

DIALOG



Diet **FOOD** & NUTRITION

HOW CRITICAL IS
NUTRITION IN ICUS?

FOOD SAFETY HYGIENE & QUALITY
INDIAN FOOD ENTERPRISES &
THE ROLE OF FSSAI

Nutrition
during cancer
therapy

Obesity Prevention &
Treatment: Lifestyle
Approach

Picky eating
behaviour

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DIALOG

ON DIET & NUTRITION



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President, CAHO



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Healthcare delivery is a basic need of mankind and has been important since time immemorial. The evolution of modalities to deliver healthcare has been truly mind-boggling. It is important to look at this journey from the perspective of quality in healthcare: Every invention and change was aimed at saving lives and every invention was adding a tool in the hands of doctors to cure more and more people with better and better outcomes.

The advances in the field of medicine have reached such a level that many disorders which were considered untreatable are now controlled or cured routinely. This should have been the golden era for the medical profession.

However, these disruptive changes brought with them some unwanted elements that started to work against the very core principle of "First Do No Harm". These elements include medical errors, high cost of care, a gap in communication and increasing complexity leading to a fragmented care system that lacks coordination.

Healthcare delivery today has become very complex, resulting in increased medical errors. Medical errors ultimately mean that patients are being harmed while being treated. The fact that medical errors have become the 3rd leading cause of death in a developed country like the USA is a pointer to the possible scenarios around the world.

Until the late 19th Century, data on "harm" during treatment were hard to come by and were mostly anecdotal, making most physicians and hospital administrators ignore medical errors as aberrations. They were noticed only when lawsuits were filed.

Healthcare was considered to be safe and inexpensive, less invasive and under the comforting personal care of a family physician; while in present times it is being viewed as potentially dangerous, expensive and driven primarily by technology and medical consultants. It was only natural that the medical profession came under tremendous pressure to manage quality and reduce medical errors. With the increased focus on outcomes and quality, a lot has improved, but the increased complication of care makes it necessary to explore patient safety as a separate subject in itself, requiring its studies and research.

Every year, CAHO joins WHO's World Patient Safety Day program with an event of its own, perhaps one of the largest events in the world, by the sheer number of patients represented by the organizations that participate.

DIALOG

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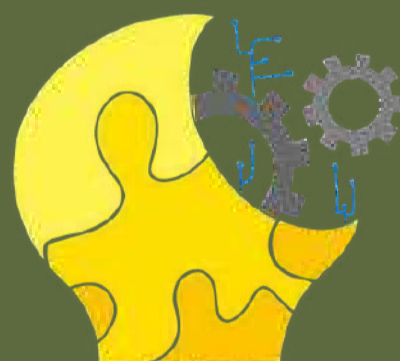
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DIET & NUTRITION

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DIET & NUTRITION

DECEMBER 2022

Food safety Hygiene and Quality-Indian Food Enterprises, Role of FSSAI

(Special focus on Hospitals and the
Healthcare Industry)



DR MOHAN POLEPAKA
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The Food Safety and Standards Authority of India, also known as FSSAI, was established on August 23, 2006, and operates as a regulatory body under the Ministry of Health and Family Welfare in the Government of India. Before the creation of FSSAI, the food industry in India mainly followed guidelines set by the US Food and Drug Administration and other food authorities in India. After several committees were formed following India's independence, FSSAI was finally established in 2006 with a panel of 16 scientists.

With the diverse range of cuisine found across the Indian subcontinent, it took FSSAI six years to systematically compile information on the various foods and recipes from urban, rural, tribal, and semi-urban areas. In 2011, they were able to implement a protocol system to regulate the entire Indian food industry under the FSSAI.





The FSSAI is a conglomeration of various organisations, including nutritional societies, fortified food networks, and the newly established training entity known as FoSTaC. Through FoSTaC, food handlers can receive training and certification in the food industry. The FSSAI also launched the E-Trade campaign to raise awareness among citizens about safe food choices. Food regulation is included in the concurrent list of the Indian constitution, meaning that some aspects can be regulated by state governments, while the majority falls under the jurisdiction of the FSSAI. Any regulation or licence issued by the government of India bears the logos of both the state government and the central government (FSSAI). In addition to the various network societies, the FSSAI also oversees BHOG, an organization that regulates eateries near religious sites such as temples, churches, and mosques based on hygiene guidelines. Other organisations governed by the FSSAI include fortified certifications, NetProFan, and the Indian Chef Organisation. These organisations serve as advisory bodies to the FSSAI.

Food safety in hospitals

Hospitals are facilities where patients receive treatment for their illnesses. However, foodborne diseases in these establishments can easily spread to individuals with weakened immune systems, such as pregnant women, senior citizens, and infants. The care and treatment provided by healthcare practitioners must be supplemented by safe and contaminant-free food. If the food supplies are contaminated, it can hinder the effectiveness of the prescribed treatment and medicines. This highlights the significance of food safety in hospital administration. Proper food safety practices are crucial in enhancing the treatment process and should be a priority for food technologists and the FSSAI. The vulnerability of patients in a hospital setting is heightened, as they are at increased risk of picking up germs during their stay. If the food provided within the hospital also carries contaminants, it makes it even more difficult to treat the patients effectively. This emphasises the need for maintaining high standards of food safety in hospitals.



Risk factors

Several factors can compromise food safety. According to studies, the temperature is a significant contributor to food contamination, accounting for approximately 40% of all food spoilage incidents. For instance, if food is not stored at the proper temperature, such as not being frozen when it should be, or not being held at a temperature below 5 degrees Celsius, it can result in spoilage. These temperature-related issues are responsible for roughly 40% of food spoilage worldwide.

In addition, contaminated equipment used in food preparation and preservation, such as containers and boxes, accounts for 18.9% of food spoilage. People involved in food handling and preparation are also responsible for 18% of food spoilage. Chemical contamination contributes to approximately 13% of food spoilage. These are the major contributors to food spoilage.

Challenges to food safety in hospitals

When it comes to food contamination, it is a serious issue for everyone involved. Contaminants refer to any foreign objects that should not be present in food, either through contamination within the food itself or through cross-contamination. In healthcare settings such as hospitals, where patients receive treatment through the use of medications, microorganism extracts, and insulation, even a small agent can result in food spoilage. The use of equipment and machinery also plays a huge role in this. The "cleaning in place" model is used to prevent food spoilage, but if the hospital infrastructure does not follow this model, it can also contribute to food spoilage.



AN INSTANCE OF OUTBREAKS

On May 7, 2010, 42 residents and 12 staff members at a Louisiana state psychiatric hospital experienced vomiting, abdominal cramps, and diarrhoea. Within 24 hours, three patients had died.

- CDC found that the chicken was cooked approximately 24 hours before serving and not cooled as per the hospital guidelines.
- *C. perfringens enterotoxin (CPE)* was detected in 20 of 23 stool specimens from ill residents and staff members.

Country of report and year of the outbreak	Causative organism	Setting	Number of case (number at risk where stated)	Number of deaths	Implicated food vehicle	Evidence implicated food vehicle
US, 1973	S.Typhimurium	Hospital	32-18 patients, 14 staff		Eggnog	Epidemiological and microbiological studies
US, 1979	Listeria monocytogenes	<u>Eight hospitals in Boston</u>	23		Tuna fish, chicken salad and cheese	Anecdotally all three dishes had common ingredients, namely raw celery, tomatoes, and lettuce.
US, 1987	S.Enteritidis	Municipal hospital	404	9	Hospital-made mayonnaise contains raw eggs.	Epidemiological study plus macaroni salad and raw egg culture positive
Canada, 1995	STEC 0157	Community Hospital	21-8 patients; 10 staff, 3 volunteers (360)		Green salad	Case-control study
Denmark, 1995	S.Enteritidis PT6	Hospital	35		Eggs	Circumstantial
Finland, 1995	Listeria monocytogenes	Tertiary care hospital	25 patients	6	Pasteurised butter	Matched case-control study and isolation of an indistinguishable organism from butter samples and dairy environment
India, 1999	Norovirus	Nurses hostel of a civil hospital	130		Salad sandwiches	Descriptive study
Sweden, 1999	STEC 0157	Children's hospital	11 (250)		Lettuce	Descriptive study



Safe and nutritious food at hospitals

The FSSAI has established an SNF program which provides access to all material created by FSSAI officials, including safe nutritional practices for Indian hospitals. The website snf.in was specifically created to allow individuals to download these resources, with 13 different books available for a wide range of ages and areas of interest. These books cover topics such as cross-contamination, elimination of contamination, and the impact of the environment on food spoilage. They are designed to be easily understood by anyone from a five-year-old to an 80-year-old.



Food safety

The major factors in food safety are the hazards that impact it. There are four such types of factors: physical, chemical, biological, and allergens.

Physical hazards are tangible, can be observed with the naked eye, and don't require any special equipment.

Chemical hazards are naturally occurring and process-induced chemical substances that can cause foodborne illness. It can be transmitted through the vessels or boxes that are used during food preparation or storage.

- **Process-induced chemical contaminants:**

1. Toxic metals in the catering setups and supply chain
2. Pesticides and colourants
3. Cleansing products and sanitisers
4. Equipment lubricants
5. Chemical food additives and preservatives

- **Process-induced chemical contaminants:**

1. Ciguatoxin, saxitoxin, brevetoxin and domoic acid from marine algae
2. Histamine/scombroid poisoning from fish

Biological hazards are microorganisms or substances produced by them that are hazardous to human health. They are a major concern in food processing as they cause most of the foodborne illness outbreaks. A mnemonic device called FAT TOM can be used to remember the conditions that can favour the growth of microorganisms in food.

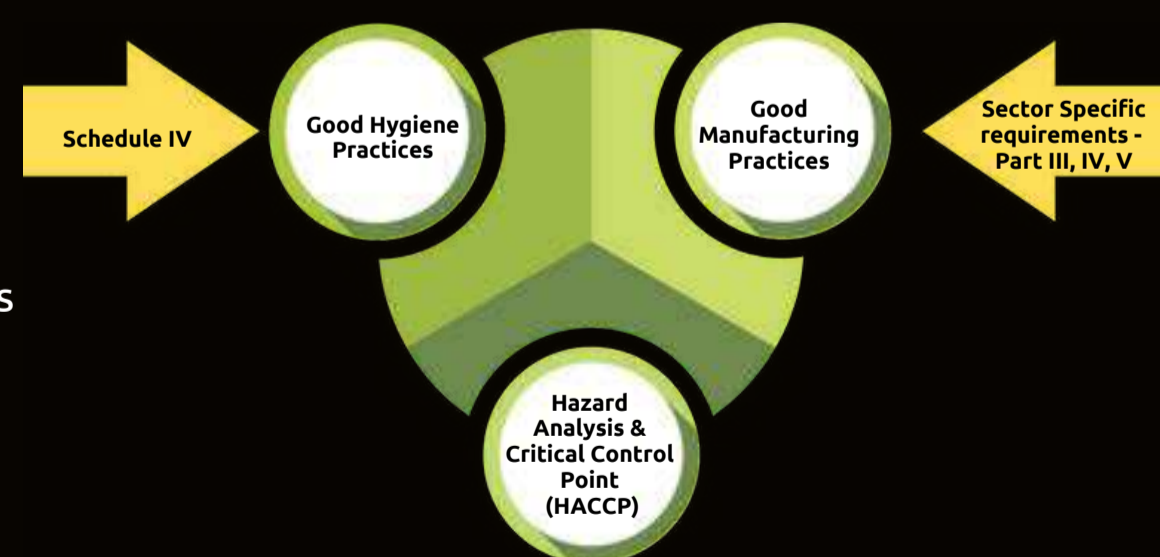
- Bacteria: *Salmonella* spp. Enterohemorrhagic *E.coli*, *Campylobacter jejuni*, *Yersinia enterocolitica*, *Listeria monocytogenes* etc
- Virus: hepatitis A virus, Norwalk virus, Rotavirus
- Parasites: *Toxoplasma gondii*, *Cryptosporidium*, *Giardia* spp, *Trichinella spiralis*, etc.

HAZARD

Conditions favouring the growth of microorganisms;	
Food	Foodborne microorganisms draw nutrients from potentially hazardous foods.
Acidity	Food borne microorganisms grow well within the pH range of most foods.
Temperature	Microorganisms grow well between the temperature range of 5°C- 60°C
Time	Microorganisms need sufficient time to grow when exposed to the 'danger zone'.
Oxygen	Microorganisms require oxygen in a free or combined state; to favour their growth.
Moisture	Microorganisms require water to grow and it is measured in the form of their water activity (Aw)

What is FSMS?

The FSSAI Act of 2006 outlines the importance of following the FSMS, which stands for "**food safety and management systems**". This formula ensures the implementation of good manufacturing practices and good hygiene practices in any place where food is being prepared or served. The system falls under HACCP, which stands for Hazard Analysis and Critical Control Point. This involves identifying potential hazards that can cause food contamination or spoilage and implementing measures to control these hazards at critical points.



Food safety is covered in Schedule 4 of the FSSAI's governing document. The FSSAI Constitution outlines the necessary precautions to be taken to ensure food safety. This Constitution comprises of four schedules, with the first outlining the food regulations in India, the second detailing the organisational structure of the FSSAI, the third addressing the issuance of licences and registrations, and the fourth, consisting of 13 sections, providing information on sanitary practices. The fourth schedule, the Sanitary Practice Force Schedule, includes the FSMS system.

Regulation 2.1.2: General hygienic and sanitary practices to be followed;

In the holistic system of food preparation, the scientific panel was able to come up with general hygiene and sanitary practices to be followed in five parts.

- Part I:** Street Food Vendors and Petty Food Operators
- Part II:** All Food Business Operators
- Part III:** Milk and Milk Products
- Part IV:** Meat and Meat Products
- Part V:** Food Service Establishments/Catering

Schedule IV

Schedule IV includes good manufacturing practices(GMP) for the whole premise and to ensure the quality of the food products. It included the personal hygiene of the workers, transportation and handling of the food, storage as well as special things required for schedules



Food Safety Management

In the FSMS system, we adopt a PDCA-based approach, which is the plan, do, check, and action system. This way, food safety and hygiene practices are insured.

Preventive approaches:

PDCA-based approach: The four-step plan-do-check-act cycle is a method for implementing change. The PDCA cycle must be conducted again for continual progress like a circle that never ends. A tool for project planning is the PDCA cycle.

Risk-based thinking: From the viewpoint of ISO 9001:2015, the concept of risk-based thinking has taken over the role of what was previously referred to as preventative action in the previous standard version. The ISO now integrates risk into preventative action throughout the system, rather than separating them. When creating processes, controls, and improvements within a Quality Management System, businesses must adopt a risk-based approach.

- a. Organisational risk
- b. Operational risk (HACCP)

What is the difference between HACCP, VACCP, and TACCP?

The purpose of HACCP is to provide information about hazards. The VACCP gives complete information, and points out the vulnerability. TACCP is completely about threat management.

		TACCP		
HACCP	FOOD QUALITY	FOOD FRAUD	TYPICALLY REFER TO RAW MATERIAL CONTROL	
	FOOD SAFETY	FOOD DEFENCE		Intention: Harm (Public, Economic, Terror)
		Action: Unintentional Adulteration	Action: Intentional Adulteration	TACCP
				REFERS TO PROCESS, PEOPLE, RESOURCES, SECURITY, CONTROLS

Food fraud

Food fraud is defined as the deliberate contamination or spoilage of food. According to Article 4, when a food vendor sells food to increase their financial gain, it is considered food fraud. This can be accomplished through substitution, the addition of unauthorised ingredients, tampering, or mislabeling. The food industry, which encompasses the separation and distribution of conventional and natural foods, can contribute to food fraud if proper regulations and labelling are not in place. Any such violations can be taken to court. Any other deliberate actions intended to compromise the safety of food are referred to as "food defence."

FSMS principles

There are several key considerations to keep in mind. The first is a focus on the customer, which encompasses the way you treat and educate your patients during the treatment process. All businesses and entrepreneurs need to inform their customers about the ingredients used in preparing food items, including the nutritional content and calorie information. Any food prepared in a hospital or market must be fully disclosed, including the recipe and calorie information. It is also necessary to display allergen information, and this information should be readily available in restaurants. If this information is not provided, it may be subject to challenge in court.

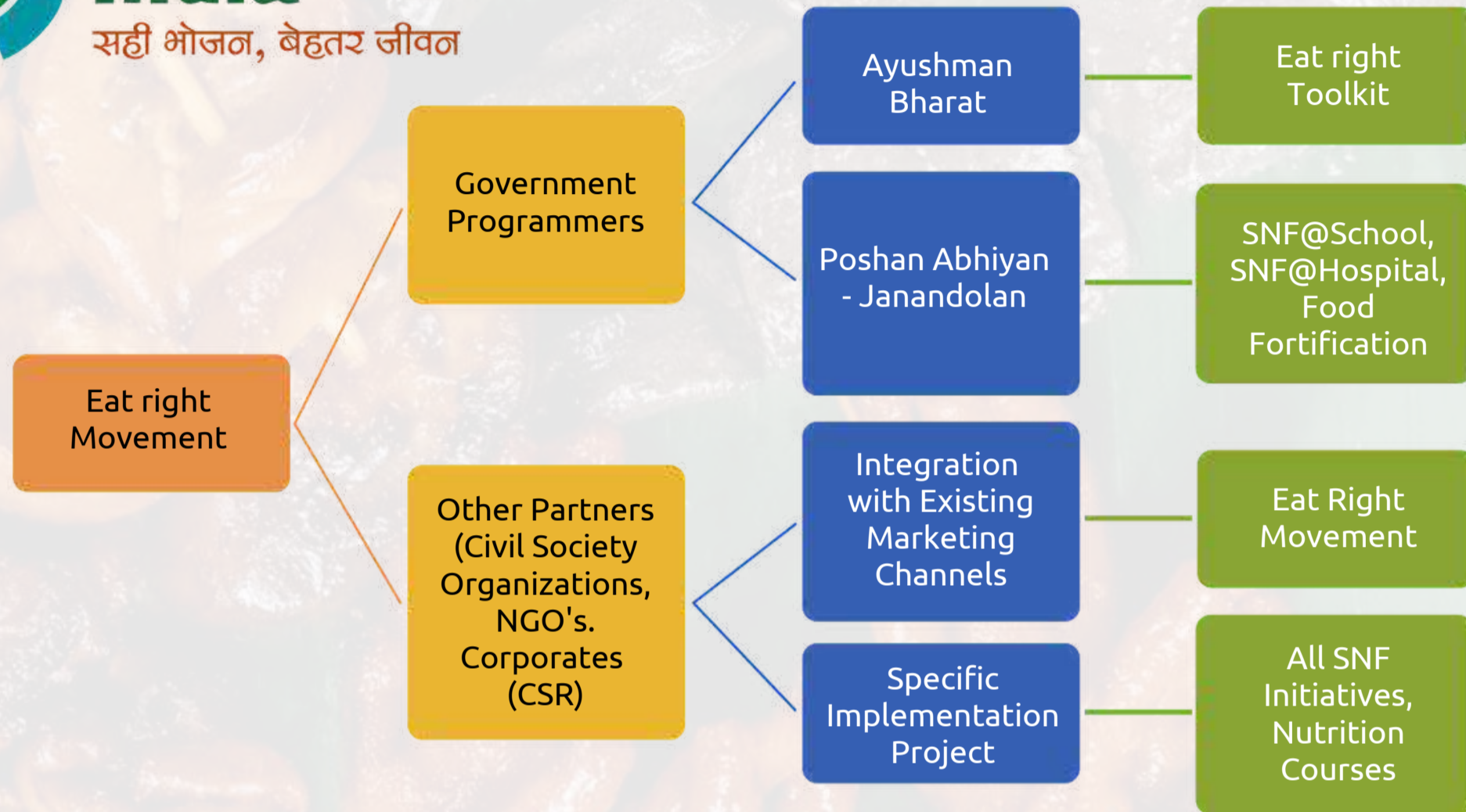


FSSAI initiatives and convergence with different stakeholders;



Eat Right India

सही भोजन, बेहतर जीवन



Eat right': Simply Three



SAFE

- Personal and surrounding hygiene
- Hygiene and sanitation in the value chain
- Combat adulteration
- Eliminate toxins and contaminants like pesticide residues, heavy metals, antibiotic residues, Aflatoxin
- Total polar compounds in used cooking oil.



HEALTHY

- Balanced Diet - Diet diversification
- Local, Seasonal, Variety
- Complete elimination of toxic (industrial) trans-fats diets
- Reducing consumption of salt, sugar and saturated fats
- Eating fortified staples to take care of deficiency of essential micronutrients.



SUSTAINABLE

- No food waste
- reduce plastic
- Conserve Water in the food sector

Various campaigns are being launched at workplaces, schools, and colleges, and these are the organisations under the FSSAI that are driving the force. There are several initiatives and campaigns run by the FSSAI. They want members of society to come forward and voluntarily adopt good eating habits and the right kind of food all over India.

QUESTION 1

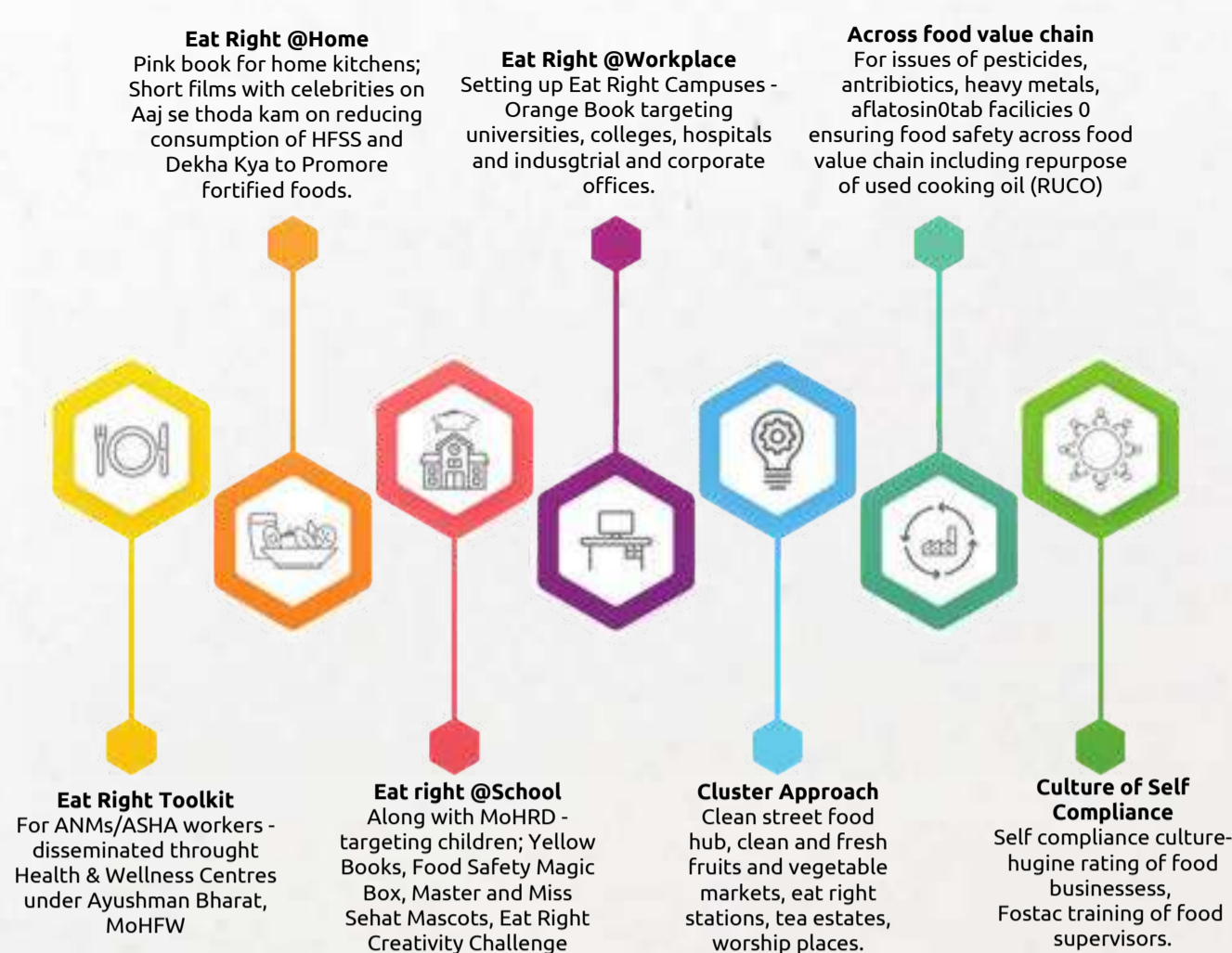
Is it standard procedure to send food samples to the laboratory when a patient reports digestive issues, such as diarrhoea, after consuming hospital food?

