or consumed (for example school canteen, food outlets in the school neighborhood, food and nutrition-related programs) (Mukanu et al., 2022).

It offers an entry point to reach children, parents, school staff and the wider community to improve food consumption behaviors and can include relevant policy and standards, provision of nutritious food in and around schools, nutrition education and complementary activities to promote nutrition and health.

In Sri Lanka, the implementation of nutrition-related policies/programmes such as a school meal programme, school canteen policy, and school health promotion initiatives hold profound importance for cultivating a healthy school food environment.

The school meal programme, led by the Ministry of Education, aims to provide nutritious meals to all students in grades 1-5 nationwide. It seeks to address nutritional deficiencies among students, enhance daily attendance rates, instill healthy eating and lifestyle habits, elevate academic performance, and promote local culinary traditions. Evidence suggests that such programs positively impact students' energy intake and nutrient levels in various countries, including the US, the UK, and many developing nations (Bassi et al., 2021).

School canteen policy is one initiative taken by the government in 2006 to combat malnutrition among school

children through the provision of nutritious, culturally acceptable food at affordable prices within the school premises. One of the key obstacles to operating a healthy canteen is the presence of food stalls close to the school that sell unhealthy food. The majority of these offer fast food and carbonated drinks which are restricted by the school canteen guidelines. Furthermore, the non-adherence to school canteen guidelines by canteen operators is a key issue due to the existence of canteens as profit-making ventures (Malwenna et al., 2020).

The School health promotion Programme is one of the components that is practiced at the field level by the staff of the Medical Officer of Health, under the guidance of the Ministry of Health. The key objective of this programme is to promote activities under the School Promotion Programme focusing the full attention of the school community on making the school premises a promotion place to improve the health status of the students (Townsend et al., 2015).

Nutrition education can help students attain the knowledge and skills they need to make healthful food choices and develop lifelong healthy eating patterns. Schools are ideal settings for nutrition education because they reach most adolescents, and nutrition incorporates several subject areas including science, health, practical and technical skills, home economics, agriculture and food technology. However, there are no school curricula specifically devoted to nutrition and the above subjects might cover some aspects of nutrition. Out of these subjects except for science, all other subjects are elective and disseminating food and nutrition messaging reaches a very limited number of students. Moreover, the emphasis on mandatory subjects like science and mathematics disconnects children from more practical aspects such as cooking and gardening (Nanayakkara et al., 2018).

School garden programmes have emerged as an innovative and potentially engaging strategy to promote nutrition among school children. There is evidence of efforts taken by different countries to incorporate food and nutrition concepts into children's lives through garden-based activities.

School gardens can positively impact students' understanding of where food comes from, how it grows, and its nutritional value. In addition, gardening can be a beneficial component of an educational environment that provides teachers with an excellent opportunity to teach nutrition as well as integrate the learning process with gardening (Lam et al., 2019).

Media remains one of the dominant societal influencers of food choice and marketing channels for food and beverages to children. In addition, the use of smartphones and social media platforms by adolescents exposes them to predatory food marketing where unhealthy foods are portrayed as cool and exciting. Therefore, there is a need for interventions to promote healthy foods instead of fast food through mass media. Moreover, policy recommendations to regulate predatory food marketing.

Initiatives such as the school meal programme, school canteen policy, school health promotion programmes, nutrition education and school garden programs play a crucial role in creating a healthy school food environment. However, there are still gaps within the above components. There is still a need for comprehensive policies and interventions to improve the existing school food environment. By promoting collaboration between government organizations, schools, communities, and other stakeholders, Sri Lanka can work towards creating a school food environment that prioritizes the health and well-being of its future generations.

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Sustainable Nutrition; A spotlight to SDG (Sustainable Development Goals)

As the term "sustainability' is not novel for the vocabulary, the whole world is on an immense focus to achieve sustainability in various aspects throughout the past decade. It's true that we all talk about sustainable energy, sustainable economy more frequent, but do we have ever focus on sustainable nutrition?

Acquiring the nutritional needs is not a difficult task to overcome, if the access to the proper nutritional sources are available at the right time. However, the term "sustainable nutrition" holds the meaning that the ability of food systems to provide sufficient energy and essential nutrients to maintain the good health of a population, without compromising the ability of future generations to meet their nutritional needs. It is a concept that has emphasized the importance to maintain the fair access and distribution of nutritional sources for both present and future generations.

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The biggest issue faced by the world nowadays is finding ways to feed the growing populations amidst the struggle to come up with solutions for environmental degradation. Finding solutions for these burning issues has become much difficult as they are bound like links of the same chain.

It is estimated that the world population will rise up to 9.6 billion by the year 2050 making "sustainable nutrition" a responsibility than a target to be achieved. According to Food and Agriculture Organization (FAO) data, out of the food produced around the world, nearly 30% of the food is wasted daily. Hence, it is essential to take actions to minimize food wastage, increase production and uplift the fair distribution of nutritional sources.

Finding solutions to promote "sustainable nutrition" is not an easy due to the fact that it covers different dimensions. When introducing new meals and dietary habits, it is important to consider whether it provides the adequate nutrition given by the meal to which it is replaced. Food

safety is also one of the major concern. New food products should be accessible and affordable while the process of production should cause a minimum harm to the environment. Production of Genetically Modified food (GM food) has been identified as a promising solution for many questions related to food wastage, especially during transportation and storage, and receiving a bigger harvest. However, clearing the doubts and breaking the ethical taboos related to GM food has been a major concern and various efforts has been put by FAO and other International and local organizations to make people educate about the scientific background of GM food.

Other than that, it is required to make people aware on the ways to minimize food wastage. Setting up the "Food banks" in local and international level has become an emerging trend which must be further supported by the national and international organizations and the specialists to maintain the quality of the food banks and to promote this new concept around the world. This is a timely address to minimize the food wastage by supporting the fair distribution of nutrients to the under-privileged.

Reducing the carbon foot-print in acquiring the nutritional needs is also a fact that we have to keep our eye on, where certain international companies have come up with the concept of promoting mini–gardens at the kitchen for those who struggle for the space for home gardening.

It is evident that the idea of "sustainable nutrition" is driving a global transformation in food production and consumption systems. It is acceptable the fact that United Nations Sustainable Development Goals has become a roadmap in setting up many sustainable strategies but the potential to put those into actions is in our hands. What is your opinion? The choice is yours!!!

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Be Aware about Zombies

Poem By
M.P. Theja Virajini

Beep sound of the alarm awakens the zombie,
For another new day
The zombie is getting ready for work

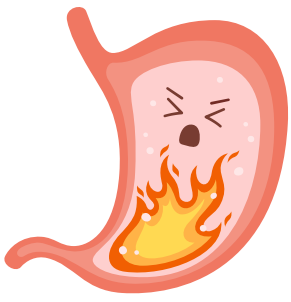
She is so busy with her stuff and has no time,
Even for her breakfast
"No problem, at least she will have lunch"
Thought innocent stomach

Work Work Work, She has no time for lunch either,
Just ate a bun with coffee to please her stomach
"No problem, she will definitely have a luxury dinner"
Oh! Poor stomach

Came back to the apartment,
Too late and no foods Ate some instant noodles
Seems like she didn't had another choice

The poor stomach is difficult to bear anymore,
It's trying to suicide day by day by drinking acids
But, the zombie doesn't even care about her stomach,
Her world only filled with work

Finally, her stomach is slowly dying
Let's pray that her stomach rests in peace



DIETARY FIBER

What is Dietary Fiber?

The indigestible part of plant-based diets is referred to as dietary fiber, sometimes called roughage or bulk. It includes plant parts that the body is unable to completely absorb or digest. In contrast to other nutrients such as proteins, lipids, and carbs, dietary fiber mostly makes it through the digestive tract undigested. Unlike other meal ingredients, it is not taken into the bloodstream or converted by digestive enzymes into nutrients. Rather, fiber helps with digestion, regulates bowel motions, and gives the stool more volume (Barber et al., 2020).

Two primary types of dietary fiber

1) Soluble Fiber

- In the digestive tract, soluble fiber turns into a gel-like concoction. In addition to balancing blood sugar levels and promoting a feeling of fullness, this gel helps to slow down the digestion and absorption of nutrients. Soluble fiber can be found in a variety of foods, including barley, oats, legumes, apples, oranges, and carrots and Brussels sprouts (P. and Joye, 2020).

2) Insoluble Fiber

-This type of fiber adds volume to the stool and facilitates regular bowel movements, reducing constipation. It does not dissolve in water. By helping food and waste flow through the digestive tract, it functions as a natural laxative. The typical sources of insoluble fiber are nuts, seeds, and the skins of fruits and vegetables. Whole grains include brown rice and wheat bran (P. and Joye, 2020).

