Year End Edition

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Newsletter

Nutrition Society of Sri Lanka

nutritionsocietyofsrilanka.org

Message from the President

As we close out another year, I would like to take a moment to emphasize a priority that remains central to our mission: improving nutritional literacy across Sri Lanka. Nutritional literacy is not merely about understanding what foods are healthy but encompasses a broader comprehension of how diet impacts our overall health, resilience, and quality of life.

In our rapidly changing food environment, the ability to make informed dietary choices has never been more critical. At the Nutrition Society of Sri Lanka, we are committed to equipping individuals, families, and communities with the knowledge they need to make health-positive choices amidst evolving health challenges. This includes understanding nutrient density, the importance of food diversity, and the impact of nutrition on both physical and mental health.

As we continue to expand our outreach, I encourage all members and stakeholders to support initiatives that promote evidence-based nutritional knowledge in schools, workplaces, and public forums. Let us aim to build a nutritionally literate society where everyone has the knowledge to make informed choices for lifelong health.

Thank you for your continued commitment and dedication to this cause. Let us work together to make a lasting impact on the nutritional well-being of our nation.

Warm regards,

Prof. Ananda Chandrasekara
President,
Nutrition Society of Sri Lanka

Editorial

Let's wrap it up in style ...

Once again, it is that time of the year that everybody's looking for ... The time for a break ... The time for celebrations ... The time of joy and happiness ... The time to welcome a brand-New year - 2025 ...

For many, would also most probably be the best time of the year to reflect back on their ups, downs, good, bad, indifferences, while making the resolutions for the coming New year - Sounds familiar ?? So as for the Nutrition Society of Sri Lanka (The NSSL).

Reflecting back year 2024 - The Annual Scientific sessions (2024), conducting a considerable number of community nutrition projects in various parts of the island, timely release of two Issues of the NSSL Newsletter and the National art competition for the school children are only a few examples of this year's galore of tributes of the NSSL to the Nation.

Besides, as almost everybody gets prepared to welcome the New year 2025, on behalf of the NSSL, would like to emphasize that in-line with our Vision, improving nutritional literacy across Sri Lanka would remain a top priority for us in year 2025 too - I.e. Empowering Sri Lanka with knowledge that they require for a broader comprehension of nutrition related information that would lead them for well-informed dietary choices for their lifelong health and wellbeing would continue. Hence, as proud veterans of the NSSL, all members and stakeholders are encouraged to continue to support the initiatives that promote evidence-based nutritional knowledge in schools, workplaces and public forums.

Lastly, amidst all these reflections and celebrations, the Editorial won't be completed, if the most celebrated event in the NSSL's annual calendar is not pointed-out - I.e. The Annual Scientific sessions, 2025. Hence, on a concluding note, inviting all of you to stay tuned for the updates ...

Udara Dassanayake
Editor - The Nutrition Society of Sri Lanka

The Nutrition Society of Sri Lanka

Presents

Annual Scientific Sessions 2025

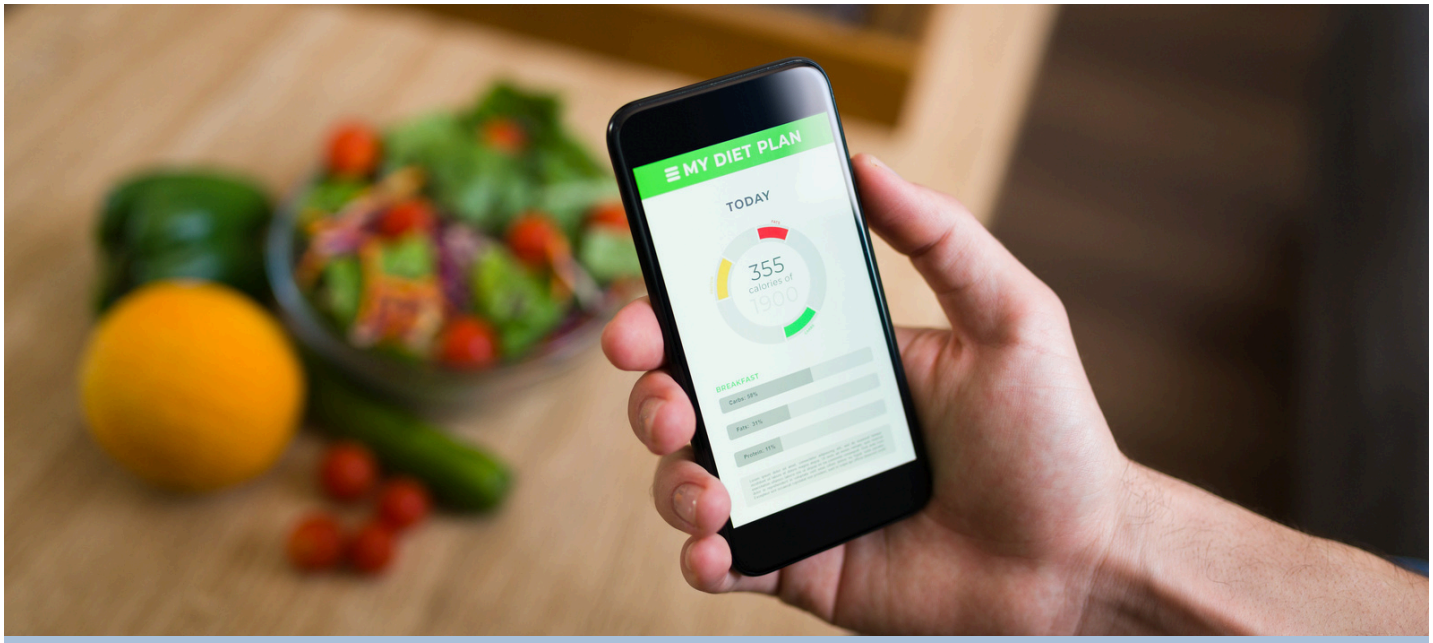
18th & 19th January 2025 at BMICH, Colombo

"Empowering Communities through Advanced Nutrition and health Literacy"

Stay tuned for the updates of NSSL Annual Scientific Sessions 2025...

SCAN ME!

CONTENTS



The Rise of Digital Nutritional Interventions: A Modern Approach to Health and Wellness

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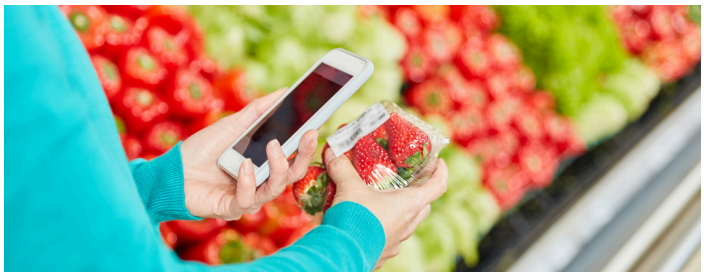
The recent rapid development of digital technology including digital tools, systems and processes, has bloomed digitalisation in many fields. When comes to health, digitalisation can be applied to health promotion, prevention, care provision and management of health systems. Nutrition has a wide spectrum of implications including all areas of health mentioned above. A healthy diet will help individuals to achieve their maximum health and prevent diseases and diet can be a treatment for certain diseases. Interestingly, the whole spectrum of actions can be facilitated by digital technologies in this digital age. These digital technologies are available for the public, healthcare service providers and even health administrators.

Digital nutritional interventions include any digital tool, system or process that is involved in nutrition management. These interventions can range from simple health educational short messages to a smartphone application providing individualised dietary recommendations based on Artificial Intelligence (AI) platforms. They can provide health education and information, track food intake, monitor nutrient levels in foods taken and provide personalised recommendations. Health education and information are vital for individuals to make informed decisions about their nutrition-related behaviours. Monitoring and tracking of food and nutrient intake will help users to control their nutritional intake against recommended levels of food and nutrient. Further, tailored recommendations will guide the users with the optimum diet that they can have to match their nutrition requirements considering many factors.

Digital nutrition interventions with the above capabilities can address human and medical nutrition challenges. Such interventions can achieve portion control and ensure the optimum food intake, variety, and balanced diet. Further, they will optimise the dietary management of chronic diseases by controlling dietary intake according to recommendations. On the other hand, these interventions will address several health system challenges, such as accessibility to services and a lack of staff to provide health care services. Wide availability and accessibility to digital platforms will improve the availability and accessibility of nutritional health services.

The ability to provide data-driven information, advice or service is a key advantage of digital interventions. Because one's dietary behaviour and intake are highly specific, nutritional interventions must be highly personalised to be effective. Digital technologies will use existing data provided by users or healthcare providers, to deliver tailor-made interventions for the user. This can be achieved through various mechanisms. Pre-defined algorithms can determine the best-fit intervention considering a set of variables. For example, a digital tool will select the best health message to the user considering the user's age, education level, and disease conditions etc. On the other hand, an AI-based tool will recommend a tailor-made diet for a user considering a large amount of data such as the user's data (age, gender, occupation, income, dietary preferences, disease conditions etc.), nutrient content of food items and dietary recommendations for various diseases or conditions. Further, these algorithms and AI models can be enriched with evidence-based practices such as dietary guidelines and specific dietary recommendations for diseases.

In addition to the ability to personalise interventions, digital nutritional tools will bring up a few more advantages. Because digital devices are widely available and these tools are incorporated with user-friendly features to increase the uptake, interventions are more convenient for users. On the other hand, data recording and storing have been incorporated into these tools and made healthcare provider's life easy.



Research studies were conducted to assess the effectiveness of digital health interventions over conventional health interventions. Studies have claimed the effectiveness of digital health interventions. However, there is contrasting evidence as well. Most of the reviews concluded as inconclusive due to the heterogeneity of studies. Providing nutritional instructions, feedback on dietary behaviours and intake, contingency rewards and self-monitoring were commonly used features or interventions in digital nutritional tools. Among them, self-monitoring was more effective.

Despite the advantages and opportunities of digital nutritional interventions, challenges and limitations are there to overcome. Data safety is a major concern when it comes to these digital interventions. Because nutrition and health-related data are sensitive and confidential, data safety must be fully ensured in interventions. On the other hand, the accuracy of the output of these digital tools will depend on the input by users (laymen or health workers). Therefore, accurate and timely data input must also be ensured. Ultimately these tools will lack the human touch in their outputs which can lead to non-compliance by end users. However, it is predicted that further development of AI technology will eliminate this. The digital divide is one of the major concerns in digitalisation around the world. Certain groups of people and geographical areas have limited access to information technologies. Therefore, digitalization will not reach these disadvantaged populations leading to inequity in healthcare service provision.

Though many digital tools are available for nutritional interventions such as diet planning, physical activity tracking etc., a tool fully customised for local foods and dietary guidelines is yet to be developed. However, the complexities and varieties of food and culinary practices in the country make it difficult to develop a tool customised to the Sri Lankan context. Therefore, available tools must be used under the guidance and supervision of a qualified person in human or medical nutrition.

In conclusion, digital nutritional intervention is a potential area for uplifting individual and population nutritional status and thus overall health and got attraction and interest by many parties due to recent advancements in digital technologies including artificial intelligence. As it has its advantages and disadvantages, using and incorporating such technologies must be preceded by a thorough understanding of the technology and the country's context and detailed planning of implementation.

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From Plate to Podium: The Ultimate Nutrition Guide for Athletic Performance

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Importance of proper nutrition for athletes

With the rapid growth in research and practice of sports nutrition, nutrition is increasingly recognized as a key component of optimal athletic performance. Several diet strategies are shown to enhance athletic performance. These strategies include optimizing intakes of fluids, macronutrients and micronutrients, and matching the timing and composition of these nutrients throughout the day. Consumption of nutritional supplements can also enhance the performance it taken properly.

The main dietary objective of endurance athletes is to supply sufficient energy. A good energy intake that matches energy expenditure and promotes the maintenance or increase in strength, endurance, mass, and health is the first step for the success of endurance athletes. The diet should be carefully planned to provide in proper amount and proportion the macronutrients of fat, protein, and carbs so that this would ensure peak performance in athletes. The balance between intake and expenditure of energy is a major influence in athletic performances. If it is out of balance, it can even negate the gains achieved through training in the form of exercise.

Therefore, it is crucial for these athletes to maintain their energy balance.

"Champions aren't born; they're built with hard work, dedication, and proper nutrition."

Dietary requirements during training

Nutritional Food with a high carbohydrate content, such as cereals, vegetables, legumes, and its by-products, must be the main reason for enhanced energy needs. In endurance athletes, it would appear that a carbohydrate intake of 3-5g/kg/d is adequate during periods of low-intensity exercise, while in periods of high-intensity exercise, the intake may amount to as much as 8–12g/kg/d. The following table gives a better idea of how carbohydrates should be consumed according to the Period of training.

Training load		Carbohydrate intake targets (g per kg of athlete's body mass)
Light	Low intensity or skill-based activities	3-5 g/kg
Moderate	Moderate exercise program (i.e. ~1 hour per day)	5-7 g/kg/d
High	Endurance program (e.g., 1-3 hours per day of mod-high-intensity exercise)	6-10 g/kg/d
Very High	Extreme commitment (i.e., at least 4-5 hours per day of mod-high intensity exercise)	8-12 g/kg/d

Nutritional preparation before competition - "Carbohydrate loading"

One of the major factors precipitating fatigue during endurance exercise is the exhaustion of the glycogen stores.

The pre competition glycogen status should therefore be optimized. Even when carbohydrates are also ingested during competition, the performance benefits, that is, maintaining the pace at the end of the race, seem to persist. Glycogen accumulation needs tapering of exercise or rest and ingestion of more carbohydrate. Although there are different carbohydrate loading methods, the current suggestion is 10–12 g/kg/d of carbohydrates for 36–48 hr in addition to rest for 1-2 days before competitions lasting longer than 90 minutes. The pre-exercise meal should provide adequate fluids to assure hydration before exercise, are low in fat and fiber to minimize gastrointestinal complaints and enhance gastric emptying and are familiar to the athlete. The dose, 1-4g of carbohydrate per kg body mass 1-4 hr before exercise is based on individual needs and palatability.

Nutritional intake during competition

Carbohydrates, water, and sodium should be ingested during endurance events in amounts and rates that depend on the exercise duration, intensity, and environmental conditions of the event. Based on strong evidence, for endurance events, athletes should ingest 0.7g/kg/h (~30–60g/h) of carbohydrate during exercise to maintain by improving exercise performance. Even at higher intake rates, the rate of oxidation from exogenous glucose is 1 gram per minute, which has been incorporated into this guideline.

During long-distance competitions, athletes can combine drinks, carbohydrate bars, or gels because the rate of oxidation is little affected by the form of carbohydrate administration.

The carbohydrate concentration in these fluids should fall between 5 and 10% to allow the best possible balance between needs for fluid delivery and absorption of carbohydrates. This concentration can be lower under hot and humid conditions where fluid delivery needs are more important than carbohydrate absorption. Mouth rinsing with carbohydrate solutions has been shown to enhance the exercise performance during endurance exercises lasting less than 75 minutes, although the potential mechanisms are not fully comprehended. Nutrient receptors in the oral cavity seem to activate central nervous system effects and stimulate brain reward and motor control centers, thereby improving performance.

Nutrition for recovery after exercise

Good nutrition, particularly around endurance events, can aid in rehydration and the manufacture of glycogen. It has been shown that the earlier after depleting exercise carbohydrates are ingested, the more rapid the rate of glycogen resynthesis. Adequate restoration of glycogen may promote recovery, ensure optimal carbohydrate availability for any subsequent exercise, and thereby optimize exercise performance. Carbohydrate ingestion after exercise has also been demonstrated to blunt the exercise-induced increase in plasma catecholamines and cytokines and to diminish the exercise-induced depression in immunological function. It has been demonstrated that carbohydrate intake of 1.0–1.5 g·kg–1·h–1 during the first hours following exercise markedly enhances the synthesis of glycogen. If it is not possible to consume a high amount of carbohydrate, intake of 0.8g/kg/h of carbohydrate is sufficient if taken with 0.2–0.4g/kg/h of protein. Co-ingestion of protein may also have beneficial effects on the indices of muscular damage and soreness, and chocolate milk has been shown to be equally effective as more commercial recovery drinks. Protein supplementation administered in isolation appears not to enhance the recovery of muscle function, muscle damage markers, or subjective muscle soreness after endurance exercise. These nutritional goals can be achieved by the athletes taking carbohydrate-rich beverages in lower doses every 15 to 20 minutes, or rather non-liquid foods.

Clinical issues related to nutrition in endurance athletes

Hyponatremia

Exercise-induced hyponatremia, reported in endurance competitions, can be defined by a plasma-sodium concentration less than 135 mmol/L. Hyponatremia is reported in ultra-endurance competitions ranging from 0.3% to 27%. The exercise induced hyponatremia (EIH) , against which a laboratory analysis may not be available, presents symptoms that are confounded with signs of hypoglycemia, heat stroke, exercise exhaustion, or exercise-associated collapse and is a life-threatening condition. Risk factors for EIH include female sex, events lasting longer than four hours, hot and humid conditions, slower completion rates, and the use of nonsteroidal anti-inflammatory medications. To prevent EIH, athletes should utilize carbohydrate-electrolyte solutions and practice a modest hydration schedule (~500mL per exercise hour or less) rather than drinking as much water as they can tolerate.

Eating disorders, the female athlete triad, and weight management

It is true that such reduction of body fat and muscle mass is considered as a real competitive edge by most athletes.