Yes, as per the sampling and recall protocol, if the hospital cafeteria serves food that is nutritionally and medically appropriate, a sample must be taken and preserved in the hospital's laboratory. If it is not possible, the food can be sent to a relevant external organization and must be stored for a minimum of 45 hours. If a patient complains during this time, the food will be tested to determine the source of contamination, whether it occurred during preparation, transportation, or due to a lack of a Food Safety Management System (FSMS). Regardless of the cause, this issue is punishable and, as stated in Section 4, compensation must be provided to the affected patient or consumer. Legalities are applied in product claims and recall. For example, in the case of a breakfast meal, if 200 patients are served and 100-200 grams of Idli is prepared in a batch using a large number of ingredients, the mixture must be kept for at least 48 hours.

QUESTION 2

Is there a designated recall policy form available in the hospital setup?

The Food Safety and Standards Authority of India (FSSAI) is in the process of creating various protocols based on principles as food science is a long-standing field, and the regulatory body was only established in 2006. It has been inactive since 2011 and currently lacks a recall system. However, at the manufacturing level (not hospitals), there is a policy in place. Currently, hospitals have some leniencies, but by April 2023, FSSAI is planning to introduce some mandatory measures for hospitals and their cafeteria areas.



Standards of Food Safety Protocols to be followed in Hospitals



DR PRIYANKA ROHATGI


Chief clinical dietician and head,
Apollo hospital, Bangalore

This subject is not typically of much interest to dietitians due to the lack of clinical focus. However, considering that it accounts for around 60% of hospital expenses, it is important to thoroughly examine the safety protocols in place.

When it comes to patient care, safety is not always at the forefront of our minds, with emphasis instead placed on factors such as taste, accessibility, affordability, convenience, nutrition, and health. However, given that hospital food is not just for enjoyment but also for nutritional purposes, safety must be prioritised. In terms of safety, we are mainly concerned with the absence of harmful chemicals and pathogens. Food may be contaminated with harmful natural chemicals due to spoilage or other sources of contamination, so it is important to be vigilant.

The safety protocols of hospitals should be thoroughly examined as this accounts for roughly 60% of their costs, but dietitians do not typically show much interest in this topic due to the lack of clinical aspects. In terms of patient care, safety must be the top priority when it comes to hospital food, which is used for nutritional therapy and not just for taste. The food must be free of hazardous chemical compounds and pathogenic microorganisms. It is important to ensure that the raw materials used in food preparation, such as frozen raw materials and semi-finished products, are free of pathogens and properly labelled. This is particularly crucial in hospitals where patients may have issues with their electrolyte levels, be undergoing transplantations, or have conditions like heart disease or kidney problems.





The presence of additives, preservatives, and extra salt in food products can greatly affect their levels in the body. It is important to have a clear understanding of terms like "adaptors" and "preservatives" when handling food-related manuals.

Food regulations- Who should be aware?

Anybody dealing with food. It can be the consumer, grower, trader, manufacturer, vendor, caterer, dietician or nutritionist.

Safety of food additives:

- GRAS list (Generally Recognised as Safe)
- Permitted Additives - levels and food specified.
- Risk assessment and basis of safety

ADI (Acceptable Daily Intake) levels:

How are they derived? NOAEL (no-observed-adverse-effect-level) divided by uncertainty factor.

The factor is 100 if data is derived from animal assays, and 10 if derived from human assays. Hence, the level of safety is manifold higher than perceived.

The situation in India is challenging when it comes to food-related issues. Food poisoning is prevalent throughout the country, with many patients visiting emergency rooms due to illness caused by eating out. This often leads to acute episodes of vomiting and nausea. There is a high incidence of food-borne infections, and fruits and vegetables are often contaminated with pesticides. Meat and poultry contain a high level of antibiotics, while arsenic and chloride are found in water. Milk is commonly considered adulterated, and the list of food safety concerns in India continues.

The Food Safety and Standards Authority of India (FSSAI) has provided comprehensive guidelines for hospitals. Dietitians working in hospitals are expected to be familiar with these guidelines, as they are crucial for achieving NABL, BH, or GCI accreditation. These standards will be mandatory in the 7th or 8th edition and will serve as the benchmark for measuring the knowledge of healthcare professionals. This is one of the directives from FSSAI.

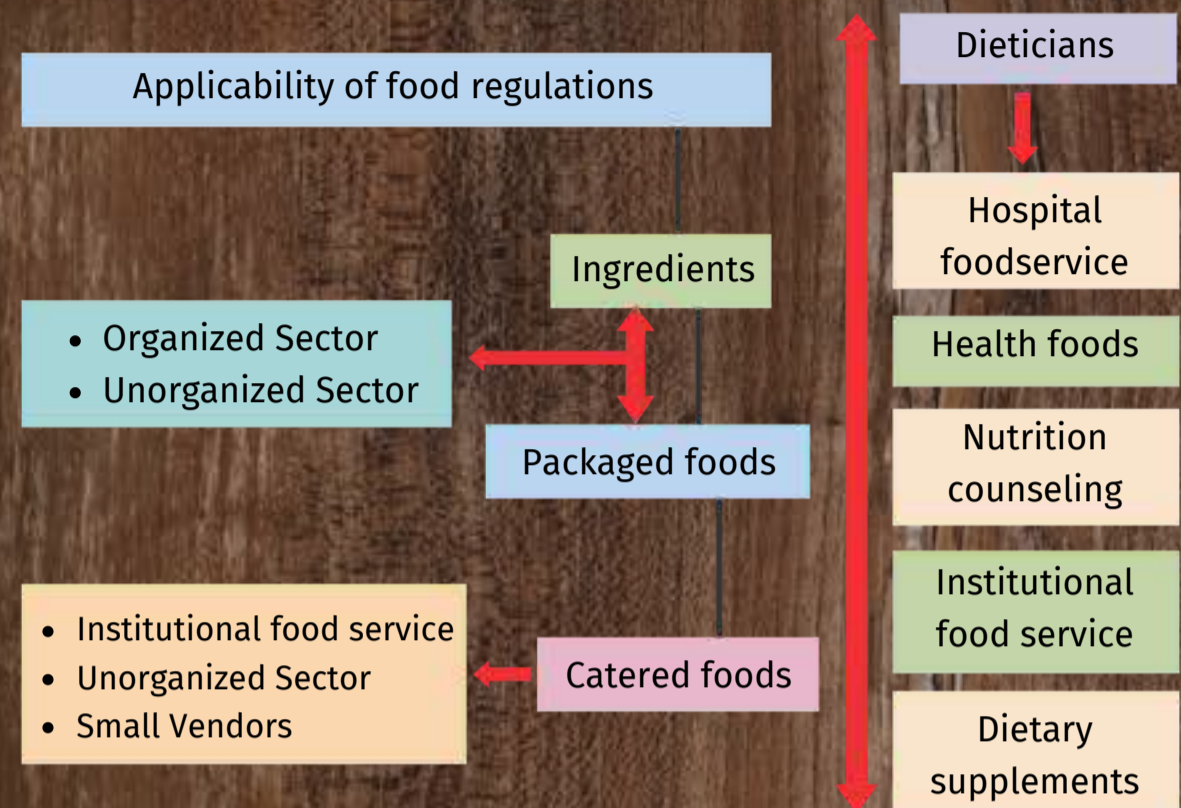
Salient features of the FSS Act, 2006 are:

- All the food Business Operators are required to be either registered or licensed
- Applicable to FBOs operating in India
- Unified licensing procedures
- Common application form and procedures
- FSSAI as a single reference point
- Decentralisation of licensing
- Consistency between domestic and international food policy measures
- Focus on Safety, hygiene and Sanitary conditions
- Preventive rather than after the event
- Achieving consumer confidence
- Enforcement of the act by State Governments and UTs



Applicability of food regulations:

It is important to be aware of the modifications made to food for medical nutrition therapy in order to meet the dietary needs of patients. These topics should receive proper attention.



The importance of food safety and hygiene cannot be overstated. This involves a series of processes, from selecting the raw materials to the cooking process to the various other stages of food preparation, to the transporting the food. It is crucial for all teams involved, including the analysts, TAM, and operations team, to develop standard operating procedures to ensure a clear understanding of the steps involved. Efforts have been made to streamline many of these processes, but it is still important to regularly assess the quality of the food, from the raw material to the final product. This can be achieved through constant audits and, if necessary, sending raw materials for laboratory testing to check for things like heavy metals and pesticides. The dietitians must also provide oversight to the food and beverage department to ensure that the menu and raw materials are of the highest quality from the outset.

Adequate infrastructure: It is essential to ensure that the food preparation area is well-lit and spacious to prevent cross-contamination. The lack of light and cramped conditions can lead to contamination, and it is crucial to have an adequate space to prepare food safely.

Personnel: It's important to educate those handling food on the importance of maintaining cleanliness, and to conduct regular inspections to ensure they are following proper hygiene protocols. The nutrient content and density of the food is the responsibility of dietitians, who must closely monitor and manage these aspects.

Acceptability: They also need to make sure that the menu that has been prepared has adequate acceptability.



In terms of food, there may be a variety of hazards to be aware of. They can be biological, chemical, or physical.

- **Biological:** In biology, we can have bacteria, viruses, parasites, mycotoxins, and food allergens.
- **Chemical:** These can be cleansing and sanitising products, pesticides, bleach, unsuitable metal contaminants, and excessive food additives.
- **Physical:** These can be broken glass, nuts and bolts, hair, fingernails, stones, plastic, etc. These are often visible to the unaided eye.

These are things that you need to keep a close eye on, and thus, random audits are necessary, which would give you good control over your kitchen as a workspace. There are more stringent parameters in a hospital kitchen because we are catering to more than just tasty food; the food that we are getting has to be familiar in terms of texture for age and health parameters. Because of electrolyte restrictions, we can't see a lot of fruits and vegetables. We can't be using too many carbohydrate-based drinks and foods because we don't want the body to get deranged. Then there are renal restrictions, as we cannot be unlimited on protein, and also fluid restrictions.

As there are so many restrictions, we have to be careful that we can put all these parameters under control within those specifications.

Causes of food poisoning

Temperature: In order to ensure that the temperature is properly managed, monitoring of the temperature is necessary. Most establishments do not have air conditioning, thus making a temperature monitor crucial, especially in places with high humidity and temperature fluctuations like Delhi, Calcutta, and Chennai. The temperature monitor should be mounted on the wall, displaying the average temperature and should be logged to prevent creating an environment conducive to the growth of microorganisms.

These microorganisms can rapidly multiply at a temperature of 5 degrees. It is important to understand the danger zone, and have some level of air conditioning and temperature control in place to maintain temperature consistency. Moreover, certain items must be stored at sub-zero temperatures.

Cleaning of freezers should be taken seriously as it is another source of infection, and logs should be kept to ensure that the food is safely transported and meanwhile the temperature is maintained in another freezer.

Organism	Symptom	source	Good practices
Listeria	Diarrhoea, fever, muscle aches	unpasteurized milk, soft cheeses	Cooking raw food thoroughly
Campylobacter	Nausea, fever, cramps, diarrhoea	raw meat; raw milk	Cooking raw food thoroughly
Clostridium perfringens	Nausea, vomiting, pain, diarrhoea	Stews, soups, and gravies held at a warm temperature	Hold food below 40°F or 4°C
Salmonella	Diarrhoea, chills, fever, vomiting, cramps	Undercooked poultry, eggs, or products containing eggs	Cooking raw food thoroughly
Escherichia coli	Cramps, diarrhoea, fever, vomiting	Contaminated ground beef, unpasteurized juice, milk	cooking raw food thoroughly and eating pasteurised food.

Bacterial: Food poisoning is a frequent cause of illness, and it can be attributed to various factors such as water, food, temperature, time, and most notably, oxygen. Different foods can be contaminated by bacteria, so it's essential to have a "best before" date and to consume them within that time frame. Proper labelling of the food is also crucial to prevent consumers from consuming potentially contaminated products.

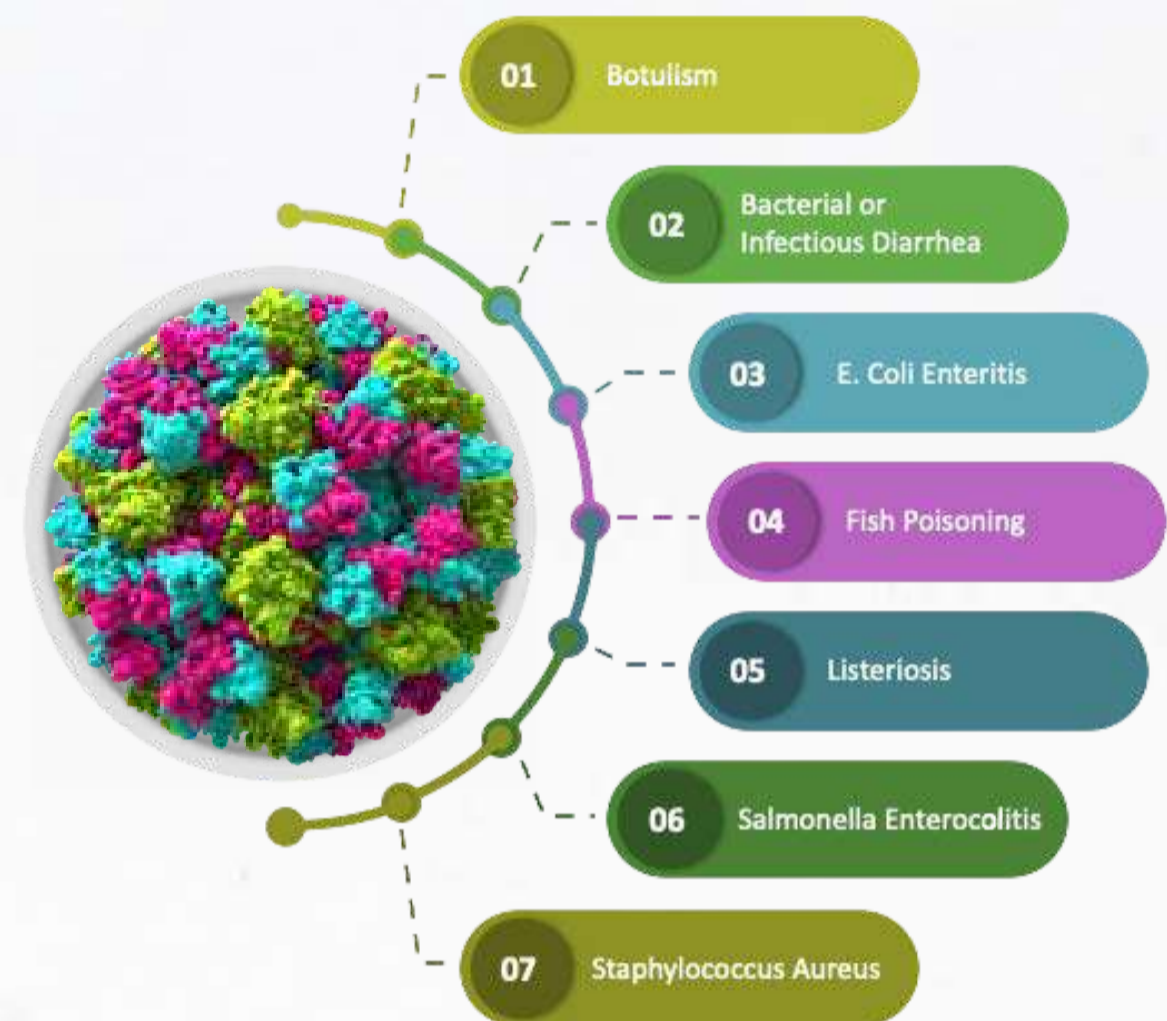
Food poisoning, in terms of other hazards, can come from:

- Food handlers
- Raw foods like Raw meat, poultry, shellfish and vegetables
- Pests and animals
- Air, dust, dirt and food waste.

Do bacteria enter the food supply?

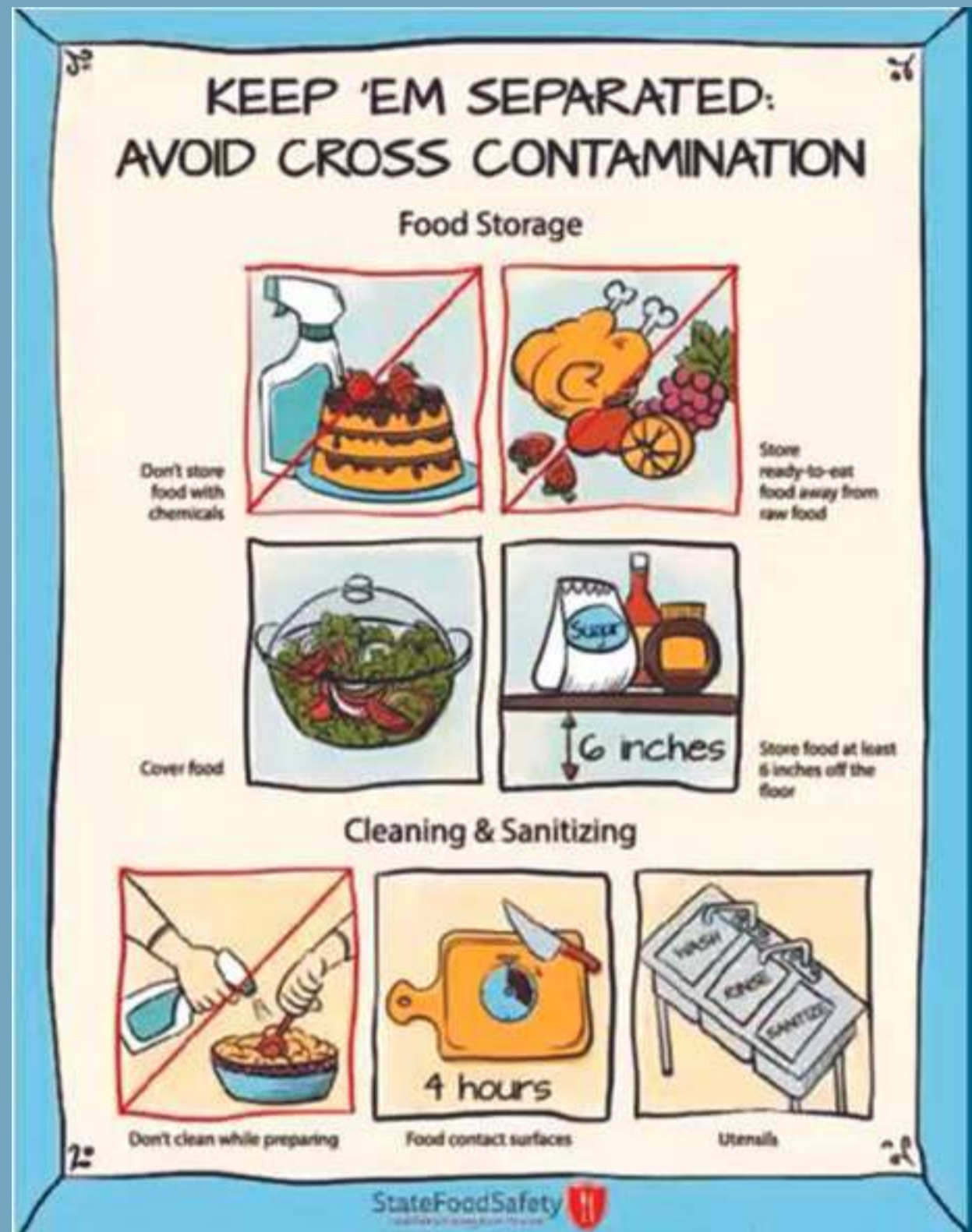
Food poisoning bacteria can come from four main sources:

- Raw material handling
- Raw foods like meat, poultry, shellfish and vegetables
- Pests and animals
- Air, dust, dirt, and food waste.



Other potential sources of cross-contamination include:

- Contaminated from another source
- Transported by hands, utensils, surfaces, equipment, food and pests. Cross-contamination by unclean hands, dirty knives, utensils, equipment and food contact surfaces.
- Unclean facilities - the presence of pests



Utensils used for handling or preparing food must be thoroughly dried to eliminate any moisture. Wipes should not be utilised as they can lead to cross-contamination, instead a dehydrating dishwasher should be used. Air drying is still considered the best method. Utensils should never be heated prior to use. Standard Operating Procedures (SOPs) should be established for safety and risk assessment, mandatory and preferred standards for manufacturing and processing, guidelines for labelling and health claims, and provisions for additives, formulation, and trade. This should also include regulations for contaminants and licensure. Manual of food safety management (FSS Act, 2002), Catering and food service establishments.

Self-inspection report:

- Be aware of the location, infrastructure and staff requirements of the establishment
- Maintain a clear-cut organogram about the amount of space allocated for food preparation and the amount of manpower in that space.



Manual of Food safety Management FSS Act-2006 Catering and Food Service Establishments

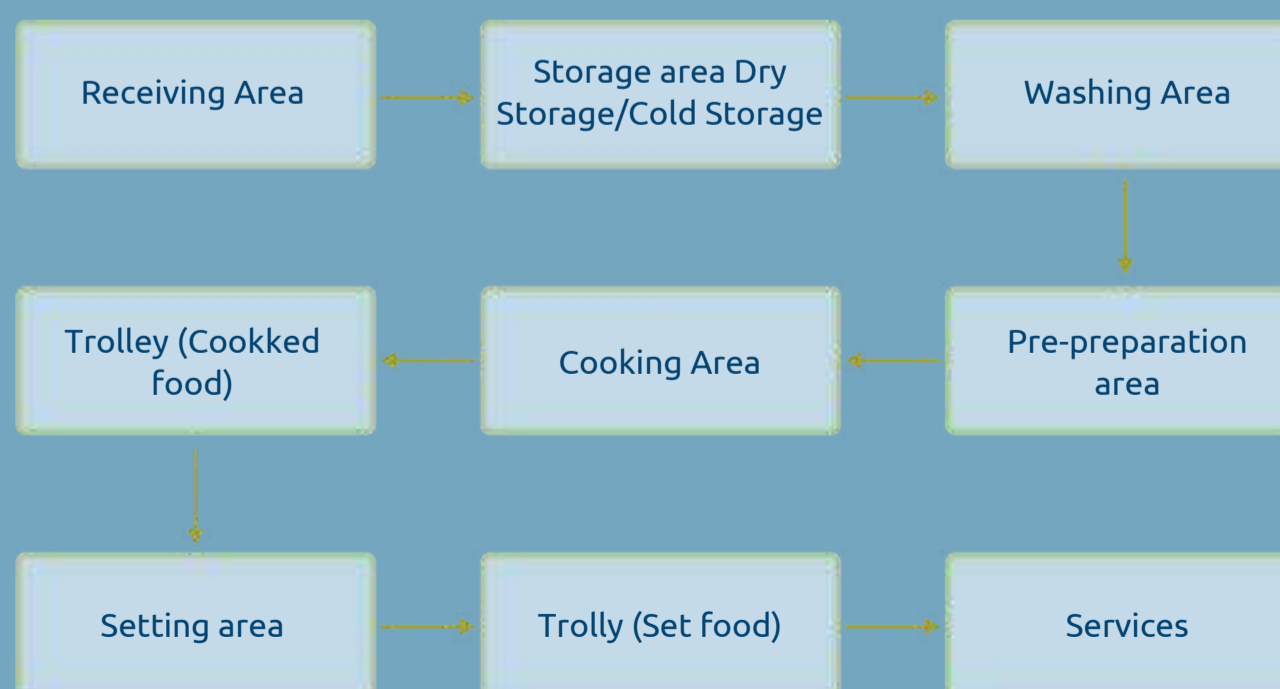
Self Inspection report Form

- | | |
|---|--|
| <ul style="list-style-type: none"> • Location and Layout • Equipment and fixtures • Storage systems • Personal hygiene • Water Supply • Pest control system • Cleaning and maintenance | <ul style="list-style-type: none"> • Conveyance, transportation and handling of food • Operational features • Adult documentation and records • Product information and consumer awareness • Training |
|---|--|

Brief description of the layout:

- **Receiving area:** it should have an air curtain at the entrance to maintain the temperature variation. A door is not preferred.
- **Storage area:** it is divided into:
 - **Dry storage:** for food items like sugar, dal, rice, fruits, vegetable salt and other dry items.
 - **Wet storage:** for items like milk curd ghee juices etc.
- **Washing area:** it is to be divided into:
 - **Dishwashing area:** it needs to be away from the cooking area
 - **Pot Washing area:** it needs to be separated from the dishwashing area.
- **Preparation area:** washed vegetables are chopped and made ready to cook. They are dipped in KMNO₄ before cooking to free them from worms and insects.
- **Cooking area:** it is next to the preparation area and is restricted only for the cooks, stewards, and bearers to maintain a minimum flow of traffic.
- **Serving area:** Prepared food is transferred to pantries using trolleys.
- **Trolley area:** food is set in hot cases.
- **Exit:** The trolley-laden food is taken out through the main doors and served to patient's ward-wise.