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Impact on Metabolic Health and implications for disease prevention

Research shows a relationship between dietary fiber consumption and metabolic health in general, especially when it comes to insulin sensitivity pathways. People who consume diets high in fiber have lower risks of cardiovascular diseases, better colon health, increased motility in the gut, and a lower risk of colorectal cancer. Additionally, a lower death rate has been associated with dietary fiber intake (Makki et al., 2018).

Role of gut microbiota

The beneficial effects of dietary fiber are mediated by the gut flora, which is an important factor to consider (Simpson and Campbell, 2015). In the stomach, microbial fermentation produces short-chain fatty acids (SCFAs) from substrates found in diets high in fiber. In order to

maintain general health, these SCFAs are essential for controlling hunger, metabolic functions, and chronic inflammatory pathways (Lai et al., 2023).

Recommendations for public health

Public health policies should place a high priority on maximizing the consumption of dietary fiber in populations, as there is ample evidence to support the health advantages of this dietary fiber. For bettering metabolic health and general well-being, it is imperative to reduce intake of highly processed foods and increase consumption of plant-based foods high in fiber (Tanes et al., 2021).

Dietary sources of fiber

Fruits

Fruits include both soluble and insoluble fiber, making them great dietary fiber sources. Fruits high in fiber include berries (strawberries, raspberries, blueberries), pears, apples, oranges, bananas, and avocados. These fruits are rich in fiber and packed with vital vitamins, minerals, and antioxidants that are good for the whole body.

Vegetables

Packed with a multitude of nutrients and health advantages, vegetables are one of the foods highest in fiber content. In particular, leafy greens with high fiber content include collard greens, kale, and spinach. Broccoli, Brussels sprouts, bell peppers, sweet potatoes, carrots, and artichokes are some additional foods high in fiber. Adding a variety of vegetables to meals provides that the body gets enough fiber and promotes health in general.

Whole Grains

Packed in nutrients and fiber, whole grains are made up of the complete kernel, including the bran, germ, and endosperm. Oats, barley, quinoa, brown rice, whole wheat, and farro are a few whole grains that are high in fiber. Both soluble and insoluble fiber are included in these grains, which support healthy digestion and help keep blood sugar levels balanced.

Legumes

Packed with a multitude of nutrients and health advantages, vegetables are one of the foods highest in fiber content. In particular, leafy greens with high fiber content include collard greens, kale, and spinach. Broccoli, Brussels sprouts, bell peppers, sweet potatoes, carrots, and artichokes are some additional foods high in fiber. Adding a variety of vegetables to meals provides that the body gets enough fiber and promotes health in general.

Nuts and Seeds

Rich in natural lipids, protein, vitamins, and minerals, nuts and seeds also include a significant quantity of dietary fiber. Nuts high in fiber include pecans, pistachios, walnuts, and almonds. In a similar vein, adding seeds to one's diet might improve general health. Flaxseeds, pumpkin seeds, sunflower seeds, chia seeds, and other seeds are high in fiber.

Summary

In our food, there's a special riches,
Called dietary fiber, it's a health measure.
Found in fruits, veggies, grains so fine,
It helps our bodies, like a lifeline.

Fiber keeps our tummy feeling light,
Helps our digestion, day and night.
In soluble and insoluble, it comes in two,
Both kinds are good for me and you.

So let's eat our veggies, and whole grains too,
To keep our bodies feeling fresh and new.
With fiber in our diet, we'll surely thrive,
In this simple truth, let's keep alive.

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මඩ ගොහොරුවේ හැදුනත් කටු පිරුණු අලේ
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The Utilization of Bioactive Compounds in the Management of Noncommunicable Diseases: Cardiovascular Diseases, Cancer, and Diabetes

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Noncommunicable diseases (NCDs) are the etiology behind approximately 41 million deaths globally per annum, with cardiovascular diseases, cancers, and diabetes constituting major contributors to this mortality rate, accounting for nearly 29 million fatalities (World Health Organization, 2024). Although these conditions often persist over long durations and are occasionally amenable to complete remission, their prevalence underscores the imperative for effective management strategies.

Dietary patterns and their qualitative attributes significantly influence the prevalence and progression of NCDs globally. Modifying diet to incorporate nutritive and bioactive compounds is an evidence-based intervention that has been shown to attenuate the incidence and ameliorate the sequelae of these diseases.

Bioactive compounds, with their genesis in plant, animal, microbial sources, and even food waste, have garnered the attention of the scientific community due to their potential to regulate metabolic processes and their cost-benefit advantage. These compounds, including terpenoids, phenolic acids, alkaloids, flavonoids, anthocyanins, tannins, quinones, carotenoids, and bioactive peptides, are imbued with a plethora of health-beneficial properties such as antioxidant, antimicrobial, anticarcinogenic, antimutagenic, antiallergic, immunomodulatory, hypocholesterolemic, and anti-inflammatory effects. The dietary integration of such bioactive compounds is advocated due to their multifarious health-promoting attributes (Thakur and Belwal, 2022).

Extraction and isolation of these compounds for research or enhanced dosing purposes are conducted using both traditional methods such as Soxhlet extraction, maceration, and hydro distillation, and innovative techniques including supercritical fluid extraction, fermentation, and ultrasound-assisted approaches.

Table 1: Bioactive compounds important for cardiovascular health, benefits and sources (Thakur and Belwal, 2022)

Bioactive compound	Potential benefit	Source
Bioactive peptides	Antihypertensive, hypocholesterolemic, antioxidant, hypolipidemic	Fermented products, fish protein, soy protein, wheat gluten, chicken collagen, maize
Omega 3 fatty acids	Reduce cholesterol level	Flaxseed, sesame seeds, walnuts, cereals, soybean, Fish and fish by-products, microalgae, shrimp, oyster
Conjugated linolenic acid	Reduce total cholesterol and LDL levels	Meat (beef, lamb), milk, dairy products (cheese
Carotenoids	Antioxidant, anti-inflammatory agent	carrots, winter squash, red-orange sweet potato, saffron, dark green leafy vegetables, tomato
Prebiotic	Protective effect against cardiovascular diseases	Artichoke, banana, flaxseed, soybean, garlic, sugar beet, asparagus, tomato, rye, whole wheat grain, oats, mother's milk, unrefined barley,
Tannins	Cholesterol lowering agent, anti-inflammatory agent, antioxidant.	Raspberries, strawberries, olives, mango, pomegranate, oak, meat, fish, wine, Grapes, grapes skin, berries, apples, red wine, peanut inner skins, coffee beans, chocolates, pine bark, tea, and cinnamon bar
Anthocyanins	Anti-inflammatory agent, antioxidant	Fruit and fruit derivatives, vegetables
Phytoestrogen (Isoflavones, Flavanones, Flavonoids, Plant sterols, Coumestans, Stilbenes, Lignans)	Give protection from cardiovascular diseases	Clovers (red and white), soybeans, beans, split pea, apples, red onions, citrus peels, Parsley, capsicum pepper, alfalfa, Tomatoes, broccoli, onions, apples, Corn, soybeans, sugar beet forage, avocados, pistachios and almonds, Legumes (alfalfa, clover), spinach, lima beans, soybean sprouts, Grape skin (red wine), peanuts, Flaxseed (linseed), squash, pumpkin seeds, tea (black and green), sunflower seeds, strawberries, cranberries

Bioactive Compounds and Their Impact on Predominant NCDs

Cardiovascular disease is the preeminent cause of mortality worldwide, with approximately 17.9 million deaths attributed to it in year 2019 (World Health Organization, 2024). Strategies for managing cardiovascular disease risk factors often focus on the modulation of lipid profiles. Bioactive compounds have demonstrated efficacy in this regard, contributing hypocholesterolemic, vasodilatory, and cardioprotective effects, along with antioxidant and anti-inflammatory properties that are beneficial for cardiovascular health. Notable among these compounds are specific peptides and protein hydrolysates from plant sources, which have been recognized for their cardiovascular disease mitigation potential (Belović et al., 2011).

Cancer remains a significant cause of mortality and morbidity, with research continually advancing in the quest for improved treatments. Nearly 10 million deaths were attributed to cancer in 2020 (World Health Organization, 2024). The anti-carcinogenic capabilities of bioactive compounds, along with their antioxidant and anti-inflammatory actions, contribute to their potential in inhibiting oncogenesis. A spectrum of bioactive compounds including bioactive peptides, Omega-3 fatty acids, conjugated linoleic acid, carotenoids, prebiotics, tannins, anthocyanins, chitin, glucosamine, polyphenols, and ascorbic acids have been implicated in cancer management, with microgreens identified as a rich source of these compounds (Mohanty et al., 2016).