On the other hand, loss of body mass may give rise to dieting, disordered eating, or eating disorders. It was reported that 10% of endurance athletes suffered from an eating disorder. Chronic dietary restriction or low energy availability adversely affects reproductive, cardiovascular, endocrine, gastrointestinal, renal disorders, and performances. The female athlete triad-disordered eating, amenorrhea, osteoporosis, or subclinical manifestations of these conditions-affects 4 to 27% of elite athletes. Long-term health consequences (premature osteoporosis, impairment of reproductive function) cannot be entirely excluded. Male endurance athletes on limited diets also are at risk for the same health problems (osteopenia).

The diet and training schedule for athletes should be designed in a way that will guarantee energy availability of 30-45 kcal/kg fat-free mass/d to lessen the risk of negative effects on health and performance. Energy availability refers to the energy from dietary intake remaining after energy expenditure.

Iron Deficiency Anemia and Iron Deficiency

Poor intake, poor availability (eg, due to high consumption of cereals to maintain high carbohydrate needs), foot strike hemolysis, increased loss, altered gut absorption, vegetarian diets, altitude training and female sex are risk factors for iron depletion in endurance athletes. Iron requirements in endurance athletes such as runners may be as much as 70% higher. Iron deficiency anemia is also universally accepted as adversely impacting on endurance performance. It is not yet entirely certain how iron deficiency without anemia affects exercise performance, at least in its initial stages.

In summary, good nutrition is a critical factor for maximizing athletic performance. A well-planned diet providing balance in macro-and micronutrients, and also fluids, timely intake of food ensures peak energy levels, recovery, and sustained performance. Food sources from carbohydrates have a key role in training, competition, and recovery processes, while protein supplementation adds to the effectiveness of muscle repair in cases where it is given with carbohydrates. Moreover, the athletes should be aware of clinical issues like hyponatremia, eating disorders, female athlete triad, and iron deficiency because all of these may compromise not just performance but also long-term health. By designing nutrition based on the demands of activity-intensity and -duration and health status, the fulfillment of energy balance can be achieved by an athlete to ensure full potential and close the gap from plate to podium.

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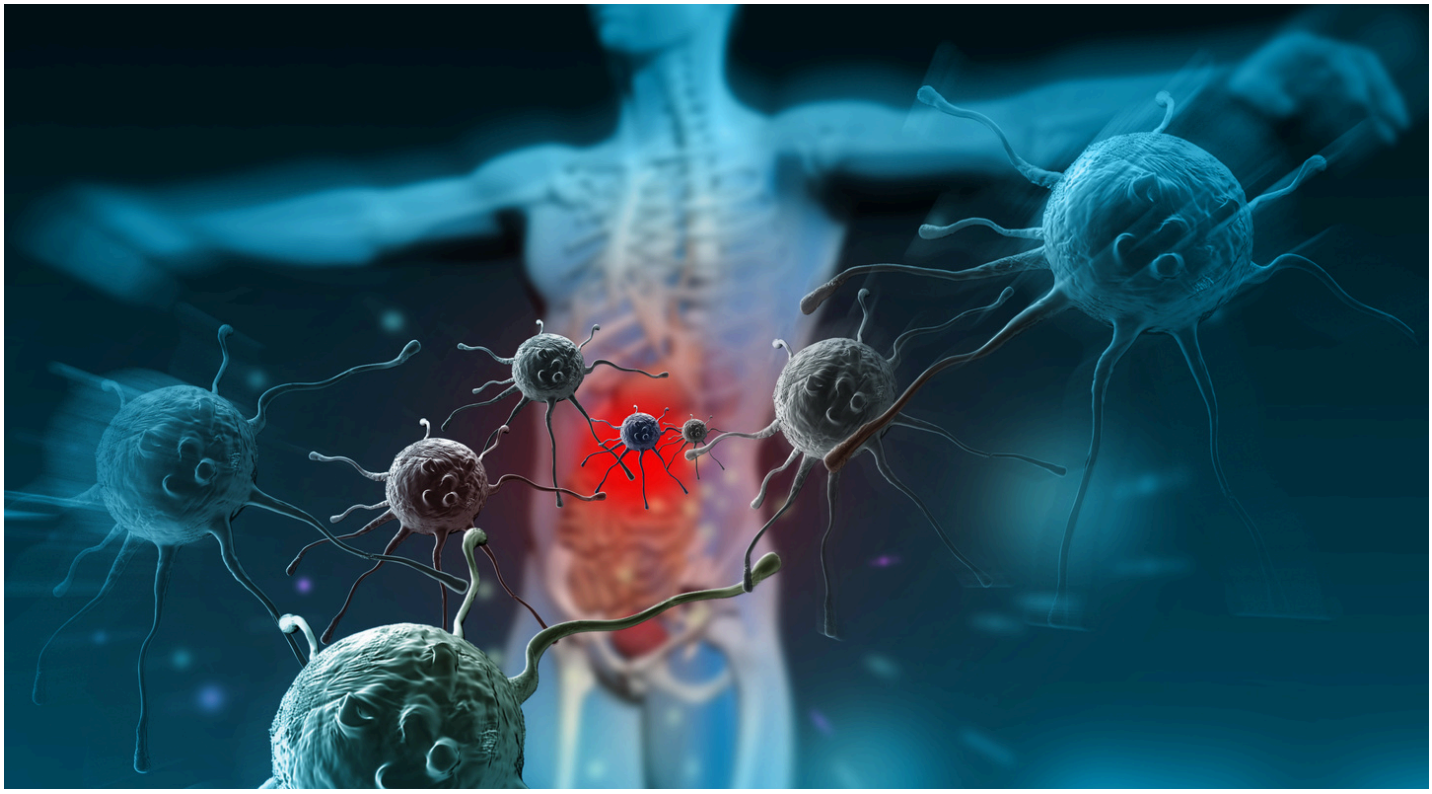

Immunomodulation by Food

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1.Background

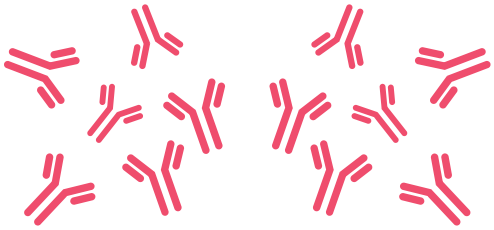
Proper immune functioning is crucial to sustain health homeostasis. There is increasing evidence that ingested diet-borne components are involved in the pathogenesis of disorders such as inflammatory bowel diseases, atherosclerosis, and type 2 diabetes. Nutrients can have short- and long-term effects in shaping the composition of the microbiota. By increasing our understanding of interactions between diet, immunity, and the microbiota, we might develop food-based approaches to prevent or treat many diseases. There is now scientific evidence to support the motto "we are what we eat", and this process begins in early life (Diesner SC et al 2012).

2. Immunomodulation

Immunomodulation is the process of modifying an immune response in a positive or negative manner by administration of a drug or compound. These are biological or synthetic substances, which can stimulate, suppress or modulate any of the immune system including both adaptive and innate immune response. Immunomodulators are substances that have been shown to modify the immune systems response to a threat upon it. They modulate and potentiate the weapons of your immune system keeping them in a highly prepared state for any threat it may encounter. (Meer Ivn et al 2012).

3. Mechanisms of Inflammatory Diets

Several diet constituents such as fructose have been associated with the development of chronic inflammatory disorders. However, excessive sodium consumption also affects intestinal immunity and inflammation, by induction of interleukin-17 (IL17)-producing T helper cells. In contrast, a Mediterranean diet, characterized by high consumption of vegetables, olive oil, and fruits, is associated with lower rates of cardiovascular diseases and asthma. There is increasing evidence that the composition of the gut microbiota, as affected by various diets is related to disease development (Tilg H et al 2015).



4. Enhancement of immune responses by food

1) Probiotics and other microorganisms

Immune modulation by probiotics, especially lactic acid bacteria (LAB) and Bifidobacterium has been well documented. They are a component of gut associated lymphoid tissue (GALT). Furthermore many reports have shown that IgG and IgA responses are enhanced by LAB and Bifidobacterium. Enhancement of IgA secretion may be important in preventing pathogens from invading mucosal barriers. The mechanisms underlying IgA enhancement by LAB have been explored and it has been reported that LAB can act on intestinal dendritic cells and intestinal epithelial cells. Indeed, many studies have shown that oral administration of LAB can inhibit infections such as influenza in humans and in animal models. Probiotics are present in supplements and fermented products such as dairy or fermented vegetables (Erickson K.L & Hubbard N.E 2000).

2) Prebiotics and bacterial metabolites

Dietary prebiotics are typically non-digestible fiber compounds that pass undigested through the upper part of the gastrointestinal tract and stimulate the growth or activity of specific bacteria that colonize the gut by acting as substrates for them. Ingested Fructo Oligo Saccharides (FOS) are used by specific bacteria (ex: Bifidobacterium, Bacteroides) as energy sources for proliferation in the gut. The resulting changes in the intestinal microbiota and its metabolites alter the intestinal environment. This alteration induces the production of IgA, which is an important infection-preventing component of the intestinal immune system. Oral administration of prebiotic formula milk containing galactooligosaccharides and FOS to infants results in more secretory IgA in the feces than when formula without prebiotics is given.

Short-chain fatty acids (SCFAs) produced by intestinal bacteria also play an important role in defense against infection by acting on the immune system. Acetic acid produced by the metabolism of bifidobacteria on intestinal epithelial cells can help prevent infection with intestinal enterohemorrhagic Escherichia coli O157:H7. SCFA metabolites of intestinal bacteria are strongly associated with activating G-protein receptors on intestinal epithelial cells and leads to immune responses through the rapid production of chemokines and cytokines. These reactions mediate protective immunity and tissue inflammation (Yahfoufi, N et al 2018).

3) Polysaccharides and Beta glucans

β-glucan is a typical, non-digestible polysaccharide. β-glucans derived from mushrooms to yeast, including lentinan, which is an anti-cancer medicine derived from shiitake mushrooms, These β-glucans have been reported to enhance protection against infection by pathogenic bacteria and viruses. β-glucan, derived from oat has been reported to protect mice from herpes virus infection and bacterial infections.

Fucoidans are a group of sulfated polysaccharides found in edible brown algae, such as Saccharina japonica (kombu), Saccharina sculpera (gagome), Undaria pinnatifida (mekabu), and Cladosiphon okamuranus (mozuku). Fucoidans contain sulfated L-fucose and several other types of saccharides, including mannose, galactose, and xylose. Immunomodulatory functions have been reported for fucoidans, including anti-cancer and antiviral activities.

Chitin is a polymer of N-acetyl-D-glucosamine, that is present in the exo-skeletons of crustaceans, such as crabs and shrimp, and the cell wall of fungi. The de-acetylated derivative of chitin is chitosan. Immunomodulatory effects have been reported for chitosan, including anti-cancer effects and activation of macrophages. (Hachimura S et al 2018).

4) Vitamins and other micronutrients

Adequate intakes of Vitamins and trace elements are required for the immune system to function effectively. Below vitamins and minerals support in improving immune function,

Vitamins-: A, D, E, C, Vitamin B6 (pyridoxine), B9 (folate), B12 (cobalamin)
Minerals-: Iron, Zinc, Selenium, Copper (Hachimura S et al 2018).

5) Fatty acids

ω-3 fatty acids (Linolenic acid, EPA and DHA) are key components of healthy diets such as the mediterranean diet and suppress inflammation in humans. The anti-inflammatory effects of fish oil intake, concludes that the anti-inflammatory effect of fish oil involves impairment of innate immune and lymphocyte responses. In healthy humans above 55 yr of age, 1g per day of EPA and DHA reduced circulating natural killer cell population over 12 weeks. Immunomodulatory properties have also been attributed to omega-6 fatty acids (linoleic acid and -linolenic acid). Inflammation inhibitors are produced in the body during synthesis of polyunsaturated fatty acids (PUFAs). The immunostimulatory activity of fatty acids is associated with modified production of eicosanoids (leukotrienes, prostaglandins, thromboxane) and largely depends on the type and quantity of fatty acids in the diet (Fenton I et al 2013).

Eating two portions of salmon weekly from 20 weeks of gestation through delivery reduced cytokines likeIL-2,IL-4,IL-5,IL-10, and TNF-α in response to allergens which is believed to reduce the risk of allergies in children. Prenatal supplementation with 400mg DHA from 18 to 22 weeks of gestation to delivery, led to a reduction of general illness in infants at 3months of age. At 6 months post-prenatal supplementation with DHA, infants experienced a significant reduction in fever severity, nasal secretions, difficulty breathing and rash and other-illness. In HIV infected humans fed fish oil there was a trend toward a decline in CD4 cell numbers. In a chronic inflammatory state such as rheumatoid arthritis (RA), EPA/DHA supplementation may reduce RA inflammation and symptoms benefiting the patient.

High long chain ω-3 PUFA consumption may alter the immune response to microbes in the gut, alter the community structure of the microbiota and enhance susceptibility to IBD and infection- induced inflammation and cancer. Recently the researchers have found that taking high doses of fish oil supplements specifically one gram or more per day may increase the risk of developing atrial fibrillation, an abnormal heart rhythm disturbance with potentially serious complications (Gencer B et al, 2021).

6) Amino acids

Among the amino acids, arginine (Arg), glutamine (Gln), and tryptophan (Trp) have a large impact on the immune system. Arginine is known to have strong immunopotentiating effects. Catabolism of Arginine results in the formation of ornithine, which in turn forms polyamines. Polyamines play an important role in enhancing intestinal barrier function.
Glutamine is important as a precursor of nucleic acids and as an energy source for fast dividing cells, such as lymphocytes and intestinal epithelial cells. To compensate for the decreased serum level of Glutamine, caused by its increased demand during infection, wound, or surgery, the Glutamine supply from skeletal muscle is increased. It was found that oral supplementation of Glutamine improved intestinal immune function and suppressed bacterial translocation

Tryptophan is one of the essential amino acids and plays an important role in the immune response and neurotransmission through kynurenine synthesis and serotonin synthesis. Tryptophan metabolism as well as that of Arginine is critical in controlling immunity.

7) Peptides, proteins and related substances

Some kinds of peptides are known to have anti-inflammatory functions. Carnosine (β-alanyl-l-histidine), which is an imidazole dipeptide found in various kinds of meat and fish, was shown to have an anti-inflammatory effect in an intestinal epithelial cell line. In a clinical trial of healthy volunteers, it was demonstrated that the intake of an imidazole dipeptide-enriched extract from chicken meat for three months reduced the serum cell levels of IL-8 and improved cognitive function. Milk basic protein show an anti-inflammatory effect in a food allergic enteropathy. Polyamines which are formed in Arginine metabolism are known to inhibit production of inflammatory cytokines by suppressing expression on immune cells (Maestri E et al 2019).

8) Other compounds

Some phytochemicals, including quercetin (ex: apple, onion, citrus fruits, green tea) naringenin (ex: citrus fruits, tomato, beans), and genistein (ex: soybeans, soy foods, fava beans) have been shown to have immune potentiating effects, such as up-regulation of NK-cell activity. Extracts from stems and roots of Salacia reticulate (Kothala himbutu) have been used as a traditional medicine in Asia like the ayurvedic medicine for treatment of diabetes and other health problems. When administered orally these extracts which contain various phytochemicals such as salacinol, kotalanol, and catechins have been reported to show antiviral effects in influenza virus-infected mice, through up-regulation of NK-cell activity.

9) AhR Ligands

Aryl hydrocarbon receptor (AhR), a transcription factor expressed by immune cells, epithelial cells, and some tumor cells, is an important receptor for certain dietary components. There are multiple exogenous and endogenous AhR ligands some come from foods such as broccoli, others include phytochemicals, natural chemicals, and bacterial metabolites. Ligand binding activates the AhR and regulates many genes that control immunity and inflammation. Specific components of certain vegetables of the family Brassicaceae (for example broccoli or cabbage) are physiologic ligands of the AhR.

10) Polyphenols

Anti-inflammatory effects of polyphenols have been reported for numerous kinds of polyphenolic compounds. Quercetin is a flavonol that is found in a wide range of fruits and vegetables and has multiple biological effects. In addition to chatechins, quercetin is one of the most extensively studied polyphenols, and its anti-inflammatory activity has been reported. Chlorogenic acid (fruits, vegetables, olive oil, spices, wine, and coffee) has been reported to inhibit the secretion of the chemokine IL-8 from human intestinal epithelium and to decrease the amount of the chemokine. A systematic review reported that the effect of flavonoid-rich foods on reducing serum TNF-α levels seems valid in inflammatory situations but not in healthy people (Clarke J O & Mullin G E 2008).

As for the inhibition of an allergic reaction, epigallocatechin, gallate isolated from green tea has been demonstrated to inhibit the degranulation of human mast cells and thus, to alleviate allergy symptoms in human clinical trials. Naringenin chalcone, isolated from tomato skin extract, has also been revealed to have an anti-allergic effect, mediated by inhibiting degranulation of mast cells.

11) Fungal Immunomodulatory Proteins (FIPs)

FIPs are proteins of fungal origin (mushrooms). Health benefits of FIP-fve and FIP-gts, (Flammulina velutipes and Ganoderma tsugaeare) are anti-cancer. This is important for immunomodulatory activity also. The biological relevance of FIPs for allergy management became apparent when they were administered, either orally or nasally, in food allergic, as well as respiratory allergic, mouse models. Feeding of FIP every other day to ovalbumin-allergic, reduced the allergy symptom score, histamine release, and intestinal damage (ChynOu C et al 2015).