Flowchart of events followed





In inpatient processes, it is important to conduct daily regular rounds and complete one assessment within 24 hours based on the hospital's protocol. A plan should be developed and shared with the kitchen so that the proper amount of regular and special diet food can be prepared. Self-monitoring is essential, including maintaining a daily food record and activity log, as dietitians may not always be accessible. It is crucial to identify both internal and external triggers related to overeating and to modify eating behaviours in a hospital setting. To ensure compliance, these behaviours should be reinforced consistently, and consequences should be imposed if they are not followed.

Healthy eating strategies are encouraged through rewards. These can be as follows:

- Cognitive behavioural techniques
- Creating a substitute behaviour for overeating.

It is imperative to have a designated clean area for hand washing. In the receiving area, temperature control and quality inspections must be maintained. These inspections should encompass specifications, brand names, and the condition of the packaging.

Vegetables need to be disinfected right at the point of receiving them. Temperature control should also be maintained. Chopping boards also need to be monitored according to their colour code.



Cocktails raw ingredients should never be mixed and temperature monitoring is crucial. Regular visits from dietitians in the morning or evening are beneficial. It is important to display information about food preparation throughout the kitchen. Proper disposal of food is also crucial, as well as the method of food service. Regular checks for pests and microbes should be performed, including monthly random microbial checks for cooked foods, juices, and enteral formulas. If kitchen staff members went on vacation, they should be tested for typhoid fever, and their health should be closely monitored to ensure they do not have any potentially hazardous infections.

NUTRITION DURING CANCER THERAPY



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The method of managing nutrition must follow a data-based approach, like any other scientific field. To start, dietitians must perform a nutritional assessment using various tools. This assessment involves evaluating different factors such as the patient's medical history, physical examination results, anthropometric measurements, and body composition information. Finally, based on the results of this evaluation, the dietitian can determine and meet the patient's nutritional needs.

Nutritional screening:

Patients may undergo nutritional screening to determine malnutrition, which can be done by various methods:

- Standard scales (for example, MST/ MUST/ NRS 2002/ NRS) are important tools for screening.
- For calf circumference, another screening tool, one must try to triage the patients into those with mild, moderate, and severe malnutrition.
- Post this they must be referred to a trained dietitian. They can do the formal assessment, and the subjective global assessment, and prepare nutritional requirements for these patients based on their needs, how much they can tolerate, and avoid overfeeding and underfeeding, as that can be dangerous.



Nutritional support:

All patients who have a moderate to severe degree of malnutrition require some amount of nutritional support. In cancer, whenever one anticipates that the side effects of treatment are going to be high, for example: during treatment therapies like combined chemotherapy and radiation therapy, those patients should be given some sort of nutritional support.

Energy requirements:

To determine the energy requirements of a malnourished patient, there are various tools that dietitians may use to calculate them, such as:

- Indirect Calorimetry
- Predictive Equations
- Weight based calculations
- Cautions in high BMI and catabolic states

Weight calculations are the most frequently used parameter that can be used to fulfil energy requirements. One must ensure generous macronutrients and micronutrients are added.

Calorie requirements:

- Energy: 20-25 kcal/kg/d (bedridden) and 25-30 kcal/kg/d (Ambulatory)
- Carbohydrate: Glucose <5 g/kg/d; should not exceed 40%-50% of non-protein energy requirements
- Lipids (LCT or MCT) 0.5 and 1.5 g/kg/d up to a maximum of 2 g/kg/d; should provide up to 50% of nonprotein calories
- Protein requirements: Protein intake should be > 1 g/kg/d and, if possible, up to 1.5 g/kg/d in patients with cancer. In subjects with normal kidney function, intake of protein in doses up to and above 2 g/kg/d are safe; in patients with acute or chronic renal failure, protein supply should not exceed 1 or 1.2 g/kg/d, respectively
- Micronutrients, Vitamins: In physiological doses, without the use of high-dose micronutrients in the absence of specific deficiencies
- For PN: balanced standard solutions, vitamin K (26-10 mg/d) vitamins B, 8, (>100 mg/d), antioxidants (vitamins A, C, and E)
- Trace elements: Complete standard solutions Zinc (15-20 mg/d), Selenium (120 µg/d)
- Electrolytes: Daily adaptation (sodium, potassium, and calcium) P(>16 mmol/d), Magnesium (>200 mg/d)

Nutritional scenario during perioperative periods:

The nutritional needs of a patient, particularly those who are preparing for or have already undergone surgery, are greater and there is a higher likelihood that they may be malnourished. Furthermore, the nutritional requirements can vary depending on the time frame around the surgery. Patient nutrition management varies in different situations.

- Perioperative period: Undergoing major abdominal surgery
- HSCT: Severe mucositis or GI or GVHD
- Combined modality therapy for solid' cancers



Enhanced recovery after surgery (ERAS):

This is a protocol that needs to be followed after surgery, to prevent any lack of nutritional supplements in a patient who underwent surgery. This method was initially developed for colorectal surgery but currently, it is being carried out for many other surgeries. There are three components involved in this protocol, namely: preoperative, postoperative, and intraoperative.



POST-OPERATIVE

- Mid-thoracic epidural anaesthesia analgesia
- No nasogastric tubes
- Prevention of nausea and vomiting
- Avoidance of salt and water overload
- Early removal of the catheter
- Early oral nutrition
- Non-opioid oral analgesics NSAIDs
- Early mobilisation
- Stimulation of gut motility
- Audit of compliance and outcomes



PRE-OPERATIVE

- Pre-admission counselling
- Fluid and carbohydrate loading
- No prolonged fasting
- No/selective bowel preparation
- Antibiotic prophylaxis
- Thromboprophylaxis
- No premedication



INTRA-OPERATIVE

- Short-acting anaesthetic agents
- Mid-thoracic epidural anaesthesia/analgesia
- No drains
- Maintenance of normothermia
- Avoidance of salt and water overload



The salient features of ERAS are:

All cancer patients undergoing curative or palliative surgery should be managed within an Enhanced Recovery After Surgery (ERAS) program. As part of this program, every patient should undergo malnutrition screening, and if found to be at risk, they should receive additional nutritional support.

This programme entails three key components:

- To avoid prolonged fasting
- Carbohydrate and preoperative fluid loading: There is data to support the trend that fluids can be safely given to the patients for up to two hours and last more than 6 hours before the anaesthesia.
- The recommencement of oral diet after 1st preoperative day i.e., early enteral feed.

When there are no issues with digestive mobility, a patient can typically return to their normal diet within 24 hours after surgery. This is achieved by monitoring bowel sounds, observing for signs of ileus, and using motility-enhancing agents as needed.

Early Enteral Nutrition:

Randomised controlled trials conducted between 1979 and 2012, along with their meta-analyses, showed that early enteral nutrition (EN) reduced mortality and infections in interventional patients compared to controls who had delayed or no EN.

Furthermore, whey supplements have been shown to be beneficial for a specific group of patients. Before undergoing cholecystectomy procedures, consuming whey protein drinks combined with carbohydrates can maintain muscle strength; enhance patient satisfaction by reducing fatigue, anxiety, and discomfort; and decrease the inflammatory response caused by the procedure.

Immuno-nutrition:

The idea of immune nutrition has existed for many years but is somewhat controversial. However, both ESPEN and ASPEN recommend providing immune-boosting nutrition, such as arginine, glutamine, or omega-3 fatty acids, in the perioperative period, especially for patients undergoing significant gastrointestinal tract damage.

Post-Discharge: ONS

Clinical trials were conducted to study the effect of oral nutritional supplements (ONS) on post-discharge patients at nutritional risk after colorectal cancer surgery, and on post-discharge patients at nutritional risk after gastric cancer surgery who received ONS with dietary advice. These trials demonstrated that post-discharge ONS improves nutritional outcomes, preserves skeletal muscles, enhances tolerance to chemotherapy, and enhances the quality of life.

Nutritional requirements in an ICU setting:

Nutrition is of utmost importance for patients in the ICU. The dietitian's first priority is to ensure hemodynamic stability, and once it is stabilised, they can begin administering oral feeding. Enteral nutrition is the preferred method, but parenteral nutrition may also be used when necessary. If the caloric needs are not met, under-feeding may be permitted, especially for patients in the ICU, while considering the proper balance of micro and macronutrients. It is also important to maintain the patient's glycemic index at the same time.

Recommendations for cancer survivors:

The importance of nutrition applies even to cancer survivors. These individuals should undergo nutritional screening using validated tools. Common screening tools such as MST, MUST, NRS 2002, or NRS may not accurately detect muscle wasting, which can only be identified through a CT scan.





Nutritional recommendations in the terminal stages of cancer:

Nutrition is important for the final stages of a cancer patient's life. Several guidelines can be followed that address this issue. One of these guidelines is:

ESMO 2020 guidelines; This guideline entails:

- The main nutritional objective for patients with only a few weeks to live is comfort-directed care.
- Nutritional interventions are less invasive and should be preferred for patients with a life expectancy of 3 months.
- In patients with an estimated life expectancy of greater than or equal to three months, routine screening and nutritional interventions should be taken into consideration.

Foods to be consumed for the prevention of cancer are:

- Fruit and vegetable consumption
- Higher consumption of fish and lower consumption of red and processed meat
- Calcium and yoghurt intake
- Alcohol consumption increased the risk of cancer

Nutrition by itself is not enough to prevent cancer, exercise also plays a crucial role. Over 1,000 randomised controlled trials have demonstrated the significant benefits of exercise for both cancer patients and survivors. Another study has found that high-intensity aerobic exercise can lower the likelihood of metastatic cancer by 73%.

Conclusion

Nutrition is frequently neglected despite being a crucial aspect of cancer treatment. Neglecting this aspect has led to negative outcomes for many patients and survivors. Even when their nutritional needs are recognised, they are often under-addressed. To address this, clear guidelines must be established for healthcare providers, patients, and the general public. A collaborative approach is necessary to effectively identify and address the nutritional needs of cancer patients. Hospitals should have standard operating procedures, quality controls, monitoring, and audits in place to enhance the implementation process. Furthermore, improved randomised control trials are needed to advance our understanding of the field



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Obesity Prevention & Treatment, Lifestyle Approach



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Obesity is defined as a multi-factorial, neurobehavioral disease that is chronic, progressive, relapsing, and treatable, in which an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in negative metabolic, biomechanical, and psychosocial health consequences.

Many factors determine the risk of being obese, such as:

- **Biological:** Biological determinants such as

- Genetics
- Brain-Gut Axis
- Prenatal Determinants
- Pregnancy & Menopause
- Neuroendocrine Conditions
- Medications
- Physical Disability
- Gut Microbiome
- Viruses

- **Behavioural**

- Excessive Calorie Intake
- Eating Patterns
- Sedentary Lifestyle
- Reduced Physical Activity
- Insufficient Sleep
- Smoking Cessation

- **Environmental**

- Food Abundance
- Built Environment
- Socioeconomic Status
- Culture Bias & Discrimination
- Environmental Chemicals

Comprehensive Weight Management Program:

To train obese people in reducing and maintaining lower weights, there is a comprehensive weight management program that attempts a lifestyle intervention which focuses on the following:

- **Nutrition:** This component includes: balanced meals, visible fat, hidden fat, visible sugar, hidden sugar, sugar-sweetened beverages, carbohydrates: vegetables and fruits, carbohydrates: starch products, energy density, food labels, salt, alcohol, food eaten at the restaurant, on holidays, on business travel, eating behaviour and psychological aspects
- **Physical Activity:** This component included: Sedentarily (sitting time), daily physical activity, organised sports and leisure time, physical activity, muscle strengthening and being active on holidays or business.
- **Cognitive Behavioural Therapy:** This component included: Hunger, speed of eating, satiety, stress management, snacking, emotions, eating disorders and self-esteem.
- Medication and or surgery when indicated.

Lifestyle intervention:

The lifestyle interventions that can be done for these patients are:

- According to the Obesity Guidelines, people who are obese (BMI 30 kg/m²) or overweight (BMI 25.0-29.9 kg/m²) and could benefit from weight loss should be encouraged to take part in a comprehensive lifestyle intervention for at least six months.
- A trained interventionist delivers instruction in behaviour therapy, physical activity, and diet as part of comprehensive programmes.
- Health professionals like registered dietitians, exercise specialists, psychologists, or health counsellors are frequently used as interventionists
- The goal of comprehensive interventions is to cause a weight loss of roughly 0.5–1 kg per week for the first 12 weeks, followed by more gradual weight loss until the weight loss typically reaches a plateau at 6–9 months.
- The Obesity Guidelines define at least 14 on-site individual or group treatment sessions over the first six months as being of high intensity.

For weight loss to be clinically meaningful (i.e., 25% of starting weight), frequent contact is essential.

Medical Nutrition Therapy - Overweight or Obese Adults:

Medical nutritional therapy for obese patients usually involves the following:

- Referral for medical nutrition therapy to a registered dietitian
- Assessment, diagnosis, action, supervision, and evaluation of nutrition
- Interventions focused on intrapersonal elements that help modify energy balance behaviours.

Obesity Intervention - Interpersonal

For conducting obesity intervention, the patients will first need to be assessed according to the following parameters:

- Food and nutrition-related history
- Anthropometric measures
- Biochemical data, medical tests and procedures
- Nutrition-focused physical findings
- Patient History
- Energy intake and nutrient content
- Motivation, readiness and self-efficacy

After the assessment, the dietician will carefully curate a dietary intervention according to the patient's needs with one of the following:

- 1,200 kcal to 1,500 kcal (women); 1,500 kcal to 1,800 kcal (men)
- Energy deficit of 500 to 750 kcal/day
- One of the evidence-based diets that restrict certain food types
- Before treating the patients, the dietician should collect data about all the health indicators.

Health improvement	Health indicator	Example
Cognitive improvements body composition improvements appetite-related improvements	Memory, concentration, attention, problem solving, sleep hygiene	Ask client/ patient to rate each of these health outcomes using 0-10 scale, where 0 is low/poor and 10 is high/great: <ul style="list-style-type: none"> • Energy level • Stress • Sleep hygiene • Mobility • Strength • Pain • Bowel health • Mood • Relationship with food • Hunger • Cravings • Overall health
Functional improvements	Strength, flexibility, mobility, coordination, physical activity capacity, endurance, pain	
Medical improvements	Cardiometabolic, endocrine, gastrointestinal, wound care, nutrient deficiencies, changes to medications	
Body composition improvements	Body fat, muscle mass, bone health, waist circumference	
Appetite related improvements	Hunger, satiety, cravings, drive to eat, palatability of foods	
Mental health	Disordered eating behaviours, self-esteem, self-efficacy, emotional regulation, mood/anxiety, addiction	

Motivational Interviewing:

Patient counselling is a very healthy way to go about helping them reduce weight and maintain a healthy lifestyle. Using a patient-centred counselling strategy, which, in the context of obesity medicine, encourages patients with obesity to have healthier body weights and body compositions.

The principles of these sessions are:

- To encourage people to express empathy
- Avoid argumentation
- Develop discrepancy
- Resolve ambivalence
- Support self-efficacy

Dieticians follow the 5A guidelines during obesity management. These are:

- **Ask:** Ask for permission to discuss body weight, and explore readiness for change
- **Assess:** BMI, waist circumference, and obesity stage. Explore drivers and complications
- **Advice:** Advise the patient about the health risks of obesity, the benefits of modest weight loss (i.e., 5-10 per cent, the need for long-term strategy, and treatment options
- **Agree:** Agree on realistic weight-loss expectations, targets, behavioural changes, and specific details of the treatment plan
- **Arrange/Assist:** Assist in identifying and addressing barriers; provide resources; assist in finding and consulting with appropriate providers; arrange regular follow ups

Diet	RCT Evidence Support	RCT Evidence Non- Support	RCT Evidence
Low Calorie Diet	X		
Very Low-Calorie Diet	X		
Very Low Carbohydrate Diet	X		
Mediterranean with energy restriction	X		
High Protein with energy restriction	X		
Meal replacement/structured meal plans	X		
Decreasing sugar-sweetened beverages	X		
Portion Control	X		
Increasing fruits & vegetables		X	
Low glycemic index/load with energy restriction		X	
Eating Frequency			X
Time of Eating			X
Breakfast Consumption			X

Principles of healthy nutrition:

To recommend a healthy diet to obese patients, dieticians follow certain principles. Some foods are to be completely avoided, such as:

- Ultra-processed foods that are unhealthy and have little nutritional value, such as "sweets," "junk foods," cakes, cookies, candies, pies, chips, and ultra-processed meats like bacon, sausage, and hot dogs
- Energy-dense foods that are high in calories
- Steer clear of trans fats and too much sodium.
- Sucrose and saccharin, among sweeteners, may increase body weight more than aspartame and sucralose.

Some foods that need to be encouraged to be included in their diet are:

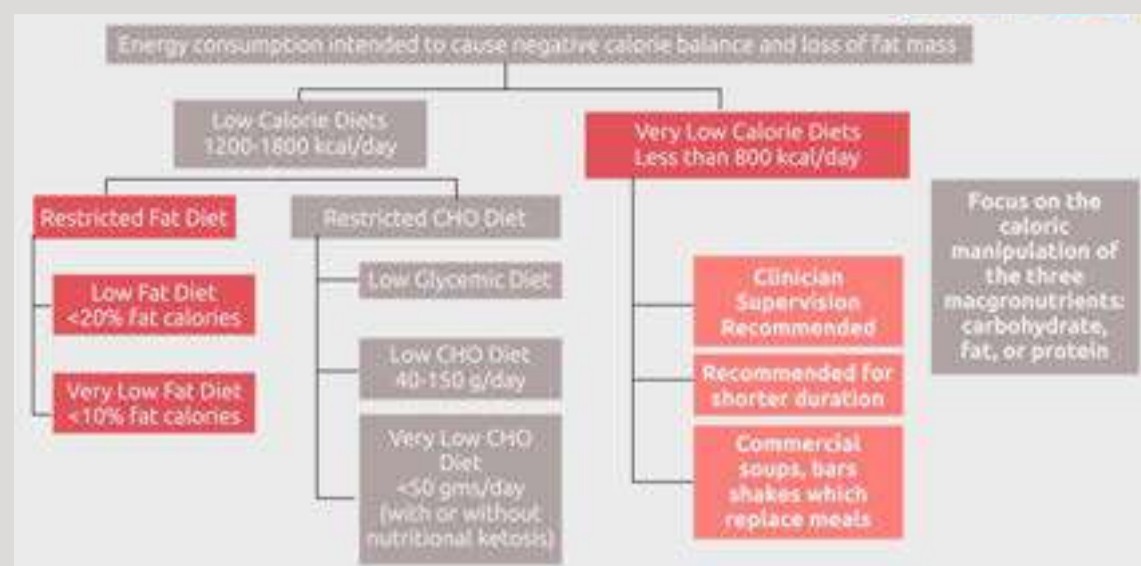
- Consumption of lean proteins, healthy fats, fruits, berries, vegetables, leafy greens, nuts, legumes, and whole grains.
- Simple sugars are preferred to complex carbohydrates: Choosing foods with a low glycaemic index over those with a high glycaemic index.
- Foods high in fibre, as the fibre after getting fermented includes the hormone that stimulates the feeling of fullness.
- Numerous dairy goods (while being mindful of caloric content).
- Reading the labels rather than the marketing claims.

Choosing Nutrition Therapy for Obesity

When creating a nutritional therapy plan for a patient, it is important to keep in mind that the best weight loss plan is one that is secure, effective, and that the patient can adhere to in the long term. It reaches and maintains a healthy weight; dieticians should encourage foods that produce a negative caloric balance.

They should consider the following while designing the same:

- Eating behaviours, and meal patterns;
- Cultural background, traditions, and food availability
- Time constraints and financial issues
- Nutritional knowledge and cooking skills
- Medical conditions potentially affected by the nutrition plan



- **Low fat:** This method helps in a greater reduction in total and LDL cholesterol.

Dietary patterns:

Understanding the various metabolic and weight loss effects of several dietary patterns is essential to getting a greater insight into the calorie restrictions that must be implemented. Certain diets which have given promising results for obese people in losing weight are as follows:

While designing nutritional therapy for obese patients, there are two main options that they can opt for, which are:

- **Low-calorie:** It has been observed that low cal-low-calories consisting of 1200–1800 kcal/day are very effective in helping them lose weight while maintaining balanced energy levels for them to partake in physical activities as well.
- **Very low calorie:** These diets consisting of 800 kcal/day may provide faster results but may harm the patient’s metabolism if continued for a longer term. Therefore, doctors usually recommend these diets as short-term measures under medical supervision and move back to a low-calorie diet once the target weight is achieved.

Several interventions can be implemented while designing a nutritional therapy for the obese, which are:

- **Calorie restriction:** It reduces blood pressure, lipid and glucose contents, and induces weight loss in obese but it also negatively impacts health by lowering bone density, muscle strength and BMR. The advantage of this process is that initial weight can be attained but on the contrary, it is very difficult to retain, easy to regain weight and long-term weight loss is <5%
- **Low carbohydrate:** The advantage of this method over other methods is that it leads to the loss of about 8 kg at 6 months, while greatly impacting the health of a patient in the following ways:
 - Restores the pre-prandial rise in ghrelin plasma levels
 - Reduction in serum TGs
 - Reduction in serum glucose & HbA1C
 - Increase in HDL

Mediterranean diet: The Mediterranean diet is a general term that encompasses various modifications in eating patterns, and it is supported by robust scientific evidence for reducing the likelihood of developing atherosclerotic cardiovascular disease. The diet emphasises the consumption of foods such as olive oil, vegetables, fruits, legumes, whole grains, nuts, seeds, seafood, fermented dairy products, poultry, eggs, and red wine, while limiting the intake of red meat, meat products, and unhealthy highly processed carbohydrates.

Plant-based foods contain many beneficial macro and micronutrients such as:

- High amounts of dietary fibres raise satiety
- High water content
- Low glycemic index and low energy density
- Low levels of saturated and trans-unsaturated fats and high levels of MUFA. MUFA-rich diets appear to improve glucose metabolism and increase postprandial fat oxidation.

It is a diet that may not show drastic effects on weight but has many health benefits, such as:

- Improves A1C, TG
- Increases HDL
- Cardiovascular events reduction
- T2DM risk 52% reduced Reversion of MetS

Therapeutic lifestyle diet: It is a low-fat meal-plan variation that was suggested by the Adult Treatment Panel of the National Cholesterol Education Program. It is the "diet" that is most frequently used in lipid clinical trials.