Diabetes mellitus, characterized by inadequate insulin production or action, imposes a significant health burden. The disease contributes to major complications such as blindness, kidney failure, and cardiovascular complications, even though the direct mortality attributed to diabetes was 2 million in 2019 (World Health Organization, 2024). Bioactive compounds offer an alternative to conventional pharmacotherapy for diabetes, given their antidiabetic properties and lower incidence of side effects. For example, conjugated linoleic acid has been highlighted for its role in improving glucose tolerance and regulating insulin secretion. Moreover, the hypoglycemic effect of polypeptide-p, found in bitter gourd, has been likened to that of insulin, thereby aiding in glucose management (Ngan Tran and Bao Pham, 2020).

Table 1 summarizes the bioactive compounds that are important for cardiovascular health, along with the potential benefits and the sources (Thakur and Belwal, 2022).

In summary, bioactive compounds exhibit diverse mechanisms of action that are propitious for the management of cardiovascular diseases, cancer, and diabetes. Their inclusion in dietary regimens through the consumption of fruits, vegetables, fish, meat, and milk offers a promising approach to mitigating the global burden of these predominant NCDs.

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Cultivating Nutrition Literacy: Integrating Nutrition-Sensitive Agriculture through School Gardens

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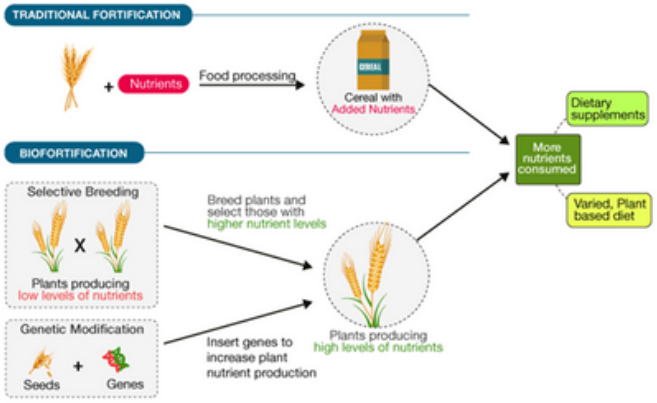
The world today faces a double burden of malnutrition and micronutrient deficiencies. Many school-aged children suffer from various forms of malnutrition and it is important to address their nutritional status given the effects it has on their health, cognition and subsequently their educational achievements. “Can integrating nutrition-sensitive agriculture in schools be the solution to malnutrition?" Here, nutrition-sensitive agriculture (NSA) steps in, offering a framework to cultivate not just food, but health itself. This approach understands that farming is not only about growing food. It also affects what we eat and how healthy we are. One promising avenue for implementing nutrition-sensitive agriculture is through school gardening programmes, which have the potential to not only educate children about the origins of food but also to promote healthier eating habits and address nutritional deficiencies. School gardens have a long history as a valued educational tool (Ohly et al. 2016). School gardening has been increasingly popular in the past decade both in developed and developing countries (Schreinemachers et al. 2017). School gardens teach students about plants, nature, and how to take care of the environment. However, by integrating principles of nutrition-sensitive agriculture into these programs, educators can enhance their impact on children's health and well-being.

Nutrition Sensitive Agriculture is an agricultural approach that prioritizes the production of nutritious foods alongside increasing overall yields. It recognizes the interconnectedness between agriculture, nutrition, and health (Sharma et al. 2021). One key aspect of nutrition-sensitive agriculture is diversifying food production to ensure a balanced diet. When designing a school gardening model, this principle can be applied by cultivating a variety of fruits, vegetables, grains, and legumes. Vegetables offer a rich array of nutrients essential for health. They are packed with vitamins like A, C, K, and various B vitamins, crucial for vision, skin, immunity, and energy. Additionally, they provide essential minerals such as potassium, magnesium, calcium, iron, and zinc, supporting functions like blood pressure regulation, muscle function, and immune response. Moreover, vegetables are high in fiber, promoting digestive health and reducing the risk of chronic diseases.

They are also abundant in antioxidants like beta-carotene and flavonoids, guarding cells against damage and lowering disease risk (Butt and Sultan 2018). Fruits like oranges and mangoes provide a natural source of vitamin C. This diversity ensures students have access to a wider range of micronutrients often lacking in typical diets. By exposing children to a wide range of foods, educators can expand their palates and encourage them to consume a more diverse and nutrient-rich diet. It emphasizes producing a diverse range of nutrient-rich foods that meet people's specific dietary needs.

Another key aspect is bio-fortification. It is a process by which the nutritional quality of crops is enhanced through breeding, agronomic practices, or biotechnology to increase their levels of essential vitamins and minerals (Yashveer et al. 2014).Plant breeders develop new crop varieties with higher levels of specific nutrients such as iron, zinc, vitamin A, or vitamin C. They use traditional breeding techniques to select and cross plants with naturally higher nutrient content.



Agronomic techniques such as soil management, fertilizer application, and irrigation can also influence the nutrient content of crops. Soil pH and organic matter content influence the availability of nutrients to plants. In soils with high pH or low organic matter, zinc availability to plants may be limited. Farmers can optimize soil management practices by applying soil amendments such as gypsum or organic matter to improve zinc uptake by wheat plants. When considering fertilizer application, fertilizers can be applied to plants to supplement soil nutrient levels and ensure adequate uptake by plants. Nutrients can be applied either through broadcasting or banding at the time of planting.

The application rate and timing of fertilizers should be based on soil test results and crop requirements to maximize nutrient uptake and utilization by plants. Another important agronomic practice is irrigation. Sometimes, water stress can affect nutrient uptake and translocation within plants. Proper irrigation management is essential to ensure optimal growth and nutrient uptake by plants. Adequate soil moisture levels should be maintained throughout the growing season, especially during critical growth stages such as flowering and grain filling, to support efficient nutrient uptake and accumulation in grains. Water-efficient irrigation methods like drip and sprinkler irrigation methods can be incorporated into the school garden model. By optimizing these practices, farmers can enhance the uptake and accumulation of nutrients in crops.

Biotechnological approaches, including genetic engineering, can be used to directly introduce genes responsible for nutrient accumulation into crop plants. For example, researchers can insert genes encoding for specific vitamins or minerals into crop genomes to produce bio-fortified varieties. One of the most well-known examples of biofortification through biotechnology is Golden Rice. Golden Rice is a genetically modified variety of rice that has been engineered to produce beta-carotene, a precursor of vitamin A, in the rice grain. Consumption of Golden Rice can help combat vitamin A deficiency, as beta-carotene is converted into vitamin A in the human body (Brooks, 2013). By incorporating this trait into rice varieties commonly consumed in regions where vitamin A deficiency is prevalent, Golden Rice offers a sustainable and cost-effective solution to improve the nutritional status of populations.

Schools can integrate this kind of new innovative ideas like bio-fortified crop varieties naturally rich in essential vitamins and minerals like iron, zinc, and vitamin A. Imagine students planting orange-fleshed sweet potatoes, a readily available source of vitamin A, or bio-fortified maize varieties with higher levels of zinc.

Furthermore, school gardens provide an opportunity to teach children about the nutritional value of different crops and the importance of consuming a balanced diet. Educators can incorporate lessons on the nutritional content of various fruits and vegetables, highlighting the vitamins, minerals, and other beneficial compounds they contain. By engaging in hands-on activities such as tasting sessions and cooking demonstrations, students can develop a deeper appreciation for the nutritional value of fresh, whole foods. The garden becomes an exciting classroom where teachers can easily include gardening in science, math, and nutrition lessons. Moreover, school gardens can serve as living laboratories for exploring sustainable agricultural practices. Educators can teach students about the environmental impact of different farming methods and the importance of conserving natural resources. By practicing techniques such as composting, crop rotation, and water conservation in the school garden, students can learn firsthand how sustainable agriculture can support both human health and the health of the planet. School gardens can become centers where the community works together. Local farmers can share their wisdom on sustainable agricultural practices, while nutritionists can conduct workshops on healthy eating for both students and parents. This fosters a collaborative environment that nourishes not just the garden, but the entire community.

In addition to promoting dietary diversity, nutrition-sensitive agriculture emphasizes the importance of food accessibility and affordability. School gardens can play a role in addressing these issues by providing fresh produce to students and their families, particularly in communities where access to healthy foods is limited. When students help grow and pick crops, school gardens make them feel like they're part of something important. It gives them a sense of ownership and teaches them they can help make sure there's enough food for everyone. Another important aspect of nutrition-sensitive agriculture is promoting gender equality and empowering women in agriculture. School gardening programmes can play a role in challenging traditional gender roles by involving both boys and girls in all aspects of food production. By providing equal opportunities for participation and leadership, educators can help break down barriers and foster a more inclusive learning environment.