5. Summary

In summary, immunity is improved in the long term by introducing food to a diet that is rich in immunomodulators (vitamins A, C, D, E, and microelements such as zinc, selenium, iron, omega-3 fatty acids, live active probiotic bacteria, prebiotics, peptides, polyphenols, polysaccharides, and fungal proteins) and the decreased incidence of viral, bacterial and fungal infections. The term immunomodulation refers to interventions which induce specific changes in the immune system, irrespective of the body's health or nutritional status. Specialists in medical and nutritional sciences study the possibility of modulating and controlling the immune responses of the body.

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Management of Cancer Cachexia; A Thought for Ensuring Cancer Nutrition

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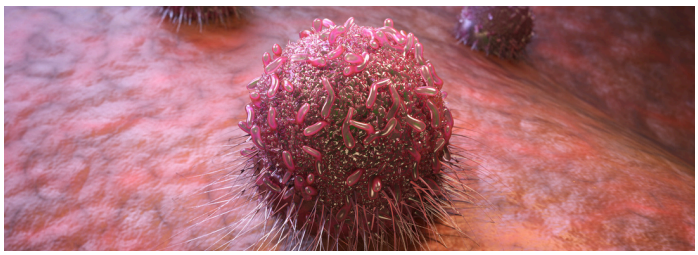
Cancer patients may have different nutritional statuses at presentation and during the course of their treatment. Many people lose weight inadvertently, which results in a cancer diagnosis (1). The onset of symptoms including anorexia, nausea, and vomiting over the course of the disease substantially compromises energy metabolism in advanced cancer patients by preventing them from receiving a regular diet. Serious changes in cell metabolism might result, which would be detrimental to immune system effectiveness, nutritional status, and body composition of the patient. Malnutrition, cachexia and sarcopenia are identified as the main metabolic and nutritional alterations among patients with cancers, especially in advanced stages (2, 3). These metabolic and nutritional alterations can influence treatment outcomes including delay wound healing, worsen muscle function and increase the risk of post-operative complications. It can also impair tolerance and response to anticancer treatments, which can in turn lead to extended hospital stay, increase the risk for treatment interruptions, and possible reduced survival (4, 5). However, metabolic and nutritional alterations associated with cancer is still mainly ignored, undervalued, and inadequately addressed in clinical practice globally. Therefore, there is strong indication that dietary concerns with other nutritional support should be considered in conjunction with anticancer therapies, starting at the time of cancer diagnosis and continuing throughout the diagnostic and therapeutic process (6).

Reduced food intake, combined with metabolic abnormalities such as increased energy expenditure, excessive catabolism, and inflammation can cause alteration in nutritional status of the patients. This directly affects the development of cachexia among cancer patients. Cachexia is identified as a main feature of cancer and has a high prevalence among cancer patients (7). Cachexia, simply described as 'loss of body weight and muscle mass, and weakness' (8) is a multifactorial condition, which is common among patients suffering from chronic medical illnesses including cancers. It is a complex host-phagocytic condition characterized by a progressive decrease of skeletal muscle mass, with or without fat loss. Cancer cachexia mainly occurs in patients with late stage of cancers(stage 3 and 4) according to literature with its underlying pathophysiology (9, 10).



Burden of cancer cachexia is high in terms of morbidity, mortality, quality of life, mental well-being of the patients and caregivers, treatment costs, treatment effectiveness and burden to patients, community and health system. Hence, early identification of patients at-risk for cachexia is mandatory and the cancer care services need to take actions to prevent development of cachexia among cancer patients(11). Due to these detrimental consequences and the high prevalence of (up to 80%)(12), cancer cachexia needs to be managed effectively to enhance cancer survivorship. Moreover, it was found that cachexia increases hospitalization costs and length of stay, which recommended identifying the medical burden associated with cancer cachexia for an effective treatment plans (13). Hence, cachexia is recognized as a crucial component to address in order to offer more effective care for patients suffering from cancers. However, it is not given enough attention in cancer care worldwide, including in Sri Lanka.

In spite of the increasing need of raising awareness and availability of health care facilities for palliative care, the role of cancer nutrition is not being adequately emphasized and it is identified as a neglected aspect (14, 15). Cachexia palliative care for cancer patients should involve a multimodal treatment approach, which includes not only symptom management, but also nutritional assessment, nutrition and psychological counselling and promotion of physical activity to reduce muscle atrophy. This realization is an important first step in creating more responsive care for the patients with cancer, which could be easily approached through appropriate nutritional interventions which provide nutritional support targeting cancer cachexia.

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Eat Right.

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பிரபஞ்சத்தில்
படைக்கப்பட்ட உயிரணுவின்
உன்னத பிறவி மானுடம்- எனினும்
எம்மவர் ஆயுளின் நீட்சி
எம்மாலே அழிவின் விளிம்பில்
உண்கின்றோம் உணவாய்
மருந்தை - தவிர்க்கின்றோம்
நல் உணவை.....
காய்கறி பழங்கள்
அளிக்குது நல் ஆரோக்கியத்தை
தானியங்கள் தருகின்றது
தடை தாண்டும் பலத்தை
பழம் கொண்ட பாதுகாப்பை
பாதாளம் தள்ளிவிட்டு
வில்லைகளில் தேடிக்கொள்கின்றோம்
விற்றமின்களை....
கொள்ளு, வரகு, சாமை தானியத்தை
குதிரைக்கும், கழுதைக்கும் அளித்துவிட்டு

போத்தலில் அடைக்கப்பட்ட
போசாக்கை தேடுகின்றோம்
நல்லவற்றை உதறிவிட்டு
நாகரீகம் என்றபெயரில்
நஞ்சை நாடுகின்றாம்
சரியானதை உண்போம்
சரீரத்தை பேணுவோம்.

Why avocados deserve a spot in your daily diet?

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It's no secret that avocados have long been heralded as a superfood. These creamy green fruits are a great addition to your diet because they are not only delicious but also have many health advantages. Avocados are an incredibly powerful food that should be on your plate because of their nutrient-dense makeup and their many culinary uses.

The high nutrient content of avocados is one of the main factors contributing to their health benefits. Essential vitamins and minerals, such as vitamin K. vitamin E, vitamin C, and several B vitamins, are abundant in avocados. Additionally, they are a good source of potassium, which is necessary to keep blood pressure levels within normal ranges. Furthermore, monounsaturated fats, which are heart-healthy fats that can help lower cholesterol and lower the risk of heart disease, are rich in avocados. Avocado oil. which is used in cooking, is an edible oil that is extracted from avocado pulp.

Your daily dose of heart-healthy fats

Avocados have a remarkable nutritional profile, but they also have several other health advantages. According to the available research findings, avocados may aid in weight loss, better digestion, and a decrease in inflammation. Additionally, they are a good source of fiber, which can support a healthy gut microbiome and help control blood sugar levels. Avocados also contain antioxidants, which can lower your chance of developing chronic illnesses and shield your cells from harm.

Beyond the Basics: Versatility in the kitchen

From salads and sandwiches to smoothies and desserts, avocados can be incorporated into many different recipes. They can be blended into a creamy pasta sauce, sliced and added to sandwiches, or mashed and spread on toast. When it comes to using avocados in your meals, the options are endless, making it simple to regularly reap their health benefits.

Food & Mood: The relationship between the Nutrition and Mental health

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Food has a two-way relation to our mood: food choices affect our mood and our mood influences our food choices. That is the reason why eating healthy is so important. Our brain cells are the most demanding in our bodies. Though they constitute just 2% of our total weight, they consume 20% of our energy from food. And that energy is focused equally on our emotional health as it is on our physical health. Food and emotions influence each other bi-directionally. Knowing how they interact with each other helps you make choices for healthy food while avoiding eating emotionally or compulsively.

1. Neurotransmitters

Your brain plays a great deal in maintaining your mood. Neurotransmitters are some chemicals in your brain that often send signals throughout the parts of your body and affect your stress level, as well as your ability to focus on something. Three neurotransmitters most connected with mood are:

- Serotonin: This neurotransmitter is involved in promoting calm and reducing longing or craving for something.
- Dopamine: It's a neurotransmitter that helps raise your attention and boosts motivation.
- Norepinephrine: This neurotransmitter raises the level of awareness and strengthens memory.

Deficiencies in these neurotransmitters lead to depression, anxiety disorder, bipolar disorder, and attention deficit hyperactivity disorder (ADHD), as well as sleep disorder, fatigue, irritability, and apathy. Serotonin, dopamine, and norepinephrine derive their structure from nutrients. Without the proper nutrition, the brain cannot properly communicate with the rest of your body; this may cause a mood change.

2. What is the relation between diet and nutrition with mental health?

Food can affect mood just as much as mood can influence food choice. Food ingredients help the brain to produce neurotransmitters like serotonin and dopamine, also referred to as "happy hormones", to uplift mental health and decrease anxious feelings or despair. Neurotransmitters might be dependent on changes in eating, hence affecting behaviour, sleep, and energy. During depression, we resort to comfort foods whereas stress may affect appetite and are associated with unhealthy eating patterns.

Lately, more and more attention has been devoted to the specific linkage between our food intake and mood. Indeed, many research studies have shown that adherence to the Mediterranean diet, including a range of fruits,

vegetables, nuts, legumes, and moderate amounts of poultry, eggs, and dairy products, can significantly lower the risk of developing depression. The complicating factor is teasing out the exact relationship between these factors. It can also enhance the efficiency of medication taken for this very purpose, such as antidepressants.

3. Food, Mood, and Inflammation: A Complex connection

New studies have revealed more about how diet, inflammation, and depression are connected in very elaborate manners. Studies have demonstrated that one can incite an anti-inflammatory response in one's body, through the intake of a Mediterranean diet high in fruits, vegetables, and healthy fats. On the other hand, diets containing large levels of harmful fats and processed foods may induce inflammation. It has also been related to several psychiatric conditions, including depression. The implication is that a poor diet can also raise the risk of depression through encouraging inflammation. Some nutrients, like polyphenols and omega-3 fatty acids, have anti-inflammation properties and could ease symptoms of depression. Yet, the relationship between diet, inflammation, and depression is complex. The presence of stress and a history of depression will determine the effect of diet on inflammation and mood.

4. Look after your gut

Your gut may reflect your mood. When you're stressed or anxious, you can feel bloated, constipated, or not want to eat. This is because these emotions can make your stomach move too fast or too slow. The gut microbiome consists of billions of microorganisms residing in our intestines (some are helpful and some are harmful) is nowadays much more important to our general health and, particularly, to our mental health. Probiotics, with their helpful bacteria, have demonstrated potential in regulating the brain's reaction to emotional triggers and could potentially alleviate symptoms of depression. Nutrition plays a key role in moulding the gut microbiome. A diet dominated by highly processed foods and bad fats disrupts the gut barrier, leading to an imbalanced gut microbiome. While the standard American diet favours the growth of bad bacteria, which produce pro-inflammatory chemicals. On the contrary, the Mediterranean diet high in fiber, polyphenols, and healthful fats promotes good gut bacteria-producing anti-inflammatory chemicals.

Consuming certain gut-friendly foods that are believed to promote gut health is recommended to help in achieving an optimal digestive system. These include fruits, vegetables, legumes, whole grains, and probiotics.

5. From Good Food to Good Mood: Mindful eating for better mental health

Good nutrition helps your mental well-being. A healthy diet contains a variety of foods and drinks that supply the body with the nutrients it needs for a good mood. What we eat significantly impacts our mental health. More praise is directed toward the Mediterranean diet, which, by supplementing vegetables, fruit, omega-3-containing fish, nuts, legumes, and olive oil, has been credited with decreasing the symptoms of depression. A diet containing whole, unprocessed foods with adequate protein, healthy fat, and fiber can be very helpful in blood sugar control after meals, which in turn is related to better mood and lower anxiety.

Nutritional deficiency or disorders may occur if a person keeps consuming food poor in nutrients. Important nutrients to maintain a healthy mood include Folate, Iron, Long-chain omega-3 fatty acids (EPA, DHA), Magnesium, Potassium, Selenium, Thiamine, Vitamin A, Vitamin B6, Vitamin B-12, Vitamin C and Zinc.

5.1 Eat complex carbs at every meal

You will only feel hungry, angry, and tired if you are not consuming foodstuffs that will help feed your body with energy throughout the day. This may lead to deteriorated mental health in the long run. Irritation and being tired could be from low levels of blood sugar. To avoid this, balance your intake by having regular meals and focus on those meals which ensure the release of energy is steady, and thus stable blood sugar levels. The glycemic index plays an important role because it signifies the rate of digestion and absorption of carbohydrates into the body. Food with high glycemic indexes, such as white bread and sweetened beverages, can give overly quick increases in blood sugar followed by steep drops. These ups and downs can have the potential to disturb our mood and increase the chances of depression. Use brown pasta, rice and bread made from whole-meal carbohydrates instead of white pasta, rice and bread. If you

have diabetes do not make any diet changes that may impact your blood sugar without consulting a medical expert.

5.2 Seed in your meal healthy fats, especially Omega-3 fats

With our brain comprising 60% fat, it should be no surprise that healthy fats are one of the major components needed to keep it running optimally. It has been shown in studies that, when these healthy fats are consumed on a regular basis-omega-3 fatty acids, in particular, could help improve conditions such as depression and bipolar disorder. Nutrients that are very important to the health of the brain include seafood such as salmon, mackerel, tuna, and sardines; nuts; and plant oils. If you want to enhance your mental health naturally, include a bit more omega-3 food in your diet.

5.3 Be sure to provide an adequate amount of protein food, rich in Iron & Zinc

Zinc and iron are found in many protein foods especially red meats and to a lesser degree fish, chicken, pork, eggs, legumes and nuts. Zinc is a key structural component of many body proteins, and also plays a role as an activator of chemical pathways in the brain. Low levels of zinc have been found in individuals with depression. Iron carries a person's oxygen around the body, where it will be taken into the cells to be used. If iron is lacking in one's body, they can become lethargic and rundown. Thus, their mood will be negatively affected. A diet with lots of protein should allow regular mental status and moods. Protein intake from sources such as fish, steak, chicken, beans, eggs, and unsweetened yoghurt is associated with increased levels of dopamine and norepinephrine, neurotransmitters that have a significant effect on mood, motivation, and concentration.

5.4 Eat Penalty of Fruits and Vegetable

The NHS (National Health Service) in the UK suggests consuming a minimum of five portions of various fruits and vegetables daily to guarantee adequate nutrient intake for maintaining overall physical and mental well-being.Fruits and vegetables have high levels of vitamins, minerals, and antioxidants that supply very important nutrients to enable higher happiness levels. Carotenoids, flavonoids, vitamin C, and vitamin E-antioxidants are contained in all fruits and vegetables. The nutrients prevent the creation of injurious free radicals that may cause oxidative damage and neural inflammation, thus

enabling the brain to fight against such factors. This assists in defending the brain against depression, anxiety, and neurodegenerative disorders.

5.5 Caffeine in Moderation

Caffeine is a stimulant, which provides you quick burst of energy at first. But when this wears off, you may start feeling anxious and depressed. Excessive consumption of coffee interferes with sleep patterns especially when consumed prior to going to bed and may lead to depression and anxiety-related symptoms. You may also have withdrawal symptoms like irritability if you abruptly halt the intake of caffeine after your body system has become dependent on it.

It is prudent to take caffeine in moderation with full knowledge of its effects on mood.
Caffeine is added to coffee, tea, chocolate, cola and most of the energy drinks.

5.6 Hydrate adequately

Proper hydration is crucial for the whole body. Lack of water can impact mood and lead to tiredness, irritation and sleeplessness. Normal health fluid intake is around 1.5 to 2.5 litres per day. Remember, this includes all beverages, not just water, and solid foods with high liquid content, like soups, fruits and jelly.
Adequate fluid intake can lessen the occurrence of some side effects from some antidepressants, like constipation and xerostomia (dry mouth). It is possible to overhydrate; therefore, do not overdo it.

Further complicating this relationship between nutrition and mental health, there are many barriers in the way of a person with a mental illness. These include economic constraints, lack of availability, and even psychiatric medications' side effects that make it difficult for them to maintain proper nutrition. More often than not, one of these challenges victimizes people suffering from poor mental health.

In summary, Feeling good comes from a diet with an adequate quantity of healthy choice carbohydrates, including complex carbs at regular times to keep blood glucose levels stable. Eating breakfast is thus a sensible habit. Diets should also contain a wide variety of protein, healthy fats, vitamins and mineral-containing foods to support the body's functions. As a rule, plenty of fruits and vegetables and wholegrain cereal foods, with some protein foods, including oily fish, will support a good supply of nutrients for both good health and good mood.

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Reassessing the Safety of Your Household Water:

Are We Truly Protected?

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In today's interconnected world, access to safe and reliable household water varies significantly across different regions and countries, ranging from sophisticated municipal water systems in developed nations to unprotected wells or surface sources in remote villages of developing areas. This disparity raises the question of whether everyone worldwide has access to good-quality, safe drinking water.

According to the CDC, while access to safe drinking water is crucial for public health, there are global inequalities, with developed countries generally having extensive infrastructure ensuring high water quality standards, whereas developing and non-developed countries face significant challenges due to inadequate infrastructure and sanitation practices (CDC., 2019).