In this diet, the following parameters are encouraged:

- Total fat: 25-35% of daily calories
- Polyunsaturated fat: Up to 10% of total daily calories
- Monounsaturated fat: Up to 20% of total daily calories
- Carbohydrates: 50% to 60% of total calories
- Soluble fibre: At least 5-10 grams a day, preferably 10-25 grams a day
- 2 grams per day of plant stanols or sterols through foods or dietary supplement

Some parameters that are discouraged are:

- Limit saturated fat: < 7% of total calories
- Limit cholesterol: < 200 mg a day
- Avoid foods with trans fatty acids

The **DASH diet** is a plan designed by the National Heart Lung and Blood Institute in the U.S. to treat high blood pressure, but it also helps with obesity. It has been shown to decrease the risk of heart-related issues and stroke through a reduction of various health markers such as CRP, LDL, HbA1C, among others. Additionally, it leads to a loss of 1.42 kilograms and a reduction in waist circumference of 1.05 inches over a 24-week period.

The following guidelines are followed in this diet:

- **Consuming:**
 - Vegetables, fruits, and whole grains
 - Fat-free products or low-fat dairy
 - Fish, poultry, and lean meats
 - Nuts, seeds, and legumes
 - Fibre and the minerals calcium, potassium, and magnesium
- **Limiting:**
 - Sodium to 1,500-2,300 mg per day
 - Total fat to <27% of total daily calories
 - Saturated fat to <6% of daily total calories
 - Cholesterol to <150mg/day for a 2100-calorie eating plan
- **Avoiding:**
 - Red and processed meats
 - Sugar-sweetened beverages
 - Foods with added sugars

Ketogenic (modified Atkins) diet: It is a nutritional strategy that restricts carbohydrates and encourages the use of fat for energy and induces ketosis, which may help with lowering hunger.

Foods with a high glycemic index or load, trans fatty acids, and ultra-processed and refined foods are typically discouraged in keto diets. Various phases of the ketogenic diet have different goals, such as:

- The induction phase restricts total daily carbohydrate intake to no more than 20 g from non-starchy vegetables and leafy greens, and it promotes adequate protein and a higher proportion of dietary fat to lower insulin levels and induces nutritional ketosis.
- During the ongoing weight loss phase, a wider variety of vegetables, seeds and nuts, and low-glycemic fruits are permitted (i.e., strawberries and blueberries).
- After reaching the desired weight, the pre-maintenance phase allows for a gradual increase in carbohydrate intake, provided weight gain does not occur.
- In the maintenance phase, if weight and health benefits are maintained, 60 to 90 g of carbohydrates per day are permitted, which may include legumes, whole grains, and fruits.
- Every stage promotes harmony between saturated, monounsaturated, and polyunsaturated fatty acids.

- **Ornish diet:** It is a vegetarian dietary intervention using animal protein, refined sugar, and low fat. It is more of a lifestyle than a diet. This diet usually encourages:

- It is best to consume foods in their natural state.
- Fruits, vegetables, whole grains, and legumes
- DA daily serving of one soy product
- Small quantities of green tea
- 3 to 4 g of fish oil per day
- Several small meals were taken throughout the day.
- Limit dietary fat: < 10% daily total daily calories
- Limit dietary cholesterol: < 10 mg per day
- Limit sugar, sodium, and alcohol

While discouraging:

- Animal products (red meat, poultry, and fish) and caffeine (except green tea)
- Foods with trans fatty acids, including vegetable shortening, stick margarine, and commercially prepared foods, such as frostings; cake, cookie, and biscuit mixes; crackers and microwave popcorn; and deep-fried foods
- Refined carbohydrates and oils

Paleo diet: The Palaeolithic Diet, based on a dietary pattern believed to have existed during the Palaeolithic era (lasting 3.4 million years and ending 6000-2000 BC), is a dietary intervention that prohibits the consumption of grains, dairy products, and highly processed foods. It is essential to consult with a registered dietitian before starting this diet. The guidelines that need to be followed while consuming such a diet are:

- Fresh vegetables, fruits, and root vegetables
- Grass-fed lean red meats
- Fish/seafood
- Eggs
- Nuts and seeds
- Healthful, naturally-produced oils (olive, walnut, flaxseed, macadamia, avocado, and coconut)

This diet does not include:

- Cereal grains
- Legumes, including peanuts
- Dairy products
- Potatoes
- Ultra-processed foods
- Refined sugar, refined vegetable oils, and salt

Vegetarian or vegan diet: A diet rich in plant-based foods is often associated with weight loss, lower risk of heart disease, positive impacts on some types of cancer, and metabolic diseases, and possibly reduced risk of all causes of death. However, these benefits can be reversed if the diet includes a high amount of ultra-processed foods, fried foods, and refined carbohydrates instead of whole plant-based foods. A plant-based diet may also lead to micronutrient deficiencies, such as Vitamin B12, which may require monitoring and supplementation. This diet emphasises the consumption of plant-based foods along with eggs and, in some cases, a small amount of meat, while excluding or limiting red meat and poultry products.

This diet shows promising effects in reducing weight as well as providing health benefits such as:

- Lowers HbA1C & LDL-C
- Increase non-HDL-C
- T2DM incidence improved
- Coronary heart disease incidence & mortality

There are various forms of vegetarian diets, such as:

- Vegan ("Total Vegetarian"): only plant-based foods (such as fruits, vegetables, legumes, grains, seeds, and nuts) and no animal by-products, such as milk, honey, or proteins from animals.
- Lacto-vegetarian diet includes plant foods as well as some or all dairy products (e.g., cheese)
- Lacto-Ovo Vegetarian (also known as Ovo-lactovegetarian): dairy products, eggs, and plant-based foods.
- Semi- or partial vegetarians eat plant-based foods, which may also include dairy products, eggs, chicken, or fish, but no red meat.
- Pescatarian: Consumes both seafood and plants.
- Flexitarians consume mostly plant-based foods that have undergone minimal processing, with the occasional serving of fish, meat, and other animal products.

Fasting diets: These diets may contribute to overall caloric restriction. Some forms of fasting diets are:

- Alternative day
- Intermittent
- Time-restricted eating

It has several advantages, such as:

- Reducing "decision fatigue" when choosing food,
- Rapid reversibility
- Possibly a better fit for routine patient scheduling (including Ramadan).
- Can have varying effects on lean body mass, resting metabolic rate, and total energy expenditure, often depending on physical activity, by reducing caloric intake.
- May lower body weight and enhance metabolic parameters (such as blood pressure, lipids, inflammatory markers, and insulin sensitivity).



Several disadvantages of fasting diet:

- Does not always emphasise the quality of a healthy meal
- It might not be suitable for people with eating disorders (e.g., bulimia or binge-eating disorder)
- Patients with diabetes mellitus who do not properly adjust their hypoglycemic anti-diabetic medication treatments are more likely to experience hypoglycemia (e.g., insulin, sulfonylurea)
- Uncertain if sustainable over the long term for a chronic illness (i.e., obesity)
- Animal studies provide the majority of long-term evidence of effectiveness, health benefits, and safety.
- Long-term fasting, as opposed to intermittent fasting, may worsen cardiac dysrhythmias, postural hypotension, gout, and urate nephrolithiasis.



Commercial diet programs

Hormones, nutrition, and obesity:

Hormones play an important role in determining one's metabolic rate. These factors also have an impact on how obese patients are treated. These problem creators need to be dealt with individually while designing a nutritional therapy for the obese.

- **High insulin:** This will cause insulin resistance which can be corrected with exercise, and sleep along with diets containing omega 3 fatty acids, Mediterranean diets, low GI carb diets, etc.
- **High leptin (satiety):** This tendency to overeat is often seen in people who are overweight or obese and can be corrected through regular exercise, reducing body fat, and improving sleep.
- **Low ghrelin (hunger):** This results in excessive eating. It is commonly noticed to be elevated prior to meals and decreases after a meal. Poor sleep quality greatly contributes to increased levels. To remedy this, maintaining a regular sleep schedule and eating routine is crucial.
- **High cortisol (stress):** This condition is often exacerbated by consuming foods that have a high glycemic index and a lack of high-quality sleep. It can lead to various health issues. To combat this, it is recommended to engage in regular physical activity, maintain a balanced diet, prioritise proper sleep, and practice meditation.
- **Low peptide YY:** To regulate these levels and prevent overeating, it is essential to include plenty of protein in the diet, maintain a balanced diet, and engage in regular physical activity.

Nutritional therapy cannot alone correct obesity, it has to be done with a change in their lifestyle and behavioural patterns too,

- Motivational interviewing & Self-monitoring
- Structured meal plans and meal replacements
- Portion control
- A goal set for problem-solving

This can be achieved by the combined efforts of several strategies, such as:

- Cognitive restructuring
- Contingency management
- Relapse prevention techniques
- Slowed rate of eating
- Social support
- Stress management

Strategizing also involves understanding several barriers that may lead to slower results. Certain barriers that may be regulated for better results are:

- Low Protein Intake
- Irregular Exercise
- Low Fibre Intake
- High intake of sugars/ sweets
- Constant Stress
- Bad fat intake
- Lack of consistent & quality of sleep
- Imbalanced Diet

Along with food, physical activities are equally essential because they can:

- Assist with weight maintenance
- Assist with weight loss
- Improve body composition
- Improve adiposopathic physiologic disturbances
- Possibly improve adipocyte function ("train" fat cells)
 - Improve insulin sensitivity
 - Increase mitochondrial biogenesis
 - Increase browning ("being") of fat cells

Carrying out physical activities without prior consultation with your healthcare provider may lead to certain injuries or health impacts. This is because they conduct a medical evaluation to ensure patient safety before advising them to exercise. They may also determine the intensity at which you may carry out your workout. These analyses include:

- Assess current physical activity level
- Assess readiness
- Assess potential need for medical testing/evaluation (i.e., cardiac stress testing, pulmonary function tests, musculoskeletal assessment, etc.)
- Assess mobility, fitness, and potential equipment needs or modifications
- Agree upon patient expectations and goals
- Potential adjustment of medications:
 - Before the start of the physical activity plan (e.g., diabetes and blood pressure Rx)
 - During the implementation of the physical activity plan

Optimal default

- **Back-up plan:** Along with physical activity, sleep plays an important role in regulating hormones such as stress hormones, cortisol, hunger hormones, insulin, leptin, ghrelin, thyroid hormone, growth hormones, etc.
- **Ghrelin:** This hormone stimulates hunger. It is produced mainly by cells that line the stomach. Sleep regulates the levels of ghrelin which tells the brain when we need to eat. Therefore, poor sleep can make us keep thinking we are hungry.
- **Insulin:** This hormone controls glucose levels and how the body uses carbohydrates and fats in food. It is produced in the pancreas. The levels of insulin are controlled during sleep so that we wake hungry and ready for breakfast. Sleep helps control insulin levels so our bodies can use insulin properly.
- **Cortisol:** This hormone is involved in metabolism, immune response and stress response. It is produced in the adrenal glands. The hormone levels peak just before waking, making us feel hungry and alert.
- **Aldosterone:** This hormone helps regulate the levels of sodium and potassium in the body. It is produced by the adrenal cortex. The levels rise during sleep which prevents us from needing to go to the toilet.
- **Leptin:** This hormone regulates body weight by inhibiting hunger. It is produced in the adipose tissue. Its levels are regulated during sleep so that we don't get hungry.

To manage obesity, another factor that needs to be controlled is stress levels as the stress hormones can damage sleep, hunger and other hormones, disrupting our eating and sleeping habits. There are several ways of managing stress, such as exercising, meditation, journaling, pursuing a hobby, talking to loved ones, etc.

Conclusion:

We acknowledge that for individuals struggling with obesity, their dietary and nutritional treatment plan cannot be universal as several elements contribute to the development of the condition. Furthermore, simply relying on treatments is not enough for a successful outcome; rather, a collaborative approach is necessary, along with a conscious change in lifestyle, to achieve positive results.

Critical Care Nutrition in Indian ICU

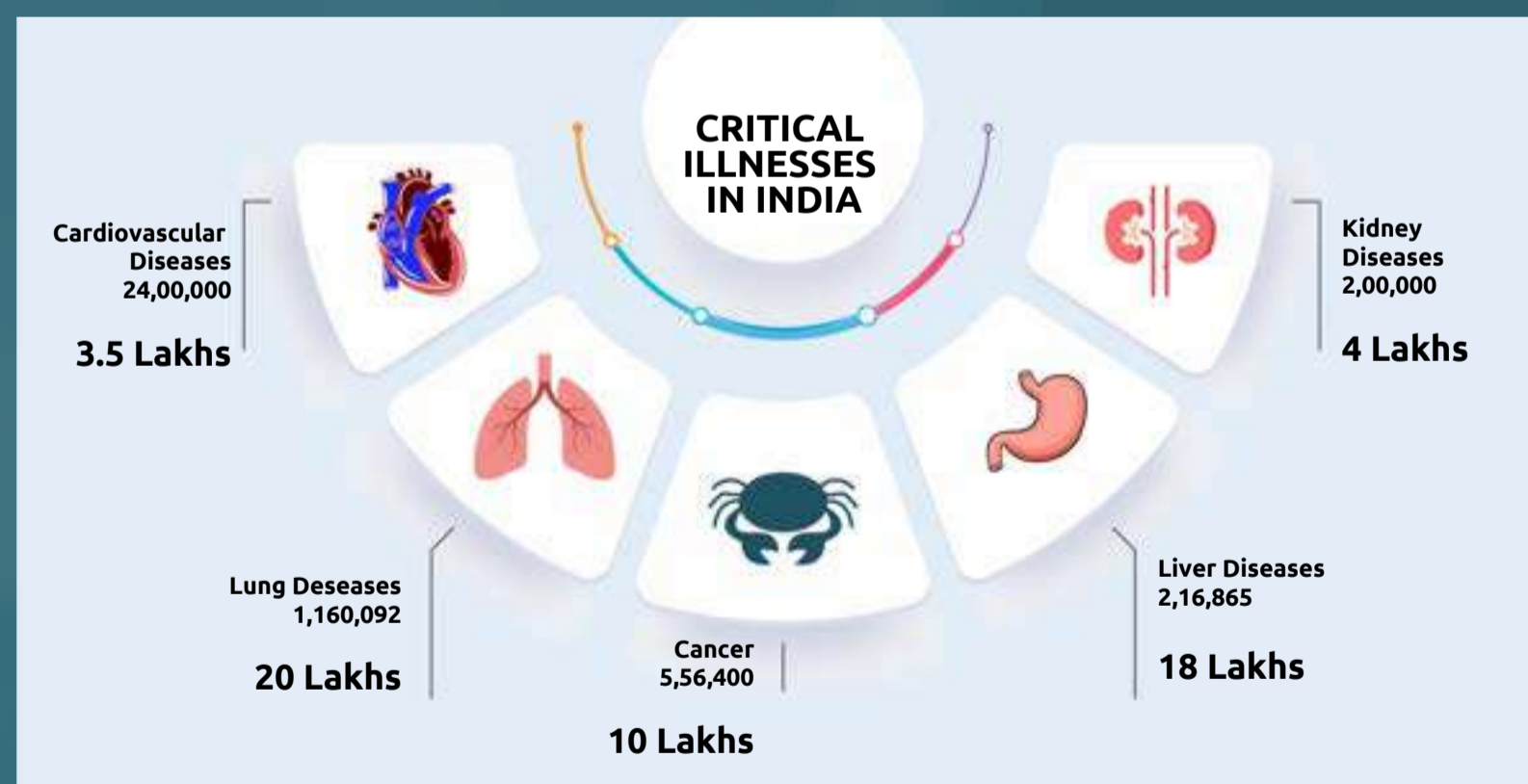


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In this article, we will delve into the understanding of the goals and needs of nutrition in critical care, as well as evaluate the advancements in critical care nutrition over the past decade. We will also examine the current recommendations and practices in this field, both globally and specifically in India, including the challenges faced in providing optimal nutrition in critical care situations.

Below diagram shows the burden of critical illness in India:



It's important to recognize the impact of critical illness in India, which affects not only one specific body organ but encompasses a range of diseases such as cardiovascular disease, lung disease, cancer, liver disease, and gastrointestinal tract diseases. The data from July 2020 shows that the number of deaths in the ICU due to malnutrition or critical care needs is alarmingly high, with a mortality rate of 31,358

Malnutrition in the critical care unit:

The main causes of malnutrition seen in ICU patients are:

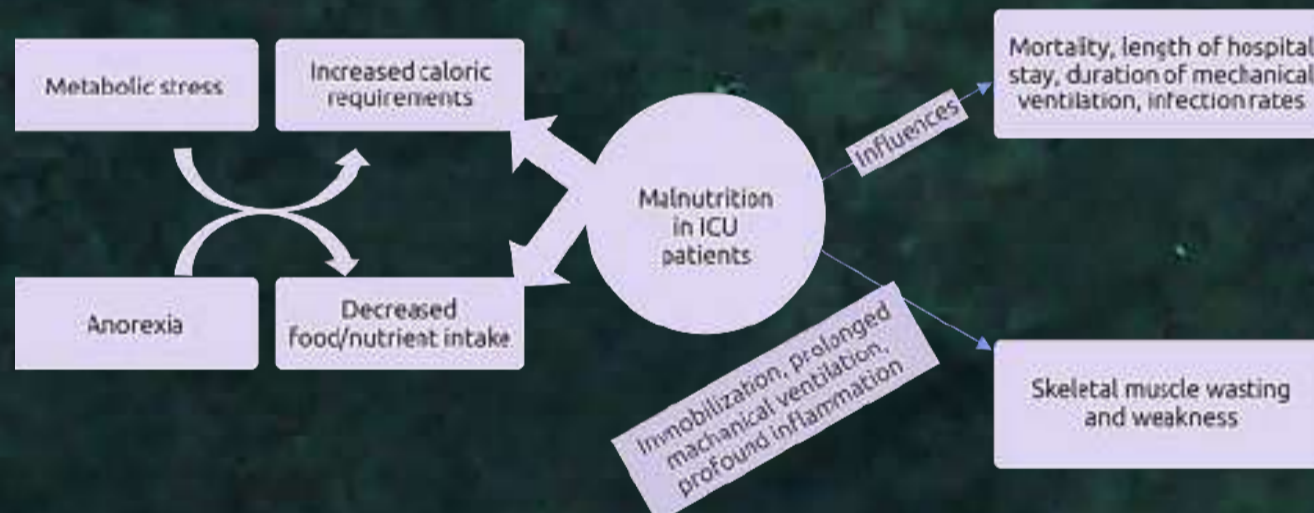
- Metabolic stress
- Increased caloric requirements
- Anorexia
- Decreased food or nutrient intake

The consequences of this would be:

- Prolonged Hospital stay or length of stay in the ICU
- Increase mortality rate
- Increased infection rate
- Duration of mechanical ventilation will be increased
- Skeletal muscle wasting and weakness due to immobilisation, prolonged mechanical ventilation, or profound inflammation

Nutritional issues in the critically ill:

Malnutrition among hospitalised patients is one of the world's major global issues. The prevalence of inpatient malnutrition is as high as 50% among acutely hospitalised adults. These numbers include not only patients who are hospitalised in a critical care unit but also those who are hospitalised in other general wards. Going about with an assessment as a patient comes to the hospital within 24 hours, has been seen more malnutrition on admission itself irrespective of if the patient is from an ICU or in an acute hospitalisation as an IPD patient.



The nutritional issues:

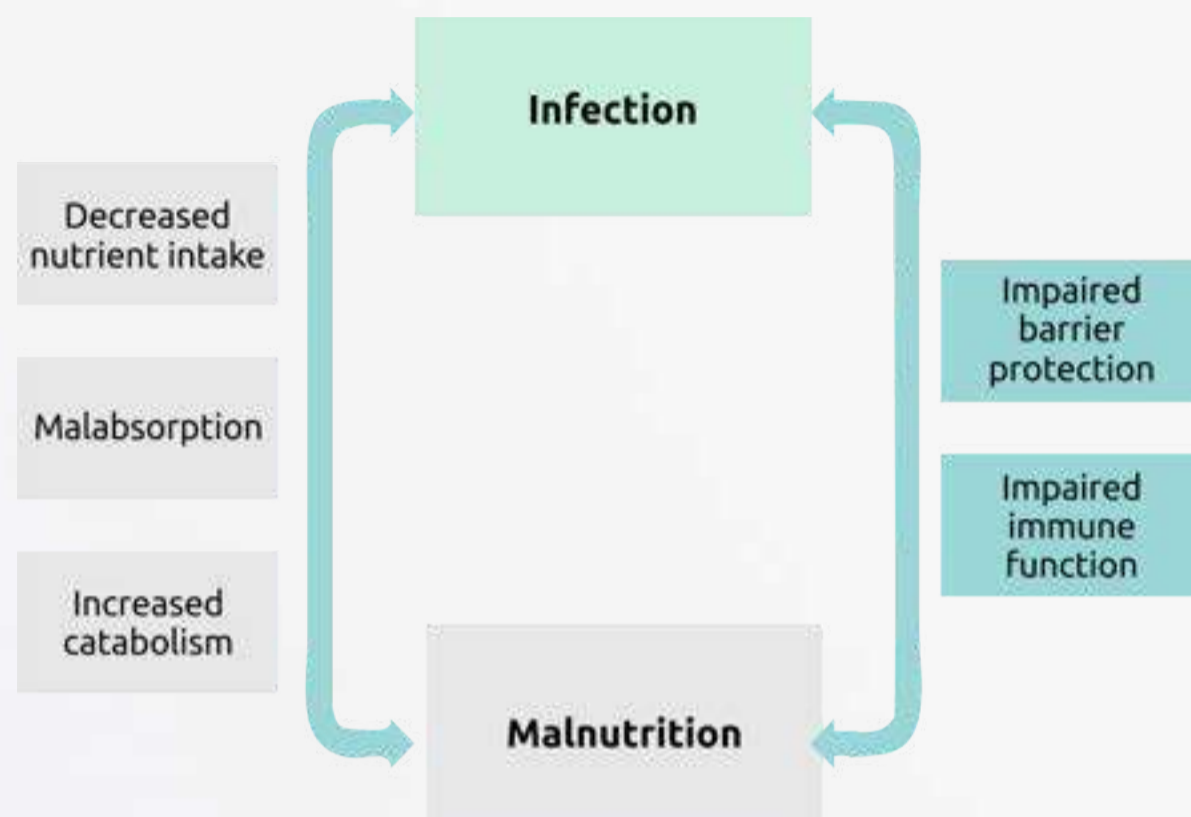
- Prolonged stay in ICUs
- Frequent insufficient feeding
- Previously altered nutritional or metabolic status aggravated by prolonged underfeeding

The consequences will be:

- The clinical outcome will be poor
- Prolonged stay in ICUs
- Increased incidences of complications
- Higher mortality rate

The bidirectional association between nutrition and infection:

When the patient suffers from decreased nutrient intake, malnutrition, and increased catabolism, the chances of acquiring an infection are higher. When malnutrition and infections are associated, they can impair barrier protection as well as immune function. This affects the clinical outcome during treatment or hospital stays.



Critical Care illnesses and their effects on nutrients:

Patients in the ICU with acute diseases, trauma, or those after major surgical procedures are seen to have higher or more pronounced stress metabolism, which causes specific nutritional challenges with a high risk of consequent malnutrition.

When these conditions are present in patients in a critical care unit, one can get:

- High pro-inflammatory cytokine activity
- Increase corticosteroids and catecholamine release
- Resistance towards insulin and other growth hormones
- Bed rest, and no or reduced food during the day
- All of these lead to the loss of body energy and nutrient stores.

The need for nutrition in critical care. The states of critical care illness are:

- Associated with a catabolic stress rate
- The systemic inflammatory response in patients

The complications of critical illness are as follows:

- Infectious morbidity
- Multi-organ Failure
- Prolonged hospitalisation

Outcomes that can be achieved by providing nutritional support to critical care patients are:

- Attenuated metabolic response to stress
- Prevents loss of lean body mass
- Reduces length of hospital stay
- Improves patient outcomes

Goals of nutrition in critical care:

The goal of nutrition in critical care can be defined as the enteral or parenteral provision or an oral feed, provided there is sufficient provision of calories, proteins, electrolytes, vitamins, minerals, trace elements, and fluids. This aims in reducing energy deficit, and energy catabolism, avoid malnutrition in well-nourished patients and prevention of malnourished patients.