In conclusion, integrating principles of nutrition-sensitive agriculture into school gardening programmes has the potential to enhance their impact on children's health, education, and overall well-being. By cultivating a diverse range of crops, promoting nutritional awareness, addressing food accessibility and affordability, teaching sustainable agricultural practices, promoting gender equality, and engaging with the community, educators can create a comprehensive and effective model for promoting nutrition-sensitive agriculture in schools.

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Word Search Box

Find the hidden 25 words in here related to Food, Nutrition, Diet and Diseases

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For answers please check page 36

Prepared by,
Nilmini Wijesinghe

Vitamin D Deficiency in Sri Lanka: Is it a concern?

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Vitamin D plays an important role in human health by participating mainly in bone metabolism, maintaining bone health and muscle function. According to the chemical structure, Vitamin D is available in two forms; vitamin D3 (cholecalciferol) and vitamin D2 . Both of these forms are fat-soluble. The sources of these two forms are different: the primary source of vitamin D2 is plants, while vitamin D3 is synthesized in the human skin from 7-dehydrocholesterol after exposure to the sun. The two forms of Vitamin D remains as inactive and a specific enzymatic hydroxylation is needed for the activation.

Both vitamins D2 and D3, undergo the same metabolism process i.e, the two-step hydroxylation process. Firstly, vitamins D2 and D3 are transported by the vitamin D-binding protein to the liver where they are converted to 25(OH)D2 and 25(OH)D3, respectively, with the help of 25-hydroxylase enzyme. Hydrolized Vitamin Ds are then transported to the kidneys where they are converted to the biologically active form of vitamin D (1,25(OH)2D), with the help of 1-α-hydroxlyases. Upon activation, vitamin D participate in vital roles in many biological, physiological and chemical functions: function of vital organs, such as the kidneys, intestinal mucosa, and bones to regulate calcium and phosphate metabolism. Vitamin D is also essential in calcium and phosphorous homeostasis and is associated with parathyroid hormone (Albarri et al,2022). There is a high demand for Vitamin D in adolescence and child-bearing age in women.

Vitamin D deficiency is considered a significant healthcare concern worldwide despite age and gender. Due to the fact that Vitamin D participate in many vital functions in the human body, inadequacy results various complications, ranging from mild discomfort to severe deficiencies. While mild deficiencies remains mostly unedified, severe deficiencies results rickets in children and osteomalacia in adults (Palamore et al,2007). There are evidences that links vitamin D deficiency to colon cancer, arthritis, diabetes mellitus, and cardiovascular diseases (Hamilton 2010, Mozos et al, 2015 & Tsoucalas et al,2017).

Vitamin D is measured as 25(OH) D and inadequacy in the human body is usually categorized as deficiency, insufficiency and sufficiency {defined as 25-hydroxyvitamin D [25(OH)D] < 50, 51–74 and > 75 nmol/L, respectively (Cui et al,2023)}. Earlier, vitamin D deficiency was more prevalent in countries located at high latitudes where ultraviolet radiation is insufficient (Heaney et al, 2003). Due to the fact that vitamin D3 can be synthesized in the human body, people who live near the summit

rarely get Vitamin D deficiency as they receive sufficient sunshine throughout the year.Thus, countries like Sri Lanka are well privileged to overcome Vitamin D deficiencies. However, since recent past, inadequacy of vitamin D have emerged as a concern affecting people, despite the latitude they live (Cui et al, 2023).There are several reasons for this, including air pollution, latitude, season, the use of sunscreen, sedentary jobs, diet and others (Arabi A et al, 2010).

According to Cui etal, 2023, vitamin D deficiency and insufficiency is prevalent in South East Asia, including India with more than 70% prevalence of vitamin D deficiency [25(OH)D < 50nmol/L] in all age groups, including toddlers, school children, pregnant women and their neonates and adult males. Further, Vitamin D status in other Southeast Asian countries also remains unsatisfactory. According to literature, there is a significant relationship between the deficiency/insufficiency of Vitamin D with the income, social status and the gender (Cui etal, 2023). Among these Southeast Asian countries, Thailand had the least prevalence of vitamin D deficiency while Singapore had slightly higher prevalence of vitamin D deficiency than in Thailand, partly due to being a more industrialized country even though Singapore is located closer to the equator (Cui et la, 2023). The common reaons of having low vitamin D levels in Southeast Asia were identified as younger age, being female, living in an urban area and being less physically active (Cui et al,2023).

The vitamin D status in Sri Lankan population too, remains unsatisfactory (https://www.epid.gov.lk/storage/post/pdfs/en_641010deea21b_Vol_50_no_08-english.pdf, Gunawardena et al,2015). Accordingly, vitamin D deficiency is fairly high among Sri Lankan adults (58.8%) and remains insufficient (31.4%). Generally, around 90% of Sri Lankan adults are not having adequate levels of vitamin D (Weekly Epidemiology Report. 2023). Further, prevalence of vitamin D deficiency is 6.5% among community dwelling Ethnic Tamil women from central hills and 40.5% in a cohort of women from Southern coastal area (Meyer et al, 2008 and Rodrigo et al 2003). Further a very high prevalence of vitamin D deficiency and insufficiency in an urban setting in Sri Lanka across all age strata, which exceeds 90% is reported while Moor ethnicity is the main recognized demographic association (Subhasinghe et al,2009).

Among the various reasons highlighted by different scholarly articles for Vitamin D deficiency in South East Asia, inadequacy of Vitamin D2 enriched food sources, air pollution and cultural practices in clothing, applying sun protective lotions are identified as factors that limit the absorption of sunlight to the skin. Other than these reasons, there is a positive association between vitamin D deficiency and some auto immune diseases such as Ankylosin spodylitis (Cai et al 2015) , Systemic Lupus Erythromatosis (Kamen etal, 2006), Rheumatoid Arthritis (Illescas-Montes, R et al,2019)and many more (Pelajo et al, 2010). Further, the association between many hyperactivity reactions such as allergies and Vitamin D deficiency, cannot be ignored (Mirzakhani et al,2015).

Therefore, a careful monitoring and understanding the risks of vitamin D deficiency is essential to prevent further risks. Since natural sources of vitamin D (dietary and UVB exposure) are limited, mechanisms are needed to allow individuals to achieve the new dietary recommendations. Establishment of local cut-off values and improve diagnostic criteria, careful monitoring of risk groups and proper counseling on identified risk groups is essential. Since most of the mild symptoms lie unseen, it is very essential to carry out random sampling tests, throughout the country. Those measurements will be useful to predict and prevent the burden of Vitamin D deficiency in Sri Lankan community.

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Smart Nutrition:

Unleashing the Power of AI in Tracking Adolescent Diets and Transforming Health in Low and Middle-Income Countries

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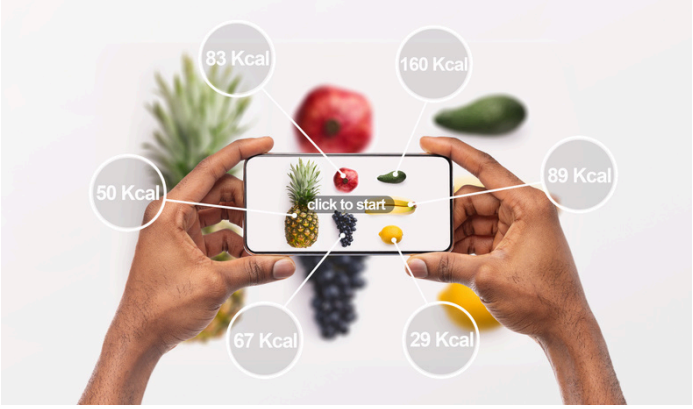
Adolescence represents a period of rapid physical, mental, and social development (Daly et al., 2021). Due to the rapid growth and development during this time, total nutrient intake is significant. Adolescent diets are often distinguished by low intakes of fruits and vegetables and high intakes of foods that are high in calories but low in nutrients, such as sweet and salty foods, beverages with added sugar, junk food, and fast food (Beal et al., 2019). Adolescents are frequently anemic and suffer from micronutrient deficiencies, which have serious negative effects on their quality of life, risk of early mortality, and the health of future generations. In most parts of the world, adolescents are becoming more overweight and obese at the same time (Beal et al., 2019). The development of lifelong eating habits and the growth of long-term health promotion depend on nutrient intake during adolescence. For example, being overweight as an adolescent is linked to being overweight as an adult, intake of fat during adolescence may be linked to an increased risk for coronary heart diseases in adulthood, and low calcium intake has been shown to result in low bone density during adulthood and osteoporosis in later life (Dwyer et al., 2006). Therefore nutrient intake and healthier dietary behavior during adolescence period are significantly important.