UNICEF reports show global progress in household drinking water access but highlight continuing gaps, especially in rural and marginalized communities. In Asia, countries like Japan, China, and South Korea have achieved near-universal access to safe water, whereas countries such as Afghanistan and Cambodia have large populations lacking access to safe drinking water (UNICEF, 2024).

In Sri Lanka, approximately 89% of the population uses at least basic drinking water services, but 7% rely on unimproved sources and 2% on surface water, posing health risks due to potential contamination. Despite progress in providing basic water services, Sri Lanka needs continued efforts to improve access to safe and reliable drinking water across all regions (UNICEF, 2024).

This newsletter explores household water quality complexities, contamination identification, and public awareness to address ongoing challenges and ensure safe water for all Sri Lankans.

Diverse ways in which Sri Lankans fulfill their household water requirements.

There are many different and evolving ways for satisfying household water needs in Sri Lanka. Organized water supply systems, mostly overseen by the National Water Supply and Drainage Board (NW & DB), provide its service to around 40% of the population. A further 59.4% of the people of the country rely on wells, tube wells, rivers, lakes, and streams as alternatives where 10% of the above portion use unprotected sources. Groundwater is widely used in Sri Lanka, especially in dry regions; 3.2% of people use tube wells and 36.4% of people use dug wells for drinking water. Over the past ten years, the amount of groundwater coverage has not increased, while the amount of safe water coverage through pipe-water supply has increased from 36.8% to 51.5% (Indika et al., 2022)

The pipe water users expand yearly (increasing 100,000 customers each year) to the system due to urbanization and population growth prevailing in the country.

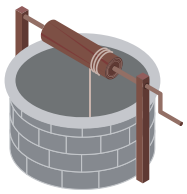
How do the water resources mentioned above become contaminated?

Surface water contamination

Surface water in Sri Lanka is contaminated by industrial and agricultural runoff. Pollutants like chemicals, heavy metals, pesticides, and fertilizers are introduced into rivers, lakes, and streams. The Kelani River basin is mainly affected by chemical discharge from growing industries. Some of the most polluted surface water bodies in Sri Lanka include Beira Lake, Bolgoda Lake, Boralesgamuwa Lake, Kesbewa Lake, Kandy Lake, River Kelani, River Manik Ganga, Mahaveli River, and Walawe River. Improperly treated sewage and wastewater discharge, animal waste, natural events, and atmospheric deposition from industrial emissions further contaminate surface water (Nuwanaka & Gunathilaka, 2023)

Ground water contamination.

Groundwater sources like wells, tubes, and springs can be contaminated by various activities, including human activities, agricultural activities, improper waste disposal, industrial activities, mining operations, and natural sources (Indika et al., 2022). Regional differences exist in Sri Lanka's groundwater quality, where the wet zones indicate higher quality and dry zones having higher mineral concentration. Problems with total hardness, fluoride, alkalinity, and salinity are present in dry zones including trace elements such as arsenic, cadmium, and lead, but most areas have safe drinking levels (Indika et al., 2022).



Piped water contamination

Cross-contamination, low water pressure, inadequate monitoring, old infrastructure, and poor maintenance are some of the major causes of piped water contamination in Sri Lanka. Regular infrastructure maintenance, strict adhering to water quality standards, and effective monitoring and management practices are crucial to ensure the safety and reliability of piped water (Fontanazza et al., 2015).

How can we identify our water has been contaminated?

Signs of surface water contamination

The first step is to visually evaluate any turbidity, discoloration, or floating debris in water. Then, chemical and microbiological analysis testing contaminants such as heavy metals, pesticides, and pathogens is crucial (Nuwanaka & Gunathilaka, 2023).

Signs of ground water contamination

contamination can be recognized by changes in watercolor, taste, or smell. Testing for elevated levels of contaminants such as nitrate, arsenic, or pesticides is also done. Monitoring nearby agricultural lands or industrial areas will help identify potential sources of contamination (Indika et al., 2022).

Signs of pipe water contamination

Signs such as unusual taste, odor, or visible particles in water and also can be identified by the regular laboratory tests for microbes (Fontanazza et al., 2015).

How can I check if my well water is safe to use?

In Sri Lanka the ensuring of the water quality of Dug wells, the World Bank-funded Water Supply and Sanitation Improvement Project (WaSSIP) facilitate tube wells. WaSSIP has 27 laboratories at water treatment plants and 2 mobile laboratories island wide which are well equipped with trained local lab technicians. You should hand over a carefully collected water sample from your well in a clean sterilized container. Your sample is then tested for various parameters crucial to determining water quality, including physical appearances like color, turbidity, and odor, along with chemical parameters such as pH, total dissolved solids (TDS), hardness, and the presence of contaminants like heavy metals, nitrate, fluorides, and pesticides. Microbiological testing is also conducted to detect bacteria such as E. coli that indicate fecal contamination. Depending on your sample status, they will advise you to take suitable measures like boiling, filtering or chemical disinfections and in the severe contaminations you will be provided with the expert's advice. So, to ensure the water safety, you should go for regular monitoring especially following events that could impact water quality, such as heavy rainfall (Water Quality Testing-Atomic Energy Board Sri Lanka., 2020).

Immediate actions that should be taken during contamination

- Stop using contaminated water.
- Notify relevant authorities immediately.
- Seek and start using alternative water sources.
- Try to investigate what the problem might be carefully; Health monitoring and preventing further contamination.

To what extent are Sri Lankans aware of safe drinking water?

Based on the results of a questionnaire survey conducted by Abhayawardana in 2020, it is evident that there are significantly unsatisfactory levels of awareness among the population regarding safe drinking water. Further, to measure the knowledge, attitudes, and practices regarding household safe water consumption, Knowledge, Attitude, and Practices (KAP) surveys have been designed.

Why conduct Knowledge, Attitude, and Practices surveys (KAP)?

The purpose of conducting a Knowledge, Attitude, and Practice (KAP) survey is to collect valuable insights into what individuals know, believe, and do regarding a specific issue. These surveys are typically designed to represent the target population accurately. KAP surveys can gather both qualitative and quantitative data through the use of semi-structured or structured questionnaires. These questionnaires can be self-administered or conducted by interviewers, depending on the needs of the study (Andrade et al., 2020).

How do KAP surveys evaluate Sri Lankans' knowledge, attitudes, and practices toward safe household water consumption?

Knowledge/Awareness of safe household water consumption

Awareness of the potential contamination issues associated with water. Sri Lankan households with higher education levels tend to view water as riskier due to awareness of potential contamination issues (Céline & Van Den Berg, 2008). Similarly, in other South Asian countries, there is awareness of the contamination risks posed by arsenic, industrial pollutants, and human enteric pathogens in drinking water (Luby, 2008).

However, a study done in Kegalle district showed that the participants' basic understanding of the issues related to water was very inadequate (Abhayawardana, 2020). Sri Lankans lacked knowledge about the cost involved in producing drinking water from raw water directly available from surface water sources (Abhayawardana, 2020).

Attitude on safe household water consumption

Women in Sri Lanka was more concerned about consuming safe drinking water, as indicated by the fact that 88% of the females carried a clean bottle of water when going out, compared to only 17% of the men (Abhayawardana, 2020).

Safety Perception:

In Sri Lanka, a majority of households consider piped network water to be safe, while public taps, private wells, and water obtained from neighbors are also deemed safe by most. However, public wells, rivers, lakes, and streams are considered less safe (Céline & Van Den Berg, 2008). When comparing with other South Asian countries, since groundwater supplies a large amount of South Asia's overall water demand, it is usually considered an effective supply of water for households (Lacombe et al., 2019).

Although surface water is abundant in some areas, such as Bangladesh, it is not considered safe to drink due to regular pollution problems (Lacombe et al., 2019). Comparatively, while Sri Lanka faces similar challenges with surface water safety, the reliance on and trust in groundwater is a common attitude across South Asian countries.

Impact of Water Quality Attributes: The taste, smell, and color of water (exogenous attributes) influenced people's perception of risk associated with it (Céline & Van Den Berg, 2008).

Practice of safe household water consumption

A study focusing on three districts in Southwest Sri Lanka revealed that 42% of households treated or filtered their water before consumption, primarily through boiling (93%) or filtration methods (Abhayawardana, 2020). In comparison, boiling is the predominant method among households in low to middle-income countries, including 21% overall and 10.4% specifically in India (Juran & MacDonald, 2014).

According to a study conducted in Srilanka showed that, only 56% of the surveyed population took a clean bottle of water when leaving their houses, with a notable gender difference: 88% of females versus 17% of males carried water (Abhayawardana, 2020).

Only 34% obtain drinking water from the National Water Supply and Drainage Board (NWS&DB), while others rely on wells, community-based organizations (CBOs), or nearby rivers. Unfortunately, 97% of those using water from rivers, streams, and wells have not subjected it to laboratory testing, potentially consuming unsafe water (Abhayawardana, 2020).

What policies has the Sri Lankan government implemented to monitor the quality of household water?

National Policy on Drinking Water (Effective from March 2024): The National Water Supply and Drainage Board (NWSDB) and the Department of National Community Water Supply (DNCWS) monitor water quality. A Water Quality Surveillance Committee System (WQSCS) ensures compliance with standards set by the Sri Lanka Institute of Standards (Water Safety Portal | a Journey towards Safe Drinking Water for All, 2020). In conclusion, the quality of household water remains a major problem worldwide, with major differences between developed and developing counties.

Although countries such as Japan, China, and South Korea have global access to safe drinking water, many developing countries, including Sri Lanka, still face significant challenges in providing clean and reliable water supplies. While many people in Sri Lanka have access to standard drinking water solutions, a considerable proportion still relies on unimproved sources which leads to health risks and highlights the need for ongoing efforts to improve water quality.

The findings from Knowledge, Attitude, and Practices (KAP) surveys underline the gaps in awareness and practices related to safe drinking water in Sri Lanka. Improving education and public engagement efforts, along with stringent water quality monitoring and regulation, are crucial measures to ensure that all Sri Lankans have access to safe and reliable drinking water.

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Food & Nutrition
CROSSWORD PUZZLE

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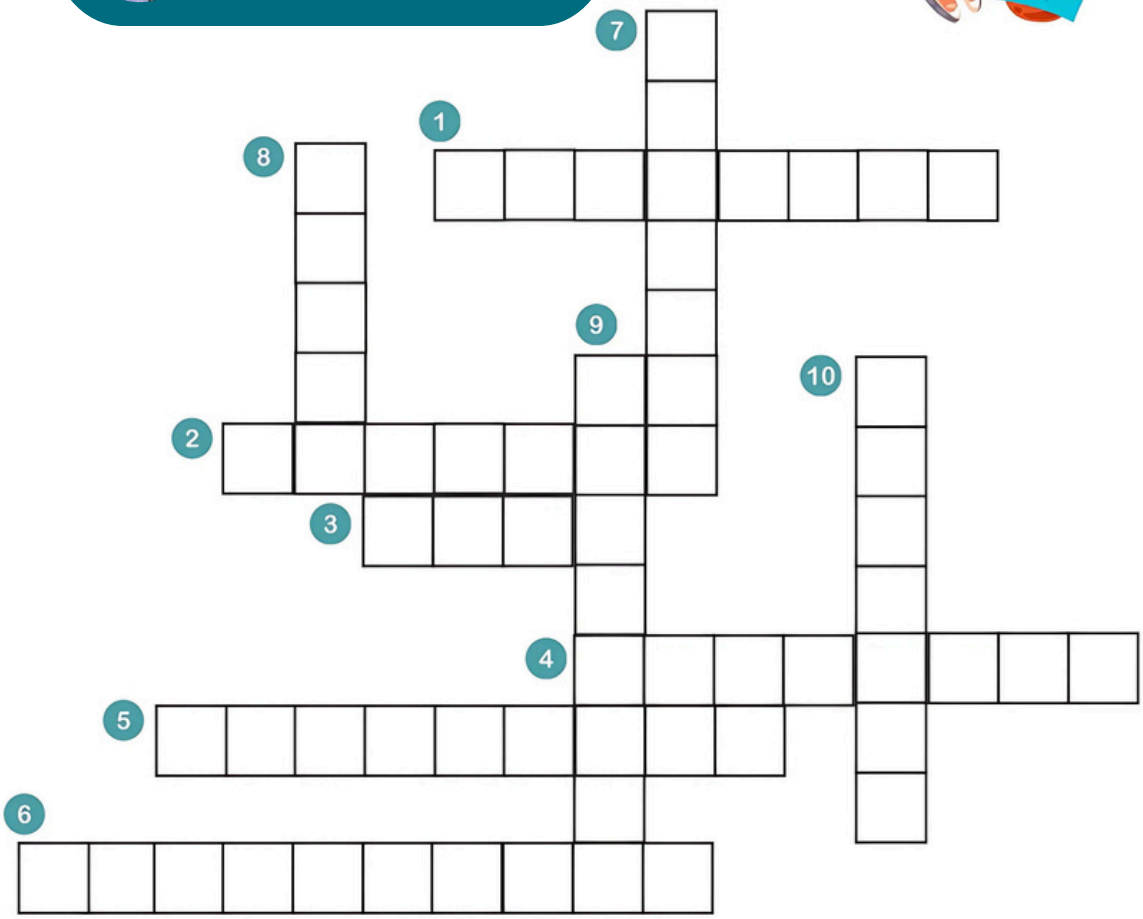

1. *A substance that provides nourishment*
2. *Essential for building and repairing tissues*
3. *The kind of food a person habitually eats*
4. *Inorganic substances important for bodily functions*
5. *The process of providing adequate fluids*
6. *The chemical processes that occur within a living organism*
7. *A specific amount of food served*
8. *A type of carbohydrate that aids digestion*
9. *Organic compounds necessary for growth*
10. *A unit of energy in food*

Answers are on another page

Embracing a Plant-Based Diet: A Journey Toward Health, Sustainability, and Flavour

In recent years, the buzz surrounding plant-based diets has grown louder, with advocates touting its health benefits, environmental impact, and sheer diversity of flavors. But beyond the trend, a plant-based lifestyle is a meaningful shift toward mindful eating. Whether you're motivated by personal health, concern for the planet, or simply curious about new foods, embracing a plant-based diet can be a transformative journey.

Why Plant-Based?

At its core, a plant-based diet emphasizes whole, unprocessed foods that come from the earth: fruits, vegetables, grains, legumes, seeds, and nuts. It's more than just vegetarianism—it's a holistic approach that minimizes animal products while maximizing the nutritional benefits of plant foods. For many, this shift can lead to improved energy levels, better digestion, and long-term wellness.

From a health perspective, numerous studies highlight the benefits of plant-based diets in reducing the risk of chronic diseases. Cardiovascular health improves as cholesterol levels drop, blood pressure stabilizes, and overall inflammation reduces. Similarly, plant-based eaters often find themselves better equipped to maintain healthy body weight without obsessing over calorie counts. Rich in fiber and packed with antioxidants, plant-based meals provide essential vitamins and minerals often lacking in highly processed diets.

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A Sustainable Choice

The impact of our food choices on the environment is undeniable. Traditional animal agriculture is a significant driver of greenhouse gas emissions, deforestation, and water usage. Transitioning to plant-based alternatives allows individuals to reduce their carbon footprint significantly. By choosing beans over beef, one can save thousands of gallons of water and contribute to the preservation of ecosystems.

But sustainability is about more than just reducing harm—it's about creating a food system that is regenerative and respectful of natural resources. Growing plants for direct human consumption requires fewer inputs and generates less waste. The rise of regenerative farming practices also adds another layer of sustainability, as they promote soil health and biodiversity while improving the nutritional quality of crops.

Flavors that Challenge Tradition

For many, the misconception that plant-based diets are bland or restrictive holds them back. But in reality, shifting to plant-based eating opens the door to an entirely new world of flavor and creativity. By exploring different cuisines, you'll discover how vegetables, grains, and legumes have been celebrated across cultures for centuries. Think of the vibrant curries of India, the rich umami flavors of Asian stir-fries, or the hearty grains and beans central to Mediterranean dishes.

One of the most exciting aspects of a plant-based diet is the freedom to experiment. With a rainbow of ingredients at your disposal, you can craft vibrant salads, hearty grain bowls, creamy nut-based sauces, and decadent desserts without ever reaching for animal products. Beyond the humble tofu, there are now myriad innovative plant-based proteins, like tempeh, jackfruit, and pea protein, to mimic the textures and flavors of traditional meat dishes.

Debunking the Myths

A common myth is that plant-based diets lack sufficient protein. However, the plant world offers a bounty of protein sources. Beans, lentils, quinoa, nuts, seeds, and even vegetables like spinach and broccoli pack a protein punch. For those with specific dietary needs, there are endless options to create a balanced, nutrient-rich plate that meets all macro and micronutrient needs.

Another myth is the idea that plant-based eating is expensive. While it's true that some specialty products can be pricey, plant-based staples like grains, beans, and vegetables are often more affordable than meat and processed foods. Shopping locally and seasonally also helps reduce costs while supporting local farmers and ensuring the freshest produce.

A Future of Flavor and Innovation

The future of plant-based eating is exciting, as innovation continues to drive change in the food industry. Beyond plant-based burgers and milk alternatives, companies are creating dairy-free cheeses, cultured meats, and egg replacements that mimic the textures and flavors of their animal-based counterparts. As food science evolves, so too does the accessibility and appeal of plant-based diets.