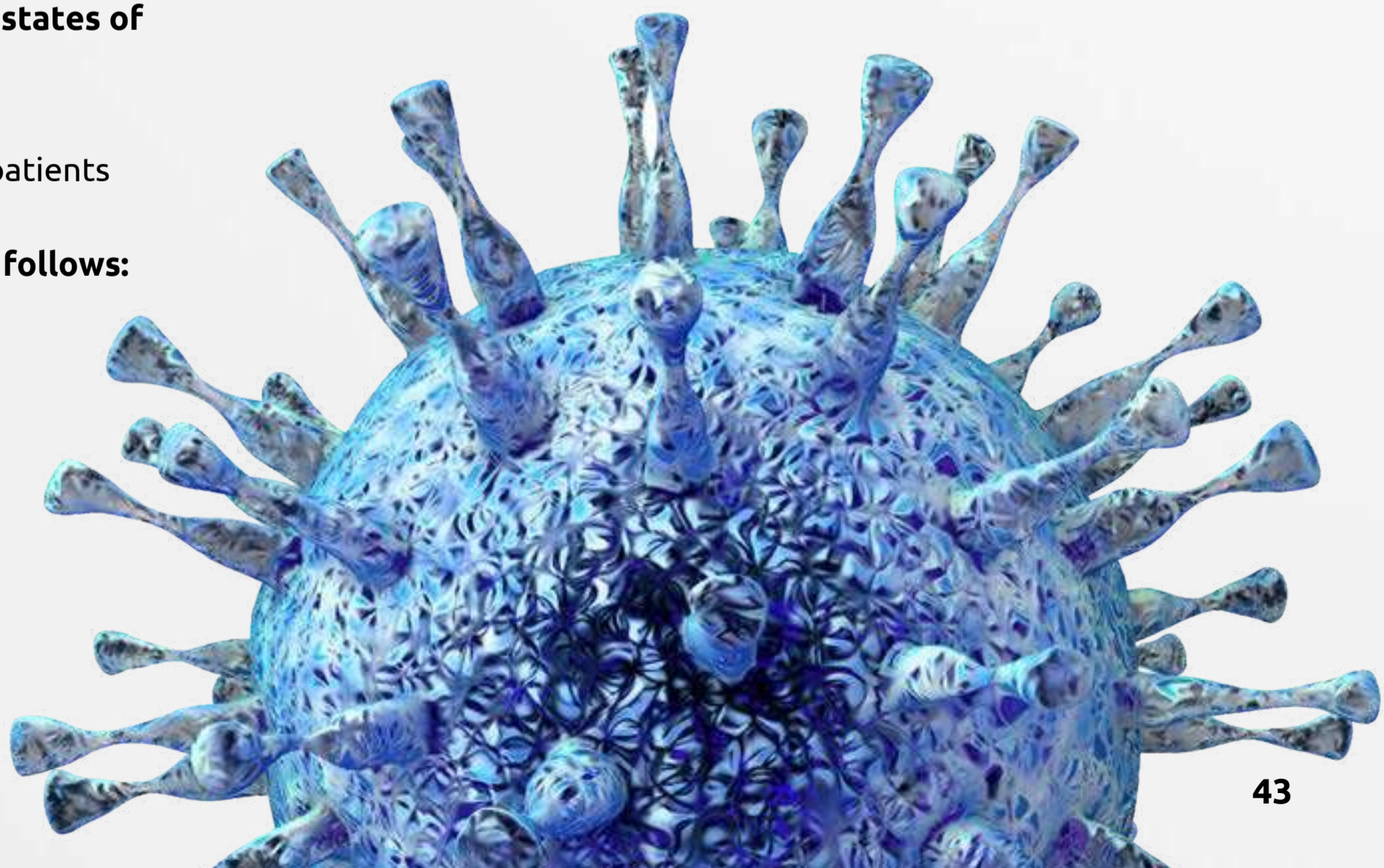
In the continuum of nutrition intervention, there are various methods of providing medical nutritional therapy, such as:

- Oral strategies: such as food
- Enteral strategies: such as ONS nutrition and tube feeding
- Parenteral strategies: such as IV strategies

The doctor decides which form of strategy should be provided to their patients depending on various parameters.

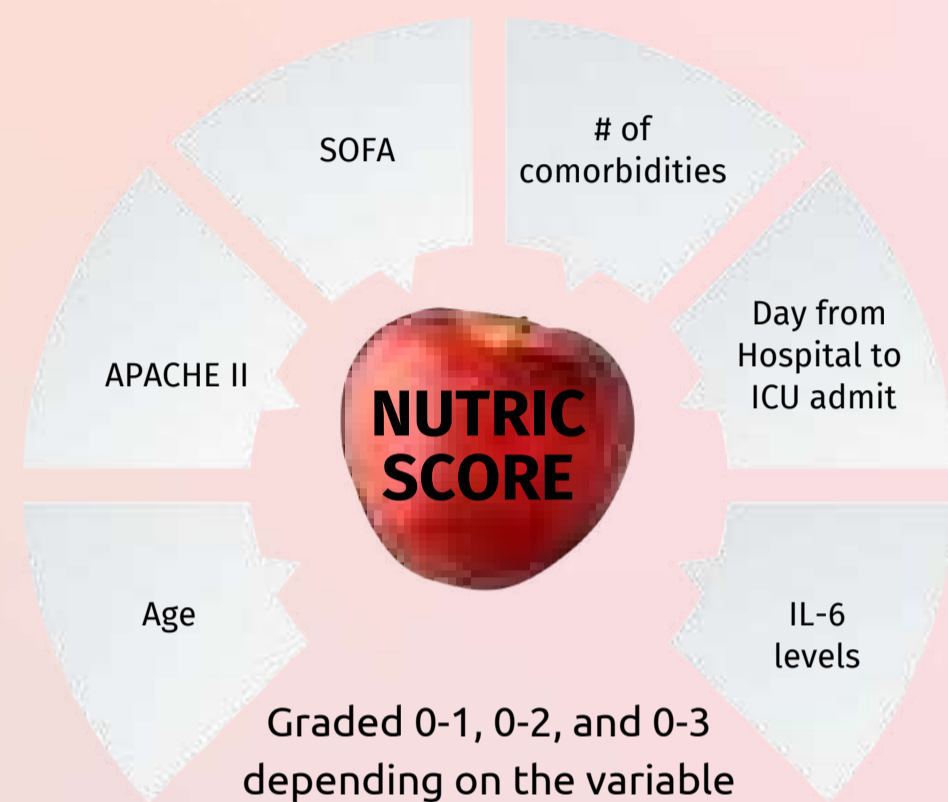
Evolution in critical care nutrition in the last decade:

It is now required that a full evaluation of a patient's nutritional status be performed within 24 hours of their admission to the hospital, as opposed to the previous requirement of within 48 hours. Additionally, the potential risk of malnutrition in patients in the ICU must also be assessed. To ensure this is done properly, it is necessary to determine the policies and standard operating procedures of the hospital's nutritional department.



The parameters used to determine nutritional assessments are:

The NUTRIC scoring system takes into account various factors, including age, APACHE II score, Sequential Organ Failure Assessment (SOFA) score, presence of comorbidities, days from hospital admission to ICU admission, and IL-6 levels. However, this method may have some limitations, such as the unavailability of IL-6 measurement in certain countries or the lack of access to the laboratory measures required for determining SOFA, leading to inconsistent results.



Mode of nutrition delivery, changes over the decade:

Over the last decade, there has been a shift in the preferred approach to treating patients upon their admission to the ICU. According to expert opinions, early initiation of nutrition within the first 48 hours after admission is considered to be more effective than either enteral or parenteral nutrition.

For patients with uncontrolled low blood pressure who are receiving treatment with vasopressors, it may be necessary to temporarily suspend enteral nutrition or start with a smaller dose. Using hypocaloric or trophic feeding can allow for a lower dose to be given and determine the patient's tolerance.

A comprehensive review of the literature suggests that the ESICM guidelines favour the initiation of enteral nutrition as soon as possible, rather than waiting for later initiation of either enteral or parenteral nutrition. This approach has been shown to result in a significant reduction in infection rates, although there has been no significant reduction in mortality rates when later initiation of enteral or parenteral nutrition is chosen.

The benefits of late parenteral nutrition are:

- Lower mortality and infection rates
- Decrease in the duration of mechanical ventilation and time of renal replacement therapy
- Indirect calorimetry

Indirect calorimetry is a method that is used as a standard for evaluating the basal metabolic rate and caloric needs of patients in critical care units. This method allows physicians to calculate caloric requirements based on oxygen consumption and carbon dioxide generation in critically ill patients. Compared to older predictive equations such as Harris and Benedict's predictions, which have been found to have inaccuracies of up to 60%, indirect calorimetry is considered to be more accurate, and is therefore the preferred method for determining caloric needs in an ICU setting.

Choosing the right mode of action at the right time:

The developments that have been seen in choosing the right mode of nutrition throughout the year are as follows:

- In the past, early enteral nutrition was considered standard care, however, there was limited robust evidence to support this. Through various studies conducted over the years, it has been shown that early enteral nutrition is more advantageous than parenteral nutrition, particularly in reducing the rate of infections.
- A recent meta-analysis of studies showed that the positive effects of early enteral nutrition were not evident when similar doses of enteral and parenteral nutrition were used.
- New areas of research suggest that early hypocaloric nutrition should be the first choice, and then the nutrition should be increased to enteral or parenteral according to the desired dose. However, when it comes to parenteral nutrition, there is a lack of consistency in the results.

Enteral nutrition versus parenteral nutrition: ESPEN recommendation;

It is recommended to maximise the effort to initiate EN before starting PN. If it is observed that EN is contraindicated or intolerable, then PN should be started within 3 days of ICU admission.

Gastric versus post-pyloric methods of enteral nutrition:

For critically ill patients, gastric feeding is highly recommended. However, for those with a lower risk of aspiration and pneumonia, post-pyloric feeding is often administered through the nasoduodenal or nasojejunal route.

In the case of post-pyloric methods there is enough evidence that has been recommended in patients:

- Where the risk of aspiration is more
- Where the feeding intolerance is not ameliorated with the prokinetic agents
- Intensive care expertise plays an important role in these recommendations.

Nutritional recommendation based on energy expenditure:

The ESPEN and ASPEN guidelines from 2006 and 2009 yield little guidance on this topic.

ESPEN's 2019 recommendations now recommend the following:

- Indirect calorimetry (IC) method: It is the standard to assess early enteral in patients in critical care units. If EE is assessed in patients, hypocaloric nutrition is recommended by the dietician, which is followed by iso-caloric nutrition during the early phases of the illness.
- Other predictive equations: When other predictive equations are used to assess early enteral nutrition, the dietician recommends hypocaloric nutrition to be given during the first week of critical illness. Also, calorie nutrition can then be followed from that point onward. This is usually recommended for patients with insulin resistance and hyperglycaemia that accompany critical illness.

Macronutrients: Protein dosage

For the survival of a normal individual, the recommendation for protein per day is 1.2 g/kg/day. As per ASPEN and ESPEN recommendations, the daily protein requirement for critically ill patients, even during the early phase of critical illness, should be more than 1.2 g/kg/day of protein.

This will help in the early restoration of physical activity in critically ill patients to elevate and counteract the protein loss. High protein supplements are recommended for all patients unless there is a clear

contradiction, such as the presence of other illnesses like hepatic or uremic encephalopathy.

Macronutrients- essential fatty acids:

In critical illness, the absorption of lipids is impaired and the fat metabolism is altered. As a result, the newest guideline from ASPEN suggests that the glucose-to-lipid ratio should be reduced to the lower end of lipid levels and to a rate of 1.5 grams per kilogram per day in the form of an emulsion for parenteral nutrition.

As per the latest ESPEN guidelines glutamine (GLN) is recommended at a dosage of 0.320.5 G per kg per day for one to two weeks as soon as EN can be started. However, GLN is not recommended except in burns and trauma. But later studies have shown that even supplementation of glutamine is not effective in burn patients, so instead of putting a burden on the treatment cost, one can go with the regular nutritional supplements for people that are supposed to be given this which will be more cost-effective.

MICRONUTRIENTS:

Micronutrients play a vital role in the care of critically ill patients, but they should only be supplemented if deficiencies are identified. This is particularly important for vitamins C and D. Vitamin D deficiencies are common among ICU patients, especially those with long stays and limited exposure to sunlight. The ESPEN 2019 recommendations suggest administering over 500,000 IU of vitamin D during the first week of ICU admission for patients with a deficiency.

Recommendations in hemodynamically unstable critically ill patients

Starting enteral nutrition in critically ill patients with unstable blood pressure can be difficult due to the risk of bowel ischemia. Nonetheless, there are several guidelines developed by organisations such as ASPEN and ESPEN that offer recommendations for such patients.

For those with uncontrolled hypercapnia, acidosis, hypoxia and other illnesses, a delay in enteral nutrition may be necessary. If the patients show improvement with low caloric doses, then gradually increasing the dose to reach appropriate levels of enteral nutrition is recommended. On the other hand, for patients with conditions such as an acute spinal cord injury, an open abdomen or severe acute pancreatitis, early enteral nutrition is advised.



Practice guidelines for critically ill patients in the Indian scenario:

It is crucial to perform a nutritional assessment on patients in the critical care unit to ensure they receive the necessary macro and micronutrients, with a minimum energy and protein intake of 20 to 25kCal, and 1 to 1.2g/kg/day, even in patients with renal and hepatic issues. The appropriate mode of nutrition, either enteral, parenteral, or oral, should also be determined. If the volume of gastric residuals is greater than 500 ml, it may be necessary to skip a feeding and restart with Trophic feed.

Gastrointestinal problems such as diarrhoea, vomiting, nausea, and sometimes loading can occur, and even immobile patients may experience constipation and bloat.

Key points for clinical trial consideration:

- During clinical trial phase 3, the outcomes should be patient-centric.
- The phase 3 RCTs should be done adequately, and should be exercised under proper guidelines that can be followed and are feasible for all.
- The different phases of critical illness, or specifically the points of the “anabolic switch” should be altered.
- There should be attempts to identify specific types of patients. For example, those with previous poor nutrition.
- The best approach should be taken to balance measure and unmeasured confounders by adequately powered RCTs.

Conclusion:

The recent pandemic has led to a heightened need for critical care and ICU services in India. Malnutrition is a prevalent issue among critically ill patients, making nutrition an essential aspect of critical care. The goal of nutrition in critical care is to prevent malnutrition in healthy patients and to halt the worsening of malnutrition in already affected patients.

In the last decade, critical care nutrition has evolved with advancements in nutrition assessment, administration methods, and understanding of macro and micronutrient requirements. Oral nutrition supplements play a crucial role in critical care nutrition and the scientific formula is widely used and has several advantages over the blenderized formula.

Peri-Operative Nutrition in IBD



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IBD, or Inflammatory Bowel Disease, is a long-term condition that results in inflammation and damage to the gastrointestinal tract. The World Health Organization considers IBD to be one of the most difficult diseases to treat, and it encompasses two main types: ulcerative colitis (UC) and Crohn's disease. In India, the most common type of IBD is ulcerative colitis. This disease can lead to malnutrition and malabsorption, with malnutrition affecting patients with both UC and Crohn's, and malabsorption typically only seen in those with UC. These issues may require nutritional support for individuals with IBD.

Ulcerative Colitis: It causes ulcers (sores) and inflammation in your gastrointestinal tract. Ulcerative colitis affects the lining of your large intestine, also known as the colon, and the rectum. There are five main types of UC:

- Ulcerative proctitis.
- Proctosigmoiditis.
- Left-sided colitis
- Pancolitis
- Acute severe UC (fulminant colitis).

Symptoms:

- Diarrhoea with blood or pus
- Bowel movements that are frequent and urgent
- Pain and cramps
- Fever
- Nausea and vomiting
- Dehydration
- Anaemia



CROHN'S



COLITIS



Crohn's disease: It is an inflammatory disease that affects the entire gastrointestinal tract, resulting in tissue swelling (inflammation), which can cause abdominal pain, severe diarrhoea, exhaustion, weight loss, and malnutrition. Usually, rectal involvement is not common.

Causes:

IBD can be caused by genetic, epigenetic, immunological, microbial, and environmental factors. Researchers have found that a lack of intestinal microorganisms during early childhood influences the development and tolerance of the immune system, thus increasing the risk of acquiring IBD as an adult.

Risk factors:

The most common risk factors for acquiring an IBD include:

- Smoking (CD)
- Urban living (CD and IBD)
- Appendectomy (CD)
- Tonsillectomy (CD)
- Antibiotic exposure (IBD)
- Oral contraceptive use (IBD)
- Consumption of soft drinks (UC)
- Vitamin D deficiency and (IBD)
- Non-helicobacter pylori like Enterohepatic helicobacter species (IBD)
- The fatty acid, omega 6, which is present in red meat, margarine, cooking oils, etc., increases the risk of ulcerative colitis. At the same time, it is also notable that eating fish, which contains Omega 3, is protective against IBD.

Requirement for nutrition in IBD patients:

As malnutrition is more frequent in IBD patients, various nutrient losses may occur in CD patients, such as:

- Vitamin B12 is depleted as a result of inflammation in the lower small intestine or the removal of that part of the intestine.
- Folate can be depleted due to the use of sulfasalazine, extensive inflammation in the jejunum, or removal of that part of the intestine..
- Vitamins D, E, and K can be depleted due to fat malabsorption, inflammation in large parts of the jejunum or ileum, or the removal of portions of these areas of the intestine.
- An increase in Vitamin A intake can raise the risk of fat malabsorption, particularly if the duodenum and upper jejunum are affected.
- Magnesium can be depleted due to extensive inflammation and removal of large portions of the jejunum and ileum, as well as through losses from fistulas and chronic diarrhoea.
- Zinc can be depleted due to extensive inflammation and removal of parts of the jejunum, as well as through losses from diarrhoea, fistulas, and the use of prednisone. Low blood levels of zinc can be an indicator of these losses.
- Calcium can be depleted due to avoiding dairy products in those who are lactose intolerant, fat malabsorption, the use of prednisone, extensive inflammation, or surgery that affects the entire small intestine.
- Potassium depletion can occur due to fluid loss, extended periods of vomiting and diarrhoea, and taking prednisone.

Consequences:

Such drastic depletion of macro and micronutrients may lead to several consequences such as:

- **Decreased bone strength:** due to a deficiency of vitamin D, it is a very common complication for people with IBD to have decreased bone strength, which can further put the patient at risk of fractures.
- **Growth delays:** This complication is usually seen in children with IBD who have chronic inflammation and malnutrition or have been on steroids for a long time.

The factors that determine malnutrition in IBD patients

The nutritional requirements arise from malnutrition in IBD patients, which are determined by various factors, such as:

- **Decreased intake** can be due to nausea, abdominal pain, vomiting, and diarrhoea. This can also happen with prolonged restrictive diets or hospitalisation.
- **Malabsorption** can happen due to impaired epithelial transport or integrity, bacterial growth or increased intestinal motility
- **Medications** such as steroids can impact as well
- **Increase energy expenditure** such as through bowel inflammation can lead to malnutrition
- **Gastrointestinal nutrient loss** through processes such as alterations of ionic transport, ulceration of bowel surfaces, and biliary salt diarrhoea are all factors that determine malnutrition.



Pathophysiology of malnutrition and sarcopenia in IBD:

When patients with Inflammatory Bowel Disease (IBD) are found to be malnourished, they often experience sarcopenia as a result. It's crucial to note that sarcopenia is not only a problem with protein, but it also decreases muscle mass and strength, leading to low physical energy and fatigue. Additionally, there may be issues with bones, muscles, and fat, with elevated levels of cytokines like leptin, resistance to bone resorption, etc.

Impact of malnutrition on IBD patients:

IBD patients who suffer from malnutrition may have a higher likelihood of postoperative difficulties and death. Nutritional risk becomes severe when there is a weight loss of over 10 to 15% within 6 months, a BMI below 18.5 kg/m², or albumin levels below 30 g/litre. Albumin is not just an indicator of malnutrition but also a component of systemic inflammation and infection, which are part of IBD, and its decrease can worsen the patient's prognosis, leading to higher morbidity and mortality rates. Hence, it is crucial to conduct nutritional screening, evaluation, and intervention and develop tailored nutritional therapy plans for each patient before surgery, as their needs can differ. For patients with Crohn's disease, the dietitian should concentrate on malabsorption, while malnutrition should be the primary concern for patients with ulcerative colitis. This will help improve the outcomes for those with severe nutritional risk.

Nutritional Diagnosis:

Nutrition diagnosis is the critical link between nutrition assessment and nutrition intervention:

To recognise the dietary needs and triggers in an IBD patient, it is essential to conduct an analysis. There are a few different ways in which the dietary plans for patients suffering from IBD are been performed;

These may be according to the following procedure:

- ADIME: assessment, dietary intervention, monitoring, and evaluation

- **Food diary:** Patients can take an active role in managing their diet by keeping a food diary and consulting with their doctors. By providing information about what they eat, when they eat, and any symptoms they experience, including the timing of those symptoms, the doctor can quickly identify the triggers and provide support. Once the patient becomes aware of the triggers and their timing, they can effectively manage their IBD symptoms
- **Food Frequency Questionnaire:** Another way to assist the patient is by giving them a Food Frequency Questionnaire, which can help determine the symptoms and their timing.

Nutritional assessment in IBD:

There are also several tools that dieticians are provided with for conducting a nutritional assessment in patients suffering from IBD. These tools include:

- **MUST:** This tool analyses BMI, unplanned weight loss in the past 3-6 months and an acute disease effect score.
- **MIRT:** This tool measures the same parameters such as BMI, unplanned weight loss and CRP.
- **NRS:** This includes reduced dietary intake in addition to BMI, unplanned weight loss and ICU admission status. However, this has only been validated in patients.
- **Sask IBD and NRT:** There is a new tool called the Sask IBD and NRT that evaluates patients' histories of GI symptoms and food restrictive behaviours and commonly contains screening questions about weight loss and poor oral intake. The Sask IBD and NRT do not capture disease severity and are reliant only on nutrition-specific data points to assess the risk.

Nutritional evaluations are crucial as malnutrition in IBD can be related to inflammation and secondary malabsorption even when food intake is not reduced. A comparison of the sensitivity of different screening tools with the GLIM criteria for malnutrition diagnosis shows that the specificity is higher than sensitivity.

Goals for nutrition support:

A dietitian's objectives for each IBD patient are unique as their nutritional requirements can vary. For patients with UC, the focus is on preventing and correcting dehydration, hypokalemia, sarcopenia, electrolyte deficiencies, etc. For patients with CD, the priorities are promoting growth and development, preventing micronutrient deficiencies and improving tolerance to diet, preventing weight loss, and addressing sarcopenia.

The PES (problem, aetiology, and symptoms) will vary for each patient. For instance, a patient with an ileostomy may experience inadequate total energy intake, malabsorption, and dehydration, which can manifest as weight loss, hair loss, dark urine, protein deficiency, etc.

Some of the common nutritional goals for any patient suffering from IBD can be divided into short-term and long-term goals.

- **Short-term goals:**
 - Reduce stomal output
 - Prevent dyselectrolytemia
 - Prevent further weight loss
 - Prevent and manage nutritional inadequacies
 - Prevent the development of AKI
- **Long-term Goals:**
 - Promote healthy weight gain
 - Prevent the loss of muscle mass and sarcopenia
 - Prevent readmission
 - Improve the quality of life
 - Decrease stomal output
 - Prevent dyselectrolytemia
 - Prevent further weight loss
 - Prevent and manage nutritional inadequacies
 - Prevent the development of AKI
 - Reduce LOS

In order to meet these objectives, it is necessary to continuously monitor the patient's nutritional needs. IBD patients may have different energy requirements compared to healthy individuals.



Typically, the calorie intake for IBD patients is similar to that of a healthy person because they are not as physically active and do not need additional calories. However, as the BMI decreases, the calorie needs will increase. Once the patient is in remission, they can return to a normal calorie requirement.

Estimated energy needs based on BMI:

1. <15 : 36-45 kcal/kg
2. 15-19 : 31-35 kcal/kg
3. 20-29 : 26-30 kcal/kg
4. >30 : 20-25 kcal/kg

Nutritional Support in IBD patients:

The period around a patient's surgery is referred to as the "perioperative period" and typically covers admission to the hospital, the stay, the surgery itself, the recovery, and discharge. IBD patients who have nutritional needs during this time may receive nutritional support if they are unable to maintain oral intake at 60-75% or higher of the RDA for more than 10 days.