Adolescence is a window of opportunity to influence dietary behavior and nutritional status, which can have a lasting impact on future health outcomes. Many health-related habits developed during adolescence tend to continue into adulthood, making the teenage years an optimal time to encourage healthy eating and health-promoting dietary behaviors (Daly et al., 2021). "Family" was still the most important thing in the lives of young people, with "Health" in second and "Friends" the third most important element in their lives, with all three elements potentially affecting their dietary behaviors and food choices (Daly et al., 2021). During adolescence, peer and social influence becomes much greater than parental influence, which governs more during childhood. However, due to their tendency to lack full financial or legal freedom, adolescents are still largely dependent on their parents. The majority of research on adolescent

dietary intake shows that adolescents rarely follow healthy eating guidelines, consuming high amounts of confectionary or processed foods, and low amounts of fruits and vegetables. Adolescents struggle to eat healthy foods even though they place a high value on their health. Adolescents‟ understanding of a healthy diet, taste preferences, the temptation of less healthy foods, their access to healthy foods, the cost of healthy foods, and various social and environmental factors that either encourage or discourage the consumption of health-promoting foods are among these barriers (Daly et al., 2021).

Adolescent diets are frequently blamed on a lack of information about healthy eating; however, the majority of current research indicates adolescents have a relatively good comprehension of a healthy diet but fail to apply it (Daly et al., 2021) . Adolescents who know what they should be eating also cite practical obstacles to eating well, such as a lack of knowledge or ability to cook or prepare food. The main sources of information on healthy eating include school textbooks, public health initiatives, family and friends, and increasingly social media and the internet. A diverse level of knowledge about food and nutrition is frequently caused by the sources and quality of this online information, misinterpretation of information, or competing preconceptions about foods. This knowledge can then influence consumption behaviors among adolescents.

There is a gap in the dietary intake data of adolescents in low and middle-income countries due to the resource intensiveness and expensive of available traditional dietary assessment methods (Nguyen et al., 2022). Dietary data facilitate the understanding of the food and nutrient intake of a population or an individual within a particular period. It is necessary to collect more accurate nutrient intake data to provide information for national and global health and nutrition policies. However, in the thinking concept of the general population, there is a lack of relationship between the visual impression of the appearance of all types of food and the weight of the corresponding food. Therefore, a significant obstacle to collecting correct dietary data is the precise measurement of meal weight. Both under- and over-reporting of food consumed are major sources of error in the assessment of the dietary structure, as well as energy and nutrient intake (Ding et al., 2021). Open-ended techniques, like the 24-hour dietary recall (24-HR) and dietary record, and closed-ended structured questionnaires, like the food frequency questionnaire (FFQ) are the two main categories of nutritional assessment methods (Ahn et al., 2019). Although open-ended approaches demand a significant amount of coding work and represent individuals' generally short-term intakes, they offer precise dietary data. Even while FFQs are simpler to complete, less expensive, and reflect long-term food intake, they are not precise enough to assess the absolute nutritional intake (Ahn et al., 2019). Interviewer-led methods may be prospective, such as weighed food records or retrospective methods including FFQs and 24-HR, which rely on respondents‟ memories to estimate their intakes. Although the sources of error in prospective and retrospective approaches differ, such as altered eating habits for weighed methods or response bias for recollection methods, the overall levels of error are comparable (Harris-Fry et al., 2016).



Finding personal dietary insights has frequently been accomplished by food tracking. In food tracking, reflection is essential for establishing and maintaining healthy eating habits since it makes people more aware of their diet, consider their eating habits, and possibly make better food decisions (Blair et al., 2018). Many commercial programs, such as Make My Plate, MyFitnessPal, MyFoodDiary, Bitesnap, and YouAte are promoted to help people track their daily meals because food choices play a significant influence in a person's everyday life (Blair et al., 2018). The majority of application designs are influenced by user expectations like calorie counting or weight loss. Supporting people's healthy eating objectives, raising self-awareness, and encouraging positive behavior change through food tracking have been the main topics of research studies in the interim. Additionally, by providing visual feedback, using photo-based tracking, imparting nutrition knowledge, and facilitating social sharing, researchers have used a variety of tactics to encourage users to make healthy food choices and to increase user engagement. Due to the substantial capture burden that food tracking generally entails, researchers created automated food-tracking techniques.

Nudging for Good (NFG) is an innovative project aimed at developing, validating and examining the feasibility of using AI-based technology to improve the diets of

adolescent girls in urban Ghana, Viet Nam and Sri Lanka (IFPRI, 2022). The project involves an interdisciplinary collaboration between International Food Policy Research Institue (IFPRI), PlantVillage in Penn State, the University of Ghana, Thai Nguyen National Hospital, Thai Nguyen University of Pharmacy and Medicine, and the National Institute of Nutrition (NIN) in Viet Nam and the Wayamba University of Sri Lanka working together to extend new technology with the potential to change "business as usual" and improve the lives of millions of adolescents.

Food Recognition Assistance and Nudging Insights (FRANI) is a new artificial intelligence (AI) assisted mobile phone application, developed under NFG project that aims to close that evidence gap by being able to identify foods, track the consumption of different food groups, provide statistics about diets, and can offer nudges to encourage better food consumption. The FRANI for dietary assessment in adolescent girls in Ghana and Vietnam was validated in 2021 by the Nudging for Good Project team against weighed records, the gold standard for nutritional assessment, and the conventional multi-pass 24HR approach. According to the results, FRANI works as well as, and frequently even better than, the 24HR when used to measure daily nutrient intake. In addition to the validation study, two randomized pilot studies in Ghana and Vietnam evaluated the viability of FRANI and its impact on adolescent girls' food preferences (IFPRI, 2022; Braga et al., 2022). FRANI is a tool to encourage healthy diets through personalized diet-based nudges. FRANI may offer significant advancements in dietary data collection techniques, including high-quality, high-frequency data as well as a means of raising adolescent awareness, interest in nutrition, and motivation to make better food choices. The development of healthier eating habits, including an increase in the consumption of fruits and vegetables and a decrease in the consumption of bad snacks and sweetened beverages, may then occur. Currently, FRANI is being developed in Sri Lanka as a part of a PhD project under the Department of Applied Nutrion, Wayamba University of Sri Lanka. The project aims to develop, validate and examine the feasibility of using FRANI in Sri Lankan context to track adolescent diets and change their behavior for a healthy life.

It takes a lot of time and work to change eating habits. Promoting healthy eating requires long-lasting and recurrent inputs. The ease of access to mobile apps regardless of location enables app users to quickly engage in dietary tracking, which may motivate and trigger behavioral responses. Research suggests that an AI-assisted dietary assessment more accurately estimates the nutrient intake in adolescents when compared to the traditional method of dietary assessment. FRANI will be the first AI-based, gamified self-monitoring app that aims to help adolescents in low and middle-income nations improve their diets. It will enable high-frequency and high-quality data collecting on food consumption, improve the diets of female adolescents, reduce errors, lower the expenses associated with long-term research, and assist close the information gap about adolescent food consumption. In addition to that, FRANI may lead to significant improvements in encouraging healthy diets through individualized diet-based nudges, raising adolescent awareness, interest in nutrition, and motivation to choose healthier foods.

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Nutri-Toon

Drawing by:
Dehami Muthukumarana

How to Uncover Hidden Sugars on Food Labels and Making Healthier Choices

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Malabe, Sri Lanka

Food label is any tag, brand, mark, pictorial or other descriptive matter, written, printed, stenciled, marked, embossed or impressed on, or attached to a container of food or food products (Food and Agriculture Organization of the United Nations, 2024). As the food labels on pre-packed foods contain nutritional information, they play a significant role in guiding consumers to select the best food products. The nutritional labels help to keep track of the amount of fat and sugar, sodium and fibre, protein and carbohydrates. It also allows consumers to make an informed judgement of a product's overall value. Hence, food labels have considerable potential to influence food choices and dietary behaviour.

However, there are different terminologies related to sugar content on food labels and familiarizing with these terms is important for consumers for different reasons. These terms are important for consumers to make appropriate decisions about their dietary choices which will assist them to manage their overall health and well-being. Understanding the terminologies related to sugar content on food labels helps consumers become more aware of the types and quantities of sugars they are consuming. This knowledge is essential for managing sugar intake, particularly for individuals who are attempting to cut back on sugar to manage their weight or have health issues like diabetes. In addition, the knowledge about sugar terms helps the customers to make better decisions when selecting food products. They can compare different products and choose ones with lower sugar content or healthier sugar alternatives. Further, many processed foods in the market contain hidden sugars under various names. Hence, the knowledge of these sugar related terms will help customers recognize and prevent products that contain excessive added sugars, which can contribute to health issues like obesity, heart diseases, and dental problems.