But beyond the science, it's the simplicity of plant-based eating that often surprises newcomers. With fewer processed foods and more whole ingredients, a plant-based diet encourages people to cook more at home, experiment with new flavors, and connect with their food in a meaningful way.

The Takeaway

A plant-based diet is not just a passing trend—it's a mindful shift toward better health, a more sustainable world, and a deeper appreciation for the vast array of flavors our planet offers. Whether you're fully committing to a plant-based lifestyle or simply incorporating more plant-based meals into your week, every step counts.

In the end, the plant-based journey is as much about discovery as it is about nourishment—one meal at a time.

The Power of Personalized Nutrition:

Unlock Your Optimal Health with AI power

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In current days, the world of altering diet regimens is continuously developing, so personalized nutrition is being used to alter the way that we understand our food and health. General dietary guidelines, although they are practical for the general population, they are usually not individualized to every person. It is precisely, personalized nutrition that does this job. To be more precise, it accepts that each person has the unique dietary needs that are determined by such factors as genetics, lifestyle, health objectives, and even gut microbiome. It is by not taking the one-size-fits-all approach but rather recommending a particular solution for each person that we can see the improvement in the health of each person.

What is Personalized Nutrition?

In the present era of the frequent emergence of dieting patterns, the concept of personalized nutrition is reshaping our approach to food and health. Although general dietary guidelines offer some practical help to people, they generally do not include the individual aspects of a person. On the other hand, individualized nutrition actually takes all these things into account. It recognizes that each person has his or her individual dietary needs because he or she carries different genetics, lives a different lifestyle, seeks other goals for his or her health, and has different microbes in the gut as well.

Personalized nutrition is the tool to formulation of a diet program that is actually for you as an individual. It takes other factors such as your age, gender, lifestyle, genes, and gut consideration other than nutritional. The human race has been created in such a way that it is diverse and there is no clear explanation to this wonderful complexity of the human organism.

Personalized nutrition makes sure that we are not only aware of our innate differences. We are also enabled to decide on a course of action that would fit our own metabolism well. This concept is scientifically-based and the research done in this area demonstrates that every person has a unique disease profiles and health needs from birth. The different genders, age groups, physical activities, life stages (including pregnancy, adolescence,

and menopause) and ethnicities as well as types of thing to be eaten, food supplements, herbs, or pharmaceuticals are other elements that communicate the increasing importance that nutrition plays in human functioning. Personalized nutrition is the tool to answer and the procedure that guarantees that individuals dial the right balance of nutrients that will overarch their health and well-being in all life-stage situations.

The popularity of various diet trends such as keto, paleo, or veganism may imply that there is an ultimate solution to attaining optimum health, but the reality is far from simplistic. As much as there exists a specific layer of discipline to follow any diet plan, the effectiveness of that diet plan will mostly depend on how the body responds to the diet, which is different in every individual. Here are a few reasons why one diet doesn't work for everyone:

1. Genetic Differences

Your genetic makeup plays a significant role in the recovery processes of your body including the digestion process. For example, those who don't have the APOE (apolipoprotein E) gene variant that predisposes them to high cholesterol are at a lower risk of high fat intake. This gene has been identified to be associated with fat metabolism, thus people with different variants of this gene are likely to respond differently to fat intake. Such genetic factors can help tailor one's diet specifically for them through personalized nutrition.

2. Phases of life and Physical distinctions

There are different needs for us as we grow through life. For instance, teenagers have different dietary needs to older adults. Pregnancy or menopause are also times of significant physiological reorganization for the body, and thus more specific nutritional support based on these unique changes. During pregnancies, for example the mother and baby share increased iron need; calcium needs are also high 2.5 g/day of weight gain in a growing fetus. In some cases, ethnicity matters; they are for instance more lactose intolerant, or process alcohol in a different way. Starting with personalized nutrition, these can be tailored to our genetics and microorganisms in order that we receive the correct nutrients at every life-stage.

3. Gut microbiome

The microbiome is made up of many trillions of bacteria living in and on your body. Everyone has a unique microbiome. Human gut microbiome composition is shaped by multiple factors but the relative contribution of host genetics remains elusive. Your geography, health status, stress level, age, gender and everything you eat can affect the composition of your microbiome and the types of bacteria found in your body.

Every person's gut microbiome stands unique meaning individuals break down foods in different ways. Some people's gut microbiomes may help them digest carbohydrates well, while others might feel bloated or tired after eating the same foods. By looking at your gut microbiome personalized nutrition can give you specific food advice to boost gut health and, as a result, your overall health.

The Science behind Personalized Nutrition

Food choices at the highest level of personalization rely on genetic differences. This approach, which involves customizing meals based on genetic testing, would prove helpful in cases where no other visible trait could give similar insights. The most important scientific contribution to growing our understanding of genetically imprinted sensitivity to foods and nutrients is the study of metabolism-related genes for sequence variations. From the viewpoint of consumer applications, some guidelines should steer the development and use of such measures, such as,

- a consumer should undergo genetic testing if a nutritional solution that can be tailored to the genetic variations being measured exists
- the frequency of the genotype of interest in a specific target population should be measured to assess the economic feasibility of delivering adapted food solutions

The Impact of Technology on Custom-Tailored Nutrition

Personalized nutrition stands out as one of the most groundbreaking advancements in food and health sectors. New tech has made it possible to tailor meals to each person's specific needs boosting their health and quality of life.

Diet tracking apps now allow people to monitor and adjust their food intake. These apps let users scan barcodes or search vast food databases to log their meals as they eat. Once foods are recorded, the apps offer a detailed breakdown of the macronutrients and micronutrients consumed helping to spot any potential dietary surpluses or shortfalls.

These apps can also give personalized tips based on the user's data. They can suggest diet changes to help reach specific goals like shedding pounds, building muscle, or boosting overall health. Many of these apps also link up with wearable gadgets such as fitness trackers and smartwatches, to provide full monitoring that includes food intake, sleep patterns, and exercise. For instance, apps like MyFitnessPal or Cronometer let users keep tabs on what they eat and check their macro and micronutrient levels.

The Future of Personalized Nutrition: How AI Has an Impact on Nutrition

Picture a world where your diet matches your genetic makeup, lifestyle, and personal health goals. A world where AI knows what you should eat to boost your health, stop diseases, and improve your overall well-being. This isn't a far-off dream; it's the future of nutritional science, and it's happening now. As AI tech gets better, it's changing how we think about nutrition and plan diets. This brings in a new age of personalized nutrition that's set to cause a revolution in health outcomes worldwide.

Old-school diet guidelines often use a one-size-fits-all approach, which doesn't work for many people. As in the emerging field of personalized medicine, there are increasing efforts to go beyond the one-fit-for-all diet approaches. Driven by technological advances, our insights into human variation (with all that it encompasses) and its effect on disease risk are steadily increasing. AI however lets us create super-specific diet plans by looking at different things like genetic info, gut bacteria makeup daily habits, and personal health data.

Among the many uses of AI in personal nutrition, genetic analysis is the most fascinating. AI systems are able to discover specific genetic markers that influence how the body uses food by studying a person's DNA. People can best reach their health goals by using this information to make a customized food plan that is based on their genetic predispositions and that will optimize their nutrient intake.

Getting feedback on the spot when you are taking your 'nutrients-AI-driven apps' and gadgets make tracking of vitamin intake easy with the latest advances in technology. These devices provide real-time results and give you precise information concerning nutrition in accession to the advantage you receive from making better dietary decisions. They can give you advice on healthier eating, keep you on track of your goals, and even remind you of the follow-ups which will in turn help you in keeping to it.

Microbiome Insights: The gut microbiome is a key factor in metabolism, immune function, and in general wellbeing. The AI-driven microbiome data analysis can provide pedagogic or instructional responses for your personal health. AI's role is to help identify foods that might help the beneficial gut bacteria do its work and therefore personalized dietary recommendations would be directed at supporting the gut flora.

Real-World Applications and Success Stories

Nutrigenomix: It is a platform that is based on genic testing to analyze specific genes. Nutrigenomix does this by giving custom-made advice to the individual, based on the genetic information received. This way, the individual can get started with the necessary nutrients, and thus, the risk of being sick decreases.

DayTwo: This Company connects microbiome healthcare providers to the customer through personalized nutrition recommendations via microbiome analysis. The patients can thus improve their metabolic health and prevent the immediate conditions like diabetes if they achieve the balance with such a low-load diet supplementing exercise using body fat as the energy source.

In a nutshell, personalized nutrition tailor diets based on genetics, lifestyles, health goals, and gut microbiome recognizing individual differences. AI enhances this approach by analyzing genetic and microbiome data, providing customized meal plans. This method can promote optimal health offering tailored solutions beyond one-size-fits-all guidelines, revolutionizing modern nutrition.

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உணவின் மூலம் இதய நோய்க்கு ஓர் இறுதிபுள்ளி வைப்போம்

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இதய நோய் என்பது முன்பெல்லாம் 60 வயதை கடந்தவர்களுக்கு தான் ஏற்படும். ஆனால் இன்று 20 வயது இளைஞரையும் இதய நோய் தாக்குகிறது. நல்ல உணவு, உணவுக்கு ஏற்ற உழைப்பு, உழைப்புக்கு ஏற்ற ஓய்வு. இவைதான் நல்வாழ்வுக்கான சூத்திரம். கம்பங்களியும், கேழ்வரகு கூழும் சாப்பிட்டுவிட்டு, கடும் வெயிலில் கடினமாக வேலை செய்த போது உணவு கலோரியாகி எரிந்துபோனது.

சரிவிகித சத்துணவை சாப்பிட்டு, உடலை பாதிக்கும் தவறான செயல்களை தவிர்த்து, கட்டுப்பாட்டோடு இருந்ததால்தான் நம் முன்னோர் நோய் நொடியின்றி நெடுங்காலம் வாழ்ந்தனர். ஆனால், இன்று எல்லா கட்டுப்பாடுகளும் தளர்ந்துவிட்டன. நம் வாழ்க்கை முறை முற்றிலும் மாறிவிட்டது. உடல் பருமன், இதய நோய், சர்க்கரை நோய் என எல்லா நோய்களும் வரத்துவங்கிவிட்டன.

உலக அளவில் மிக சிறு வயதிலேயே புகைப்பிடிக்கும் பழக்கம் உருவாகிவிடுகிறது. புகைப்பிடிப்பவர்கள் அவர்களுக்கு மட்டுமின்றி, அருகில் நிற்பவர்களுக்கும் இதய நோயை பரிசளிக்கிறார்கள். புகைக்கு அடுத்தபடியாக உணவுப்பழக்கம் முக்கிய காரணமாக இருக்கிறது.

உணவுக்கும், தட்பவெப்பத்துக்கும் நிறைய தொடர்பு உண்டு. நாம் அரிசியை முதன்மை உணவாக சாப்பிடுவதும், வடமாநிலத்தினர் கோதுமையை சாப்பிடுவதும் அப்படித்தான். இன்று தட்பவெப்பத்துக்குத் தொடர்பில்லாத உணவுகள் எல்லாம் வந்துவிட்டன. உடம்பால் அந்த உணவுகளை கிரகித்துக்கொள்ள முடியவில்லை. உணவுக்கேற்ற உழைப்பும் இல்லை. அதனால் மிஞ்சியவை எல்லாம் கொழுப்பாக மாறி, எங்கெல்லாம் இடமிருக்கிறதோ அங்கெல்லாம் படிந்துவிடுகிறது. ரத்தக்குழாயில் படிந்த கெட்ட கொழுப்பு (எல்.டி.எல்) இதய நோய் வர முக்கிய காரணமாக இருக்கிறது.

அடுத்து, மன அழுத்தம். இளைஞர்கள் எதையோ தேடி அதிவேகத்தில் ஓடிக்கொண்டிருக்கிறார்கள். ஓய்வு, உறக்கம் மறந்து வேலை செய்கிறார்கள். உலகமயமாக்கலுக்கு பிறகு பணிச்சூழலும் மாறிவிட்டது. குறிப்பாக, ஐ.டி துறையில் பணியாற்றும் இளைஞர்கள் இதனால் பெரிதும் பாதிக்கப்படுகிறார்கள். வாழ்க்கையும், வேலையும் பிரிக்க முடியாததாக மாறிவிட்டது. அலுவலக சூழல், குடும்பத்தையும் பாதிக்கிறது. இதனால், மனஅழுத்தம் அதிகரிக்கிறது. இதுவும் இதய நோய்க்கு முக்கிய காரணம்.

இவை தவிர, உடல் பருமன், சர்க்கரை நோய், உயர் ரத்த அழுத்தம் ஆகியவையும் காரணம். இன்று, பலரிடம் உடற்பயிற்சி என்பதே இல்லாமல் போய்விட்டது. இதனால், குறைந்த வயதிலேயே மாரடைப்பு நோய் தாக்குகிறது. உலகளவில் ஏற்படும் இறப்புகளில் மூன்றில் ஒரு பங்கு இதய நோயால் ஏற்படுகிறது.

மாரடைப்பு எவ்வாறு ஏற்படுகிறது?

மாரடைப்பு, இதய தசைகளுக்கு இரத்த ஓட்டம் மற்றும் ஆக்சிஜன் பாய்வதை நிறுத்தும்போது ஏற்படுகிறது. தசைகளுக்கு இரத்தத்தை எடுத்துச் செல்லும் கரோனரி ஆர்ட்டரிகளில் அதிகப்படியான கொலஸ்ட்ரால் மற்றும் கொழுப்புத் தொகுதிகள் ஆர்ட்டரிகளின் அகலத்தைக் குறைத்து இரத்த விநியோகத்தைத் தடுக்கின்றன. போதியளவு இரத்தம் கிடைக்காத போது இதய தசை பாதிக்கப்பட்டு இதயம் துடிப்பதை நிறுத்தும். இவ்வாறு இதயம் செயல்படுவது மற்றும் இதய ஆரோக்கியத்தில் உணவுமுறை முக்கிய பங்கு வகிக்கிறது. சில உணவுகள் இரத்த அழுத்தம், ட்ரைகிளிசரைடுகள் மற்றும் கொலஸ்ட்ரால் அளவை அதிகரிக்கும். இவை அனைத்தும் இதய நோய்க்கான உண்டாக்கும் அபாயம் கொண்டுள்ளது. உங்கள் இதய ஆரோக்கியத்தை மேம்படுத்த, மாரடைப்பு வராமல் இருக்க சிறந்த உணவுப்பழக்கத்தை பின்பற்றுவது அவசியம்.

அவ்வாறான சிறந்தஉணவுகள் யாவை?

தானியங்கள்

பொதுவாக தானியங்களில் கோதுமை, தவிடு கொண்ட அரிசி, ஓட்ஸ், பார்லி மற்றும் குயினோ ஆகியவை அடங்கும். உணவில் அதிக முழு தானியங்களை சேர்த்துக்கொள்ளும் போது அதிக நார்ச்சத்து கிடைக்கும். இது உடலில் குளுக்கோஸ் அளவை சீராக பேணுவதன் மூலம் இதய ஆரோக்கியத்திற்கு நன்மை பயக்கும் என்று பல ஆய்வுகள் கண்டறிந்துள்ளன.

கொழுப்பு மீன் மற்றும் மீன் எண்ணெய்

சால்மன், கானாங்கெளுத்தி, ஹெர்ரிங் மற்றும் டுனா போன்ற கொழுப்பு நிறைந்த மீன்களில் ஒமேகா-3 கொழுப்பு அமிலங்கள் உள்ளன. இந்த மீன்களில் உள்ள ஒமேகா-3 கொழுப்பு அமிலங்கள் இதய நோய் அபாயத்தைக் குறைப்பதில் பெரும் பங்கு வகிக்கிறது. மீன் சாப்பிடுவது இதய நோய், மனச்சோர்வு மற்றும் இறப்பு அபாயத்தை குறைக்கிறது. மீன் எண்ணெய் சப்ளிமெண்ட்ஸ் இரத்தத்தில் ட்ரைகிளிசரைடுகளை குறைக்க உதவுகிறது, தமனி செயல்பாட்டை மேம்படுத்துகிறது மற்றும் இரத்த அழுத்தத்தை குறைக்கிறது.

கீரை மற்றும் பச்சை காய்கறிகள்

கீரை, பச்சை காய்கறிகள், மற்றும் இலை வகை உணவுகளில் வைட்டமின்கள், தாதுக்கள் மற்றும் ஆன்டி-ஆக்சிடன்ட்டுகள் நிறைந்துள்ளன. இவை வைட்டமின் கே நிறைந்துள்ள உணவு வகையாகும். இது இதயத்தின் தமனிகளைப் பாதுகாக்க உதவுகிறது மற்றும் சரியான இரத்த ஓட்டத்தை ஊக்குவிக்கிறது. இரத்த அழுத்தத்தைக் குறைப்பதற்கும், தமனிகள் விரைத்துப் போவதை தடுப்பதற்கும் மற்றும் இரத்த நாளங்களைச் சுற்றியுள்ள உயிரணுக்களின் செயல்பாட்டை மேம்படுத்துவதற்கும் உதவும் நைட்ரேட்டுகள் அதிகமாக உள்ளன. சில ஆய்வுகள், இலை காய்கறிகளை அதிகமாக சாப்பிடுவது இதய நோய் அபாயத்தைக் குறைக்கிறது என்று கண்டறிந்துள்ளது.