It is important to remember when the patient is on glucose saline oral intake and if this saline contains more potassium there could be a risk of hyperkalaemia.

Nutritional support may be given to a patient in several ways or a combination of these methods, such as:

- **Oral nutrition supplements (ONS):** These are minor supportive therapy which is provided to supplement the normal diet. It is usually the first step taken in patients who require artificial nutrition.
- **Oral feeding:** Oral feeding can be done in two ways, namely:
 - **Enteral nutrition (EN):** This uses formula or liquids that are fed to the patients
 - **Parenteral nutrition (PN):** This nutrition is given through an IV line directly into the patient's blood.

Nutritional support is especially important for surgical patients with CD as there is a risk of postoperative complications such as stomal high output, or even mortality.

If malnutrition is found in an IBD patient prior to surgery, it should be postponed for 7 to 14 days if possible and the patient should receive intensive artificial nutrition during that time. However, if there are complications that require immediate surgery, the patient should start receiving artificial nutrition as soon as possible after the operation.

The advantage of particular formulations:

There are various advantages of artificial nutrition formulations which may differ for different patients, such as:

The standard elemental formula (EN) with a moderate fat content and no specific supplements should be the first choice for IBD patients. If they can tolerate it, they can then switch to other formulations, but if not, they should be given a supplemental elemental formula. If adult patients cannot tolerate the adult semi-elemental formula, they may be placed on a paediatric semi-elemental formula.

Also, on occasions when the patient can consume very small amounts of nutrition orally, a surgeon can put a PEG on the patient, making it easier to feed them through it, and they can administer the remaining nutrition orally.

- Specific formulations or substrates such as glutamine or omega-3 fatty acids are not recommended in use with EN or PN in IBD patients.
- Usually, these formulations can be given as enteral (EN) or parenteral (PN) nutrition. EN is always preferred before PN or a combination of both for patients in whom >60% of energy needs need to be met via EN.

It is important to remember that PN, especially in perioperative periods, should always be supplementary to EN unless there is a real contraindication, such as:

- If it is impossible to feed enterally (absence of access, severe vomiting and diarrhoea) or there could be a contraindication such as an anal fistula, an obstructed bowel, or a severe shock.
- If oral or tube feeding is not sufficiently possible, for example in the case of GI tract dysfunction or CD patients with short bowel.

ERAS - Preoperative Carbohydrate Loading:

It's crucial to keep in mind that the Enhanced Recovery After Surgery (ERAS) protocol can cause fluctuations in blood sugar levels and decreased insulin sensitivity in patients with diabetes. As such, it must be administered carefully to these patients with consideration for their metabolic and safety needs. Normal feeding should be resumed quickly once the patient is stable in order to minimise the risk of postoperative infections and facilitate a quicker recovery. To address any deficiencies in micronutrients, it is necessary to regularly assess the patient for specific deficiencies and correct them in accordance with established guidelines.

Anaemia in IBD patients

It is common to see cases of anaemia related to ulcerative colitis and Crohn's disease. If the patient's haemoglobin level falls below 10 g/dL, oral iron supplements may be prescribed if they are well-tolerated. If not, intravenous iron may be considered. While dietary changes can have positive results, it is not enough to rely solely on dietary supplements for patients with haemoglobin levels lower than 10 g/dL.

CASE STUDY:

Patients with CD who underwent surgery and had high output were studied. The complications seen in the patient due to a high output ileostomy are:

- Low urine output
- Dehydration
- Electrolyte imbalance
- AKI
- CKD
- Dialysis
- Fatigue
- Frequent leakages
- Peristomal skin complications
- Social isolation
- Reduced physical activities
- Depression

Dehydration and malnutrition can result from having an ileostomy and are connected to longer hospital stays and repeated admissions.

The patient lacked a dietician and was given an imbalanced solution instead. They were unaware of the proper diet recommendations for a high-output stoma patient, which include guidelines for maintaining a balanced diet.

- It is recommended for stomal high-output patients to consume less than 500ml of fluid per day and to have a 2.5 to the 3-hour gap between drinking liquids and consuming solid meals.
- The patient was advised to incorporate boiled bananas, boiled potato, etc. in their diet to decrease the amount of stomal output and form a more solid stool.

These patients were advised to receive an intravenous fluid infusion daily to prevent the need for dialysis. The reduction in stomal output was not enough to prevent dehydration.

FOOD TO INCLUDE

FOODS THAT MAY HELP DECREASE ODOR:

- Buttermilk
- Cranberry Juice
- Yogurt
- Parsley

FOODS THAT MAY HELP THICKEN STOOLS:

- Applesauce
- Banana, strained or flakes
- Boiled Rice
- Cheese
- Creamy Peanut Butter
- Pasta
- Tapioca

It's important to note that for patients with high stomal output, the use of hypertonic or hypotonic solutions is not recommended as it may worsen the stomal output and lead to dehydration.

Dietary suggestions:

1. Add more complex carbohydrates and avoid simple sugars.
2. Avoid sugar alcohols in liquid medicines and sugar-free diabetic foods.
3. Add adequate amounts of salts to the diet.
4. Drink smaller amounts of fluids, sip between meals, and avoid hypertonic and hypotonic fluids.

FOODS TO AVOID

FOODS THAT MAY CAUSE GAS

- Beer
- Brussels Sprouts
- Cauliflower
- Cucumbers
- Carbonated Beverages
- Dairy Products, if you are lactose intolerant
- Broccoli
- Cabbage
- Onion
- Dried beans, peas, lentils

HIGH FIBER FOODS THAT MAY CAUSE BLOCKAGES

- Celery
- Coleslaw
- Dried fruits
- pineapple
- Skins (apple, potato)
- Seeds
- Coconut
- Corn
- Nuts
- Popcorn

FOODS THAT MAY CAUSE YOUR STOOLS TO HAVE A STRONGER ODOR

- Asparagus
- Brussels Sprouts
- Dried beans, peas and lentils
- Eggs
- Garlic
- Onion
- Beer
- Cabbage
- Fish
- Green pepper





Recommended Guidelines:

- Restrict hypotonic fluid (water, tea, coffee, fruit juices, alcohol or dilute salt solutions) to 0.5-1.0l/24 hours.
- To meet the fluid requirement, the patient is encouraged to drink a glucose-saline rehydration solution.
- For patients with marginally high stomal output (1-1.5 L), a combination of mild oral fluid restriction (less than 1.5 L per day) and the addition of salt to their diet may be beneficial.
- If an oral/enteral liquid feed is given, it aims to be iso-osmolar (300 mmol/ kg) and have a sodium concentration of 90-120 mmol/L.
- When stoma losses are in the range 1200-2000mL, or sometimes more, patients can maintain sodium balance by sipping on other glucose-saline solutions (sodium concentration 90-120 mmol/L) or salt capsules; and if hypomagnesaemia gives magnesium supplements.

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Dietary Approach in COPD: Mandate



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COPD is a preventable and treatable disease characterised by persistent respiratory symptoms and airflow limitation caused by airway and or alveolar abnormalities, which are usually caused by prolonged exposure to noxious or gaseous particles.

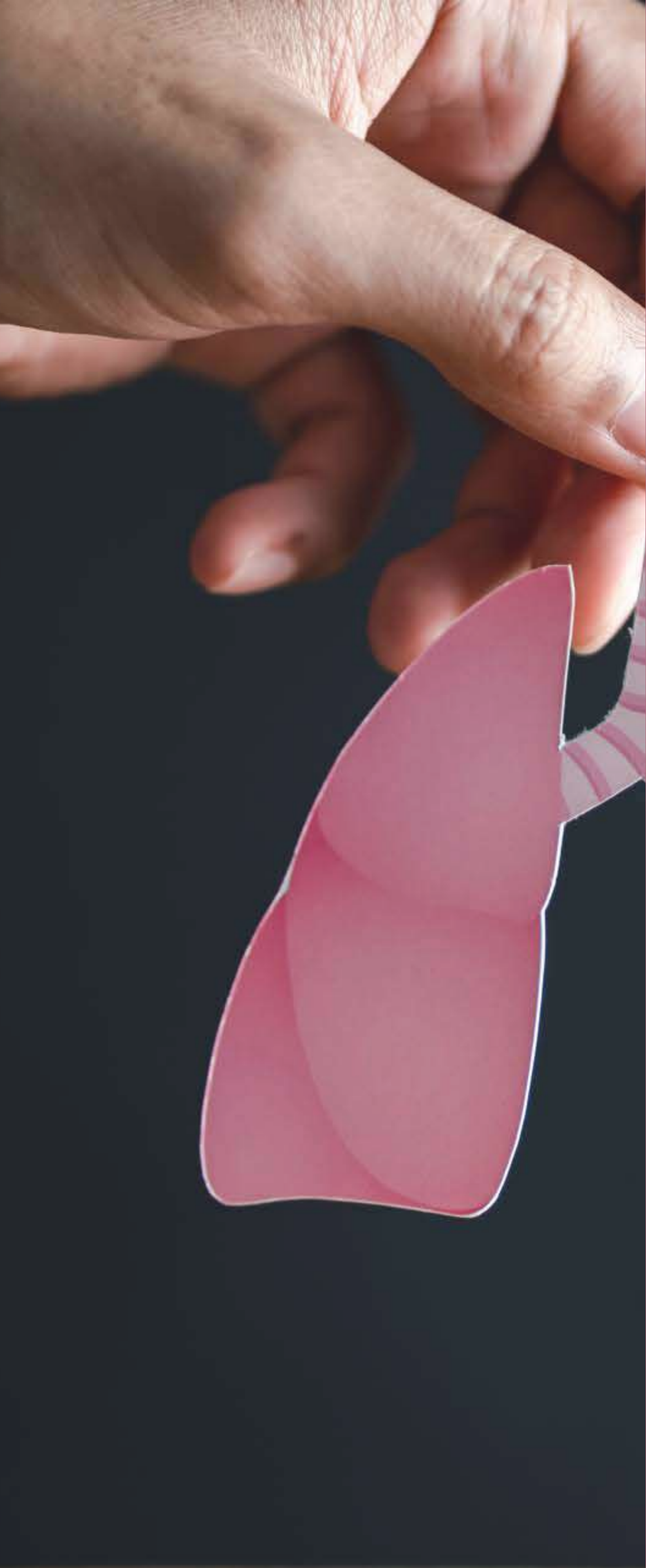
There are two main forms of COPD are:

1. **Chronic bronchitis:** It is characterised by changes in the airway passage and can be seen as:
 - a. Inflammation
 - b. Mucus hypersecretion
 - c. Airway narrowing
 - d. Infiltration by immunocytes/ inflammatory cells
2. **Emphysema:** It involves the narrow passages of the alveoli. The features are:
 - a. Breakdown of lungs' elastic structure
 - b. Loss of elastic recoil
 - c. Destruction of alveolar walls
 - d. Air trapping

Epidemiology:

As per the Global Burden of Disease (GBD) study report 2019, COPD is the third leading cause of death in the world, with 3.23 million deaths in 2019. It was responsible for 6% of all deaths worldwide in 2019. Another report showed that currently, about 480 million people in the world are living with COPD making it the seventh leading cause of years of life lost. In India, the scenario is much worse as according to a 2019 report, it is the second leading cause of death. The total number of deaths caused by COPD has reached 9% of all deaths in the country. 37.8 million people in India are currently living with COPD, of which 3 to 8% are men and 3 to 5% are women.





Causes:

Multiple factors are causing COPD, which are:

- **Genetic elements:** there is an Alpha1 antitrypsin deficiency in the genes of COPD patients.
- **Environmental factors:** Environmental factors can both cause and exacerbate the condition of COPD. These factors can be further divided into:
 - **Outdoor pollution:** Light pollution from vehicles and industries, exposure to toxic gases
 - Indoor pollution: like particulate matter, biomass smoke, allergens, smoking, passive smoking etc
 - **Other factors:** There may be certain other factors such as occupational exposure, tuberculosis, childhood asthma, respiratory infections or low birth weight which may influence COPD.

Symptoms:

The major symptoms include:

- Chronic Progressive dyspnea: this indicates difficulty in inbreeding or shortness of breath
- Persistent cough
- Excessive sputum production
- Wheezing and tightness in the chest are usually non-specific and may vary.

Diagnosis:

It includes the identification of risk factors and symptoms. This is primarily followed by a spirometry test. Other tests that may be conducted include:

- Arterial blood gas analysis
- Alpha one antitrypsin level
- CT scan of the thorax
- Sputum culture
- ECG

Effects of COPD:

COPD can cause a myriad of effects on a person. These effects not only have local consequences, but they can also cause a system infection.

Local effects: These effects are observed or experienced in the respiratory system, such as:

- Airflow obstruction
- Air trapping leading to hyperinflation
- Dyspnea
- The abnormal gas exchange like hypoxaemia, hypercapnia
- Pulmonary arterial hypertension



Systemic effects: These are more dangerous as they go beyond the respiratory system, affecting other organ systems. These can lead to:

- Oxidative stress
- Activated inflammatory cells such as neutrophils lymphocytes
- Increase plasma levels of cytokines and acute-phase protein
- Skeletal muscle dysfunction: it can lead to:
 - Loss of muscle mass
 - Abnormal structure and function of the skeletal muscles
 - Exercise limitations
- Nutritional abnormalities and weight loss: it can lead to:
 - Increased resting energy expenditure;
 - Abnormal body composition
 - Abnormal amino acid metabolism
- Other potential systemic effects are:
 - Cardiovascular effects such as corpulmonale
 - Osteo Skeletal effects

Nutritional or diet components in COPD patients:

When it comes to nutritional factors in COPD patients, it has been observed that malnutrition is a common problem seen in patients with COPD but is often underdiagnosed because it is a diagnostic blind spot that most healthcare professionals overlook.

It is very rare to find stable COPD patients who are referred to a dietician because only patients with comorbidities such as diabetes or hypertension are referred to a dietitian to manage their nutritional requirements.

As a result, these patients are not given appropriate nutritional supplements unless they develop cachexia or a severe loss of weight or muscle mass.

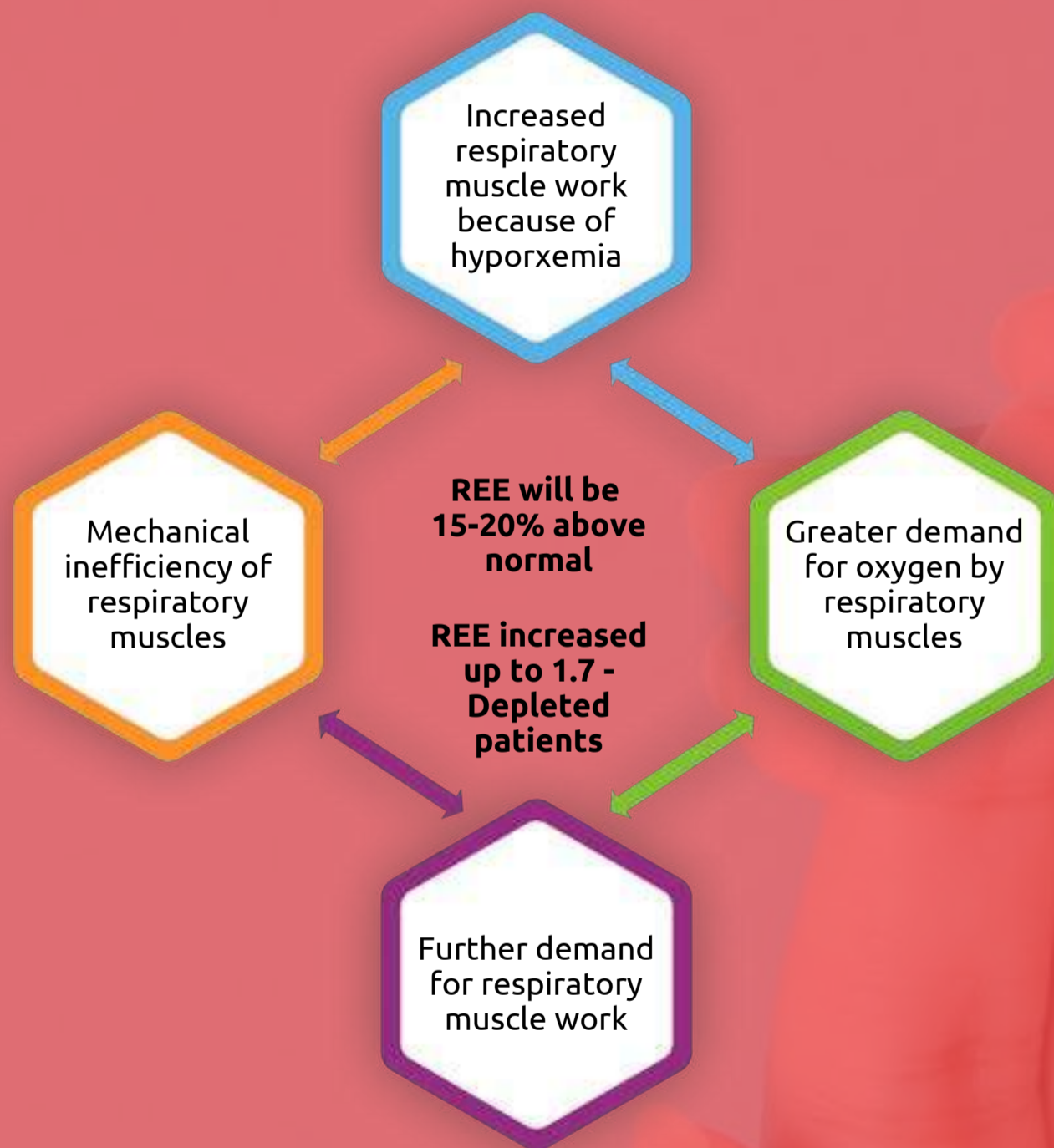
Statistical data show that over 20–45% of COPD patients have shown severe weight loss, which was due to a lack of nutritional supplements provided to them in the early stages.

It has also been observed that in patients with mild to moderate COPD, 20% have low skeletal muscle mass, and 40% have low skeletal muscle mass. Cachexia is observed in 10–15% of patients with moderate COPD and 50% with severe COPD. Overall, if one analyses the prevalence of malnutrition, data show that it affects 30 to 60% of inpatients and 10 to 45% of outpatients.

COPD and malnutrition:

COPD does not always result in nutritional deficiencies, as has been observed in obese, overweight, normal-weight, and underweight patients. It particularly depends on the phenotypic nature of the disease; for example, in emphysema, the patients are mostly seen to be more prone to being cachectic, whereas, in bronchitis, the patients usually have normal to overweight bodies. This is because there is mechanical insufficiency of respiratory muscles, which increases the need for muscle work because of hypoxemia, which increases the demand for oxygen by respiratory muscles. With a higher expenditure of energy, higher nutrition is required. In patients with COPD, the resting energy requirement is generally 15 to 20% above normal in normal-weight patients, whereas in depleted patients it can be as high as 70%.

Increased resting energy expenditure



Fatigue of Chest Muscles is one of the important reasons for using accessory muscles for breathing

Therefore, not all COPD patients require nutritional supplements. Some of these patients may rather require a reduction in food or nutrient intake to avoid their symptoms worsening.



Some patients who may suffer from fatigue during eating, early satiety, loss of appetite, depression due to the disease, dyspnea, and the inability to perform routine activities may experience serious reductions in food intake. This may necessitate the provision of nutritional supplements.

Metabolically, malnutrition creates a negative nitrogen balance. This is because energy intake is down but the muscles need to work, thus using up the most amino acid pools. Moreover, the ongoing inflammation in a COPD patient also requires the degradation of amino acid pathways.

Many vitamins and minerals might also need to be supplemented because the patients frequently use corticosteroids, which are prescribed for treating inflammation. This risks the depletion of vitamin D and other micronutrients.

OUTCOMES OF MALNUTRITION:

Nutritional supplements are vital for any patient as they may face several consequences as a result of malnutrition, some of which are:

- Reduced muscle strength
- Reduced respiratory muscle function
- Decreased Exercise capacity or tolerance
- Reduced immunity
- Longer hospital stays
- More frequently readmissions
- Increased Healthcare cost

Identifying and quantifying malnutrition:

Since the requirements for nutritional supplements for COPD patients vary according to their conditions, the dietician relies on various parameters to quantify and identify malnutrition, which are:

- Anthropometry: This parameter includes height, current weight, weight history, BMI, history of weight loss, and body composition.
- Biochemical data, medical tests and procedures: this includes,
 - visceral protein assessment
 - immunocompetence
 - haematological assessment
 - electrolytes, pH, glucose, arterial blood gases
- History (personal, patient, family, medical and social): Medical diagnosis, economic status, support system, education, and psychological status are all included in this parameter. Along with that, medications such as corticosteroids are also taken care of.



In the picture below, there is a scanned image of body composition, so the yellow component indicates fat mass and the red one indicates fat-free mass. It can be seen that patient C has the most muscle mass, whereas patient A has the least muscle mass. This cannot be measured with a simple BMI measurement, so a separate measurement with a valid procedure such as a bioelectrical impedance analysis can help evaluate the changes. It is essential because these diseases are progressive, and the progressive deterioration of body mass needs to be monitored by a dietitian.

Importance of monitoring the nutritional requirements of COPD patients:

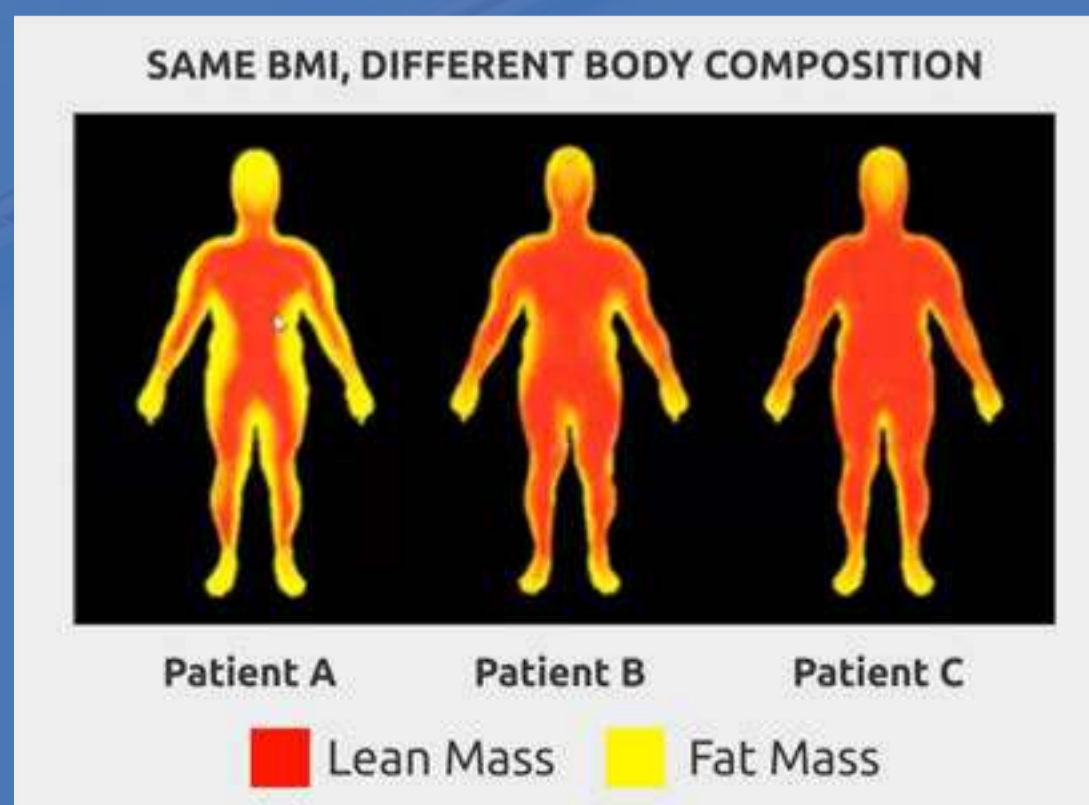
COPD is a progressive degenerative disease, which if not kept in check, can rapidly degrade a person's health conditions. This holds for the nutritional requirements of the patients, too. A patient must be constantly monitored for their nutritional requirements, as they may vary during the disease. Below mentioned are the data that highlight the importance of the same.