There are different terms on food labels related to the sugar content of the food product such as sugar, total sugar, added sugar, corn syrup, high fructose corn syrup, sucrose, fructose, glucose, maltose, dextrose, honey, maple syrup, agave nectar, sugar alcohol, sugar-free etc. However, research studies have shown that customers

still do not have a clear idea about the terminologies on food labels. As reported by Devenyns in 2020, the research done by Sugar Association has shown that more than 69% of consumers believe products labeled "reduced sugar" or "no sugar added" are lower-calorie products. Hence this article aimed to empower individuals to navigate food labels effectively based on different terms on food labels related to the sugar content, which will enhance awareness of consumers and adopt healthier eating habits.

The term "Sugar" is the most straightforward term on food labels and refers to a class of carbohydrates that provides sweetness to foods and beverages. This term indicates the presence of either added sugars or naturally occurring sugars in the product. The term "Total Sugar" also describes both added sugars and naturally occurring sugars present in the food. Naturally occurring sugars are those that are inherently present in ingredients such as fruits, vegetables, and dairy products.

"Added Sugars" on the Nutrition Facts label include sugars that are added during the processing or preparation to enhance sweetness or flavour. Examples of added sugars include sugars that are added during the processing of foods (such as sucrose or dextrose), foods packaged as sweeteners (such as table sugar), sugars from syrups and honey, and sugars from concentrated fruit or vegetable juices. Diets high in calories from added sugars can make it challenging for consumers to meet daily recommended levels of key nutrients while keeping within calorie limitations. When Added Sugars are included on a label with the term "includes" preceding them, it means that Added Sugars are counted toward the product's total sugar content in grams.

For example, a container of yogurt with added sugars, might list:

Total sugar 15 g	
Includes 7 g Added Sugars	**14%**

This means that the product has 7 grams of Added Sugars and 8 grams of naturally occurring sugars for a total of 15 grams of sugar.

However, added sugars can be listed on food labels under various names. Some common alternative names for added sugars include sugar, high fructose corn syrup, corn syrup, fruit juice concentrates, honey, molasses, Agave nectar, cane sugar, brown sugar, maple syrup, syrup, dextrose, maltose, sucrose and fructose etc. Hence, it's important to read labels carefully to identify added sugars in products.

"Artificial sweeteners" are another term customer should be aware. Artificial sweeteners, also known as nonnutritive sweeteners (NNS)/low-calorie sweeteners or intense sweeteners. Aspartame, saccharine, sucralose, neotame, acesulfame-K, are some examples of artificial sweeteners which recognized as safe by the United States Food and Drug Administration (FDA). As reported by Tonneson in 2020, the research done by the Sugar Association has shown that 73% of parents think it is important to know the amount of sugar substitutes in their children's food. Hence, the Sugar Association's petition asks the FDA to require food manufacturers to add the term "Sweetener" in parentheses after the name of all non-nutritive sweeteners on the ingredient list.

The term "Sugar-free" is another term that can be found on food labels. According to the FDA, a food is considered "sugar-free" if it contains less than 0.5 grams of sugar per serving. The term "sugar-free" is a regulatory term, so if a product says "sugar-free" on the label, it is assumed that the product contains less than 0.5 grams of sugar per serving. However, it's important to note that while a product may be labelled as "sugar-free," it doesn't necessarily mean it's devoid of sweeteners. Many sugar-free products use alternative sweeteners like stevia, erythritol, or sucralose to provide a sweet taste without adding sugar or calories. Consumers looking to reduce their sugar intake or manage conditions like diabetes often seek out sugar-free products. However, it's essential to check the ingredients list to understand what sweeteners are used, as some sugar alternatives may have their considerations, such as potential laxative effects in high doses (like with sugar alcohols) or controversy surrounding artificial sweeteners.

Further, all of the information on the food label is based on the serving size listed. Hence, if people eat more, that means they will be getting more calories, carbohydrates, etc. than what is listed. However, it's common for product labels to indicate a serving size that's much smaller than people would typically eat in a sitting. Therefore, customers should keep an eye on serving sizes if they are watching and tracking their sugar.

The term "Sugar Alcohol" is also another component on the label which needs to be aware by consumers. Sugar alcohols are a type of sugar substitute that has fewer calories per gram than sugars and starches. Sugar alcohols are found naturally in small amounts in a variety of fruits and vegetables. Commercially

produced sugar alcohols are added to foods as reduced-calorie sweeteners and are found in many sugar-free and reduced-sugar products. Sorbitol, xylitol and mannitol are examples of sugar alcohols. If a food contains sugar alcohols, it would be listed on the label under the Total Carbohydrate. Chewing gum and hard candies are some of the examples of common sources of sugar alcohol.

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Food labels also give information on whether the sugar content of the food you are consuming or purchasing is comparativelylow or high. Foods which contain not more than 5.0 g sugar/100 g (solids) or 2.5 g sugar/100 mL (liquids) are considered as low sugar. whereas foods which contain 20% or more sugar are considered as high-sugar foods. The American Heart Association (AHA) recommends no more than 38 grams of added sugar per day for men, and 25 grams per day for women (Johnson et al., 2009). The AHA recommends that added sugar values for children vary depending on their age and calorie demand. The information on sugar levels on food labels provides quick information to the customers and it is very important for individuals who are trying to reduce their overall sugar consumption for health reasons. In addition to health awareness, the information about sugar levels on food labels provides dietary choices for customers. Consumers looking to reduce their sugar intake can easily identify products with lower sugar content, while those needing extra energy or carbohydrates may opt for products higher in sugar. Hence, indicating whether a product is low or high in sugar on food labels plays a vital role in promoting public health by empowering consumers to make informed choices about their diet and lifestyle.

Further, Sri Lanka has implemented a traffic light coding system for packaged foods in the country, targeting specified levels of sugar, salt and fat content. According to the Gazette of the Democratic Socialist Republic of Sri Lanka published on 17th April 2019, the colours are given as follows.

Food products that contain,
more than 22g of sugar per 100 g - Red
5 g to 22 g sugar per 100 g - Amber
Less than 5 g - Green

Hence, this colour-coded labelling makes it easy to see at a glance if a product is high (red), medium (amber) or low (green) in sugars. Although the traffic light coding system provides important information, according to Perera, Subasinghe and Pathirana (2022) only 32% of participants mentioned that they were accustomed to using traffic light labelling while making food purchases.

In conclusion, uncovering hidden sugars and decoding food labels is an essential skill for promoting healthier eating habits and overall well-being. By understanding sugar-related terms, analyzing nutritional information, comparing products, and being mindful of marketing tactics, individuals can make informed choices and reduce their sugar intake. Empower yourself with knowledge, - Read the labels diligently, and prioritize whole, nutrient-dense foods to embark on a journey towards a healthier lifestyle.

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Effects of probiotics in pediatric nutrition

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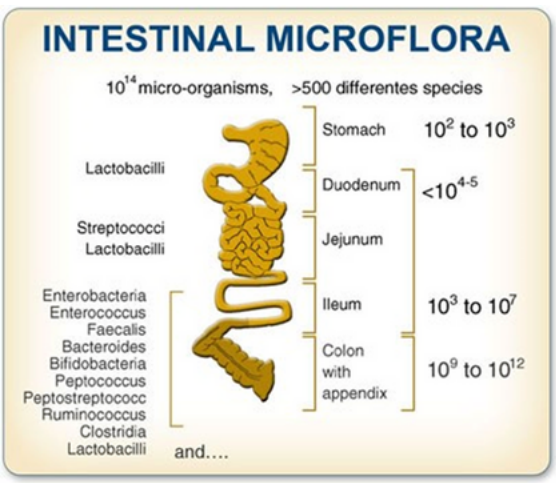
1.Introduction

Infectious disease (particularly diarrhoeal disease) is one of the underlying causes of under-nutrition (both macro and micronutrient deficiencies) through different mechanisms. These nutrients are essential for adequate child growth and development and continuous poor nutrition results in poor growth. Child growth has been identified as an important indicator for measuring the nutritional status and health of populations. The past decade has seen a new era in medical science with increased use of 'probiotics' for health benefits, especially in diarrhoeal diseases. There have been recent reviews published on the effects of probiotics in children with specific disease conditions such as acute infectious diarrhoea, antibiotic-associated diarrhea, necrotizing enterocolitis in very low birth weight infants, childhood atopy, Helictobacter pylori infection and infantile colic. (Onubi et al 2015).