அவரை

அவரை வகைகளில்மாவுச்சத்தும் நார்ச்சத்தும் அதிகம் உள்ளது. அவரை சாப்பிடுவது இதய நோய் அபாயத்தைக் குறைக்கிறது என்று பல ஆய்வுகள் கண்டறிந்துள்ளன. கூடுதலாக, அவரை வகைகள் சாப்பிடுவது இரத்த அழுத்தம் மற்றும் வீக்கம் ஆகியவற்றைக் குறைக்கும்.

தக்காளி

தக்காளியில் லைகோபீன் உள்ளது, இது பல ஆக்ஸிஜனேற்ற பண்புகளைக் கொண்டுள்ளது. தக்காளியின் லைகோபீன் கூடுதல் இரத்த லிப்பிடுகள், இரத்த அழுத்தம் மற்றும் எண்டோடெலியல் செயல்பாடு ஆகியவற்றில் நேர்மறையான விளைவைக் கொண்டுள்ளது.

பெர்ரி பழங்கள்

ஸ்ட்ராபெர்ரி, ப்ளூபெர்ரி, ப்ளாக்பெர்ரி மற்றும் ராஸ்பெர்ரி ஆகியவை இதய ஆரோக்கியத்தில் முக்கிய பங்கு வகிக்கும் சில ஊட்டச்சத்துக்கள் நிறைந்தது. பெர்ரிகளில் ஆன்டிஆக்ஸிடன்ட்களான அந்தோசயினின்கள் நிறைந்துள்ளன. இது ஆக்ஸிஜனேற்ற அழுத்தம் மற்றும் வீக்கத்திலிருந்து இதயத்தைப் பாதுகாக்கிறத. அதே போல, ப்ளூபெர்ரியை தினமும் உட்கொள்வது இரத்த அழுத்தம் மற்றும் இரத்த உறைதலை கட்டுப்படுத்த உதவுகிறது.

அவகேடோ

அவகேடோ இதய ஆரோக்கியத்திற்கு தேவையான நல்ல மோனோசாச்சுரேட்டட் கொழுப்புக்களைக் கொண்டுள்ளது. அவை கொலஸ்ட்ரால் அளவைக் குறைத்து இதய நோய் அபாயத்தைக் குறைக்கின்றன. இதய ஆரோக்கியத்திற்கு தேவையான பொட்டாசியமும் இது உள்ளடக்கியுள்ளது.

வால்நட்ஸ்

வால்நட்ஸ் நார்ச்சத்து மற்றும் மெக்னீசியம், செம்பு மற்றும் மாங்கனீசு போன்ற நுண்ணூட்டச்சத்துக்களின் முக்கிய ஆதாரமாகும். சில ஆய்வுகள் வால்நட்ஸ் போன்ற வித்துக்களை தொடர்ந்து உட்கொள்வது இதய நோய் அபாயத்தை குறைக்கிறது என்று கண்டறிந்துள்ளது.

டார்க் சாக்லேட்

டார்க் சாக்லேட்டில் ஃபிளாவனாய்டுகள் போன்ற ஆன்டிஆக்ஸிடன்ட்கள் உள்ளன. இது இதய ஆரோக்கியத்தை மேம்படுத்துகிறது. மிதமான அளவில் சாக்லேட் சாப்பிடுவது கரோனரி இதய நோய், பக்கவாதம் மற்றும் நீரிழிவு அபாயத்தைக் குறைக்கும். குறைந்த பட்சம் 70% கோகோ உள்ளடக்கம் கொண்ட உயர்தர டார்க் சாக்லேட்டைத் தேர்வு செய்ய வேண்டும்.

பாதாம்

பாதாம் ஊட்டச்சத்து நிறைந்த வித்து வகைகளில் ஒன்றாகும். இதய ஆரோக்கியத்திற்கு தேவையான வைட்டமின்கள் மற்றும் தாதுக்களின் களஞ்சியமாக பாதாம் உள்ளது. அவை இதய ஆரோக்கியத்திற்கு நல்ல மோனோசாச்சுரேட்டட் கொழுப்புகள் மற்றும் நார்ச்சத்தை வழங்குகிறது. பாதாம் சாப்பிடுவது உங்கள் கொலஸ்ட்ரால் அளவுகளை நிர்வகிக்க உதவும் என்று ஆராய்ச்சிகள் கூறுகிறது.

சியா மற்றும் ஆளி விதைகள்

சியா விதைகள் மற்றும் ஆளி விதைகள் நார்ச்சத்து மற்றும் ஒமேகா-3 கொழுப்பு அமிலங்கள் உட்பட இதய-ஆரோக்கியமான ஊட்டச்சத்துக்களின் முக்கிய ஆதாரங்களாகும். இந்த விதைகள் உங்கள் உடம்பில் வீக்கம், இரத்த அழுத்தம், கொழுப்பு மற்றும் ட்ரைகிளிசரைடுகளை சீராக்க உதவும்.

பூண்டு

பூண்டு பல நூற்றாண்டுகளாக பல்வேறு நோய்களுக்கு இயற்கை தீர்வாக பயன்படுத்தப்படுகிறது. பூண்டு இதய ஆரோக்கியத்தை மேம்படுத்த உதவும் என்று ஆராய்ச்சி காட்டுகிறது. இதில் அல்லிசின் என்ற கலவை உள்ளது, இது பல நன்மை பயக்கும் விளைவுகளைக் கொண்டுள்ளது. பூண்டு சாறு சிறுதட்டு திரட்டலைத் தடுக்க உதவும் என்று ஆய்வுகள் காட்டுகின்றன. இது இரத்த உறைவு மற்றும் பக்கவாதம் ஏற்படும் அபாயத்தைக் குறைக்கும்.

ஆலிவ் எண்ணெய்

ஆலிவ் எண்ணெயில் ஆன்டி-ஆக்ஸிடன்ட்கள் நிறைந்துள்ளன. இது வீக்கத்தைத் தடுக்கும் மற்றும் நாள்பட்ட நோய்களின் அபாயத்தைக் குறைக்கும். மேலும் இதில் மோனோசாச்சுரேட்டட் கொழுப்பு அமிலங்கள் நிறைந்துள்ளன. ஆலிவ் எண்ணெயின் பயன்பாடு இதய ஆரோக்கியத்தை மேம்படுத்துகிறது என்று பல ஆய்வுகள் கண்டறிந்துள்ளன. ஆலிவ் எண்ணெயில் ஒலிக் அமிலம் மற்றும் ஆக்ஸிஜனேற்றங்கள் அதிகம் உள்ளன. இது உயர் இரத்த அழுத்தத்தைத் தடுக்க உதவுகிறது.

கிரீன் டீ

அதிகப்படியான கொழுப்பைக் குறைப்பது மற்றும் இன்சுலின் உணர்திறனை மேம்படுத்துவது போன்ற பல ஆரோக்கிய நன்மைகளை கிரீன் டீ கொண்டுள்ளது. இது பாலிபினால்கள் மற்றும் கேட்டசின்களால் நிரம்பியுள்ளது, அவை உயிரணு சேதத்தைத் தடுக்கவும், வீக்கத்தைக் குறைக்கவும் மற்றும் இதய ஆரோக்கியத்தை பராமரிக்கவும் ஆக்ஸிஜனேற்றிகளாக செயல்பட முடியும். மூன்று மாதங்களுக்கு க்ரீன் டீ சாற்றை உட்கொள்வதால் இரத்த அழுத்தம், ட்ரைகிளிசரைடுகள், எல்டிஎல் மற்றும் கொலஸ்ட்ரால் குறையும் என்று ஆய்வுகள் தெரிவிக்கின்றன.

இவற்றோடு தினமும் உடற்பயிற்சி செய்வதன் மூலமும் சிறந்த உணவுப்பழக்கத்தை கடைப்பிடிப்பதன் மூலமும் நாம் இதய நோய்களிலிருந்து பாதுகாப்பு பெற முடியும். உணவின் மூலம் இனிவரும் காலங்களில் இதய நோய்க்கு இறுதிபுள்ளி வைப்போம்.

Advances in Edible Coatings for Fresh Fruits and Vegetables

Summary

The edible coatings/films are one of the most advanced methods to extend the commercial shelf-life of fruits and vegetables by acting as gas barrier properties, moisture barrier properties, lipid barrier properties and have a similar effect on the storage under modified atmosphere (MA). The development of edible coatings with improve fresh and minimally processed fruits that challenges of the postharvest industry. Edible coating is best alternatives for traditionally used plastic packaging which non-degradability and important environment pollution concerns of plastic packaging materials. In fresh cut fruits and minimally processed fruits, edible coatings also retain the phytochemicals they are antioxidants, phenolic, color, physicochemical weight loss, respiration rate and total soluble solid properties for a longer period. This review discusses about the use of different edible coatings (polysaccharides, proteins, lipids and composite) as carriers of functional ingredients on fresh fruits and vegetables to maximize their quality and shelf life. This also includes antimicrobials, texture enhancers, nutraceuticals improve quality and functionality of fresh-cut fruits.

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1.0 Introduction

Today, changes in the current lifestyles of modern consumers have increasing in the sales of ready-to-eat (RTE) and minimally processed foods. Consumers are responsive microbiologically safe fresh and fresh like products that are healthy, shelf-stable, convenient, and produced using environmentally friendly technologies. (Cagri etal, 2004).

Fresh cut fruits are extremely perishable, live organisms, evaporation of moisture, occur in oxidation and enzyme activity. Therefore, Vegetables and fruits are highly perishable as contain 80–90% water by weight. Deterioration of fresh foods occurs regularly at the time of storage, and its cumulative effect reduces the food unacceptable to the consumers. The major problem experienced by most food processors is loss of food quality during storage which increase in waste. Since fresh fruit and vegetable can occur biochemical deteriorations such as browning, off-flavor development, texture breakdown, decreasing the fruit quality and the risk to consumer due to pathogenic microorganism's presence.

Packing and packaging methods helps in maintaining and extending shelf life of fresh produce. Impacts of

temperature, Oxygen and relative humidity in storage and during transportation. In modern food systems, advanced packaging techniques including edible coatings play a great role in maintaining product freshness and quality during storage. Hence Major losses in quality and quantity of fresh fruits and vegetables occur between harvest and consumption.

Numerous technology can have controlled atmosphere storage and modified atmosphere storage have been used for preserving fruits by reducing their quality changes and quantity losses during storage. Edible coatings on fresh fruits and vegetables can provide different to modified atmosphere storage by reducing quality changes and quantity losses of the internal atmosphere. So edible coatings contribute to extend them shelf life of fresh fruits and vegetables by reducing moisture, gas barrier, respiration, and oxidative reaction. (Baldwin, 1996)

1.1 Edible Coating

Edible coatings defined as the thin layers of edible material which coats the food and serves as a barrier between the food material and their surrounding environment during handling, processing and storage. Also edible coatings can have defined as primary packaging layers made from edible components with barrier properties.

Edible coating act as a hurdle between food and the surrounding environment. These coatings reduce deterioration without affecting food quality and extend the shelf life. They act as barriers to moisture and gas and therefore slow down the ripening rate of fruits by controlling the respiration rate. Edible coatings do not exclusively slow down food deterioration but can also improve functional properties by incorporating components such as antimicrobial compounds, antioxidants, minerals and vitamins (Majid etal, 2018).

Therefore, edible antimicrobial coatings are attracting part for the interest of researchers in the food industry. So they can improve the food quality, safety, extend shelf life, and functionality of food products, while minimizing both spoilage and pathogenic microorganisms during storage, transportation, and handling (Arrieta, 2014) . Also edible coatings could act as health-related compounds such as vitamins, minerals, and bioactive compounds but also of antimicrobial and antioxidant. (Cagri etal, 2004)

1.2 Properties of Edible Coatings

Edible coatings have natural biocide and antimicrobial activity due to inhibiting food deterioration and enhancing its safety (García, 2014). The edible coating has used with fresh-cut products due to short handling period. These edible coatings consisting of natural and biodegradable substances are the most acceptable due to their non-pollutant nature. (Debeaufort, 1998)

The coating is the most suitable due to its non-pollutant and economic nature. Edible coating improves food quality, extend shelf life such as antibrowning agents, colorants, flavors, nutrients, spices, and antimicrobial compounds that can extend product shelf life and reduce the risk of pathogen growth on food surface (Pranoto, 2005) and reduce waste products. There are three types of Edible coatings biological materials hydrocolloids (polysaccharides and proteins) lipids and composite coatings.

Generally, biopolymer-based films are good gas barriers however, they provide poor moisture migration resistance. In comparison, lipid-based films act as good moisture barriers but have poor mechanical strength and present little gas transfer resistance. Therefore, composite coating has been mostly used in fresh produce to provide efficient barrier properties to both air as well as moisture (Sapper, 2018) .

Protein film-forming materials are derived from many different animal and plant sources, such as animal tissues, milk, egg, grains and oil seeds. Proteins are good film forming exhibiting excellent oxygen, carbon dioxide and lipid barrier properties. (Kester, 1986). The Hydrophilic nature of proteins and polysaccharides, coatings and films exhibit limited water vapor barrier ability.

Fruits	Coating Matrix	Effects of coating matrix	References
Fresh-cut strawberries	Gel coatings	• Reduced microbial count	(Tomadoni, 2018)
Apricot	Soybean protein isolate chitosan edible coating	• A beneficial effect on weight loss, retention of firmness, Titratable acidity and soluble solids content, Delaying the increase in respiration rate and inhibiting the ethylene production	(Zhang, 2018)
Apple and strawberry	Chitosan	• Increased antibacterial and antifungal activity. • Reduced weight loss when compared to uncoated	(Khalifa, 2016)
Fresh cut apples	Carboxymethyl cellulose, Calcium chloride, ascorbic acid	• Reduced browning activity, • Retained firmness. • Soluble solid content and TA were reduced. • Decreased total phenolic and flavonoid concentration	(Koushesh, 2016)
Guavas	Chitosan, cassava starch, glycerol	• Increased antimicrobial activity. • Maintain Total soluble solid and Total Acidity • Maintained firmness • Improve color	(Bezerra, 2015)
Cavendish Banana	Deacetylated chitosan	• Delayed fruit ripening. • Reduction in weight loss and Vitamin C loss	(Suseno, 2014)
Fresh cut papaya	Multilayered coating of chitosan, pectin and calcium chloride Chitosan, Glycerol,	• Reduced weight loss and respiration rate. • Increased firmness. • Higher ascorbic acid content. • High carotenoids content. • Acceptable color and taste	(Brasil, 2012)
Cherry tomato	Chitosan	• Inhibition of microbial growth • Reduced respiration, • Reduction of titratable acidity	(Won, 2017)

Table 1: Application of Polysaccharide based edible coatings improving the quality of fresh and cut fruits

Fruit	Coating Matrix	Effects of coating matrix	References
Fresh-cut apples	Whey protein isolate films incorporated with montmorillonite and citric acid	• Reduction in enzymatic browning, • Maintenance of color characteristics, • Reduction in quality loss (associated with acidity, • soluble solids, water activity) • Reduction of polyphenol oxidase and peroxidase • activity • Extending the shelf life of the apples	(Azevedo, 2018)
Fresh-cut apples	Ferulic acid with soy protein isolate	• Control of weight loss and firmness, • Decrease in the oxidative degradation, • Extended shelf-life	(Alves, 2017)

Table 2: Application of protein-based edible coating improving the quality of fresh and cut fruits

Fruit	Coating Matrix	Effects of coating matrix	References
Fresh Mango	Hydroxypropyl methylcellulose (HPMC), beeswax (BW), nanoclay and ginger oil	• Reduction in weight loss, • Firmness loss, • Changes in flesh color, • Maintain Soluble solids content • Shelf-life extension	(Klangmuang, 2018)
Strawberries	Chitosan glycerol and polyvinyl alcohol (PVA)	• Inhibition microorganisms growth on fruit surface • Preservation of physicochemical properties	(Hajji, 2018)
Tangerine	Chitosan	• Reduction weight loss, • Higher contents of total soluble solids (TSS) and titratable acidity (TA) • Extend shelf life	(Xu, 2018)
Apple cubes	Chitosan, alginate, xanthan gum, pectin, starch, carboxymethyl cellulose	• Reduce antibacterial effect.	(Carmen, 2016)
Fresh strawberries	Chitosan, beeswax	• Reduced weight loss, • Respiration rate and effective on fungal infection. • Effectively retained firmness, • Maintain color, TA, pH, soluble solids and sugars	(Velickova, 2013)

Table 3: Composite edible coating for fresh and cut fruits

2.0 Effect of edible coating on different properties of fruits

2.1 Phytochemical properties

2.1.1. Phenolic and flavonoids

Edible coating is effective techniques to modify slow down the metabolic processes of fresh fruits and vegetables. According to a study that coating helps to maintain the phenolic content for a longer period than uncoated fruit. Edible coating effectively delayed the senescence by controlling the metabolic rate, therefore retaining the phenolic for a longer storage period. Furthermore, edible coating can extend the shelf life of the fresh cut fruits and vegetables.

2.1.2. Antioxidants

Antioxidant activity in fruits is due to the presence of phenolic, flavonoids, lycopene and carotenoids (Abourashed, 2013).Antioxidants compounds has been occurred as ripening process. With the application of coating solution, respiration rate can be slowed down and antioxidant activity can be maintained for a longer storage period.