- In about 18% to 36% of COPD patients, muscle mass loss has been seen, which is responsible for weight loss.
- Muscle wasting occurs in 6 to 21% of normal-weight patients.

Standard screening or assessment tools used in identifying body mass loss:

Once we understand the importance of constant monitoring of nutritional requirements, we must also understand how dieticians monitor the same. Several tools monitor the body mass loss of a COPD patient, the results of which can be used to determine if their nutritional supplements need to be changed. Some common tools that are used are:

- **MUST:** Malnutrition Universal screening tool
- **SGA:** Subjective Global assessment
- **PG SGA:** Patient-generated subjective Global assessment
- **NRS:** Nutrition risk screening tool (2002)
- **MNA:** Mini Nutritional Assessment



OPTIMAL NUTRITION STRATEGIES

REPLETION & MAINTENANCE OR mind weight loss in OBESE



CASE STUDY

Nutritional diagnosis examples that have been observed in different COPD patients: The following patient studies are mentioned about their problem, aetiology and symptoms:

- In early satiety and COPD patients, involuntary weight loss has been seen that is related to problems with breathing and swallowing and inadequate intake of calorie-dense food. This condition has been seen to lead to more than 10% weight loss in 6 months and fatigue and meal times.
- Inpatient protein, intake inadequate protein intake has been seen as related to early satiety and food knowledge deficit as evidenced by lab values of protein 5.8g/dL, albumin 3.3g/dL, MAC of 50%, and 24-hour recall and current protein intake of less than 30 g per day

The goals and nutrition care for COPD patients:

The main goal of the dietitian for a COPD patient is repletion and maintenance, which are needed for normal and underweight patients, while mild weight loss is needed for obese patients. The major focus will be to provide:

- Complete and balanced nutrition, which is much more than just protein.
- Support protein in pairing by providing adequate macronutrient support
- Support body functions by providing adequate micronutrients
- Support muscle by providing protein supplements

To achieve these goals, the patients are first analysed for their energy requirements, which can be evaluated by various equations, such as:

- Indirect calorimetry
- Prediction equations such as Harris-Benedict, Mifflin St Geor equation, etc.
- $TER = REE * AF * DF$
- DF for COPD is equal to 1.2 - 1.3, up to 1.5 in depleted patients
- Jeffrey A. Moore and Vito. A. Angellilo for moderate to severe COPD patients

After estimating the energy requirements, it is very important to remember not to overfeed the patients, as more nutritional provision will increase the production of carbon dioxide. The dietitian can gradually increase the provision of nutrition for these patients based on the patient's respiratory symptoms, changes in the respiratory system, and the traditional impact on these symptoms.

ANTIOXIDA



LOW CAL

MINERALS

The commonly followed parameters by the dietician concerning various macro and micronutrients are as follows:

PROTEIN: RQ=0.8

The minimum amount of protein required for lean body mass, supporting muscle function, and protein synthesis is 1.2-1.7 g/kg of body weight, and at least 1.5 g/kg for patients who are having progressive weight loss and depleting body mass.

CARBOHYDRATES: RQ= 1.0

Although carbohydrates should be provided in higher concentrations, much of the literature supports a lower carbohydrate diet because more carbohydrate leads to more carbon dioxide production, and more carbon dioxide production requires more muscle work. In normal patients, the ideal amount of carbohydrates is 55 to 60% and 20 to 30 grams of fibre per day.

FATS: RQ= 0.7

Many studies in the literature support a high-fat diet, especially when the patient is on enteral nutrition. Usually, 20 to 30% of total calories should be fat, considering there is no compromise made on satiety. It is also essential to limit trans-fat and saturated fat.

WATER:

The average requirement for water is 30 to 50 ml per kg of body weight; this can be altered depending on age, and pulmonary cor pulmonale.

VITAMINS: RDA

Vitamins play an important role as anti-inflammatory and antioxidant agents. A diet rich in vitamins can boost the antioxidant pool.

MINERALS: RDA

Maintaining an RDA is sufficient for stable patients. But patients who are already depleted, admitted for a long term, and have aggravated symptoms may have the requirements for higher amounts of minerals such as calcium, phosphorus, magnesium and vitamin D.

Depending on the patient's specific requirements, certain functional foods, such as nutraceuticals can also be added to their diet to enhance their anti-inflammatory and antioxidant profile. This provides a protective effect rather than a treating effect. Many food combinations containing phytochemicals such as curcumin, flavonoids, polyphenols etc. have shown positive associations in lowering inflammatory levels but one must ensure that these are only administered to stable patients.

Nutritional counselling:

Many patients who suffer from early satiety, nausea, and diarrhoea may not follow a very strict diet or may develop a fear of food. Therefore, nutrition counselling is the most essential and final step of intervention, in which the patient is told to:

- Avoid overeating
- Avoid foods that cause gas or bloating such as carbonated beverages, fried greasy or heavily spiced foods, beans, broccoli, cabbage etc.
- Encourage them to eat more slowly, have smaller bites and chew slower to avoid early satiety
- Plan for five or six small meals a day instead of three large meals
- Advice to rest before eating
- Consume nutrient-dense foods rather than consuming food with poor nutritional value, milkshakes with fruit versus carbonated beverages or chips
- Use of oral nutrition supplements

Nutritional counselling for dietary adaptation:

To ensure that the patients are not just eating enough food, but nutritionally balanced foods, counselling may be required. These sessions assist a patient in the following ways:

- Patients are usually asked to consume whole cereals and products because fibre is crucial in avoiding constipation and further avoiding worsening GI symptoms
- Add pulses to your meal but ensure to limit them if bloating is significant
- Vegetables and fruits combined up to five cups a day
- Milk can be consumed three cups a day based on the type of diet if the patient is vegan dinner, then they will require specific supplements
- Fish meat and poultry can be added which are low low-fat lean meats depending on the diet of the patient. If they're vegetarian it is essential to add specific supplements.
- Limit foods that are in taste or refrigerated
- Fats are essential in their diet especially a combination of MUFA and PUFA-rich oils
- Nutrition is ordered because it is necessary to meet the patient's nutritional needs and energy deficiency
- Monitoring and evaluation: since COPD is a long-term condition, therefore, dietary restrictions and supplementation should be constantly monitored. The monitoring and evaluation of the patient involves 3–4 sessions. These sessions involve:
 - Keeping a check of their weight and body composition changes more overtimes during compliance with di regime
 - The adequacy of nutrients that need to be met.
 - Monitoring the increase or decrease in their exercise capacity
 - Monitoring changes in symptoms such as respiratory and nutritional impact symptoms





Oral Nutritional Supplements (ONS)

For patients who may require additional supplements other than their regular diet, Oral Nutritional Supplements are very good options. ONS is a simple nutritional supplement that can be easily constituted, carried, and consumed.

ESPEN has recommended the consumption of ONS in small amounts to avoid postprandial apnea and satiety as these may be high-fat-containing pounds.

The main benefits of these include:

- Improve hand grip strength
- Improve weight
- Improve respiratory muscle strength
- Improve quality city of life
- Improve exercise performance
- Improve patients' nutritional intake
- Increase energy and protein without affecting dietary intake.

Most of the ONS are commercially available and therefore may not be economically feasible for people with poor socio-economic status; therefore, some oral supplements have been developed that are prepared from all consumed foods. These formulations were found to be 60–70% less expensive in terms of prices but equally effective as the commercial ones, as seen after 3 months.

Conclusion:

Patients who are suffering from COPD are frequently seen suffering from undiagnosed malnutrition. To avoid such a situation, routine nutrition screening and assessment can be carried out for patients at any time, as it is essential for identifying malnutrition and other nutrition problems. Once the nutritional requirements are known to the dietician, they can follow the optimal nutritional strategy, which is not just focused on protein quantity and quality but on complete and balanced nutrition by adding sufficient macro- and micronutrients. For nutritional supplements, the use of oral nutritional supplements has been reported to be an easy step to complete or meet nutritional targets for COPD patients.

Nutrition management in organ transplant



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It's true that the number of solid organ transplants has increased in recent years, but there is still a significant shortage of organs available for transplant. Despite the increase in transplants in India, the numbers are still far from meeting the demand. To address this shortage, it's important to raise awareness about the importance of organ donation and encourage more people to become donors. This can help save countless lives and improve the health and well-being of those in need of a transplant.

Types of grafting

- Autograft- e.g. skin grafting
- Allograft - e.g, human tissue or organ
- Isograft - e.g. between the twins
- Xenograft - e.g, porcine heart transplant
- Split graft - e.g. one - to two
- Domino transplant - e.g. heart and lung

Organ transplantation refers to the process of transferring human cells, tissues, or organs from a donor to a recipient in order to restore the normal functioning of damaged or non-functioning parts. There are several types of transplants, but the focus here is on organ transplants, which can be done either from a living or a deceased donor. A large percentage of patients seeking organ transplants, around 80%, are malnourished due to factors such as decreased dietary intake, symptoms of underlying diseases, anorexia, alterations in taste, and disruptions to digestion. This malnutrition often occurs prior to the transplant process.

The success of a transplant can be affected by the pre-existing malnutrition of the patient. This can lead to greater surgical blood loss, the need for blood transfusions, prolonged stays in intensive care units, a higher risk of infection, and increased mortality rates. Patients may also experience post-transplant nutritional deficiencies.

The following are the reasons for the requirement of nutritional value:

- Inflammation
- Recovery from a major infection
- Increased work on breathing

Due to these the need for nutrients is more.

Macronutrient Disturbance

Carbohydrates	Protein - negative b balance	Lipids - increased fat oxidation
Low glycogen stores - Hypoglycaemia	Gluconeogenesis	Lipolysis
Insulin resistance - postprandial Hypoglycaemia	Decreased synthesis	Malabsorption - fat soluble vitamin deficiency
	Increased catabolism Increased AAA/BCAA ratio	Associated pancreatic insufficiency

The requirement for increased amounts of carbohydrates, calories, and protein is necessary due to the high metabolic and gluconeogenic activity taking place in the body. This disrupts macronutrient metabolism and leads to micronutrient deficiencies, particularly concerning vitamins, minerals, and trace elements, including those found in fat-soluble vitamins like Vitamins A, D, E, and K.

In some cases, a lack of micronutrients can also occur due to inadequate absorption. Deficiencies in zinc, iron, calcium, magnesium, selenium, and copper are very common during the pre-operative period.

Micro Nutrient Disturbance

Fat soluble vitamins	Water soluble vitamins	Trace elements
Vitamin A deficiency	Associated Malabsorption	Zinc deficiency
Vitamin D		Iron
Vitamin F		Ca/Mg (Vitamin D and fat binding)
Vitamin K		Selenium deficiency (cardiomyopathy) Cu/Mn (Basal Ganglia deposition)



Post-operative stage - first two weeks

In pre-transplantation, the patient can experience a catabolic state because of various factors such as malnutrition before the procedure, the functioning of the transplanted organ, stress from the surgery both physically and mentally, immunosuppression, organ malfunction, and even infections like sepsis.

Nutritional goals:

- To correct malnutrition in the patients
- Prevent metabolic complications from occurring
- Improve the quality of life (this is the most important goal as the aim of any treatment is to give a better life to the patients)
- Reduce Perioperative complications
- Nutritional education - individualised care plan (during the hospital stay and even after the discharge)

Both the patient and their family members need to understand the type of nutritional therapy being administered to the patient, whether it be oral nutrition supplements, enteral nutrition supplements, or total parenteral nutrition. If the patient is unable to comprehend this information, it should be communicated to their relatives.

The nutritional care pathway is as follows:

- **Screening:** Conduct a validated nutrition assessment for all patients upon admission to the hospital using a recognized tool.
- **Assessment:** Conduct a validated nutrition evaluation for all patients who have been identified as being at risk for malnutrition using a reputable tool.
- **Diagnosis:** Record the nutrition diagnosis for all patients who have been identified as suffering from malnutrition.
- **Care Plan:** Create a nutrition care plan for all patients who have been identified as suffering from malnutrition or at risk of malnutrition.
- **Intervention Implementation:** Carrying out a nutrition care plan, including therapy, for all patients who have been identified as suffering from malnutrition or at risk of malnutrition.
- **Monitoring/Evaluation & Discharge planning:** Implementation of processes including discharge planning that provide ongoing monitoring and support the care of patients identified as malnutrition or at risk for malnutrition



Post-transplant nutritional care guidelines

There is a scarcity of Indian guidelines for post-transplant nutritional care. Even international guidelines are limited in number. Although there are some older guidelines, there is a lack of updated guidelines currently.

ASPEN, ESPEN guidelines are as follows:

- It is necessary for patients on the transplant waiting list to undergo regular evaluations of their nutritional status and receive expert dietary advice. Once a patient is selected from the waiting list for a transplant, they should receive preoperative nutritional care, including proper nutrition counselling, which will help improve their nutritional status as they wait for the transplant to take place.
- The guidelines for both the living donor and recipient are similar to those for patients undergoing major abdominal surgery. Malnutrition plays a significant role in affecting the success of the transplant. If a patient is found to be malnourished, the doctor need to have a conversation with them to determine if they are unable to eat or if there are other related issues. These patients will then be admitted to the hospital and receive prompt nutritional support, ideally in the form of enteral nutrition. They will be gradually transitioned to an oral diet to help them achieve the desired level of nutrition.
- Malnutrition has a significant impact on the outcome of transplantation, making proper nutrition crucial. In cases of malnutrition, the use of supplementary oral nutritional supplements (ONS) or enteral nutrition (EN) is recommended.
- Following liver, pancreas, and kidney transplantation, it is recommended that patients resume normal food intake or start enteral nutrition (EN) within 24 hours if their ventilation time is within the normal range of 6 to 7 hours. An oral diet is the preferred option. However, in 80% of cases, patients require ventilation for more than 24 hours, in which case the doctor will initiate EN nutrition. Early initiation of enteral nutrition is crucial.
- Even after transplantation of smaller organs, enteral nutrition (EN) can be started early, but with caution, during the first week, potentially within 24 to 48 hours.
- Continuous feeding is an easy method to provide nutrition
- In cases of intolerance, polymeric feeds or semi-elemental feeds can be used. If needed, enteral nutrition (EN) and parenteral nutrition (PN) can be combined. For all types of transplant patients, long-term nutritional goals and expert dietary counselling are recommended.
- It is recommended to transition to oral feeding if it can be tolerated, after receiving enteral feeds.



Screening as per Nutrition, NRS, 2002, ESPEN Guidelines

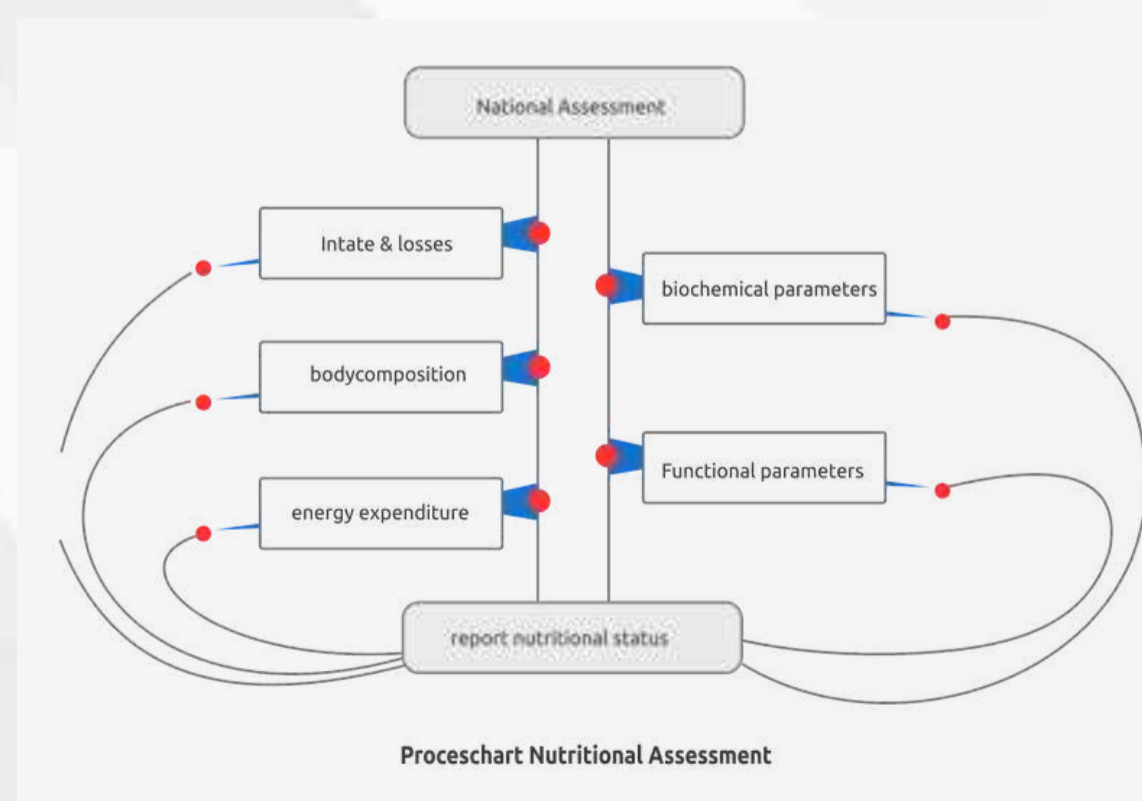
The most common tools used in India and across the globe for screening are NRS and ESPEN. There are other tools as well and you can use any of them.

Initial screening		Yes	No
1.	Is BMI =20.5		
2.	Has the patient lost weight within the last 3 months?		
3.	Has the patient had a reduced dietary intake in the last week?		
4.	Is the patient severely ill? (e.g, intensive therapy)		

Yes: If the answer is "Yes" to any question, the screening of next questions will be performed
 No: If the answer is "No" to all the question, the patient is re-screened on weekly interval.

Complete nutritional assessment preoperative and post-operative

The preoperative assessment may not be sufficient as there may have been changes during the transplant, so a thorough assessment must be conducted post-transplant. It is crucial to take into account any changes that may have occurred during the procedure. This is why the doctor must reassess the patient. ABCD is a comprehensive method of nutritional assessment, while the hand grip method is a newer approach that is gaining popularity among healthcare professionals and has been shown to be useful in many studies. It measures the strength of hand muscles. In addition to this method, tools such as MRI and CT scans can be used to assess body composition, which is valuable information in the nutritional assessment process. Healthcare providers should utilise all available tools.



Body Composition Measurements

Body Mass

LBM - Body Mass which contains a small % (~3%) of essential fat

[Essential fat + Muscle + Water + Bone]

Fat-Free Mass (FFM)

Fat Store:

Essential Fat for physiological function, such as fat stored in muscle, liver and heart.

Storage fat in adipose tissue - visceral fat and subcutaneous fat. Low skeletal muscle mass is an independent predictor of Mortality in critically ill patients,

How is the Assessment of malnutrition performed?

The Subjective Global Assessment is the most commonly used tool for this purpose.

Healthcare professionals prefer the hand grip method as it is both easy and reliable. While the Nutric score has also been used, it is more time-consuming and does not provide a full picture, making the Subjective Global Assessment the preferred option.

Subjective Global Assessment is used because:

- Valid assessment tool
- Strong correlation with subjective and objective measures of Nutrition
- Highly predictive of nutritional status in several different patient groups
- Quick, simple and reliable

In the combined recommendations for all types of transplants, most guidelines suggest a protein intake ranging from 1.3 to 2 grams. However, it should be noted that these recommendations are based on guidelines from 2014 and 2015 and that there are no recent guidelines specifically for transplants. All the recommendations state that patients should receive high amounts of protein in the immediate aftermath of the transplant and throughout the recovery period, which usually lasts 3 to 6 months. In the long term, they should consume a normal amount of protein, which is approximately 1 to 1.2 grams.



	Kidney	Liver	Heart	Lung	Pancreas
Protein Short term	1.3 to 2.0 g/kg (Higher levels for dialysis)	1.5 to 2.0 g/kcal	1.3 to 1.5 g/kg 2.5 gm/kg (Infection,)	1 to 1.5 g/kg (Maintenance) 1.5 to 2 gm/kg (repletion)	1.3 to 1.5 g/kg
Long term	0.8 to 1.0 g protein/kg	0.8 to 1.0 g protein/kg	1.0 to 1.3 g/ kg	1.0 to 1.3 g/kg	0.8 to 1.0 g protein/kg
Kilocalories Short term	30 to 35 kcal/kg	30 to 35 kcal/kg	35 kcal/kg	35 kcal/kg	30 to 35 kcal/kg
Maintenance	25 to 30 kcal/kg or adequate to maintain desired weight	25 to 30 kcal/kg	25 to 30 kcal/kg	25 to 30 kcal/kg	25 to 30 kcal/kg
Fat Short term	30 to 50% non protein kcal	25 to 35% non-protein kcal, <300 mg cholesterol, 7 to 10% calories from saturated fat	<30% Kcal, <300 mg cholesterol, <10% calories from saturated fat	<30% Kcal, <300 mg cholesterol, <10% calories from saturated fat	30 to 50% non protein kcal
Maintenance	<30% total kcal, <300 mg cholesterol, 7 to 10% calories from saturated fat	25 to 30% total calories <300 mg cholesterol, <7% calories from Saturated fat	<300 mg cholesterol, 7% to 10% calories from saturated fat	<300 mg cholesterol, 7% to 10% calories from saturated fat	<300 mg cholesterol, 7% to 10% calories from saturated fat
Carbohydrates Short term	50 to 70%	50 to 70%	50 to 70%	50 to 70%	50 to 70%
Maintenance	45 to 50% total calories, 25 to 30 g fibre/day	50% non-protein kcal, 25 to 30 g fibre/day	50 to 60% total calories, 25 g fibre/day	50 to 60% total calories, 25 g fibre/day	45 to 50% total calories
Fluid	Ad Lib	Ad Lib	Ad Lib	Ad Lib	30 to 40 ml/kg/day or equal to output (bladder drainage)
Electrolytes & Minerals	No added salt, monitor potassium, phosphorus, Magnesium, 1000 to 1500 mg calcium	No added salt, monitor potassium, phosphorus, Magnesium, 1000 to 1500 mg calcium	No added salt, monitor potassium, phosphorus, Magnesium, 1000 to 1500 mg calcium	2-4 g sodium if hypertension or oedema, potassium, phosphorus, Magnesium, 1500 mg calcium	Additional sodium and bicarbonate (bladder drainage), monitor potassium, phosphorus, Magnesium. Supplement calcium
Vitamins	Supplements Vitamin D	400 to 1000 IU Vitamin D	400 to 1000 IU Vitamin D	No specific guidelines for Vitamin D	Supplement Vitamin D

Most transplant recommendations suggest that patients should receive 30 to 35 kilocalories for a period of 3 to 6 months, depending on their recovery. Later, the patient can receive 25 to 30 kilocalories. The patient's body weight must be taken into account, and for obese patients, the Adjusted Body Weight should be used. A common mistake is to use the Adjusted Body Weight to determine protein recommendations for obese patients. In liver and pancreatic transplantation, there is no need to reduce the fat recommendation. The amount of nutrients is gradually increased to reach the desired nutritional goals, so there is no need to be concerned about the amount of protein, carbohydrates, or fats.

Some healthcare professionals may prohibit fat consumption during liver and pancreatic transplants, however, this is not indicated by any guidelines.

If patients are able to consume oral nutrition supplements in conjunction with an oral diet, they can obtain most of their necessary nutrients from food alone. Enteral nutrition products typically contain adequate amounts of micronutrients, but special care must be taken to ensure that parenteral nutrition also provides sufficient micronutrients. According to the 2020 guidelines, for a liver transplant, it is essential to provide pre-operative nutritional care for the patients. It also suggests 30 to 35 kilocalories and 1 to 1.5 grams of protein. Generally, a regular formula is used after the transplant.