2. Pediatrics and Gut microbiome

The microbial count in the gut differs at inter-individual-level largely on the basis of region-specific diet, geography, health, host genetics, early microbial exposure and age and these factors are also responsible for inducing variability in the gut microbiota over time at the individual-level. At birth the gastrointestinal (GI) tract is essentially germfree, with initial colonization occurring during birth or shortly afterwards. The GI tract of newborns is inoculated primarily by organisms that originate from the maternal microbial flora of the genital tract and colon and from the environment. Subsequently, the gut microbiota alters drastically during different stages such as colonization, development, and maturation within the first two years of life. Along with the factors, there are more factors such as mode of delivery (vaginal or cesarean), exposure to antibiotics, feeding type, hospital environment and use of prebiotic/probiotic, which play significant roles in the variability of microbial community at the early age of life (Fouhy et al 2012).



3. Health effects of probiotics in pediatrics

Probiotics, microorganisms that can have positive health effects when ingested, are increasingly studied and used in humans. Thus far, they have shown particular promise in the treatment of acute infectious diarrhea and the prevention of antibiotic-associated diarrhea, incidence and duration of upper respiratory tract infections and may improve child growth through the prevention of infections and micronutrient deficiencies as they have been shown to improve the absorption of certain nutrients (calcium, zinc and vitamin B12) and reduce the risk of anaemia. Although the use of probiotics has been widespread in the general population, only a few health benefits have been actually confirmed by well-designed trials, which allow for definitive conclusions (Morais and Jacob 2006)

1)Antibiotic-associated diarrhoea and Clostridium difficile infection

Antibiotics are amongst the most commonly prescribed drugs in hospitals. However, as well as treating infection they can cause disruption to the gastrointestinal microbiota. This can lead to the relatively common side effect of antibiotic-associated diarrhea (AAD). Several studies have shown that probiotics taken with antibiotics reduce the incidence of C. difficile- associated diarrhoea (CDAD) and AAD. Administration of Saccharomyces boulardii, a probiotic yeast, reduced the overall risk of AAD in patients treated with antibiotics. A recent study showed ~60% reduction of risk of developing CDAD when patients were co-prescribed probiotics with antibiotics, along with a decrease in the risk of developing side effects related to antibiotics (Dinkci et al 2006).There is still much to be learnt about the optimum timing, duration, formulation and dosing of probiotic supplementation for reducing risk of CDAD. (Goldenberg et al. 2016).

2) Eczema

Atopic eczema is an inflammatory skin condition characterized by pruritus, redness and thick and scaly skin. It is often associated with other atopic diseases such as allergic rhinitis and asthma; an estimated 30% of children with atopic dermatitis develop asthma later in life. Studies found probiotics reduced the risk of developing eczema in infants when consumed by women during the last trimester of pregnancy when used by breastfeeding mothers or when given to infants. These findings resulted in the World Allergy Organization (WAO) convening a guideline panel to develop evidence-based recommendations about the use of probiotics in the prevention of allergy. (Ouwehand. 2007).

3) Inflammatory bowel diseases

There is high incidence of inflammatory bowel diseases (IBD), ulcerative colitis (UC) and Crohn's disease in Western countries, with diet, genetics and environment appearing to affect prevalence. Additionally, antibiotic treatment in the first year of life appears to confer an almost three times greater risk of developing IBD. Because of the apparent association of diet and microbiome with IBD, there is considerable interest in dietary interventions and probiotic supplementation as a treatment. Interestingly, many of the same traditional medicines are used for both UC and Crohn's disease, but trials testing probiotics as a treatment for Crohn's disease have consistently failed, suggesting that at least the probiotics tested to date are an ineffective treatment for Crohn's disease. (Thomas et al 2010).

4) Lactose intolerance

Alleviating symptoms of lactose malabsorption was one of the first clinical effects of probiotics to be demonstrated. Lactose intolerance is common throughout the world and is related to a deficiency of the enzyme b-galactosidase in the intestinal mucosa. Undigested lactose is clinically manifest by abdominal distension, excessive flatulence and profuse watery diarrhoea. Probiotic bacteria (such as lactobacilli and bifidobacteria) increase the production of b galactosidase (lactase) concentrations, which can then improve lactose digestibility in the small intestine, thus alleviating the symptoms of lactose malabsorption (Parracho et al 2007)

5) Necrotising enterocolitis

Necrotising enterocolitis (NEC) is a serious neonatal disease causing inflammation and necrosis of areas of the bowel, primarily in premature infants and those with a birthweight of <1500 g. It carries a significant mortality. However, although several researches have shown that probiotics can reduce neonatal morbidity and mortality, these studies used several different probiotic strains, and no comparative trials have been conducted to determine the most effective probiotics. These data highlight the importance of the choice of probiotic formulation and that further high-quality studies are required for optimal strain and dose selection.(AlFaleh & Anabrees 2014).

6) Food allergy

Probiotics have also been reported to help prevent or manage food allergies (e.g. cow's milk allergy) in infants. Immaturity of the immune system and the GI barrier may explain the peak prevalence of food allergies in infancy (Salminen et al. 1998). Probiotic and peanut oral immunotherapy (PPOIT) was associated with reduced peanut skin prick test responses and peanut-specific IgE levels and increased peanut-specific IgG4 levels. PPOIT was effective in inducing possible sustained unresponsiveness and immune changes, which suggests modulation of the peanut-specific immune responses. Further probiotics could reduce the risk of atopy in terms of atopic sensitization especially when administered prenatally to pregnant mothers and postnatally to the children, and the risk of food hypersensitivity (Zhang et al 2016).

7) Infantile colic

Colic is defined as inconsolable crying for more than 3 hours per day, more than 3 days per week, for longer than 3 weeks. This is a common condition and is very difficult to treat. No traditional medical intervention is effective for colic (Johnson et al. 2015). Although colic occurs in infants, the aetiology remains unclear. Diet and intestinal microbiome likely play a role, with lower counts of lactobacilli being reported in the intestinal microbiota of colicky infants. These early studies motivated researchers to study the effect of probiotics on colic. One microorganism, L. reuteri 17938, is the most widely studied strain as an intervention given to infants suffering from colic. Importantly, no adverse events were attributed to L. reuteri 17938 treatment (Sung et al. 2018). This effect was only demonstrated in breastfed infants.

8) Constipation

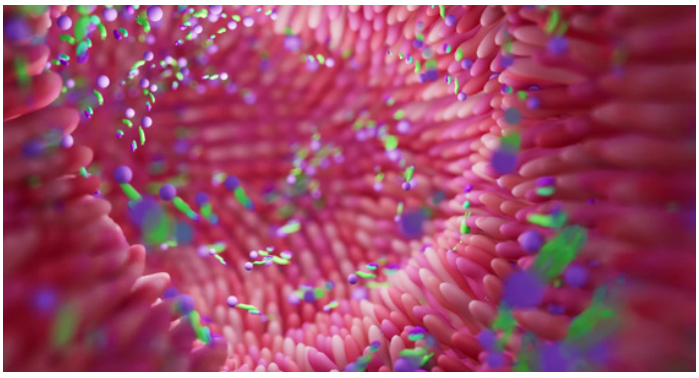
There is some evidence suggesting that probiotics might relieve constipation. Constipation is a common condition characterised by a slow transit time that results in infrequent bowel movements, small hard faeces or difficult painful defecation, in addition to discomfort, distension and abdominal bloating. Children and the elderly are the most affected individuals; however, it can occur as a symptom-based disorder. An unbalanced diet is the usual cause of constipation. Probiotics have been suggested to increase the metabolic activity of colonic microflora in order to improve intestinal motility and reduce faecal enzyme activity. Studies have shown that milk or yoghurt fermented with different probiotics may reduce intestinal transit time and increase the daily stool number in constipated patients (Parracho et al 2007).

9) Nonalcoholic fatty liver disease

A new area of interest is to find evidence on the effect of probiotics in the very widespread pathology of nonalcoholic fatty liver disease (NAFLD) in children. In this regard, recent data support the view that modulation of gut microbiota with probiotics has become an attractive treatment strategy of obesity and NAFLD. They concluded that Bifidobacteria seem to have a protective role against the development of NAFLD and obesity, highlighting their possible use in clinical They found that after 8 weeks there was a normalization of fatty liver in 80% of cases and a reduction in serum ALT level despite there being no change in BMI or visceral fat (Alisi et al 2014). They showed that VSL#3 had significant improving effects on fatty liver and BMI, despite no significant change in ALT. It should be noted that a limited course of probiotics could be effective in improving NAFLD in children, in addition to life style and dietary changes (Sansotta et al 2019).

10) Colon cancer

The endogenous flora and the immune system play a role in the modulation of carcinogenesis, and some probiotics seem effective to prevent or help treat tumours in animal models. Several trials have shown that some probiotics may reproducibly decrease the faecal levels of enzymes, mutagens, and secondary bile salts that may be involved in colon carcinogenesis. In addition, some epidemiological studies suggested that consumption of fermented dairy products might have protective effects against large colon adenomas. The prospect of using probiotics to decrease colon cancer risk is thus open and intervention trials are needed (Marteau et al 2002).