2.1.3 Color or pigments

Color is an important indicator of ripening for determines the quality storage condition and consumer acceptability for fresh products. During ripening of fruits, chlorophyll gets degraded and formation of other pigments including lycopene and anthocyanin takes place (Petriccione, 2015). The edible coating slows down the ripening rate, therefore delaying the color change as compared to uncoated fruit. Chitosan coating significantly delayed the color change in fresh fruits and vegetables better than control fruits by slowing down the respiration rate (Abebe, 2017).

3.0 Advantage of Edible Coatings

- Protect food products from moisture migration
- Reduce microbial growth on the surface
- Reduce chemical changes, oxidation of nutrients of fresh produce
- Improve the physical strength of food products and mechanical handling properties
- Reduce particle clustering
- Maintain structural integrity
- Retain volatile flavor compounds, natural color pigments and nutrients
- Improve visual and physical features on products surfaces
- Insect infestation and microorganism growth can be restricted by using active agents in the coatings
- Reduce volume for disposable non-biodegradable packaging materials
- As a relatively low cost technology, coatings may have more potential in developing countries

4.0 Future prospects of Edible Coating

Many technologies are attempt to development to improve the quality and increase the safety of fresh food products. For future consideration more emphasis use of edible coatings or films. Also renewable and biodegradable materials, used to reduce the amount of non-degradable packaging materials, thus solving the waste disposal problem (Andrade, 2012).

More researchers are determining of the effect of these active ingredients to the sensory, mechanical, functional and shelf-life of the food product. Hydrocolloids and lipid source used as base replaced with more economic and region base availability. As edible coating techniques are needed to reduce the labor cost and make it more economical in today. Also edible coating or films can be used for food product and can improve their functional properties beyond shelf life.

Prevention of postharvest losses is a major concern for food processing industries of future generations. Also Edible coating is best alternatives for traditionally used plastic packaging which non-degradability and important environment pollution concerns of plastic packaging materials. Furthermore, as a relatively low cost of edible coating technology more potential in developing countries

Commercial implementation of edible coatings should be based on sensory and consumer studies that focus on marketing strategies advertising the benefits for consumers of the incorporation of edible coatings to food products.

5.Conclusion

Edible coating is best alternatives for traditionally used plastic packaging which non-degradability and important environment pollution concerns of plastic packaging materials. Edible coatings have been developed, to the internal environment of fruits but also add value to the products of fresh fruits. In fresh cut fruits and minimally processed fruits, edible coatings also retain the phytochemicals they are antioxidants, phenolics, colour and physicochemical weight loss, preservation methods. Therefore, it can be concluded that edible coating is one of the best methods for the preservation of fresh fruits.

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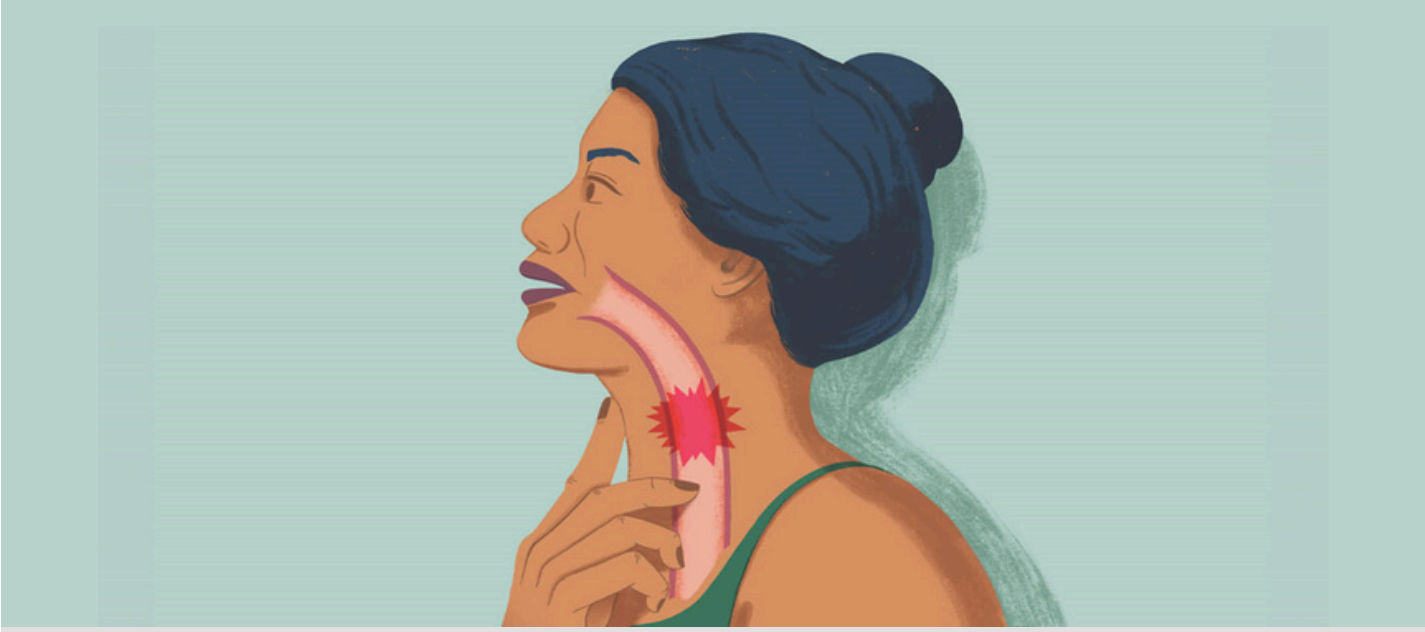

Dysphagia:
Is eating a source of enjoyment or a challenge for you?

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Food is a source of pleasure for most of us, but for some it can become a suffering challenge. This is especially true for those living with dysphagia, a condition that can hinder the intake of essential nutrients and fluids, leading to serious health issues related to malnutrition and a diminished quality of life. Therefore identifying and managing dysphagia is of paramount importance.

What is dysphagia?

Dysphagia is the medical terminology used to describe eating, drinking and swallowing difficulties. It is more common in the aging population. Age-related factors such as loss of muscle mass and function, reduced tissue elasticity, changes in the cervical spine, decreased saliva production, impaired dental status, reduced oral and throat sensitivity, a diminished sense of smell and taste and the reduced compensatory capacity of the aging brain, all contribute to a higher susceptibility to dysphagia. However, dysphagia is not limited to older adults, it can also develop in younger individuals with certain medical conditions, including stroke, dementia, cancers of the head, neck, and esophagus, as well as neurological disorders such as Guillain-Barre syndrome (GBS).

How to identify dysphagia:

Dysphagia can be identified through various signs and symptoms. Common signs include difficulty swallowing, coughing or choking during meals, pain while swallowing, regurgitation of food or liquids, and aspiration. In any case of having these signs a videofluoroscopic swallowing study (VFSS) or a fiberoptic endoscopic evaluation of swallowing (FEES) can help visualize the swallowing process in detail and detect the presence of dysphagia.

Nutrition related complications:

Dysphagia makes it hard to eat and drink, leading to lower intake of energy, water, and nutrients. Which will eventually cause malnutrition and dehydration if not managed. Malnutrition leads to muscle loss, including the muscles used for chewing and swallowing, which makes dysphagia worse and can start the frailty process in older adults. Dehydration increases the risk of lung infections like aspiration pneumonia by causing a dry mouth, less throat cleaning, and more bacteria buildup in the throat. It can also lead to confusion, dizziness, weakness, tiredness, kidney problems and imbalanced electrolytes, which all contribute to frailty. Not eating enough can lead to unintentional weight loss, which may have a negative effect on overall health.

Managing dysphagia:

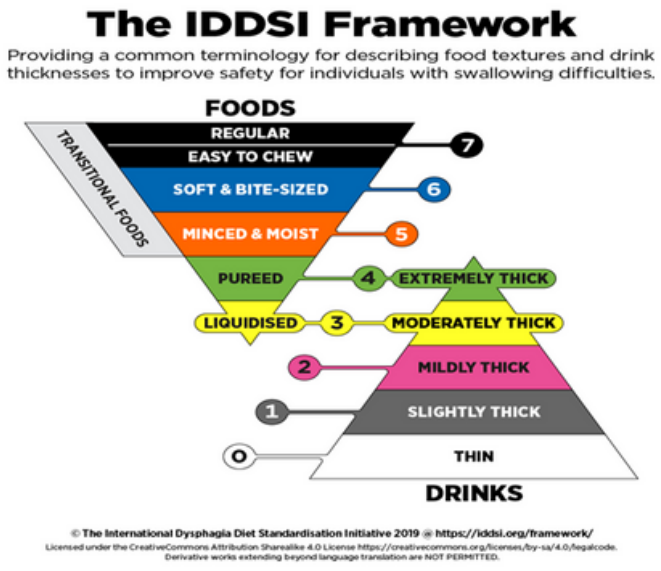
Treating dysphagia early and effectively is essential for reducing complications and improving the health and well-being of those affected. Nutritional support options include standard diets, texture-modified foods, and oral nutritional supplements. Diet modification, as a primary strategy, aims to reduce aspiration risk and ensure that energy and nutrient needs are met. Swallowing specialists evaluate safe food and fluid consistencies, while a dietitian creates a tailored nutrition plan to support safe and adequate intake. The choice of intervention should be individualized based on the type and severity of swallowing difficulties, nutritional status, and other health conditions, all determined by a thorough assessment. However, low adherence to modified diets can increase the risk of malnutrition.

Thickeners Aid in Managing Dysphagia:

Thickeners are used in dysphagia treatment to adjust the consistency of both liquids and foods. Various brands of thickeners are available on the market. The recommendation to prescribe a thickener based on factors such as the patient's degree of dysphagia, the desired consistency, texture, palatability, cost-effectiveness, and other considerations. Typically liquids and foods pass through the throat quickly and turbulently; thickeners help slow down their transit, giving patients more time to coordinate the swallowing process safely.

IDDSI diet levels:

The International Dysphagia Diet Standardization Initiative (IDDSI) has established dysphagia levels. It consists of a continuum of 8 levels (0 - 7), where drinks are measured from Levels 0 – 4, while foods are measured from Levels 3 – 7. The IDDSI Framework provides a common terminology to describe food textures and drink thickness.



Regular & Easy to chew (Level 7) food consistency refers to normal, everyday foods of various textures that are appropriate for all ages.

Soft and bite-sized (Level 6) food can be eaten with a fork, spoon, or chopsticks and can be easily mashed with pressure from utensils.

Minced and moist (Level 5) food requires minimal chewing, allowing it to be scooped and shaped on a plate without the need for biting.

Pureed or extremely thick (Level 4) foods cannot be drunk from a cup or sucked through a straw. They are typically eaten with a spoon and show slow movement under gravity.

Liquidized and moderately thick (Level 3) foods can be drunk from a cup but require effort to suck through a straw.

Mildly thick (Level 2) food flows off a spoon and is sippable, pouring quickly but slower than thin drinks.

Slightly thick (Level 1) food is thicker than water, requiring a bit more effort to drink.

Thin (Level 0) food flows like water, allowing for easy consumption through any appropriate vessel.

Choosing an appropriate food consistency is essential in treating dysphagia. The strong connection between swallowing ability, nutritional status, and health outcomes in dysphagia patients underscores the importance of effective management. Successful swallowing interventions not only support safe oral intake but also improve nutritional status and help prevent related health issues, such as pneumonia. As awareness of dysphagia continues to grow, ongoing research and education will be essential in optimizing care strategies and ensuring that individuals can enjoy mealtimes safely and with dignity.

Prebiotics and Their Role in Gut Health and Well-Being

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Understanding Gut Microbiota, Probiotics, and Prebiotics

The gut microbiome is a diverse community of microorganisms, including bacteria, viruses, fungi, and other microbes in the gastrointestinal tract. This microbial community play a significant role in maintaining human health, with probiotics and prebiotics playing key roles in its balance. Probiotics are specific live microorganisms, that, when consumed in adequate amounts, provide health benefits to the host by positively impacting the gut microbiome. They contribute to improved digestion, immune function, and overall well-being (Hill et al., 2014). Probiotics are commonly found in fermented foods, such as curd, yogurt, idly batter, dosa batter, and pickles (Binda et al., 2020). Prebiotics, on the other hand, are non-digestible food components, typically dietary fibers, that serve as food for beneficial bacteria in the gut. These fibers are not digested in the upper gastrointestinal tract; instead, they pass through the colon, where they are fermented by gut bacteria to produce short-chain fatty acids (SCFAs), and other compounds, which further play important roles in promoting gut health (Slavin, 2013; Gibson et al., 2017).

Characteristics of Prebiotics

For the non digestable fibers to be classified as prebiotics, certain criteria must be met. First, they should resist digestion in the upper gastrointestinal tract, allowing them to reach the colon intact (Gibson & Roberfroid, 1995). Once in the colon, prebiotics should be fermentable by beneficial gut microbiota, providing fuel that supports the growth of these helpful bacteria (Slavin, 2013). Additionally, they should not encourage the growth of harmful pathogens in the gut (Gibson et al., 2017). By meeting these criteria, prebiotics can effectively contribute to a balanced gut environment and promote overall health (Hudson et al., 2015).

Types of Prebiotics

Fructooligosaccharides (FOS): These are found in foods like onions, garlic, leeks, and bananas. FOS are short chains of fructose molecules. They stimulate the growth of beneficial bacteria like Bifidobacteria and Lactobacilli in the gut.

Inulin: This is a naturally occurring prebiotic fiber. Inulin is found in foods such as onions, garlic, and wheat. Inulin can improve gut health by enhancing the absorption of minerals and promoting a balanced microbiome.

Galactooligosaccharides (GOS): These are found in legumes (such as beans and lentils) and certain dairy products. GOS is beneficial for infants, as it closely resembles the structure of human milk oligosaccharides (HMOs) that help in building a healthy gut microbiota in babies.

Resistant Starch: This is present in foods like unripen bananas, cooked and cooled rice, potatoes, and oats. Resistant starch bypasses digestion in the small intestine and ferments in the colon, feeding gut bacteria and aiding digestion.

Pectins: This is found in apples, citrus fruits, and certain berries. They promote the growth of beneficial bacteria while also improving gut motility.

Human Milk Oligosaccharides (HMOs): Naturally found in human breast milk, HMOs act as a crucial prebiotic for infants by encouraging the development of a healthy microbiome. Synthetic versions of HMOs are now also used in some infant formulas to mimic this effect.

Other than that, there are there are synthetic prebiotics such as Lactosucrose, Lactulose, Isomaltooligosaccaride, Glucooligosaccarides and Xylooligosaccarides.

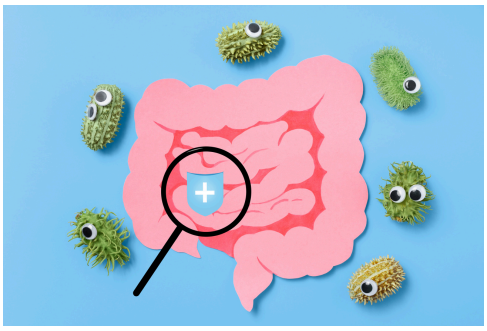
Effects of Prebiotics in Human Health

SCFAs, particularly butyrate, serve as an energy source for cells in the gut lining, strengthening gut's function and structure (Koh et al., 2016). If the gut lining is weakened, pathogens can enter the bloodstream or surrounding tissues. Because, the gut lining, or intestinal barrier, acts as a selective filter, allowing nutrients to pass through while blocking harmful substances and pathogens (Macfarlane & Macfarlane, 2012). When this barrier is weakened, pathogens and toxins from the gut lumen may cross into the bloodstream or surrounding tissues, potentially triggering inflammation and infections (Zhao et al., 2021). So the SCFAs produced help preserve the barrier that protects against harmful substances and pathogens entering the bloodstream, reducing inflammation and supporting overall gut health (Segain et al., 2000).

Further, SCFAs, particularly acetate, propionate, and butyrate, help regulate fluid balance in the colon by stimulating the absorption of water and electrolytes, which can soften stool consistency (Perry et al., 2016). This softening helps ease stool passage, making bowel movements smoother and more regular (Mandel et al., 2015).

Prebiotics play a key role in restoring and maintaining a healthy balance of beneficial bacteria in the gut microbiome, especially when it has been disrupted by factors such as antibiotic use, illness, or a poor diet. Antibiotics, for instance, can eliminate both harmful and beneficial bacteria, leaving the gut vulnerable to imbalances that may affect digestion, immunity, and overall health (Allen et al., 2013). By introducing prebiotics and probiotics, the population of good microbes in the gut can be replenished. This would help re-establish a balanced microbial community. Because, this balanced microbiome is essential for several vital functions in the body eg, synthesis of certain vitamins, such as vitamin K and some B vitamins (Boulund et al., 2020).

Prebiotics play a significant role in supporting the gut-brain connection and can have a positive impact on mental health by promoting a balanced gut microbiome. The gut-brain connection, also known as the gut-brain axis, refers to the communication between the gut and the brain, where the gut microbiome plays a crucial role in influencing mental health (Cryan & Dinan, 2012). Research has shown that the microbes in the gut can affect brain function and behavior by producing neurotransmitters, hormones, and other chemicals that influence mood, stress, and anxiety levels (Foster et al., 2017). For example, gut bacteria produce serotonin, a neurotransmitter that helps regulate mood. A balanced gut microbiome supports optimal serotonin levels, which can positively impact emotional well-being (Foster et al., 2017). Additionally, balanced gut bacteria can produce other molecules like gamma-aminobutyric acid (GABA), which has a calming effect on the brain and helps reduce anxiety (Naseribafrouei et al., 2014).