ESPEN 2020 Guidelines

Liver Transplantation (LTx), Surgery-pre-operative phase and post-operative

phase screening, assessment and general care

- Liver cirrhosis patients scheduled for elective surgery or listed for transplantation should be screened and assisted for malnutrition timely in order to treat malnutrition prior to surgery, and thereby improve the body's potential state
- In the immediate peri-operative period, liver cirrhosis patients should be managed according to the ERAS approach in order to prevent unnecessary starvation

Emergency requirement

- Pre-operatively, a total energy intake of 30 to 35 kcal·kg⁻¹·d⁻¹ (126-147 kcal·kg⁻¹·d⁻¹) and protein intake of 1.2 to 1.5 g·kg⁻¹·d⁻¹ should be aimed for. These ranges cover recommended intake depending on treatment goals, that is maintenance or improvement of nutritional status,
- Obese patients can be given EN and/or PN with the target energy intake of 25 kcal·kg⁻¹ IBW·d⁻¹
- In overweight/obese NASH patients scheduled for elective surgery nutrition management should proceed as recommended for NASH

BCAA and other specialised regimes:

- In adults, for pre-operative nutrition standards nutrition regimens shall be used, since specialised regimens (e.g., BCAA-enriched, immune-enhancing diets) but not superior to standard regimens regarding morbidity or mortality
- In children awaiting transplantation, BCAA-enriched formula should be used in order to improve body cell mass
- No recommendations can be made regarding donor or organ conditioning by use of a specific nutrition regimen, such as I.V. glutamine or arginine, with the objective of minimising ischemia/reperfusion damage

For kidney transplants, it is recommended to provide a protein intake of 1 to 1.5 grams per kg of body weight, which can later be reduced to 1 gram. It is important to follow the paediatric guidelines set by ICMR or WHO and take into account the stress factor when determining calorie and protein requirements. It's crucial to consider the interaction between drugs and nutrition. The patient should be informed about any suppressant drugs they are taking, including their potential side effects and any recent developments, such as an increased appetite. Additionally, carbohydrates and fats can increase triglycerides and blood sugar levels. Some kidney and heart transplant patients may experience weight gain 6 to 7 months post-surgery, but this is not advised for transplant patients.



Nutritional requirement for Pediatrics

Requirements/kg/day - Pediatric patients

Age (years)	Energy (Kcal)	Protein (gms)	Carbohydrates(gms)	Fats
Neonate	100-150	2.5-10	15-20	3
<1	100-120	2.0-2.5	12-15	3
1-6	75-90	1.5-2.0	9-12	2-3
7-12	60-75	1.0-1.5	7-9	3

CONDITION	STRESS FACTOR
Mild starvation	0.85-1.00
Post-operative state	1.00-1.05
Cancer	1.10-1.45
Peritonitis and sepsis	1.05-1.25
Multi trauma, burns	1.20-1.55

Energy expended = 1.35 × stress factor

Suppressants drugs and nutrition

DRUG	COMMON SIDE EFFECTS	DIET RESTRICTIONS
Prednisolone	Increased appetite weight gain, high BP, gastric irritation, hyperglycemia, osteoporosis and cataract	Low carbohydrates, low cholesterol, low sodium, Vitamin A, high calcium and phosphorus diet
Cyclosporine	Kidney damage, high BP, tremor, hyperglycemia, gum problems	Low carbohydrates, low sodium, Vitamin E and C rich diet
Azathioprine	Bone marrow suppression, increased risk of infection	Neutropenic diet- no fresh foods
MMF	Abdominal pain, vomiting diarrhoea	Small frequent meals
Tacrolimus	Kidney damage, high BP, hyperglycemia	Low carbohydrates, low sodium, Vitamin E and C rich diet
Sirelimus/everolimus	Increased cholesterol, joint pain, low blood cell count, high BP, diarrhoea	Low sodium, no cholesterol, high calcium & Phosphorus diet

Food Safety

It's crucial for transplant patients to adhere to food safety measures as they take immunosuppressants, which weakens their immune system's ability to fight off infections. If proper food safety guidelines are not followed, food could cause infections. Healthcare providers should educate the patient not just on nutritional care but also on food handling practices before they are discharged from the hospital. This education should include information on how to purchase, clean, store, and cook food safely.

Eating Out

You can eat out, but beware of:



Salads and Cold Deli Sandwiches

The food could have been sitting out too long and the vegetables might not be washed properly.



Raw and Undercooked Foods

No medium rare steak or sushi. Also, dressing made with raw eggs, like Caesar salad dressing, is high risk.



Wine and Cocktails

If unsure about a food, ask!

Handling and Food Prep

Four steps to follow:



Clean



Separate



Cook



Chill



Think like a detective:

How Could the food be contaminated or dirty?

Thoroughly wash hands and surfaces often, using paper towels rather than cloth towels for drying.

Thoroughly wash fresh fruits and vegetables with a mixture of water and vinegar or lemon juice.

Summary

Conducting an accurate preoperative nutritional assessment is crucial in ensuring a smooth post-transplant recovery process. Utilise all available resources to determine body composition. Preoperative nutrition therapy is vital for the success of the transplant. Providing the patient with preoperative oral nutrition supplements or enteral nutrition is beneficial. It's important to educate the patient about drug-nutrient interactions and to emphasise the importance of food safety and hygiene to prevent foodborne illnesses during the recovery phase. Regular monitoring of the patient's condition is of utmost importance.

Q. Is there any particular quality of life for an organ-specific transplant?

Ans. It's not a one-size-fits-all answer. The outcome varies depending on the type of transplant the patient underwent, whether it be a heart transplant, kidney transplant, or lung transplant. Patients who undergo kidney or heart transplants generally have a better quality of life compared to those who underwent lung transplants, which take longer to recover and require more restrictions. It's important to educate patients on the transplant process and nutrition as this can lead to improved quality of life. This can be achieved through nutritional counselling and physiotherapy. Patients may also benefit from connecting with social workers or psychologists. There is no specific questionnaire, but better nutrition results in a better quality of life for transplant patients.

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The picky eating Tot in your Op: How to manage



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These days, children are the focus of promoting good nutrition. The impact that comes from focusing on children versus adults is different. When a child refuses food, they are often labelled as being "picky." However, it is important to understand the reasons behind this and what being picky truly signifies. The distinction between picky eating and other eating behaviours is often unclear, and there is no universally accepted method of identification. There is a lack of consensus among researchers as to which tool should be used to determine picky eating, with different questionnaires having been proposed by different experts.

These questionnaires are freely available on the internet. Some of the questionnaires are:

- Children's eating behaviour questionnaire
- Child feeding questionnaire
- Lifestyle behaviour questionnaire
- Stanford feeding questionnaire
- Preschooler feeding questionnaire

It is uncertain whether these questionnaires are utilised in India to identify picky eating behaviour. Typically, healthcare providers communicate with both the child and the parents. At around 2 or 3 years of age, children start to observe and analyse things in their environment and form their feeding habits. It is crucial to comprehend this pattern and have discussions with the child. While many parents seek the help of a nutritionist to address their child's picky eating habits, they often do not bring the child along to the appointment.

Picky eating should not be confused with Avoidant Restrictive Food Intake Disorder (ARFID), which has a precise definition and is listed in the Diagnostic and Statistical Manual of Mental Disorders. This includes:

- Presence of nutritional deficiency
- Failure to gain weight
- The decline in psychological function
- Dependency on supplements

Picky eating habits often resolve as a child grows into adulthood, but if left unresolved during childhood, it can lead to serious eating disorders in the future.

There was a study conducted in Hyderabad, India. It said, out of 1600 children that were screened, around 60% of them had picky behaviour. The prevalence increased with age and their mean height and weight were lower as compared to their non-picky behaviour counterparts. This is the only study focused on the Indian population.

There is one more very interesting study but this is not conducted in India. The study suggests predictors of picky eating:

- Feeding difficulties and late introduction of lumpy food (>9 months). This delay makes a child picky eater as he reaches the age of 38 months.
- The strongest predictor was 56% of the child being choosy at 15 months old.
- If the mother was not worried, only 17% went to be picky eaters at 38 months.
- Raise to 50% if the mother was worried by this choosiness
- Providing readily prepared food predicted later picky eating





Pathogenesis of picky eating

The Supertaster theory suggests that the capacity to taste sweetness and bitterness may be linked to the number of taste buds on a person's tongue, with 25% of people having more taste buds and being considered "supertasters." Supertasters are more sensitive to bitterness due to their increased number of taste buds, leading them to avoid bitter foods. This tendency may develop at a young age, but there is limited research on the adult population. It is possible that as a child grows, their sensitivity to bitterness decreases. Only 25% of the population are considered supertasters.

A slower rate of growth during toddlerhood may be a contributing factor to picky eating behaviour. Additionally, there may be underlying physiological conditions that trigger such behaviour.

Emotional state and mood swings can also play a role in picky eating. While it is often thought that only adults experience mood swings and emotional states, children can also go through these fluctuations. Adults may either binge eat or eat too little, but children do not exhibit this pattern and instead may not eat anything at all.

Parental influence is a significant factor in the development of picky eating behaviour. If parents themselves display picky eating habits, either from their childhood or adulthood, and exhibit these behaviours during meals or other times in front of their children, the child is likely to imitate and adopt such habits.

Neophobia and slow adaptation are factors in the development of picky eating in children. Some children display neophobia and slow adaptation when they are introduced to new food groups at a later age. When parents mix everything in a bowl, the child may not know what they are eating, such as rice, lentils, or vegetables. This lack of exposure is thought to contribute to neophobia. The pace of adaptation to new foods varies from child to child and cannot be expected to be the same for all children due to individual differences.

Children may take more time to adjust to certain foods. Some children may not like spices, while others may have trouble swallowing or chewing food, and these factors can impact their behaviour towards food. It's important to take into account these factors before concluding that the child dislikes the taste of the food.

- Both genetics and environment can play a role in picky eating. As with other eating disorders, picky eating can have a genetic predisposition, which cannot be avoided. Newborns can inherit traits related to picky eating from their family, particularly if their parents or grandparents exhibit such behaviour.

Consequences of picky eating

There are potential factors that may lead to negative health and well-being outcomes including being underweight, deficiencies in nutrition, frequent constipation, the likelihood of being underweight during adolescence, the development of an eating disorder, or becoming a picky eater as an adult.

- Lower or higher intake of energy
- Lower or higher intake of proteins
- Lower intake of vegetables and fruits (fibre)
- Low intake of zinc and iron
- Poor diet diversity

Nutrition Screening and Assessment

- Paediatric SGA forms
- Growth charts
- Height and weight tables

These are the easier tools and also give reliable results. Weight and height are the best indicators for understanding the growth of children.

Estimating nutrient requirements

Energy requirements

- Holiday and Segar formula
- 10kg - 100 kcal/kg
- 10 to 20 kg - 1000 kcal + 50kg for each kg above 10kg
- >20kg - 1500 kcal + 20 kg for each kg above 20 kg
- Bedside calculation

For one-year 1000, and each completed year 100 KCl is added till puberty.

It is important to note that the Recommended Dietary Allowance (RDA) provides a general estimate of nutrient needs for the population and does not give specific recommendations for individuals. For energy needs, the Harris-Benedict formula is often used for bedside calculations. However, the RDA can be used to estimate protein and other micronutrient requirements.



Height and weight - indicators of growth

Boys

Age	Weight in kg	Height in cm
1 year	10,6	80.1
2 years	12.5	90.0
3 years	14.8	98.4
4 years	16.1	104.7
5 years	19.3	113,5
6 years	22.1	118.9
7 years	24.5	123.3

Girls

Age	Weight in kg	Height in cm
1 year	9,98	78.1
2 years	11.7	87.9
3 years	13.8	96.2
4 years	15.9	104.2
5 years	18.7	112.2
6 years	21.6	117.7
7 years	24.5	122.7

Instead of using weight for age as an indicator, weight for height is often used as a better estimate when evaluating the growth of children, especially those who are taller for their age. This measurement provides a better understanding of the child's catch-up growth needs.

Estimating catch-up growth requirements:

- Energy requirement
- RDA for energy \times ideal weight/ age (kg)
- Actual weight (kg)

- Protein requirement
- RDA for protein \times ideal weight (kg)
- Actual weight (kg)

Having a malnutrition diagnosis means that the healthcare provider can use these equations to determine the target for catch-up growth and plan a diet accordingly. These equations provide a straightforward method for estimating the necessary nutritional requirements for the child.

Weight and height of the children

Age	Weight in kg	Height in cm
Birth	3	50
3/12	5	60
6/12	7	66
9/12	9	71
1	10	75
2	12	87
3	14	94
4	16	100
5	18	106
6	20	112
7	23	118
8	26	124
9	29	130
10	32	136
11	35	142
12	38	150



Suggestions

It's important to have realistic expectations when it comes to the portion size of a child's meal. For kids between 2 to 3 years of age, an appropriate serving size is roughly half of what an adult would typically eat.

- Repeated exposure to foods - It's important to understand that it may take up to 15 positive experiences with food to help a child overcome picky eating behaviour. To help motivate the child, try to create an environment where they can learn about the importance of food. This can be done by taking them grocery shopping or to the vegetable market and allowing them to select and pick their food. These small measures can help increase their interest in and enjoyment of food.
- Non-food rewards to provide motivation - There are parents who give their children expensive gifts like PlayStation etc. as rewards but a simple pat on their back or a tight hug should be enough to let them know what they have done as far as the completion of a meal is concerned.

- Counselling and encouraging children to cook positive approach
- Avoid negativity and pressure to eat - a child was forced to eat by the grandparents and the parents. The child now refused to eat anything at all.
- Parental modelling of eating fruits and vegetables
- Trying unfamiliar foods
- Showing good health videos to the child
- Kitchen gardens in the schools or at the community level
- Market day at school

It's important to keep in mind that picky eating is a common and often temporary phase in childhood, and with proper care and guidance, it can be resolved. With patience and support, children can learn to enjoy a variety of foods and develop healthy eating habits, reducing the risk of developing an eating disorder later in life.

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LOW ARGININE IN GYRATE ATROPHY



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It's fascinating to know that nutrition plays a role in eye disorders, and a dietitian can assist in either preventing or mitigating the progression of the disease. In this case, we'll explore how a low arginine diet can be beneficial for individuals with Gyrate Atrophy.

What is Gyrate Atrophy?

- Gyrate Atrophy is a rare inherited disease of the eye's retina and choroid, characterised by nearsightedness, cataracts and progressive loss of vision
- Genetic defects impair important metabolic pathways and cause the toxic accumulation of certain metabolites, which can damage the retina and choroid plexus.
- Extreme nearsightedness is common
- The retina deteriorates from the periphery to the centre causing a progressive narrowing of the field of vision (tunnel vision).

Progression of the disease

- During childhood, they begin experiencing near-sightedness (myopia), difficulty seeing in low light (night blindness), and loss of side (peripheral) vision
- As time progress, their field of vision continues to narrow, (tunnel vision)
- Many people with Gyrate Atrophy also suffer from clouding of the lens of their eyes (cataracts). These progressive vision changes lead to blindness by about the age of 50 - as there is some amount of vision, the condition is either undiagnosed or underdiagnosed. The patient does not get any treatment as there is no medical intervention.

Deficiency of OKT

- The basic biochemical defect is a deficiency of the mitochondrial enzyme ornithine ketoacid transaminase (OKT), which converts ornithine to glutamic- γ -semialdehyde
- Resulting in the accumulation of ornithine and progressive chorioretinal degeneration of unknown Pathogenesis.

Symptoms of visual equity

- Most people with this condition show no symptoms at all apart from vision loss, but some people show additional features of the disorder
- Occasionally, newborns with gyrate atrophy develop excess ammonia in the blood (hyperammonemia), which may lead to poor feeding, vomiting, seizures, or coma
- In a few cases, mild to moderate intellectual disability is also associated with this condition. Gyrate Atrophy may also cause disturbances in the nerves connecting your brain and spinal cord to your muscles and sensory cells (peripheral nervous system)
- The slowly progressive irreversible loss of vision from retinal degeneration often leads to complete blindness, usually by the fourth or fifth decade of life

Screening

- Screening for carrier status and diagnosis of a genetic condition is only possible through genetic testing. If similar symptoms are noticed in another sibling, early screening should be done for the younger child.
- Through DNA testing the exact underlying genetic defect can be identified.





Role of Ornithine and Arginine

- The most common method of reducing the buildup of ornithine is by reducing the intake of its source, arginine, through a low-arginine diet.

Treatment

There is no pharmaceutical treatment available to halt the progression of the disorder, making dietary restrictions the only form of treatment. Early intervention through dietary restrictions can slow the progression of the disease and potentially preserve some vision.

- It has been demonstrated that a diet that is low in protein and specifically restricts the intake of arginine can slow down the decline in function as demonstrated by changes in the visual field.
- Ornithine is not present in proteins as an amino acid and is instead generated from Arginine in humans. This is why we cannot identify foods that are high in Ornithine, instead, we need to identify foods that contain high levels of Arginine.
- It has been observed that some patients experience a decrease in their Ornithine levels after taking large doses of Vitamin B6. Vitamin B6 serves as the precursor to pyridoxal phosphate.
- Increasing Lysine intake is also suggested as a potential remedy, however, it is not a guaranteed treatment. Lysine supplementation may be recommended for certain individuals.

Therefore, the only form of therapy is a low Arginine diet.

Food rich in arginine

- Nuts -walnut, peanut, pistachio, ground nut, cashew nut, raisins
- Seeds - sunflower seeds
- Gelatin
- Chocolate, cheese, coconut, oats
- Whole wheat and its products
- Soybeans
- Wheat germ

CASE STUDY

- 2 year Follow up of Gyrate Atrophy
- Two male siblings were diagnosed with gyrate atrophy of the choroid with high myopia.

Subject

- Case of two male siblings with partial blindness identified by the parents at the age of 2
- History of the visual deficit since early childhood, born of consanguineous marriage - attributed to a genetic defect
- Age - 16 years - P
17 years - V

The father observed that the children had trouble accurately locating the ball while they were playing with it. They would sometimes lean slightly to the right or left when trying to pick it up. The father took the children to see several ophthalmologists, but they were diagnosed with gyrate and informed that there was limited treatment available. The parents were then referred to a specialist in inborn errors, but they did not pursue further evaluation.

An ophthalmologist recommended a low-protein diet for the parents of the children. However, the doctor did not provide any additional information and referral to dietitians was rare at that time (16-17 years ago). The parents did not adhere to this advice as they believed that there was no cure for their children's condition.

Case relooked after 15 years

- The case was relooked up when parents were looking for a partial blindness certificate in 2012 for children's education.
- The ophthalmologist sent for Plasma amino acid profile in addition to an eye checkup and re-referred to a dietitian in 2012.

Plasma Amino Acid HPLC

- **Sibling P** showed a 7-fold elevation of ornithine, a 6-fold elevation of hydroxyproline, and a 3-fold elevation of tryptophan
- **Sibling V** showed a 9-fold elevation of ornithine, 5-fold, elevation of hydroxyproline, and 3-fold elevation of tryptophan

This profile was very useful as it isn't routinely done in the labs and one needs genetic labs to perform a Plasma Amino Acid profile.

Plasma Amino Acid Profile - 2012

Amino acid	Values for Sibling P	Values for Sibling V	Normal range
Hydroxyproline	200	250	0-53Umols/l
Arginine	97	120	10-90
Tryptophane	170	200	10-140
Ornithine	700	900	48-195
Lysine	108	120	0-39

The parents were sent to the inborn error specialist.

Treatment

Both the ophthalmologist and the inborn error specialist recommended a low arginine diet. The inborn error specialist prescribed:

- A trial of daily supplementation with 100mg of pyridoxine
- Lysine supplementation, which may be beneficial, and a follow-up of plasma amino acid profile and visual acuity tests after 6 months.

Diet Plan: Diet Recall

- Breakfast - Idli/dosa/chappati/poor with coconut and peanut chutney
- Mid-morning - Chips/kurkure
- Lunch - Rice, dal, vegetable, curd, rasam
- Evening - Mirchi/rava laddoo/payasam/biscuits/noodles/Maggi
- Dinner - Similar to lunch

The doctors do not want the child to eat much wheat but that was what he was eating.

Diet Advised

- Breakfast - Idli/dosa/uttapam with dal or vegetable chutney
- Mid-morning - Fruits
- Lunch - Rice, dal, vegetables, curd
- Evening - Rice Flakes chivda/puffed rice/popcorn, etc
- Dinner - Same as lunch

Follow Up

- The patient was asked to follow up after 6 months
- But the patient came back after 1 year without a new amino acid profile. Diet was re-emphasized to the patient directly
- A review of the acid profile and visual check-up was ordered

Sibling P

- Follow-up was done in 2014
- Follow the diet and supplementation advised
- So, beautiful reduction in the ornithine, arginine, hydroxyproline and tryptophan levels
- Visual activity improved from 20/600 to 20/320 and parents had a perception that vision has improved

Amino Acid Profile - Sibling P

Amino acids	Value - 2012	Value - 2014	Normal range
Hydroxyproline	200	14	0-53Umols/l
Arginine	97	62	10-90
Tryptophan	170	32	10-140
Ornithine	700	245	48-195
Lysine	108	109	0-39

Out of the two children, one followed the recommended dietary plan while the other did not. As a result, the child who followed the diet showed a significant decrease in their methionine values, from 900 to 245. However, the other child's methionine values remained unchanged at 700.

Sibling V

The effect of following a nutritional plan is evident as sibling V did not adhere to the recommended diet or take the prescribed medications.

Amino Acid Profile - Sibling V

Amino acid	Values- 2012	Values- 2014	Normal range
Hydroxyproline	250	42	0-53Umols/l
Arginine	120	150	10-90
Tryptophan	200	24	10-140
Ornithine	900	1020	48-195
Lysine	120	180	0-39

It was observed that Ornithine increased the values from 900 to 1020 because this child did not follow the prescribed diet and medications.

For sibling P who followed a low arginine diet, the vision equity after 2 years came down from 20/600 to 20/320.

For sibling V who did not follow a low arginine diet, the vision equity went up from 20/600/ to 20/800.

There's not much of a difference but this marginal difference can also prevent further deterioration of the child's vision. So proper follow-up with the ophthalmologist, and dietitian inborn error specialist is a must.

Conclusion

The only way to stop the decline of vision is through dietary intervention, which needs to be more widely prescribed and understood by eye care specialists, experts in genetic disorders, and clinical nutritionists.

Q. Were those children prescribed any low arginine supplements?

Ans. No, as they did not have any difficulty eating normal food. So, only high-arginine food products were taken out of their diet.

Exploring Opportunities in Dietetics and Nutritional Science

For some individuals, finding their career path is not a straightforward journey. It's normal to feel unsure even after completing your education. After graduation and post-graduation, you can choose to work in dietetics, research, or teaching. Additionally, you can combine being a dietitian with research. If you enjoy working with numbers, there are opportunities for data collection in this field. There is a strong connection between numbers and nutrition as all evidence in studies is derived from numerical data.

Once you have completed your PhD or Master's degree, you can work for international organisations such as UNICEF or WHO, or any non-profit organisation worldwide. You also have the option to work in wet labs, conducting studies on topics such as iron deficiency in animals. Some students opt for cell culture studies, while others work in dry labs. Nutrition students also gather data passively and participate in randomised controlled trials (RCTs), which require a unique skill set. Additionally, you can work in public health, but it is important to choose a field that brings you fulfilment.

The research conducted by nutritionists forms the basis for public health dietary guidelines. You can also work in community nutrition programs, such as a program in Bathinda, Punjab that aims to reduce non-communicable diseases.

For some, it may take time to discover their passion, but it is important to never settle and follow your true calling, even if it means switching careers. There are numerous career opportunities in industries and working with profit boards, as well as the possibility of starting your research foundation.


Universities also offer various openings, allowing you to be both a researcher and a teacher, where learning and personal growth are constant and you have the opportunity to shape the future by training the next generation of researchers.



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A magnifying glass with a dark frame is positioned over the words 'HEALTH' and 'WEALTH'. The word 'HEALTH' is in a light blue color, and 'WEALTH' is in a darker blue color. The magnifying glass is held by a hand in a dark suit sleeve. A pen is visible in the top right corner.

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WEALTH

**"IT IS HEALTH THAT IS REAL
WEALTH AND NOT PIECES
OF GOLD AND SILVER."**

MAHATMA GANDHI



PROJECT



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