4. Can Fermented foods be classified as probiotics?

Fermented foods and beverages have been used from long time ago. Emerging evidence suggests that the live microorganisms present in fermented foods contribute to both gastrointestinal and systemic health. In general, most fermented foods contain microorganisms that were either added as a culture to initiate the fermentation or already present in the starting material or enriched during fermentation.

The distinction between probiotic microorganisms and fermentation-associated microbes is important but often confused. As noted, probiotics refer to those live microorganisms that confer a health benefit on the host. To document a health benefit, human trials must be conducted. Such clinical evidence is obtained using a well-defined intervention. However, the live microorganisms that are responsible for spontaneous food fermentations are rarely suitably defined. Therefore, not all fermented foods are probiotic foods, as undefined and unstudied products do not meet the minimum criteria of a probiotic. (Sanders et al 2018).

Fermented products (some can be defined as probiotics) which are available worldwide and Sri-Lanka

- Dairy products: yogurt, drinking milk, drinking yogurt, (bifidus milk, yakult), cheese, curd (cow, buffalo), chocolate (cow, goat, sheep milk .etc)
- Bakery products (Bread, bun)
- Cereal products: oat drink, tarhana (sometimes + vegetable + yogurt/milk)
- Fruit juices
- Vegetable products: olives, vegetable juice, kimchi, sauerkraut, tempeh (soy product),pickles
- Fermented Meat products
- Probiotic sachets/strains (for medicinal purpose)

Safety aspects

A number of yoghurt brands commercially available in Sri Lanka have been analyzed and there are variations in the quality of yoghurt samples in the market. It is generally accepted that the yoghurt should contain 106 cfu of viable bacteria per ml of yoghurt to obtain the desired therapeutic effects. Based on the results of the study, it can be concluded that the 3 brands (approximately 37.5% of marketed brands) were obtained inclusive its therapeutic potential values within its expiry in both starter cultures. Most of the products contained very low numbers of organisms, especially L. bulgaricus which do not fulfill the quality criteria. For optimum benefits, the fermented milk products with live bacteria should be consumed within two weeks of their production date, especially within seventh to fourteenth days from the manufacturing date. Since, Sri Lanka does not specify any requirements regarding the numbers of bacteria in the fermented dairy products, standardization of commercial yoghurt products would be applicable to the development of quality fermented dairy products. (Ranasinghe & Perera 2016).

Conclusion and recommendations

In summary, it is recognized that there is evidence that some probiotic preparations have benefits on health and well-being. Reported benefits include a reduced severity of diarrhea, potential preventive effects on diarrhea, promising results of in vitro and animal studies on digestive and immune functions, and indications from human studies on possible short-term preventative and therapeutic effects on atopic eczema. In view of the potential for benefits on child health that might be achieved by the use of some probiotic bacteria, major efforts on their thorough evaluation are justified. Dietary intake of probiotics benefit in terms of weight and height gain in under-nourished children and possible benefit in terms of weight gain in well-nourished children in developing countries. It is suggested that the supplementation promotion of locally available foods with probiotics could be an effective intervention to improve growth in children, especially in developing countries. (Thomas et al 2010).

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Nurturing Food Literacy Education through Schools

Experience from Sri Lankan education system...

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FOOD LITERACY

Food literacy covers broad aspects related to food encompassing food, nutrition, and health, food system from farm to plate, and other broad aspects such as; socio-economic, cultural, political and legal, and environment aspects related to food.

School food literacy education

The Importance of Food Literacy Education

In todays' fast-paced society enhancing food literacy education is crucial for empowering individuals to make informed decisions about their diet, health, and sustainability practices. Nutrition transition, diminishing food skills along generations, increased diet-related health issues, and environmental concerns related food and environmental sustainability warranted the teaching food literacy through schools.

Food literacy education plays a vital role in promoting public health, combating food insecurity, and fostering sustainable food systems.

With rising rates of obesity, diabetes, and other diet-related diseases, teaching individuals about nutrition and healthy eating habits is essential for improving overall health and well-being.

Moreover, food literacy empowers people to make conscious food choices that align with their values, whether it's supporting local farmers, reducing food waste, or choosing ethically sourced products.

In addition to personal health benefits, food literacy education contributes to the development of more sustainable food systems.

By understanding the environmental impact of food production and consumption, individuals can adopt practices that minimize waste, conserve resources, and mitigate climate change. Furthermore, promoting food literacy fosters a greater appreciation for diverse culinary traditions and cultures, promoting social cohesion and inclusivity.

Food literacy education contributes to the development of more sustainable food systems

Sri Lankan situation >>>
Challenges associated with Food Literacy Education

Food literacy education faces several challenges. One major obstacle is the abundance of misinformation and conflicting messages surrounding nutrition and dieting on the internet and social media. With influencers promoting fad diets and questionable nutrition advice, it can be challenging for individuals to distinguish credible information from pseudoscience.

Exam-oriented, theory focused education is less likely to develop food skills that need to navigate the complex food system smartly. Food literacy is offered as elective subjects that limit the delivery to the entire student population. Uneven distribution of resources (human and physical) among the schools located in allover the country is a considerable challenge for effective food literacy education.

Moreover, the abundance of processed and convenience foods has contributed to a decline in cooking skills and food knowledge among younger generations. As a result, many people lack basic culinary skills and rely heavily on processed food which may be less nutritious. Additionally, socioeconomic factors such as income inequality and some food cultures in marginalized communities, limit access to healthy food options and educational resources.

Current status >>>
School food literacy education & school food environment

Examination of current curricula, teaching-learning processes, students' food literacy levels, teachers' confidence in teaching food literacy, and the school food environment provide valuable insights to understand the current status of food literacy education in Sri Lankan schools.

The current curriculum provides adequate content, but lacks practical exposure, especially in subjects like food literacy. While students possess knowledge in this area, they lack confidence to apply it in real-life situations or share it with others. Unfortunately, the exam-oriented and teacher-centered teaching approach encourages rote memorization rather than practical application. This lack of practical experience and confidence is further compounded by cultural factors that limit adolescent autonomy, with parents often making decisions on their behalf.

To address these issues, it's crucial to incorporate more practical components into the curriculum and shift towards a student-centered teaching approach that encourages exploration and fosters confidence. This can be facilitated by enhancing teachers' confidence and skills through professional development programs that address a wide range of needs, including subject matter updates, technological applications, classroom management, and innovative teaching methods.
In some rural and underprivileged schools, teachers with backgrounds in other disciplines are tasked with teaching food literacy-related subjects, highlighting resource disparities among schools. Moreover, the school environment itself may not be conducive to food literacy education, with unhealthy food options still being sold in canteens despite guidelines for healthy school canteens. Additionally, the lack of emphasis on canteen infrastructure and the limited involvement of principals in promoting food literacy further hinder progress in this area.

Strategies for Enhancing School Food Literacy Education

To address these challenges, innovative approaches are needed to enhance school food literacy education. Multi sectoral approach provide better initiatives.

One strategy is to integrate food education into compulsory subjects assuring learning by whole student population. Incorporating more practical in the curricula will improve hands-on learning experiences. That can be done more effectively with the help of school gardens and conducting cooking classes as extra-curricular activities. These practices would support lifelong appreciation of healthy eating and food preparation.

Furthermore, leveraging digital technologies can expand the reach of food literacy education and make it more accessible to diverse audiences. Online platforms, mobile apps, and social media can be valuable tools for delivering interactive and engaging educational content, including recipes, cooking tutorials, and nutrition tips. By leveraging multimedia formats such as videos, podcasts, and infographics, educators can cater to different learning styles and preferences.

Enhancing school food literacy education.....

Enhancing food literacy education is essential for empowering individuals to make informed choices about their diet, health, and sustainability practices. In the digital age, innovative approaches are needed to overcome challenges such as misinformation, lack of cooking skills, and limited access to healthy food options. By integrating food education into school curricula, leveraging digital technologies, and fostering community engagement, we can cultivate a more food-literate society that values health, sustainability, and social justice.

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1. Water
2. Vitamins
3. Metformin
4. Minerals
5. Constipation
6. Malnutrition
7. Diarrhea
8. Phytochemicals
9. Salt
10. Sugar
11. Thiamine
12. Energy
13. Antibiotics
14. Hypertension
15. Stomach
16. Protein
17. Cholesterol
18. Diabetes
19. Avocado
20. Insulin
21. Iron
22. Antioxidants
23. Cereal
24. Breakfast
25. Cancer

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