Incorporating Prebiotics into Daily Life

Many common foods contain prebiotics naturally. When incorporating foods like garlic, onions, leeks, bananas, apples, and oats into meals, as these foods contain inulin, pectin, and resistant starches, which are all types of prebiotics, this would be beneficial for the host. For those who are unable to get enough prebiotics from their diet, they can get it through supplements as prebiotics are available as powders or capsules. These can be added to smoothies, yogurt, or taken directly.

Switching to whole grains, and adding natural prebiotics and fiber to diet would make it easier to maintain gut health without drastic dietary changes. For example, kurakkan is a whole grain rich in fiber, particularly

beneficial for digestion. It can be used to make traditional foods like roti (flatbread), pittu, and porridge. Finger millet is also high in resistant starch, which acts as a prebiotic, feeding beneficial gut bacteria. Red rice varieties, including Suwandel and Kalu Heenati, are staple foods in Sri Lanka and offer a rich source of fiber and antioxidants. These rice varieties support gut health by enhancing satiety and encouraging a healthy digestive process, making them a culturally relevant alternative to more commonly cited whole grains. Further, green bananas contain resistant starch. We can try to add green bananas to our diet through smoothies or cook with plantains.

These days, companies are incorporating prebiotics to drinks, snack bars, and even coffee to meet consumer demand as this "food as medicine" approach appeals to consumers seeking convenient health benefits options (Liska et al., 2019) and this has become a common trend these days. A combination of prebiotics and probiotics, synbiotic products are becoming popular, as they offer a more comprehensive approach to gut health by providing beneficial bacteria and nourishing them at the same time (Markowiak & Śliz˙ewska, 2017; Davani-Davari et al., 2019). These days, newly launched products feature a variety of fibers, such as resistant starch, pectin, and inulin. These allow people to access diverse prebiotics in a single serving, promoting more comprehensive microbiome support (Carlson et al., 2018). As recent research outcomes link gut health to genetics, personalized prebiotic recommendations based on genetic tests or microbiome analysis are emerging, which is allowing people to get their intake customized for optimal benefits

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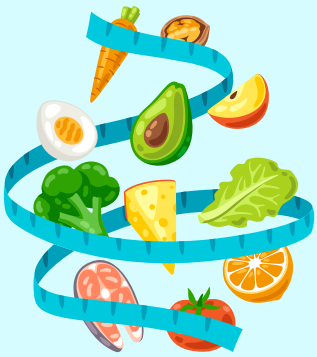
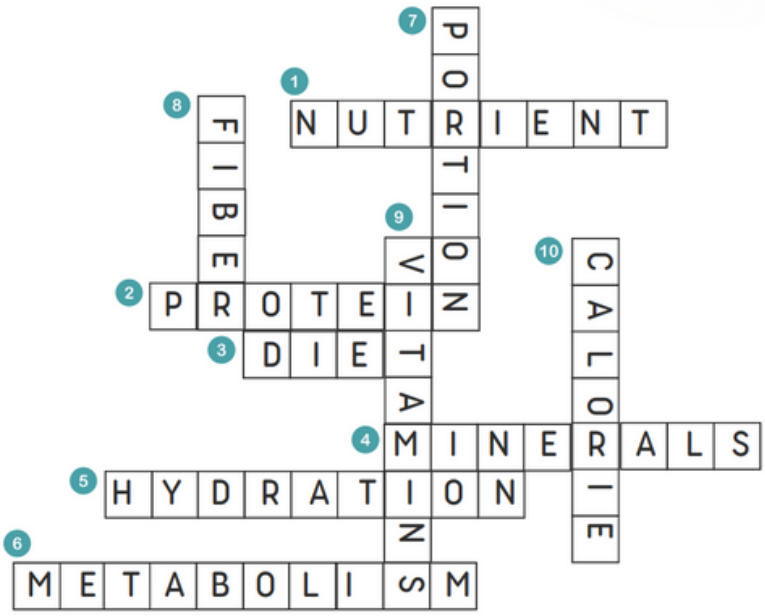
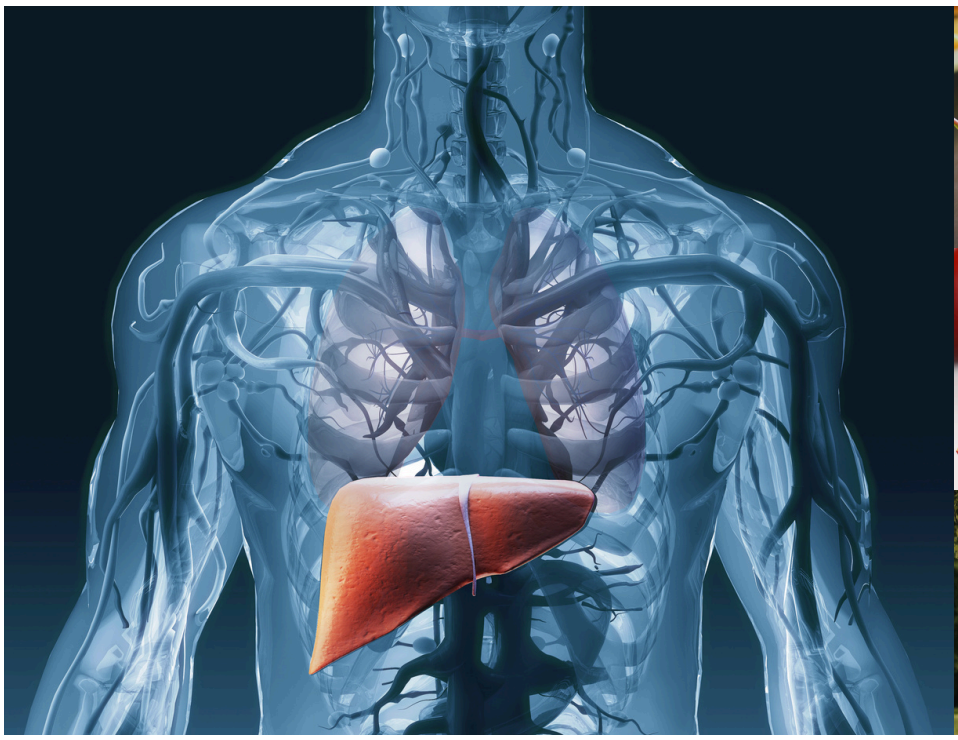
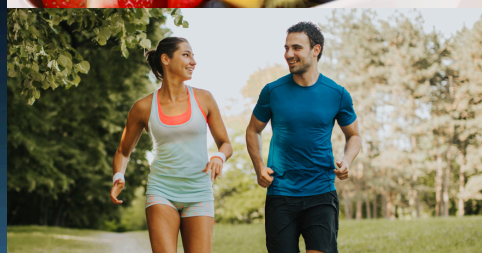
Answers for the Crossword Puzzle









Lifestyle Management of Non-Alcoholic Fatty Liver Disease (NAFLD): A Nutritional Approach

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Wayamba University of Sri Lanka

"Liver disorders contribute to significant disease burden worldwide. Among them Nonalcoholic fatty liver disease (NAFLD) is emerging as the leading chronic liver disease worldwide (Loomba et al., 2021).

NAFLD is characterized by the accumulation of fat in the liver of individuals who do not consume alcohol. NAFLD can advance to more serious liver disorders, including non-alcoholic steatohepatitis (NASH), cirrhosis, and potentially liver cancer.

Fortunately, NAFLD can often be managed and in some cases can be reversed through targeted lifestyle changes, especially those centered on weight management, nutrition and physical activity."

What is NAFLD?

Nonalcoholic fatty liver disease is the process of lipid deposition within hepatocytes in the complete absence of excessive alcohol consumption or any other known cause of hepatic steatosis. This condition can start as simple fat buildup (steatosis) but may progress to a more severe state called steatohepatitis. Steatohepatitis involves liver inflammation. In up to 15% of patients, this can further lead to the development of end-stage liver disease with fibrosis known as cirrhosis. Finally, this can even cause hepatocellular carcinoma.

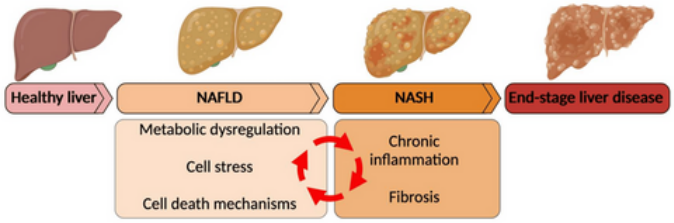

Figure 1. The spectrum of nonalcoholic fatty liver disease (NAFLD)
Source: Puengel T, Liu H et.al (2022)

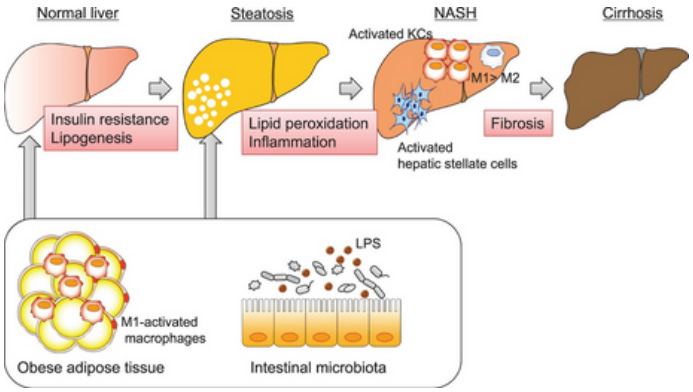

Figure 2. Progression of Non-Alcoholic Fatty Liver Disease (NAFLD)
Source: Nagashimada M, Ota T. (2019)

How NAFLD and NASH Occurs?

Obesity, along with unhealthy eating habits and environmental factors, can raise levels of free fatty acids (FFAs) and cholesterol in the blood. This can lead to insulin resistance, fat cell growth, and changes in the gut microbiome. Insulin resistance further aggravates fat cell dysfunction and increases fat production in the liver. This happens through the hepatic de novo lipogenesis pathway. This triggers the release of proinflammatory substances like interleukin (IL)-6, IL-1, and tumor necrosis factor (TNF)-α. These inflammatory signals further aggravate insulin resistance.

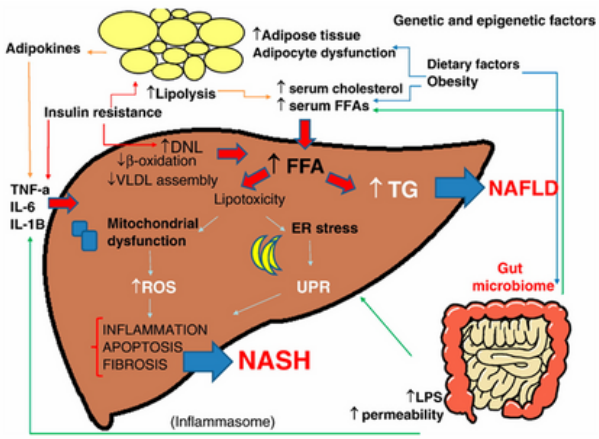

Figure 3. Pathogenesis of NAFLD/NASH
Source:El Hadi H, Vettor R, Rossato M. Vitamin E as a Treatment for Nonalcoholic Fatty Liver Disease

Altered gut microbiome leads to the buildup of triglycerides (TGs) and harmful levels of FFAs, free cholesterol, and other lipid byproducts. This accumulation causes mitochondrial dysfunction and oxidative stress. As a result, reactive oxygen species (ROS) are produced. This can create stress in the endoplasmic reticulum (ER), activating the unfolded protein response (UPR). All these events work together to cause liver inflammation and the development of fibrosis, which is referred to as nonalcoholic steatohepatitis (NASH).

Additionally, increased gut permeability allows microbial products like lipopolysaccharides (LPS) to enter the bloodstream. This further activates inflammatory pathways and contributes to ER stress causing inflammation.

Weight Management as a Cornerstone of NAFLD Intervention

The key to managing non-alcoholic fatty liver disease (NAFLD) is reaching and sustaining a healthy body weight. Research indicates that a small weight loss of 5–10% of starting body weight can enhance liver enzyme profiles, lower inflammatory markers, and considerably reduce hepatic steatosis. Crucially, it is advised to lose weight gradually because abrupt weight loss may unintentionally exacerbate hepatic inflammation by increasing the transit of free fatty acids to the liver and speeding up lipolysis.

Clinical research has demonstrated that individuals with NAFLD benefit most from a target weight loss pace of 0.5–1 kg (1–2 pounds) per week, which minimizes the dangers related to fast fat mobilization. A balanced, integrative strategy that incorporates regular exercise with dietary changes is the most effective way to get long-lasting improvements.

Engaging in regular physical activity is an essential component of weight management and plays a pivotal role in the intervention and management of Non-Alcoholic Fatty Liver Disease (NAFLD). Physical activity not only aids weight reduction but also improves hepatic insulin sensitivity, reduces hepatic fat, and decreases systemic inflammation.

For effective NAFLD management, a structured exercise regimen targeting at least 150 minutes of moderate-intensity aerobic activity per week, combined with resistance training exercises two to three times weekly, is recommended. Aerobic exercise, such as brisk walking, cycling, or swimming, promotes energy expenditure and can reduce liver fat independent of significant weight loss. Resistance training, on the other hand, improves muscle mass and metabolic function, which supports weight maintenance and enhances insulin sensitivity.

Choosing the Right Carbohydrates for NAFLD Management

Carbohydrate quality is crucial in managing Non-Alcoholic Fatty Liver Disease (NAFLD), as certain types of carbohydrates can exacerbate liver fat accumulation, while others can help manage it effectively. The liver plays a central role in carbohydrate metabolism, converting excess sugars into fat when glycogen stores are full, which can worsen hepatic steatosis. Therefore, prioritizing low-glycemic, fiber-rich carbohydrates over refined carbohydrates is essential for NAFLD patients.

Key carbohydrate choices for NAFLD management includes, whole grains, legumes, non starchy vegetables and low glycemic fruits. Whole grains provide fiber, vitamins, and minerals while releasing glucose slowly into the bloodstream, minimizing rapid spikes in insulin that can lead to fat storage.

Legumes like lentils, beans, and chickpeas offer plant-based protein and fiber, promoting steady blood glucose control and reducing cholesterol. These low-glycemic foods are also nutrient-dense and contribute to improved liver health. Non-starchy vegetables (e.g., leafy greens, broccoli, and bell peppers) are high in fiber, vitamins, and antioxidants, and have minimal impact on blood sugar levels. They add bulk to meals without contributing excess calories, aiding in weight management and liver fat reduction.

Fruits provide essential antioxidants and fiber, but it is important to focus on low-glycemic options to prevent rapid spikes in blood glucose. Berries, apples, and pears are excellent choices, while high-fructose fruits and fruit juices should be limited, as fructose metabolism in the liver can increase lipogenesis (fat production) and exacerbate NAFLD. Foods high in refined carbohydrates and added sugars, such as sodas, pastries, and white bread, should be minimized. These foods lead to quick spikes in blood sugar and increase the liver's fat production, worsening NAFLD. Selecting low-glycemic, nutrient-dense carbohydrates and avoiding refined options are vital strategies in NAFLD management.

Emphasize on Healthy Fats

The type and quality of dietary fats play a significant role in managing Non-Alcoholic Fatty Liver Disease (NAFLD). Incorporating healthy fats particularly monounsaturated and polyunsaturated fats can reduce liver fat, decrease inflammation, and improve lipid profiles. Unlike saturated and trans fats, which contribute to fat buildup and liver inflammation, healthy fats support liver function and overall metabolic health, making them a crucial component of dietary interventions for NAFLD.

Omega-3 fatty acids, a type of polyunsaturated fat, have anti-inflammatory effects that directly benefit liver health. Research shows that omega-3s can reduce liver fat, improve liver enzyme levels, and decrease triglycerides. Food sources include fatty fish (such as salmon, sardines, and mackerel), flaxseeds, chia seeds, and walnuts.

Monounsaturated fats found in Olive oil, avocados, and nuts (like almonds and cashews) can help lower LDL cholesterol and support liver health by reducing inflammation and lipid accumulation. PUFAs, found in certain plant oils like sunflower and safflower oil and fatty fish, have been associated with reduced liver fat and improved lipid metabolism.

Saturated fats, found in foods like red meat, butter, and high-fat dairy, are associated with increased liver fat and inflammation. Reducing saturated fat intake can decrease fat accumulation in the liver. Trans fats, commonly found in processed foods, fast food, and many packaged snacks, contribute to inflammation, insulin resistance, and fat buildup in the liver. Avoiding trans fats is crucial for anyone with NAFLD. When combined with other dietary modifications, incorporating healthy fats is an effective strategy for mitigating the progression of NAFLD and supporting long-term liver health.

Further use of fiber rich sources in diet can help control blood sugar and cholesterol levels, which are crucial in NAFLD management. High-fiber diets have been associated with reduced liver fat and improved liver health.

Although NAFLD is not caused by alcohol, it's essential to avoid or limit alcohol consumption, as even small amounts can aggravate liver inflammation in individuals with NAFLD.

Thus, lifestyle management remains the most effective way to control and potentially reverse NAFLD. By combining weight management, balanced nutrition, regular physical activity, and healthy lifestyle habits, individuals with NAFLD can improve liver health and overall well-being.

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